California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

Thursday, October 20, 2011
and
Friday, October 21, 2011

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814
http://www.calepa.ca.gov/EPAbldg/location.htm

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
(This facility is accessible to persons with disabilities.)

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO: http://www.arb.ca.gov/lispub/comm/bclist.php

October 20, 2011
9:00 a.m.
(Spanish Interpretation Services Available October 20 Only)

DISCUSSION ITEMS:
Note: The following agenda items may be heard in a different order at the Board meeting.

Agenda Item #

11-8-1: Public Hearing to Consider Adoption of the Proposed California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Including Compliance Offset Protocols

Staff will recommend that the Board take final action to adopt the proposed cap-and-trade regulation. The regulation was first presented to the Board at a public hearing held on December 16, 2010, at which the Board directed staff to make a number of modifications to the proposed regulation. The modified cap-and-trade regulation, which includes four compliance protocols, is now being brought back to the Board for final action. As part of this action, staff is also recommending, pursuant to the California Environmental Quality Act, that the Board approve staff's written responses to public comments received on the environmental analysis for the proposed regulation, and approve a proposed *Adaptive Management Plan for the Cap-and-Trade Regulation*.

11-8-2: Public Hearing to Consider Proposed Amendments to the AB 32 Cost of Implementation Fee Regulation

Staff will present to the Board proposed amendments to ARB's existing AB 32 Cost of Implementation Fee Regulation. The proposed amendments clarify requirements and regulatory language and revise definitions to conform with recently proposed amendments to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions.

October 21, 2011
8:30 a.m.

Agenda Item #

11-8-3: Public Meeting to Update the Board on Mandatory Commercial Waste Recycling

ARB staff, in coordination with CalRecycle staff, will present to the Board an informational update on Assembly Bill (AB) 341, which was recently signed by the Governor. Because AB 341 is consistent with the requirements of a proposed regulation that was originally scheduled to be considered by the Board at this meeting (the *Proposed Regulation to Reduce Greenhouse Gas Emissions by Requiring Mandatory Commercial Waste Recycling*), staff believes the proposed regulation is no longer needed and will not be presenting it to the Board for consideration. Staff from both agencies will instead present this informational update.

11-8-4: Public Hearing to Consider Proposed Amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate

Staff will present to the Board proposed amendments to the TRU Airborne Toxic Control Measure. The proposed amendments are designed to improve compliance rates and enforceability, restore competitive fairness, and clarify existing requirements.

11-8-5: Public Hearing to Consider 2011 Amendments to the California Reformulated Gasoline Regulations

Staff will present to the Board proposed amendments to the California Reformulated Gasoline Regulations. The proposed amendments correct drafting errors in the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," delete outdated regulatory provisions, amend the notification requirements for test-certified alternative gasoline formulations, and amend the restrictions on blending CARBOB with other liquids. Amendments are also being proposed to increase the flexibility, enforceability, and consistency of the regulations.

CLOSED SESSION – LITIGATION

The Board will hold a closed session, as authorized by Government Code section 11126(e), to confer with, and receive advice from, its legal counsel regarding the following pending or potential litigation:

Pacific Merchant Shipping Association v. Goldstene, U.S. District Court (E.D. Cal. Sacramento), Case No. 2:09-CV-01151-MCE-EFB.

POET, LLC, et al. v. Goldstene, et al., Superior Court of California (Fresno County), Case No. 09CECG04850.

Rocky Mountain Farmers Union, et al. v. Goldstene, U.S. District Court (E.D. Cal. Fresno), Case No. 1:09-CV-02234-LJO-DLB.

National Petrochemical & Refiners Association, et al. v. Goldstene, et al., U.S. District Court (E.D. Cal. Fresno) Case No. 1:10-CV-00163-AWI-GSA.

Association of Irritated Residents, et al. v. California Air Resources Board, Superior Court of California (San Francisco County), Case No. CPF-09-509562.

Association of Irritated Residents, et al. v. U.S. E.P.A., 2011 WL 310357 (C.A.9), (Feb. 2, 2011).

California Dump Truck Owners Association v. California Air Resources Board, U.S. District Court (E.D. Cal. Sacramento) Case No. 2:11-CV-00384-MCE-GGH.

Engine Manufacturers Association v. California Air Resources Board, Sacramento Superior Court, Case No. 34-2010-00082774.

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

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ONLINE SIGN-UP:

You can sign up online in advance to speak at the Board meeting when you submit an electronic Board item comment. For more information go to:

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IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CLERK OF THE BOARD:
OFFICE: (916) 322-5594
1001 I Street, Floor 23, Sacramento, California 95814
ARB Homepage: www.arb.ca.gov

SPECIAL ACCOMMODATION REQUEST

Special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia.
- Documentos disponibles en un formato alterno u otro idioma;
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:
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Byron Sher Auditorium, Second Floor
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October 21, 2011

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO THE AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider the adoption of amendments to the regulation affecting transport refrigeration units (TRU) and TRU generator sets (TRU gen set) (collectively, TRUs and TRU gen sets shall be referred to as TRUs).[1] The proposed amendments would primarily provide model year (MY) 2001 through 2003 TRU engines that complied with applicable Low Emission TRU (LETRU) in-use performance standards by specified time periods, a one or two year extension from the more stringent Ultra-Low Emission TRU (ULETRU) in-use performance standards. This extension would serve to restore competitive fairness to those businesses that elected to comply with the regulation during 2008 through 2010, although other businesses opted to defer their compliance efforts in light of the U.S. EPA's delay in issuing ARB an authorization to enforce the regulation. The proposed amendments would also clarify manual recordkeeping requirements for electric standby-equipped TRUs, and ultimately require automated electronic tracking system requirements for such TRUs, establish requirements for businesses that arrange, hire, contract, or dispatch the transport of goods in TRU-equipped trucks, trailers or containers (i.e., brokers, shippers or receivers), and clarify issues that were identified during the implementation of the regulation.

DATE:	October 20, 2011
TIME:	9:00 a.m.
PLACE:	California Environmental Protection Agency Air Resources Board Byron Sher Auditorium 1001 I Street Sacramento, California 95814

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., on Thursday, October 20, 2011, and may continue at 8:30 a.m., Friday, October 21, 2011. This item may not be considered until Friday, October 21, 2011. Please consult the agenda for the meeting, which will be available at least ten days before October 20, 2011, to determine the day on which this item will be considered.

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[1] Title 13, CCR section 2477 is known as the Transport Refrigeration Unit Airborne Toxic Control Measure and establishes in-use performance standards, recordkeeping, and facility reporting requirements for TRUs and TRU generator sets.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendment of section 2477 and adoption of sections 2477.1, 2477.2, 2477.3, 2477.4, 2477.5, 2477.6, 2477.7, 2477.8, 2477.9, 2477.10, 2477.11, 2477.12, 2477.13, 2477.14, 2477.15, 2477.16, 2477.17, 2477.18, 2477.19, 2477.20, and 2477.21, California Code of Regulations (CCR), title 13, Division 3, Chapter 9, Article 8.

Background: Over 90 percent of Californians breathe unhealthful air at times. To improve air quality and human health, ARB establishes requirements to reduce emissions from new and in-use on-road and off-road vehicles, engines, and other sources.

The California Toxic Air Contaminant Identification and Control Program, established under California law by Assembly Bill 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code (H&S Code) sections 39650-39675, requires ARB to identify and control air toxicants in California. In 1998, the Board identified particulate matter (PM) emissions from diesel-fueled engines as a toxic air contaminant (TAC). Two years later, in September 2000, the Board adopted the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel Risk Reduction Plan (RRP)). The Diesel RRP established a goal of reducing emissions and the resultant health risk from virtually all diesel-fueled engines and vehicles within the State of California by the year 2020, and included the goal of reducing diesel PM by 85 percent in 2020 from the baseline emissions in 2000. The Diesel RRP also identified various control measures for achieving the goals. These measures included new, more stringent standards for all new diesel-fueled engines and vehicles, the replacement of older in-use engines with new, cleaner engines, the use of diesel emission control strategies on in-use engines, and the use of low-sulfur and alternative diesel fuels.

TRU diesel engines currently (2011) emit approximately 1.4 tons per day of diesel PM. Staff determined that there are situations where the public's estimated 70-year potential cancer risk resulting from exposure to diesel PM emissions from TRUs is in excess of a 100 in a million, because of the high cancer-causing potential of diesel PM and the potential for large numbers of TRUs to operate at one location, such as distribution centers located near residential areas.

On May 16, 2002, the Board approved the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (title 13 CCR, sections 2700-2710). This regulation establishes procedures for the verification of diesel emission control strategies by ARB that can be utilized in various diesel-fueled engines, including those in TRUs, to significantly reduce diesel PM emissions.

Health and Safety Code (H&S Code) sections 39666 and 39667 require ARB to adopt regulations to achieve the maximum possible reduction in public exposure to TACs through the application of best available control technology (BACT), or a more effective control method, in consideration of cost, risk, environmental impacts, and other specified factors.

The TRU ATCM is part of ARB's ongoing effort to reduce PM emissions from diesel-fueled engines and vehicles, and to improve air quality. ARB adopted the TRU Airborne Toxic Control Measure (ATCM) in 2004. The TRU ATCM established in-use performance standards for TRUs and TRU gen sets that were to be phased in commencing on December 31, 2008. In March 2005, ARB requested that the U.S. Environmental Protection Agency (U.S. EPA) grant ARB authorization to adopt and enforce the TRU ATCM pursuant to Clean Air Act (CAA) section 209(e)(2); U.S. EPA granted California such authorization on January 16, 2009. However, because U.S. EPA's authorization was granted after the first compliance date specified in the TRU ATCM, ARB delayed the enforcement of the TRU ATCM's in-use performance standards until January 2010.

On February 2, 2011, the Board adopted amendments to the TRU ATCM that provided owners of MY 2003 TRU engines in the 25 horsepower (hp) and greater category, and of MY 2003 and MY 2004 engines in the less than 25 hp category, the option to meet the less stringent Low-Emission TRU (LETRU) in-use performance standard in lieu of complying with the otherwise applicable Ultra-Low-Emission TRU (ULETRU) in-use performance standard. The Board also adopted amendments to clarify that "flexibility" engines installed in TRUs by original equipment manufacturers before the effective date of those amendments under either the federal Transitional Program for Equipment Manufacturers or California's equipment manufacturer flexibility program (title 13 CCR, section 2423(d)), would be provided seven years of operational life, and that flexibility engines installed after that date would be subject to shorter operational lives under the amendments. Finally, the amendments established new reporting requirements on TRU original equipment manufacturers.

<u>Description of the Proposed Regulatory Action</u>:
ARB staff is proposing to amend the TRU ATCM to primarily provide model year (MY) 2001 through 2003 TRU engines that complied with applicable LETRU in-use performance standards by specified time periods, a one- or two-year extension from the more stringent ULETRU in-use performance standards. The proposed amendments would also clarify manual recordkeeping requirements for electric standby-equipped TRUs, and ultimately require automated electronic tracking system requirements for such TRUs; establish requirements for businesses that arrange, hire, contract, or dispatch the transport of goods in TRU-equipped trucks, trailers or containers (i.e., brokers, shippers, or receivers); and clarify issues that were identified during the implementation of the regulation. A more detailed description of the proposed amendments is presented below.

Applicability

The proposed amendments would apply to owners of MY 2001, 2002, and 2003 and older TRU engines that met the LETRU in-use standards by their originally-specified compliance dates. Freight brokers and forwarders, shippers, and receivers would be affected by the proposed amendments if they arrange the transport of perishable goods on California highways with refrigerated carriers. The amendments would also affect owners of TRUs that are equipped with electric standby, and TRU original equipment manufacturers, dealers, repair shops, lessors and lessees, and engine rebuilders.

Extend ULETRU Compliance Date for MY 2001 and Older TRU Engines That Complied With the LETRU In-Use Performance Standard by December 31, 2008

This proposed amendment would extend the ULETRU compliance date by one year for those MY 2001 and older TRU engines that complied with the LETRU in-use standard by December 31, 2008. This proposed amendment would serve to restore competitive fairness to those businesses that elected to comply with the original TRU regulation during 2008 through 2010, although other businesses opted to defer their compliance efforts given their uncertainty resulting from U.S. EPA's delay in issuing ARB an authorization to enforce the regulation. This proposed amendment would accordingly extend the current ULETRU compliance deadline for qualifying TRU engines from December 31, 2015, until December 31, 2016.

Extend ULETRU Compliance Deadline for MY 2003 and Older TRU Engines That Complied With the LETRU In-Use Performance Standard by December 31, 2009 or December 31, 2010

At the Board's November 18, 2010 public hearing to consider the 2010 amendments to the TRU ATCM, the Board directed staff to evaluate industry's request that the current seven-year operational life for TRUs be extended up to three additional years. Industry's request would therefore extend the ULETRU compliance dates for MY 2004 and newer model TRU engines by up to three years. Staff evaluated the public health risk near distribution centers using updated TRU engine activity information and the current U.S. EPA-sanctioned air dispersion model, and determined that the public health risk at the current seven-year operational life for TRUs still results in potential cancer risk levels of concern in communities near facilities where TRUs congregate. Extending the operational life of TRUs would only increase these risks. Accordingly, staff is not recommending that the current operational life for MY 2004 and newer TRU engines be extended.

However, staff is proposing to extend the ULETRU compliance date by one year for MY 2003 and older TRU engines that complied with the LETRU in-use performance standard by specified dates (December 31, 2009 for MY 2001 and MY 2002 TRU engines; December 31, 2010 for MY 2003 TRU engines). This proposed amendment would operate in conjunction with the proposed amendment described immediately above, so that MY 2001 and older engines that complied with the LETRU standard by December 31, 2008 could qualify for a total of a two-year extension from the ULETRU standard compliance date. This proposed amendment would provide economic relief to owners who had to take action during the height of the recession. Furthermore, the proposed amendment would only have a minimal emissions impact since most of the affected in-use TRU engines would already be controlled to LETRU levels and the near-source public health risk impacts associated with those emissions would be minimal.

Clarify Operational and Recordkeeping Requirements, and Require Automated Electronic Recordkeeping of Hybrid Electric, Electric-Standby (E/S) Equipped, and Hybrid Cryogenic TRUs

The TRU ATCM currently allows TRU owners to utilize hybrid electric, hybrid cryogenic, and electric-standby (E/S) equipped TRUs as compliance options (Alternative Technology compliance option). This option applies if such TRUs are operated in a manner that eliminates diesel engine operations at the facilities where TRUs operate. When staff established the Alternative Technology compliance provision in the original TRU ATCM, it intended that owners using this option needed to document, via recordkeeping, that TRU engine operations at facilities were in fact eliminated. However, manual records submitted by owners have been incomplete and inconsistent. The proposed amendments would therefore specify the information required to be provided in manual records.

The proposed amendments clarify that Alternative Technology compliant TRUs are allowed to operate under diesel engine power from the time they enter the facility fence line or property line until they are parked, from a parking spot to the gate upon leaving the facility, and while being moved to and from loading docks to parking spots by yard hostlers. Engine run time within a facility fence line would be limited to no more than five minutes each time the unit moves within the facility fence line or property boundary.

The proposed amendments also clarify, that to qualify as an Alternative Technology, facilities in California where E/S-equipped TRUs are based must have electric power plugs located where TRU equipped trucks are parked for the initial van chill-down and while awaiting dispatch and at the loading spaces. These power plug requirements also apply to any nonretail facility in California where an E/S-equipped TRU truck picks up or delivers goods if the van load includes perishable goods. At retail delivery and pick-up points, including but not limited to restaurants, grocery stores, convenience stores, and cafeterias, TRU engine run time is allowed, but limited to no more than 30 minutes per delivery/pick-up point. Electric power plugs are required at retail delivery and pick-up points if more than 30 minutes of TRU engine run time is necessary. Finally, hybrid electric or E/S TRUs must be equipped with non-resettable hour meters that record both engine and shore-powered electric motor run time (separately). This will facilitate hour meter reading records that are required.

The proposed amendments phase-in electronic recordkeeping for hybrid electric and E/S TRUs. At least 50 percent of an owner's fleet of hybrid electric or E/S-equipped TRUs that have passed an in-use compliance deadline would need to be equipped with electronic tracking systems by December 31, 2012, and the remainder of those units would be equipped by December 31, 2013. In addition, 100 percent of an owner's hybrid electric or E/S-equipped TRUs that have a December 31, 2013 in-use compliance date would also have to meet the electronic tracking system requirement. Every year thereafter, all of hybrid electric or E/S-equipped units that are required to meet an in-use standard by the end of the year would be required to meet the electronic tracking system requirement. The electronic tracking systems must provide automated Global Positioning System (GPS) tracking, engine run time monitoring, recordkeeping and reporting. Staff believes that the use of automated tracking and reporting systems will result improve enforceability and labor savings that more than pay for the capital and operating costs of such systems.

The proposed amendments will require out-of-state owners that elect to use the Alternative Technology compliance option to register those TRUs in ARBER (in-state owners are already required to register all of their units).

Requirements That Freight Brokers and Forwarders, Shippers, and Receivers Ensure That the Carriers They Hire Use California-Compliant TRUs

This proposed amendment would require a business entity that arranges, hires, contracts for, or dispatches the transport of perishable goods in TRU-equipped trucks, trailers, shipping containers, or railcars to require the carriers they hire or contract with to only dispatch equipment with TRUs that comply with the TRU ATCM's in-use standards if they travel on California highways or railways. That business entity would also be required to provide the driver with their company contact information and a bill of lading that includes shipper, carrier, and receiver information. The driver, in turn would be required to provide this information to an ARB inspector, upon request.

Limited Exemption for Mobile Catering Service TRUs

This proposed amendment would provide a limited exemption to mobile catering companies for TRUs that are used during emergencies, such as TRUs on refrigerated trucks and trailers that are used to feed emergency responders, such as firefighters suppressing wildfires. The proposed exemption would allow qualifying mobile catering services to defer compliance with the in-use performance standards until January 2025.

Clarifying Requirements for Repowering a TRU With a New Replacement Engine or a Rebuilt Engine

The proposed amendments clarify that new or rebuilt replacement engines used to repower a TRU must meet more stringent emissions standards than the TRU's original engine, and are subject to the TRU ATCM's in-use standards that are based on the new or rebuilt replacement engine's model year or effective model year.

Current tier new replacement engines would use the engine model year shown on the engine emissions label to determine the in-use standard that must be met and the in-use compliance deadline. Prior-tier new replacement engines would use the effective model year of the engine, as defined, to determine the in-use standard that must be met and the in-use compliance deadline.

The proposed amendments would require rebuilt replacement engines to meet the requirements of a new section of the TRU ATCM (section 2477.16) that clarifies federal and State requirements applicable to TRU engines. The amendments also clarify that when a rebuilt engine meets a prior-tier new engine emissions standard, the effective model year is used, which is the last year that the tier standard was in effect. However, if a rebuilt engine meets a tier standard for new engines that is currently in effect, then the model year, for the purposes of the TRU ATCM would be the year that the engine was rebuilt. Section 2477.16 also includes supplemental label requirements that include the model year.

Clarifying TRU Dealer Requirements to Allow California Dealers to Acquire Non-compliant TRUs and to Transmit Registration Information to the Ultimate Purchaser

The proposed amendments allow dealers doing business in California to purchase, receive, or acquire and possess noncompliant TRUs in California under certain circumstances (e.g., to accept non-compliant trade-ins when TRU owners buy new or newer compliant TRUs).

The proposed amendments also require dealers that sell new units or replacement engines, whether new or rebuilt, to pass a registration information document to the ultimate purchaser at point of sale. The registration document would come with the new unit or new replacement engine from the TRU original equipment manufacturer (OEM), or from the rebuilt engine supplier. If a new replacement engine is not supplied with a registration information document, then the dealer must provide a registration information document, which would include all of the engine information needed to register the unit in ARBER.

Provide Extensions When Compliance Technology is Not Available or Based on Delays Due to Private Financing, Equipment Manufacture Delays, or Installer Delays

The proposed amendments would authorize the Executive Officer to grant up to an one-year extension of a compliance deadline if no compliance technology is available for a specific TRU or TRU gen set within six months of a compliance date, or a one-time extension, not to exceed four months, if financing, delivery, or installation is delayed. These amendments provide flexibility in addressing issues related to Verified Diesel Emissions Control Strategies (VDECS) and other compliance options which may not be fully available on the market immediately prior to a compliance date.

Clarify Exemptions for Obviously Non-Operational Equipment and Refrigeration Systems Not Powered by Integral Diesel Engines

The proposed amendments clarify that obviously non-operational TRUs and TRU gen sets are exempt from certain subsections of the TRU ATCM, and that transport refrigeration systems that are not driven by an integral diesel internal combustion engine are exempt from the TRU ATCM.

Clarify Prohibitions on Selling Non-compliant TRUs

The proposed amendments extend the prohibitions of selling non-compliant TRUs to any person selling such non-complaint units. Auctioneers and motor carriers are now expressly included in the section prohibiting persons from intentionally or negligently importing, delivering, purchasing, or otherwise acquiring non-compliant new or used TRU or TRU gen set engines. The proposed amendments also require a seller of a non-compliant unit to disclose to a potential buyer located outside of California that the unit is not compliant with the in-use requirements and cannot be legally operated in California. In addition, the proposed amendments also prohibit an owner of a TRU equipped with an Alternative Technology, such as electric standby, from selling it, without disclosing in writing that it must be used in a way that qualifies it as an Alternative Technology.

Clarify and Streamline Requirements for Lessors and Lessees

The proposed amendments would formalize policies that staff developed in conjunction with companies that lease or rent TRU-equipped trucks and trailers which streamline issues related to the ARBER registration requirements, Operator Reports, and the in-use standards.

Allow Use of Unit Manufacture Year Instead of Engine Model Year to Determine Compliance Requirements and Dates

The proposed amendments allow the year that a TRU was manufactured, instead of the TRU engine model year, to be used in determining the applicable in-use performance standards and the related compliance deadline, provided that the difference between the unit manufacture year and the engine model year is no more than one year. If the difference between the unit manufacture year and model year is greater than one year, the engine model year must be used to determine compliance dates. However, the engine model year must be used when determining VDECS compatibility and must also be entered into the space for engine model year when registering the TRU in ARBER.

Allow the Use of Unique Identification Numbers Instead of Affixing an ARB Identification Number (IDN)

The TRU ATCM currently requires owners of California-based TRUs to apply for ARB Identification Numbers (IDN) and affix or paint the IDNs onto the TRU or TRU generator set (gen set) housing. ARB IDNs are voluntary for out-of-state-based units. The proposed amendments will allow the use of Bureau International des Containers (BIC) codes, or reporting marks in place of ARB IDNs, provided: the owner must still apply for an ARB IDN if the unit is California-based, the BIC-Code or reporting mark must be unique for each piece of equipment, and the BIC-Code or reporting mark must meet the same readability specifications currently required for ARB IDNs.

Additional Requirements for TRU Original Equipment Manufacturers (OEMs)

The proposed amendments require TRU OEMS that plan to equip TRUs with flexibility engines to: notify ARB at least 12 months in advance of the first flexibility engine installation in production; beginning 120 days after the effective date of the regulation, provide a supplemental engine emissions label for each flexibility engine installed in new TRUs and attach this label to the engine in an easily accessible place; and provide a written disclosure to prospective buyers, prior to sale of new TRUs, notifying them when a TRU is equipped with a flexibility engine, the effective model year of the engine, the ULETRU compliance deadline, and that the effective model year must be entered for the model year when the unit is registered in ARBER.

Beginning 120 days after the effective date of the amendments, the proposed amendments also require TRU OEMs to provide, for prior-tier replacement engines, supplemental engine emissions labels for each new replacement engine they supply. This label would list all of the engine information needed to register the equipment in ARBER (if the engine manufacturer's emissions control label does not provide this information). Additionally, TRU OEMs would be required to provide written disclosure with each prior-tier engine supplied. This written disclosure would be passed on to interested buyers, notifying them that they are buying a prior-tier replacement engine that was manufactured to meet a less stringent prior-tier emissions standard than is currently required. This notification would also provide the effective model year of the prior-tier replacement engine and the ULETRU compliance deadline. Finally, the OEMs would be required to provide a registration information document with each prior-tier replacement engine they supply that would be passed on to the end user. The registration information document would include all of the engine information needed to register the equipment in ARBER and be consistent with the information that is on the engine emissions label and supplemental engine label.

Beginning 120 days after the effective date of the amendments, the proposed amendments require TRU OEMs provide, for current-tier replacement engines and new TRUs and TRU Gen Sets, a registration information document with each current-tier replacement engine or new TRU or TRU Gen Set they supply that would be passed on to the end-user. This document would also include all of the engine information needed to register the equipment in ARBER and be consistent with the registration information that is on the engine emissions label and supplemental engine label.

Additional Requirements for Dealers and Repair Shops

The proposed amendments require dealers and repair shops to pass the registration information documents, which are supplied with new units, new replacement engines, and rebuilt engines, to the end-user. If a registration information document was not included with a replacement engine, the dealer or repair shop would have to provide it.

Additional Requirements for Engine Rebuilders

The proposed amendments require engine rebuilders to follow the federal and State engine rebuild practices of 40 CFR sections 89.130 and 1068.120, and title 13, CCR section 2423(l), and provide the supplemental rebuilt engine labels including engine model, engine effective model year (if prior-tier standard is met) or model year (if current-tier standard is met), and horsepower rating. Supplemental engine labels would need to be affixed to the rebuilt engine in a readily accessible location in accordance with 40 CFR section 89.110 (for Tier 2), or 40 CFR section 1039.135 (for Tier 4i).

Engine rebuilders would also be required to provide, within 30 days of request, documentation and engineering arguments demonstrating that they have complied with the engine rebuilding practices of 40 CFR sections 89.130 and 1068.120, and title 13 CCR section 2423(l). This technical demonstration must be completed, signed, and stamped by a licensed mechanical engineer with knowledge of the design and function of diesel engines and the control of their emissions. As part of the evaluation of the demonstration, the Executive Officer may require an emissions test to be conducted if the documentation and engineering arguments are not found to be satisfactory.

Engine rebuilders would also be required to provide a registration information document with each rebuilt engine that provides all of the engine information required under section 2477.5(e), with instructions to the dealer or repair shop to pass this document through to the end-user. The information on the registration information document would need to be consistent with the information that is on the supplemental engine label.

Clarify Registration Requirements, Consistent with ARBER Screens

During implementation, staff learned that additional information was needed to validate the registration information that was required by the original regulation. Staff believes that most of the additional data elements fall within the umbrella of existing data requirements and they are currently implemented in ARBER; however, adding them specifically would clarify the requirements and improve enforceability. Therefore, proposed amendments add registration information requirements to section 2477.5(e), which are consistent with current ARBER registration screens.

With the above-described proposed amendments, the TRU ATCM would continue to substantially decrease diesel PM and NO_x emissions, but would defer a small portion of emissions one or two years toward the end of the in-use standards phase-in (2016-2018).

COMPARABLE FEDERAL REGULATIONS

There are no federal regulations comparable to the TRU ATCM for in-use TRUs. Under federal Clean Air Act (CAA) section 213, U.S. EPA is without authority to adopt in-use standards for off-road (non-road) engines.[2]

Section 209(e)(1) of the CAA conclusively preempts states, including California, from adopting requirements for new off-road engines less than 175 hp that are used in farm or construction equipment. Under section 209(e)(2), California may adopt and enforce emission standards and other requirements for off-road engines and equipment not conclusively preempted by section 209(e)(1), so long as California applies for and receives authorization from the Administrator of U.S. EPA. TRU engines are not used in farm and construction equipment and are thus not preempted. California requested and received authorization from U.S. EPA for the initially adopted TRU ATCM in January 2009.[3]

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal. The report is entitled, *Proposed Amendment of the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units and TRU Generator Sets, and Facilities Where TRUs Operate.*

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strike-out format to allow comparison with the existing TRU ATCM, may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, on September 2, 2011.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website for this rulemaking at: http://www.arb.ca.gov/regact/2011/tru2011/tru2011.htm.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, Richard Boyd, Manager of the Process Evaluation Section, Emission Assessment Branch, Stationary Source Division at (916) 322-8285, or Rod Hill, Staff Air Pollution Specialist, Stationary Source Division at (916) 327-5636.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which

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[2] The California term "off-road" and the federal term "nonroad" refer to the same sources and are used interchangeably.

[3] 74 Fed Reg 3030 (January 16, 2009).

includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at http://www.arb.ca.gov/regact/2011/tru2011/tru2011.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed amendments are presented below. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the Staff Report.

Costs or Savings to Businesses and Private Individuals

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses.

Overall, there will be a net cost savings for compliance with the proposed amendments of approximately $13 million (2011 dollars) from 2011 through 2029. Extending the in-use standard for ULETRU for MY 2003 and older engines which met LETRU by their respective compliance dates will result in a one-time cost savings of approximately $320,000 in 2011 dollars. The cost savings from using electronic recordkeeping for electric standby units compared to manual recordkeeping is about $3.9 million. The cost to brokers, shippers or receivers for ensuring that the carriers they contract with only dispatch equipment with compliant TRUs is approximately $900,000 annually, with a total of approximately 11 million dollars from 2011 to 2029. A one-time cost savings for exempting TRUs used in emergencies is about $320,000. A cost savings of about $21 million is estimated for allowing use of the TRU model year rather than the engine model year to determine compliance dates. Requiring OEMs, dealers, installers, and rebuilders to provide supplemental engine labeling and registration information documentation will result in costs of approximately $200,000 annually, with a total of $1.6 million from 2011 to 2020.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

Alternatives to the proposed amendments are described in more detail in the Staff Report.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to California Code of Regulations, title 1, section 4, that the proposed regulatory action would affect small businesses because staff anticipates there will be cost savings if TRU and TRU gen set owners choose the retrofit compliance option. Compliance costs would not be affected if owners choose the repower option.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory amendments, the Board must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action.

Costs or Savings to Local and State Government Agencies

Pursuant to Government Code sections 11346.5(a)(5), the Executive Officer has determined that the proposed regulatory action would not create any costs to or mandates on any local agency or school district that is reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500).

Pursuant to Government Code sections 11346.5(a)(6), the Executive Officer has further determined, based on estimates prepared in accordance with instruction adopted by the Department of Finance, that the proposed regulatory action would not create additional costs to any State agency or to any local agency or school district, whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), create other nondiscretionary costs on local agencies, and affect costs or savings in federal funding to the State.

Several local agencies, school districts, and State agencies own TRUs, so the compliance cost savings discussed above may apply to these agencies if they own MY 2003 and older TRU engines or engines with a model year that is one year older than the unit manufacture year.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and comments may be submitted by postal mail or by electronic submittal before the meeting. The public comment period for this regulatory action will begin on

September 3, 2011. To be considered by the Board, written comments, not physically submitted at the meeting, must be submitted on or after September 3, 2011, and received **no later than 12:00 noon on October 19, 2011**, and must be addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), written and oral comments, attachments, and associated contact information (e.g., your mailing address, phone number, email address, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require, that 20 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted in Health and Safety Code, sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.14, 42400.2, 42400.3.5, 42402. 42402.2, 42410, 43013, 43018. This action is proposed to implement, interpret, and make specific sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

SPECIAL ACCOMMODATION REQUEST

Special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format (i.e., Braille, large print, etc.) or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at 916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia.
- Documentos disponibles en un formato alterno (por decir, sistema Braille, o en impresión grande) u otro idioma.
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD

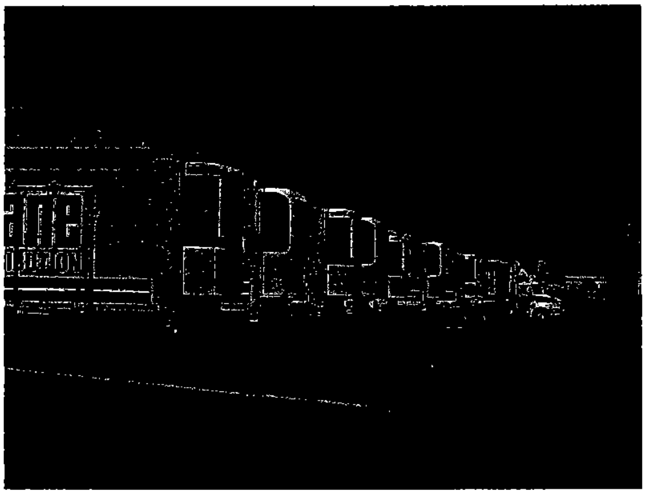
James N. Goldstene
Executive Officer

Date: August 31, 2011

California Environmental Protection Agency

AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING



2011 AMENDMENTS FOR THE AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

Stationary Source Division
Emissions Assessment Branch

August 2011

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State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

PROPOSED AMENDMENT OF THE AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

To be considered by the Air Resources Board on October 20, 2011, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Byron Sher Auditorium
Sacramento, California

Stationary Source Division:
Richard W. Corey, Chief
Cynthia Marvin, Assistant Chief
Emission Assessment Branch:
Dan Donohoue, Chief
Process Evaluation Section:
Richard Boyd, Manager

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State of California
AIR RESOURCES BOARD

PROPOSED AMENDMENT OF THE AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

Primary Authors
Rod Hill, Lead Staff
Carolyn Craig
Renèe Coad

Contributing Authors
Matt Malchow
Cory Parmer
Reza Mahdavi
Nicole Dolney
Todd Sax

Contributing Divisions
Enforcement Division
Mobile Source Control Division
Planning and Technical Support Division
Research Division

Legal Counsel
Alex Wang

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John Stirrup; Transportation Intermediaries
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Staff Report: Initial Statement of Reasons for the Proposed Amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities where TRUs Operate

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EXECUTIVE SUMMARY

The California Air Resources Board (ARB or Board) staff is proposing amendments to the transport refrigeration unit (TRU) Airborne Toxic Control Measure (ATCM)[1] that the Board approved for adoption on February 26, 2004 and last amended in 2010. This regulation was developed to reduce emissions of diesel particulate matter (PM) from diesel-powered engines used to refrigerate perishable goods in insulated truck and trailer vans, rail cars, and domestic shipping containers. There are about 33,000 TRUs based in California, with an additional 102,500 TRUs that are based outside of the State that may operate in California. About 7,900 railcar TRUs also operate in California. This regulation also applies to TRU generator sets (gen set), which provide onboard electric power to electrically driven refrigeration systems that are used in shipping containers and trailers. There are about 6,700 TRU gen sets based in California and about 26,500 based outside the State that may operate in California. Table ES-1 displays these population numbers.

Table ES-1: TRU Population Totals by Category

Category	Total Annual Population
Out-of-State TRUs	102,500
California-based TRUs	32,800
Out-of-State Generator Sets	26,500
California-based Generator Sets	6,700
Railcars	7,900
Total	**176,300**

The existing regulation requires in-use TRUs to reduce their PM emissions levels by at least 85 percent, and in accordance with a compliance schedule based on a seven-year operational life for the equipment.

Staff believes that the proposed amendments are needed to: improve compliance rates and enforceability; restore competitive fairness to those businesses that elected to comply with the regulation during 2008 through 2010 while other businesses opted to defer their compliance efforts in light of the U.S. Environmental Protection Agency's (U.S EPA) delay in issuing ARB an authorization to enforce the regulation; and clarify

[1] Title 13, CCR section 2477 is known as the Transport Refrigeration Unit Airborne Toxic Control Measure and establishes in-use performance standards, recordkeeping, and facility reporting requirements for TRUs. Any reference to TRUs in this report also includes TRU generator sets, unless otherwise specified.

existing requirements. The proposed amendments (hereinafter 2011 TRU amendments) would primarily:

1. Extend the Ultra-Low-Emission TRU (ULETRU) in-use performance standard compliance date by one year for model year (MY) 2001 and older TRU engines that met the less stringent Low-Emission TRU (LETRU) in-use performance standard by December 31, 2008. This proposed amendment would extend the ULETRU compliance deadline for qualifying TRUs from December 31, 2015 to December 31, 2016. This is shown is Table ES-2.

Table ES-2: ULETRU Extension for MY 2001 and Older TRU Engines That Met the Original December 31, 2008, LETRU Deadline

Engine MY	Deadline LETRU Met By	ULETRU Deadline	
		Original	New
2001 & Older	12-31-2008	12-31-2015	12-31-2016

2. Extend the ULETRU in-use standard compliance date by one year for MY 2003 and older TRU engines that met the LETRU in-use standard by the deadline shown in Table ES-1. The MY 2001 and older engines discussed above would qualify for an <u>additional</u> year if they met LETRU by December 31, 2008, so MY 2001 and older engines could qualify for a total extension of two years. Table ES-3 shows the relevant LETRU compliance deadlines, the original ULETRU deadlines and the new ULETRU deadlines.

Table ES-3: ULETRU Extension for MY 2003 and Older TRU Engines That Met LETRU Deadline

Engine MY	Deadline LETRU Met By	ULETRU Deadline	
		Original	New
2001 & Older	12-31-2009	12-31-2015	12-31-2016[1]
2002	12-31-2009	12-31-2016	12-31-2017
2003	12-31-2010	12-31-2017	12-31-2018

1. MY 2001 and older engines may qualify for a total extension of two years if they met LETRU by the original December 31, 2008, deadline. In this case, the new ULETRU deadline would be December 31, 2017.

3. Clarify the manual recordkeeping requirements for electric standby-equipped TRUs and add automated electronic tracking system requirements.

4. Extend the responsibility for ensuring that California-compliant TRUs are used to brokers, shippers, and distributors.

5. Allow use of the unit manufacture year, instead of engine model year, to determine compliance requirements and dates.

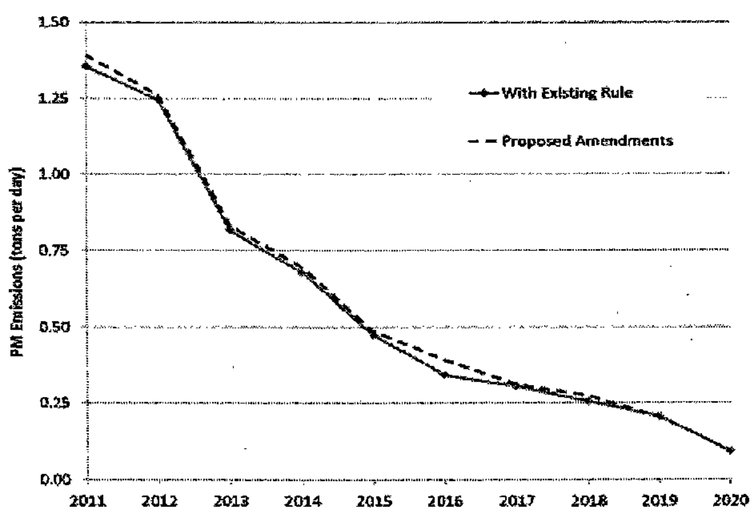
6. Add an exemption for TRUs used by mobile catering companies that feed emergency responders, such as firefighters suppressing wildfires.

7. Require original equipment manufacturers and engine rebuilders to provide supplemental engine emissions labels and registration information documents.

8. Clarify existing requirements and add requirements to improve enforceability.

The proposed amendments would continue to substantially decrease diesel PM emissions from TRUs, but would defer a small portion of the emissions reductions from TRUs each year from 2009 through 2018. Figure ES-1 shows the statewide diesel PM emission reductions expected under the TRU 2011 amendments as compared to the statewide diesel PM emission reductions from the original TRU regulation, as amended in 2010.

Figure ES-1: Statewide Diesel PM Emissions from TRUs with Existing Regulation and Proposed 2011 Amendments



To evaluate the health impact of deferring these emission reductions, staff conservatively assumed that an individual living near a large distribution center was exposed to the maximum increment of higher emissions for a full 70 years. The proposed amendments delaying the ULETRU compliance date would increase the maximum potential cancer risk by a negligible amount. For comparative purposes; the health risk assessment that staff conducted for the Staff Report for the original TRU regulation (ARB, 2003) determined that the potential excess cancer risk from diesel PM emissions attributable to TRUs was greater than 100 in a million.

A. Background

TRUs are refrigeration systems (powered by integral diesel engines) to protect perishable goods transported in insulated truck and trailer vans, rail cars, and domestic shipping containers. TRU gen sets provide onboard electric power to electrically-driven refrigeration systems that are used in shipping containers and trailers.

Federal and State regulations establish progressively more stringent emission standards that TRU engine manufacturers must meet over time. These standards are characterized by emission "tier" levels that apply to a range of manufacturing model years.

Table ES-4 shows the PM control levels associated with the emissions tiers for new engines rated at 25 horsepower (hp) to less than 50 hp.

Table ES-4: Effectiveness of PM Emission Standards for New TRU Engines (25 to 50 hp)

New Engine Emission Tiers	Percent PM Control (from Tier 0 Baseline)
Tier 0 (1998 and older)	None
Tier 1 (1999-2003)	20%
Tier 2 (2004-2007)	40%
Tier 4i (2008-2012)	70%
Tier 4f (2013 and subsequent)	97%

Table ES-5 shows the PM control levels associated with the emissions tiers for new engines rated at less than 25 hp.

Table ES-5: Effectiveness of PM Emission Standards for New TRU Engines (Less than 25 hp)

New Engine Emission Tiers	Percent PM Control (from Tier 0 Baseline)
Tier 0 (1999 and older)	None
Tier 1 (2000-2004)	20%
Tier 2 (2005-2007)	30%
Tier 4f (2008 and subsequent)	65%

To reduce PM emissions from in-use engines, ARB verifies diesel PM retrofit devices based on levels of PM control. Table ES-6 shows the emission reductions for the levels of retrofit devices required under the TRU ATCM's in-use standards.

Table ES-6: PM Control Levels for Verified Retrofit Devices

TRU In-Use Standard	Level VDECS Required	Percent PM Control
LETRU	Level 2	50%
ULETRU	Level 3	85%

Original TRU ATCM
ARB adopted the original TRU regulation in 2004 to accelerate the cleanup of existing TRUs through retrofits, engine repowers, or unit replacements. The TRU regulation established a compliance schedule that was based on the model year of the TRU engine and was designed to clean up the oldest and highest emitting TRU engines first. The schedule provides a seven-year operational life for the equipment. That is, at the end of the year in which the engine becomes seven years old, compliance action needs to be taken to reduce diesel PM emissions. Ultimately, all TRUs must have 85 percent PM control to fully comply with the regulation. Currently, only Level 3 verified retrofits can provide reduce PM emissions by 85 percent. Current MY 2011 trailer TRU engines (25-50 hp) are certified to interim Tier 4 standards (Tier 4i) that emit 70 percent less PM emissions compared to an uncontrolled Tier 0 engine. TRU engines rated at 25-50 hp that meet final-Tier 4 (Tier 4f) standards with 97 percent PM control will be produced beginning in 2013 and will meet the ULETRU in-use standard.

Under the existing regulation, owners of MY 2004 and newer TRUs must comply with the ULETRU in-use standards by the end of the seventh year after the engine model year (e.g., a MY 2004 engine must comply by December 31, 2011). TRU owners can currently select from the following compliance paths:

1. Retrofit the existing TRU with a Level 3 (85 percent PM control) filter system at a capital cost of about $5,500.

2. Replace the existing unit (engine and refrigeration system) with a new TRU equipped with Tier 4i engine at a capital cost of $16,000-$22,000. In seven years this TRU must be upgraded with a Level 3 retrofit (capital cost is about $5,500) or another new TRU equipped with a Tier 4f engine in seven years. Owners selecting this path typically have higher use existing TRUs that are at or beyond their useful lives and need to be replaced for operational and reliability reasons.

3. Repower the TRU with a new Tier 4i engine at a capital cost of $5,750-$8,400. In seven years, this TRU engine must then be upgraded with a Level 3 retrofit (capital cost is about $5,500) or replaced with a new TRU equipped with a Tier 4f engine in (capital cost is about $16,000-$22,000).

4. Use an alternative technology, like an electric standby-equipped TRU at a capital cost of $700-$3,000. Electric plug infrastructure at the home base facility and all other facilities is required, at significant additional cost, to ensure the TRU engine

operation is eliminated at these facilities. Staff concluded in 2003 that the infrastructure upgrades may be cost-prohibitive in many cases.

2010 Amendments
In 2010, staff conducted workshops to consider amendments to the original TRU ATCM. As staff progressed through the first two workshops, it was recognized that additional data would need to be collected and analyzed before specific amendments could be recommended to the Board. However, several proposed amendments required Board approval in 2010 because they would take effect at the end of that year. As a result, staff decided to bring the rulemaking forward in two phases. Phase 1 addressed the time-critical amendments that required the Board's approval before the end of 2010, and Phase 2 would address the remaining issues and concerns. The Phase 1 amendments included the following:

1. Added an Interim, Lower-Cost Retrofit Option for a Subset of TRUs. MY 2003 engines and MY 2004 engines rated at less than (<) 25 (hp) can choose to meet the less stringent LETRU in-use standard instead of what was originally required, the ULETRU in-use standard. If owners chose to meet LETRU, they would still need to meet ULETRU at the end of 2017 for MY 2003 engines and by the end of 2018 for MY 2004 engines rated at <25 hp.

2. Linked Compliance Schedule for Flexibility Engines to Their Emissions Tier. Future purchases of TRUs with flexibility engines are now required to use the emissions tier or effective model year to determine the compliance schedule to upgrade that engine. Flexibility engines meet a prior tier of emissions standard that is no longer in effect, so the effective model year is the last year that the prior tier standard was in effect. This reduces the operational life of these TRUs, so upgrades are now required one or more years sooner.

3. Expanded Reporting by TRU Manufacturers. TRU original equipment manufacturers are required to periodically report data on TRU engines that will be installed in the coming production year as well as production information for previous years. This helps staff validate registration information.

Phase 2 rule development began in early 2011.

B. Impacts of Proposed 2011 Amendments to TRU Regulation

Emission Impacts. Staff evaluated the emissions impacts associated with each of the proposed 2011 amendments.

- Extending the ULETRU compliance date for MY 2001 and older TRUs that met LETRU by the original compliance date would result in about 0.003 tons per day (tpd) of PM emissions increase in 2016.

- Extending the ULETRU compliance date for MY 2003 and older TRUs that met LETRU by applicable deadlines would result in 0.042 tpd of PM emissions increase in 2016, 0.004 tpd in 2017, and 0.012 tpd in 2018.

- Exempting TRUs that are used during emergencies would affect a small number of TRUs, representing 0.01 percent of all TRU activity in California. Therefore, the emissions impacts would be insignificant.

- Allowing the use of unit manufacture year instead of engine model year for determining in-use compliance dates would result in increases and decreases for various model years with a total cumulative increase of 0.150 tpd of diesel PM from 2009 through 2018.

- The combined emissions impacts of all of the proposed amendments are estimated to increase total cumulative diesel PM emissions between 2009 and 2018 by 0.21 tpd

These small deferred reductions can be considered to have been offset by the "early" emissions reductions achieved by the owners of MY 2001 and older engines that met the LETRU in-use standard by the original December 31, 2008 compliance date instead of delaying compliance until the end of 2009. These "early" emission reductions are considered "surplus" because enforcement of the compliance date for MY 2001 and older engines was extended from December 31, 2008, to December 31, 2009, because ARB did not receive authorization from U.S. EPA until January 16, 2009. These PM emissions reductions occurred during 2009 and staff estimates they were approximately 0.72 tpd, which is much greater than the emissions increases due to the proposed amendments over the 2009 to 2018 timeframe.

Compliance Cost Impacts. Staff evaluated the economic impacts of the proposed TRU ATCM 2011 amendments on businesses by estimating the effect of the regulatory costs on small businesses and typical businesses. Table ES-7 summarizes the costs and savings associated with the proposed amendments.

Table ES-7: Total Estimated Regulatory Costs for the Proposed Amendments (2011 Dollars)

Proposed TRU ATCM 2011 Amendment	Regulatory Cost or (Savings)
ULETRU Extension for ≤ MY 2003 Timely LETRU Compliance	($350,000)
Electronic Recordkeeping for Hybrid Electric/Electric Standby	($3.9 million)
Compliance Verification for Responsible Parties	$11 million
Exemption of TRUs Used During Emergencies	($340,000)
Use of TRU Manufacture Year Rather than Engine Model Year	($21 million)
Supplemental Labels and Registration Information Document	$1.6 million
Net Total Cost or (Savings)	**($13 million)**

All values rounded.

Overall, the proposed 2011 amendments will generate a net cost savings of approximately $13 million (2011 dollars) from 2011 through 2029. Table ES-6 shows there will be compliance cost savings due to extending the in-use standard for ULETRU for MY 2003 and older engines that met LETRU by their respective compliance dates of about $350,000. The cost savings from using electronic recordkeeping for electric standby units, instead of manual recordkeeping, is about $3.9 million. The cost to brokers, shippers or receivers for ensuring that carriers they contract with will dispatch only compliant TRUs is approximately $900,000 annually, with a total of approximately $11 million from 2011 to 2029. A one-time cost savings for exempting TRUs used in emergencies is about $340,000. A cost savings for using the TRU model year rather than the engine model year to determine compliance dates is about $21 million.[2] Finally, OEMs, dealers, installers, and rebuilders will incur additional costs from providing supplemental engine labeling and registration information documentation of about $200,000 annually, with a total of $1.6 million from 2011 to 2020.

Public Health Impacts. To assess public health impacts, staff used the results of the updated emissions inventory. This included updated engine activity and statewide engine emission factors that would result in 2014[3] after in-use compliance is completed. U.S. EPA's recommended dispersion model was used to predict the public's exposure near distribution centers. Staff then applied that exposure to risk models and found that the public health risk at the seven-year TRU operational life still resulted in potential cancer risk levels of concern in communities near facilities where TRUs congregate. TRU engine operations of 100 hours per week (about 40 loads per week) produced cancer health risks greater than 10 in a million. At 1,000 engine hours per week (about 400 loads per week) operation, the cancer health risks are greater than 100 in a million.

[2] This amendment was implemented as pilot program from 2009 to 2011 and generated approximately $4.7 million in savings during this period.
[3] The year 2014 was chosen because this is the year of the PM 2.5 SIP commitments.

The 2006 Facility Report results summarized in Appendix B show that TRU engine operations at many large facilities are well above these levels. This finding means that any extension of the current seven-year operational life requirement would likely exacerbate concerns regarding elevated cancer risk levels in nearby communities. Increasing the operational life 1, 2, or 3 years above the current 7-year operational life would increase the cancer health risks by 11, 23, and 42 percent, respectively.

Staff also modeled the emissions impacts associated with the proposed 2011 TRU amendments and found the change in the public health risk to be negligible. Under the proposed amendments, an estimated 0.21 tpd of cumulative diesel PM emission reductions would be deferred between 2009 and 2018.

Environmental Impacts. Because the proposed amendments do not require changes to the existing infrastructure at cold storage facilities, distribution centers, ports or intermodal rail yards, staff finds that no new facilities, expansion of existing facilities, or changes in operations from the status quo are likely to occur. Therefore, staff finds that there will be no adverse impacts on aesthetics, land-use, land-use planning, population and housing, transportation, agricultural and forestry resources, cultural resources, mineral resources, public services, utility and service systems, geology and soils, hydrology and water quality, or recreation.

As discussed above, staff has identified a potentially significant adverse impact on air quality due to the proposed amendments to extend the date of compliance with the ULETRU standards for MY 2003 and older TRU engines. These impacts will be mitigated by reductions that occurred in 2009 due to early compliance by some TRU operators before December 31, 2008.
Environmental Justice. The proposed 2011 TRU amendments are consistent with ARB environmental justice policies. While several of the amendments would defer a small amount of emissions reductions for one to two years toward the end of the in-use standard compliance phase-in, other amendments would improve the compliance rates and enforceability of the in-use standards. The proposed amendments therefore have a negligible net effect on emissions and public health risks in communities near distribution centers, rail yards, intermodal facilities or ports.

F. Key Issues

Availability of Level 3 VDECS for MY 2004 (>25 hp). Owners and their trade associations have expressed concerns whether Level 3 VDECS will be sufficiently available on the market in time for MY 2004 (≥ 25 hp) engines to meet the December 31, 2011, ULETRU compliance deadline. Staff has been closely monitoring the development of these retrofit devices. Currently, one Level 3 VDECS is verified and on the market (and has been for over a year). A second Level 3 VDECS is expected to complete verification and be available on the market in fall 2011. A third Level 3 VDECS is being developed and is expected to be submitted for verification review and potentially market-ready sometime in 2012. Other compliance options, such as a replacement engine or a unit replacement, are also readily available. In fact, registration data indicates that engine replacements have been the dominate compliance method used by TRU owners (used about 70 percent of the time).

Furthermore, as discussed in Chapter II, staff is also proposing amendments that will allow the Executive Officer to extend compliance deadlines should there be a legitimate issue with respect to availability of suitable compliance options. Given that one Level 3 VDECS is currently on the market and that there is an ample supply of replacement engines, staff believes sufficient compliance options are available to meet a December 31, 2011 deadline. In order to ensure that TRU owners had a reasonable amount of time for delivery and installation of compliance technologies, staff made its intent known at a public workshop discussing the amendments on June 29, 2011 (six months prior to the December 31, 2011 deadline). Additionally, staff is planning to notify owners in early September 2011 with emails to the TRU List Serve and post a notice on the TRU Website that staff is not proposing any changes to the compliance date for MY 2004 engines and that they should take immediate steps to ensure compliance by the end-of-year deadline.

Operation Life Extension for MY 2004 and Newer TRU Engines. As previously discussed, staff is not proposing to extend the current seven-year operational life for MY 2004 and newer TRU engines. Staff identified several issues associated with providing any extension to the operational life:

- The public health risk at the current seven-year operational life still results in potential cancer risk levels of concern in communities near facilities where TRUs congregate. Extending the operational life would exacerbate this concern. Increasing the operational life 1, 2, or 3 years from the current 7-year operational life would increase the cancer risk to nearby communities by 11, 23, and 42 percent, respectively;

- There are not sufficient mitigations available to offset the emissions increases associated with increasing the operational life 1, 2, or 3 years;

- The VDECS manufacturers that have invested significant resources into verifying diesel particulate filters would be left with no market for one or more years, which would most likely force them to abandon the TRU market. These filters are the lower-cost initial capital cost compliance option. Their total non-availability may cause the cost of other compliance options to increase;

- The TRU ATCM's PM emissions reductions also contribute to ARB's 2014 State Implementation Plan for meeting the federal PM 2.5 standard, so any delayed implementation could jeopardize those commitments and result in loss of federal highway funding;

- According to information published in industry trade publications, the refrigerated trucking industry did not feel the effects of the global recession to nearly the same extent as other industry sectors (Transport Topics, 2009a), (Transport Topics, 2009b), (Transport Topics, 2010); and

- Staff's proposal to allow the use of the TRU manufacturer year if no more than one year different from the TRU engine model year effectively adds six months to one year of additional operational life.

G. Public Outreach and Comments

In developing the proposed 2011 TRU amendments, ARB staff conducted three of six public workshops in 2010 and the remaining three workshops in 2011. Staff worked closely with stakeholders, including TRU owners and fleet operators, trade associations, trade journal reporters, TRU original equipment manufacturers, TRU dealers and service centers, truck and trailer dealers, truck and trailer leasing companies, freight brokers and forwarders, shippers, receivers, diesel particulate matter emissions control system manufacturers, environmental groups, engine rebuilders, mobile catering service companies, and other interested parties.

Stakeholders provided informal comments during the workshops and prior to release of the 45-day public notice. TRU owners and trade associations have expressed support for the amendments related to adding requirements for brokers, shippers, and receivers. Brokers, shippers and receivers have expressed concern that this amendment will place an undue and mostly unattainable requirement on them. ARB staff is committed to developing compliance tools and effective procedures to limit the impact on brokers, shippers, and receivers. Chapter VI provides a more detailed discussion of staff's public outreach efforts.

H. Enforcement Update

Enforcement of the TRU ATCM is mainly achieved by ARB's Enforcement Division; however; there is a Memorandum of Understanding with the Bay Area Air Quality Management District that authorizes them to enforce the TRU ATCM's requirements. Stationary Source Division staff has coordinated extensively with the Enforcement Division to provide basic support and strategies to improve enforcement effectiveness and enforceability of requirements.

MY 2003 and older units have passed a compliance deadline for meeting the in-use standards. The overall compliance rate for these units is about 65 percent. However, looking at each model year separately shows a trend of declining compliance rates ranging from about 80 percent for MY 2001 and older TRUs to about 30 percent for MY 2003 TRUs.

In consideration of economic fairness for fleets that have invested in compliance technologies, staff has taken steps to improve compliance rates. These steps include sending notification letters to owners of TRUs that are registered in ARB's Equipment Registration (ARBER) system with noncompliant equipment, and increasing inspections at border crossings. Additionally, several of staff's proposed amendments are designed to improve compliance rates and enforceability of the in-use requirements.

I. Staff Recommendation for Board Action

ARB staff recommends the Board approve the proposed 2011 TRU amendments as presented in Appendix A of this Staff Report. Chapter VII provides a more detailed discussion of staff's recommendation.

I. INTRODUCTION

A. Overview

This Staff Report: Initial Statement of Reasons for Proposed Rulemaking (Staff Report) provides the basis for the California Air Resources Board (ARB or Board) staff's proposal to amend the regulations affecting transport refrigeration units (TRU)[1] (hereinafter 2011 TRU amendments). The primary purpose of the proposed 2011 TRU amendments is to extend the compliance dates when specified categories of TRUs and TRU gen sets are required to meet the Ultra-Low-Emission TRU (ULETRU) In-Use Performance Standards.

Specifically, model year (MY) 2001 and older engines that complied with the less stringent Low-Emission TRU (LETRU) In-Use Performance Standard by the original December 31, 2008, compliance deadline would now be allowed to delay compliance with the ULETRU standards until December 31, 2016, instead of the originally required December 31, 2015, deadline. This change provides one additional year before ULETRU must be met. In 2009, staff administratively delayed enforcement for MY 2001 and older engines until December 31, 2009, because of the uncertainty created by the U.S. Environmental Protection Agency's (U.S. EPA) late approval of ARB's request for an authorization pursuant to Clean Air Act (CAA) section 209(e)(2). However, a number of MY 2001 and older TRU owners followed staff's recommendation to comply by the original December 31, 2008, compliance date.

MY 2003 and older engines that complied with the LETRU standards by December 31, 2009 (for MY 2001 and older), December 31, 2009 (for MY 2002), and December 31, 2010, would similarly be allowed to delay compliance with the ULETRU in-use standards. These engines would comply with ULETRU in December 31 2016, December 31, 2017, and December 31, 2018, respectively, instead of the currently required December 31, 2015, December 31, 2016, and December 31, 2017, compliance dates. These compliance dates are discussed in detail in Chapter II.

Other amendments are proposed to clarify existing requirements and to enhance the ARB's ability to enforce the regulation by specifically extending the regulation's requirements to motor carriers, brokers, California-based shippers, and California-based receivers. The proposed 2011 TRU amendments are provided in Appendix A of this Staff Report.

This Staff Report also updates California's estimated population of affected TRU engines and statewide emissions in Chapter III and Appendix C. Emissions impacts and the health risk impacts associated with the proposed 2011 TRU amendments are addressed in Chapters III and IV, and Appendices C and D. Potential environmental, health, and economic impacts of the proposed amendments are also updated in

[1]Title 13, California Code of Regulations (CCR) section 2477 is known as the Transport Refrigeration Unit Airborne Toxic Control Measure (TRU ATCM) and establishes in-use performance standards, recordkeeping, and facility reporting requirements for TRUs.

Chapters IV and V, and Appendices D, E, and F. The alternatives that were considered are also discussed.

The basis of the original TRU ATCM and background information can be found in the *Staff Report: Initial Statement of Reasons for Proposed Rulemaking – Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate*, October 2003 (ARB, 2003). For the remainder of this report, the original 2003 staff report will be referred to as the 2003 Staff Report.

B. Need for Regulation

ARB's mission is to protect public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants, while recognizing and considering the effects on the economy of the State. ARB's vision is that all individuals in California, especially children and the elderly, can live, work, and play in a healthful environment – free from potential harmful exposure to air pollution. To help achieve this, ARB has adopted regulations to control emissions from many different sources, including diesel-fueled engines. Diesel-fueled engine exhaust is a significant health concern because it is a source of unhealthful air pollutants including particulate matter (PM), gaseous and particulate-phase toxic air contaminants (TAC), nitrogen oxides (NO_x), carbon monoxide, and hydrocarbons.

In 1998, the Board identified diesel PM as a TAC with no specified threshold exposure level below which adverse health impacts would be expected, pursuant to Health and Safety Code (HSC) sections 39650 through 39675. A needs assessment for diesel PM was conducted between 1998 and 2000 pursuant to HSC sections 39658, 39665, and 39666. This resulted in ARB staff developing, and the Board approving, the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel RRP) in 2000 (ARB, 2000). The Diesel RRP presented information on the available options for reducing diesel PM and recommended regulations to achieve these reductions. The Diesel RRP's scope addressed all categories of mobile and stationary diesel engines and included control measures for off-road diesel PM sources, such as those covered by the TRU ATCM. The ultimate goal of the Diesel RRP is to reduce, by 2020, California's diesel PM emissions and associated potential cancer risks by 85 percent from the 2000 levels.

In the 2003 Staff Report, staff identified potential cancer risks near distribution centers and other facilities where TRUs congregate in excess of 100 chances per million. An analysis conducted as part of these amendments showed that this public health risk under the ATCM's seven-year TRU operational life still resulted in potential cancer risk levels of concern in communities near facilities where TRUs congregate. If the in-use requirements were to be relaxed by delaying compliance and extending the operational life of TRU engines, this risk would be even greater and likely exacerbate concerns regarding elevated risk levels in nearby communities. This is discussed further in Chapter II.

The federal Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (U.S. EPA) to establish National Ambient Air Quality Standards (standards) for pollutants considered harmful to public health, including fine particulate matter (PM 2.5) and ozone. The South Coast and San Joaquin Valley Air Basins are the two areas in the State that exceed the annual PM 2.5 standards. These air basins are required by federal law to develop federal State Implementation Plans (SIP) describing how they will attain the standards by 2015. U.S. EPA further requires that all necessary emission reductions be achieved one calendar year sooner – by 2014 – in recognition of the annual average form of the standard. Diesel PM emission reductions are needed because diesel PM contributes to ambient concentrations of PM 2.5.

C. Regulatory Authority

Several sections of the California Health and Safety Code (HSC) provide ARB with authority to adopt the TRU ATCM and these TRU ATCM 2010 amendments. HSC sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confer to ARB the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law. HSC sections 43013(b) and 43018 provide broad authority for adopting measures to reduce TACs and other air pollutant emissions from vehicular and other mobile sources. HSC section 39618 classifies refrigerated trailers as off-road mobile sources under ARB jurisdiction.

California's Air Toxics Program, established under California law by AB 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code sections 39650 through 39675, mandates the identification and control of air toxics in California. The identification phase of the Air Toxics Program requires ARB, with participation of other state agencies, such as the Office of Environmental Health Hazard Assessment (OEHHA), to evaluate the health impacts of, and exposure to, substances and to identify those substances that pose the greatest health threat as TACs. ARB's evaluation is made available to the public and is formally reviewed by the Scientific Review Panel (SRP) established under Health and Safety Code section 39670. Following ARB's evaluation and SRP's review, the Board may formally identify a TAC at a public hearing. Following the identification of a substance as a TAC, Health and Safety Code sections 39658, 39665, 39666, and 39667 requires ARB, with the participation of the air pollution control and air quality management districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance.

As previously discussed, the Board identified diesel PM as a TAC and in October 2000, ARB published a "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles." In the Diesel Risk Reduction Plan, ARB identified TRU emissions associated with refrigerated warehouse distribution centers as creating potential cancer risks and included off-road engines in the plan to reduce diesel PM emissions.

On February 26, 2004, the Board approved for adoption the TRU ATCM, establishing in-use performance standards for TRUs and TRU gen sets that would be phased in commencing on December 31, 2008. The Office of Administrative Law (OAL) approved the TRU ATCM, which was codified at title 13 CCR, section 2477 on November 10, 2004, and the regulation became effective 30 days later upon being certified by the California Secretary of State.

Staff requested U.S. EPA grant authorization to adopt and enforce the TRU ATCM pursuant to Clean Air Act (CAA) section 209(e)(2). U.S. EPA granted California authorization to enforce the TRU ATCM on January 16, 2009[2] (U.S. EPA, 2009). ARB delayed the enforcement of the TRU ATCM's in-use performance standards until January 2010 because U.S. EPA's authorization was granted after the first compliance date, creating uncertainty for the regulated community.

[2] 74 Fed. Reg, 3030 (January 16, 2009)

II. PROPOSED AMENDMENTS TO THE TRU ATCM

In this chapter, staff provides an overview of the existing TRU ATCM, as amended in 2010 (ARB, 2010b, Appendix A) and the events and information that necessitated the additional amendments being proposed. The main purpose of the additional amendments is to propose extensions to the ULETRU compliance dates for owners that brought their TRUs and TRU generator (gen) sets[1] into compliance with the LETRU in-use standard, if certain conditions are met. Staff is also proposing amendments to clarify existing requirements and add new requirements that will improve the enforceability of the regulation. Other amendments are being proposed, including a new exemption for TRUs used by mobile catering services during emergency responses. This chapter meets the requirements of the Administrative Procedures Act to provide a plain English version of the regulation and a discussion of the necessity and rationale for the proposed amendments.

A. Existing Regulation

1. Applicability

The existing TRU ATCM includes in-use performance standards for diesel particulate matter (PM) that apply to owners of TRUs that operate in California, regardless of where they are based or registered with Department of Motor Vehicles (DMV). In addition, owners of all California-based TRUs must register this equipment in ARB's Equipment Registration (ARBER) system[2]. There are also prohibitions that apply to any person that is in the business of selling TRUs on the California market.

2. Exemptions

The existing TRU ATCM includes an exemption for military tactical support equipment.

3. In-use Requirements, Compliance Schedule, and Compliance Options

The TRU ATCM includes in-use performance standards for TRU engines, that require diesel PM emissions to be reduced over a phased compliance schedule. There are two levels of in-use standard stringency: the Low-Emission TRU (LETRU) in-use standard, which reduces diesel PM by at least 50 percent, and the more stringent Ultra-Low-Emission TRU (ULETRU) in-use standard, which reduces diesel PM by at least 85 percent. Table II-1 displays the TRU ATCM's in-use performance standards.

[1] Unless otherwise specified, all references to TRU engines include TRU generator set engines.
[2] ARBER is a on-line, web-based system that allows TRU owners to register their units and obtain ARB identification numbers via the internet. ARBER can be accessed at http://arber.arb.ca.gov.

Table II-1: TRU and TRU Gen Set In-Use Performance Standards

Horsepower Category	Engine Emissions Certification for PM	Retrofit Required Level of VDECS
Low-Emission TRU (LETRU) In-Use Standard		
<25	0.30 g/bhp-hr (Tier 4f)	Level 2 or better (>50 percent PM reduction)
>25	0.22 g/bhp-hr (Tier 4i)	Level 2 or better(>50 percent PM reduction)
Ultra-Low-Emission TRU (ULETRU) In-Use Standard		
<25	N/A[1]	Level 3 (>85 percent PM reduction)
>25	0.02 g/bhp-hr (Tier 4f)	Level 3 (>85 percent PM reduction)

1. N/A means "Not Applicable", another compliance option must be chosen.

The LETRU section of Table II-1 shows that engines meeting LETRU must be certified to the values shown in the second column, which vary by horsepower (hp) category. For example, a less than 25 hp engine that is certified to meet 0.30 grams per brake horsepower-hour (g/bhp-hr) PM would meet LETRU. For 25 hp or greater engines, LETRU can be achieved by using an engine certified to meet 0.22 g/bhp-hr PM. Table II-1 also indicates that LETRU can be met by retrofitting the engine with a Level 2 Verified Diesel Emissions Control Strategy (VDECS), which reduces diesel PM by at least 50 percent. VDECS that are typically used on TRUs are diesel particulate filters (DPF) that control particulate matter engine exhaust emissions. These DPFs must be verified by ARB to control the PM emissions to the level claimed by the manufacturer and must be shown to meet durability requirements.[3]

The engine certification values shown in the second column are aligned with the progressively more stringent tiers used in federal and State new off-road engine standards,[4] as indicated in parentheses. Under the ULETRU in-use standard section of Table II-1, there is no value shown in the engine certification column for the less than (<) 25 hp category engines because there is no new engine standard that is clean enough to reduce emissions by at least 85 percent compared to uncontrolled engines. Table II-1 shows that ULETRU can be achieved for <25 hp engines by retrofitting with a Level 3 VDECS, which reduces diesel PM by at least 85 percent, and 25 hp and greater engines by using an engine certified to meet 0.02 g/bhp-hr PM, or by retrofitting the engine with a Level 3 VDECS.

The in-use standards must be met on a phased compliance schedule that began the end of 2008 and is based on the engine model year.[5] PM emissions must be reduced by the end of the seventh year after the engine model year. All TRU engines must eventually meet the more stringent ULETRU, but the compliance schedule allowed older engines to get there in two steps.

As originally adopted, LETRU applies to MY 2002 and older TRU engines. Seven years after complying with LETRU, these MY 2002 and older engines are required to meet the

[3] Title 13, California Code of Regulations (CCR), section 2700 through 2710.
[4] Title 13, CCR 2423.
[5] TRU Advisory 08-01 (ARB, 2008a) explains a narrow exception at: http://www.arb.ca.gov/diesel/tru/advisories.htm.

ULETRU in-use standard. For example, a MY 2002 engine is required to meet the LETRU in-use standard by December 31, 2009, and then meet the ULETRU in-use standard by December 31, 2016. As originally adopted, MY 2003 and subsequent model year engines are required to skip LETRU and meet ULETRU by the end of the seventh year after the engine model year; for example MY 2003 engines were required to meet ULETRU by December 31, 2010. However, the 2010 amendments changed the in-use standards for MY 2003 engines, which must now meet the LETRU in-use standard by December 31, 2010, and the ULETRU in-use standard by December 31, 2017.

The 2010 amendments also changed the in-use standards for MY 2004 engines that are rated at <25 hp, so that the LETRU in-use standard must be met by December 31, 2011, and the ULETRU in-use standard by December 31, 2018. As currently adopted, MY 2004 (> 25 hp) and subsequent model year TRU engines skip LETRU and must meet the ULETRU in-use standard by the end of the seventh year after the engine model year. Table II-2 illustrates the current in-use standard compliance schedule.

Table II-2: Current In-Use Performance Standards Compliance Schedule

Engine MY	LETRU or ULETRU Compliance Date	ULETRU Compliance Date
2001 or Older	December 31, 2008[6]	December 31, 2015 (if met LETRU in 2008)
2002	December 31, 2009	December 31, 2016 (if met LETRU in 2009)
2003	December 31, 2010	December 31, 2017 (if met LETRU in 2010)
<25 hp 2004	December 31, 2011	December 31, 2018 (if met LETRU in 2011)
≥25 hp 2004	Must Meet ULETRU	December 31, 2011
Subsequent MYs	Must Meet ULETRU	December 31st of MY plus seven years

Another compliance option is to use an Alternative Technology, such as electric standby or hybrid electric TRUs, or hybrid cryogenic temperature control systems. To qualify as an Alternative Technology, these technologies must be used in a way that eliminates the diesel engine operations at facilities where TRUs operate. For example, TRU engines can run on the road, but not at distribution centers, where they must run on electricity or use cryogenic cooling. There is an exception for the electric standby or hybrid electric compliance option during an emergency, which is defined as a failure or loss of normal power service or the facility's internal power distribution system, or when an affected facility is placed under an involuntary "rotating outage". Under the TRU ATCM, if diesel PM emissions are eliminated, to qualify as an Alternative Technology, the technology meets the ULETRU standard, However, this would also be a compliance option to meet the LETRU standard, since ULETRU is more stringent than LETRU. Staff intended that recordkeeping would be necessary to demonstrate that TRU engine operation is eliminated at facilities.

[6] Enforcement delayed until January 2010.

Owners may elect to maintain their TRUs in compliance by repowering these units with new replacement engines or rebuilt replacement engines that meet a more stringent emissions standard than the engines being replaced. Repowering has the effect of keeping a unit in compliance by resetting the in-use compliance requirements and dates, which are based on the engine model-year designation of the replacement engine.

New replacement engines may be manufactured to meet current or prior-tier new engine emissions standards. A new replacement engine that meets the tier of the emissions standard that is in effect when it was manufactured would use the engine model year to determine compliance requirements and dates. The engine model year is indicated on the engine's emissions label when it is manufactured to meet the emissions standards that are currently in effect at the time of manufacture.

A new replacement engine that is manufactured to meet a prior-tier standard that is no longer in effect at the time of manufacture would use the effective model year for determining compliance requirements. The effective model year is defined as the last year that the prior-tier standard was in effect. For example, a 35 hp new replacement engine that meets Tier 2, but was installed in 2009, when Tier 4i standards were in effect, would have an effective model year of 2007 (the last year that Tier 2 was in effect), would be required to meet ULETRU by December 31, 2014, seven years after the effective model year. More discussion and details related to effective model year will be presented later in this Staff Report.

A rebuilt replacement engine that meets a prior tier new engine emissions standard also resets the in-use compliance requirements and compliance dates, which would be based on the rebuilt engine's effective model year. Similar to the case of the new replacement engine, a rebuilt replacement engine that meets a current new engine standard would use an effective model year, which would be the same as the rebuild year; if it meets a prior-tier standard, the effective model year would be the last year that the prior-tier standard was in effect.

4. Registration requirements

Beginning in 2009, owners of all California-based TRUs were required to register in ARBER. In addition to providing basic information about the owner's company and contact information, the unit and engine information are required. Unit information includes the manufacturer, model, model year, and serial number. Engine information includes the manufacturer, model, model year, serial number and horsepower rating. Other registration information includes unit identification numbers, such as vehicle identification numbers (VIN), vehicle license plate number, and state the vehicle is registered with DMV, and any other identification number that is used by the owner, such as a company equipment number, railcar reporting mark, or BIC Code (unique international ID for shipping containers and TRU gen sets). In addition, owners are required to report in-use standard compliance information with the registration submittal. For example, the date and method that compliance was achieved and the in-use performance standard that is met must be provided. Updates to the registration information are required within 30 days of any changes to registration information. This is typical when a unit reaches the seven-year mark and must comply with an in-use standard or when a unit is sold or retired from service. In addition, units must be registered within 30 days of the unit coming under the owner's control.

When a registration application is complete, if the unit is in compliance with the applicable in-use standards, ARBER issues an ARB Identification Number (IDN). The owner is then required to affix or attach the IDN to both sides of the TRU or TRU gen set housing within 30 days.

Owners of non-California-based TRUs may choose to register TRUs or TRU gen sets in ARBER. Such registration prescreens compliance and would theoretically speed up the inspection process in the field.

5. Operator Reports

Beginning in 2009, operators of TRUs that are assigned to California terminals where these units are operated, garaged, maintained or dispatched from are required to submit an Operator Report. In addition to providing basic information about the operator's company and contact information, the terminal address and a list of all ARB IDN's for units assigned to the terminal are required. Updates to the Operator Report are required within 30 days of any changes to report information. This is typical when a new or used unit is assigned to the terminal or a unit is sold or reassigned somewhere else.

6. Early Compliance Incentives

If an owner brings a TRU into compliance with LETRU earlier than required, they can apply for a ULETRU compliance date extension. This only applies to model year TRUs that are required to first meet LETRU and the ULETRU. For each year that LETRU compliance was early, a year of delay in meeting ULETRU is granted. Early compliance is rounded to the nearest year, so if a unit met LETRU more than six months early, that would be rounded to one year.

7. Facility Reports

Large facilities with 20 or more doors serving refrigerated storage areas were required to submit a Facility Report in January 2006 for TRU activity that occurred in 2005. These requirements have passed. A summary of the data is provided in Appendix C.

8. Original Equipment Manufacturer Reporting

The 2010 Amendments included new requirements for original equipment manufacturers (OEM) to periodically report unit and engine information data for the coming production year, as well as production information for previous years. This data, along with enhancements to the ARBER system will, when completed, make data entry by TRU owners easier and less prone to data entry errors. This data will also aid in improving estimates of TRU populations and statewide emissions.

Reported information includes the TRU models that will be in production, along with the engine information for each model. Specifically, OEMs would be required to report the manufacturer of the engine installed in the TRU; the engine model and family; the rated horsepower and speed, displacement, exhaust emissions control system, and tier standard of the engine; and ARB's Executive Order certifying the engine for use in off-road equipment.

9. Prohibitions

The current TRU ATCM prohibits any person in California engaged in the business of selling, renting, or leasing TRUs from intentionally or negligently importing, delivering, purchasing, receiving, or acquiring a noncompliant TRU. In addition, it is unlawful for such a person to sell noncompliant TRUs to a person that could reasonably be expected to do business in California.

B. Proposed Amendments

Staff has restructured the TRU ATCM to include separate subsection numbers, under which the requirements for each applicable entity have been consolidated.
Section 2477.2 (see Appendix A) describes each of the applicable entities and directs the reader to the appropriate section that apples to an entity.

1. Extend ULETRU Compliance Date for MY 2001 and Older TRUs that Met LETRU Standard by December 31, 2008

Background
Some TRU owners brought their MY 2001 and older TRUs into compliance with the in-use standard by the applicable December 31, 2008, compliance date even though U.S. EPA had not yet approved ARB's waiver request. Other MY 2001 and older TRU owners elected to not comply due to the uncertainty created by U.S. EPA's delayed approval. After the compliance date passed, U.S. EPA approved the waiver but the approval came too late and ARB had to delay enforcement for MY 2001 and older TRUs until December 31, 2009. Owners that complied then complained that ARB's delayed enforcement created unfair competition because they made capital investments to comply with the law in effect at the time while their competitors avoided significant capital expenditures and gained a competitive advantage. The compliant owners have requested a compensatory regulatory provision to restore competitive fairness.

Proposed Amendment: Section 2477.5(g)
Staff is proposing an amendment in section 2477.5(g) that would extend the ULETRU compliance date for TRUs that met the LETRU in-use standard by the original December 31, 2008, deadline. The ULETRU compliance deadline would be extended

one year, to December 31, 2016, instead of the original December 31, 2015, compliance deadline. Certain conditions would have to be met to qualify for ULETRU compliance extension: 1) the original engine was retrofit with a Level 2 VDECS, reducing diesel PM by at least 50 percent; 2) the unit was repowered with an engine that met LETRU (Tier 4f if the engine was rated at less than 25 hp or Tier 4i if the engine was rated at 25 hp or greater); or 3) the unit was replaced with a new unit that was equipped with an engine meeting LETRU (same tiers as referenced in immediately preceding condition 2). In all cases the unit would have to be registered in ARBER. Affected owners would apply to the Executive Officer, providing information, documentation, and certifying statements that demonstrate the unit meets the conditions to qualify for the extension.

2. Extend ULETRU compliance date for MY 2003 and Older TRUs that met LETRU Standards by December 31, 2009 or December 31, 2010

Background

Affected owners and their trade associations have requested a longer operational life for TRUs than the seven years that is currently allowed under the TRU ATCM before the in-use performance standards must be met. At the November 2010 hearing for the 2010 amendments, the Board directed staff to evaluate the operational life issue.

As discussed in Chapter IV, staff has evaluated the potential near-source cancer risk at distribution centers under the current seven-year operational life approach and found that extending the operational life further would delay reductions in potential cancer risk, which remain at levels of concern. In addition, owners of older TRUs (e.g. MY 2003 and older) have been required to meet the in-use standards in 2008, 2009, and 2010 using a seven-year operational life, so there would be fairness issues if the operational life is changed at this point. Also, the retrofit device manufacturers that have invested significant resources into verifying diesel particulate filters (DPF) would be left with no market for one or more years, which would most likely force them to abandon the TRU market. DPFs are a lower-cost compliance option and their total non-availability may cause the cost of other compliance options to increase. Additionally, the TRU ATCM's PM emissions reductions also contribute to ARB's 2014 State Implementation Plan for meeting the federal PM 2.5 standard, so any delayed implementation could jeopardize those commitments and result in loss of federal highway funding. Therefore, staff is not recommending extending the ULETRU in-use standard compliance dates for MY 2004 and newer engines.

However, to provide economic fairness to those owners who had to take action during the height of the recession, staff evaluated extending the ULETRU compliance date for MY 2003 and older units that first met LETRU at seven years of age and are scheduled to meet ULETRU at 14 years after the engine model year. Staff found that the emissions impact of such and extension would be minimal since, by time that the ULETRU requirements would have to be met (2016-2017), the number of surviving units would be small. This is because by that age (14-years old), the van, truck or trailer, and refrigeration system are degraded to the extent that most will have been retired. For those remaining in service, investing in compliance technology may not be the best course of action, except in a very few cases where total accrued operating hours and mileage is unusually low for the age of the truck or trailer. Staff estimates there would be 1,420 MY 2001 and older units that would qualify in 2016; 164 MY 2002 units in 2017, and 640 MY 2003 units in 2018. The delayed diesel PM emissions reductions would be 0.042 tons per day (tpd), 0.004 tpd, and 0.012 tpd, respectively, and occur for only that single year. These delayed reductions would occur toward the end of the in-use engine clean-up period, so the vast majority of emission reductions would already have taken place and near-source risks would be greatly reduced by then. Staff has found that extending the operational life of these few remaining units an additional year would not cause a significant public health risk impact.

This extension provides economic fairness to fleets that keep their units longer, which is typically due to lower annual TRU activity, and therefore make a smaller contribution to statewide emissions and near-source risk. It is also worth noting that amendment #13, below, which proposes allowing the use of the unit manufacture year instead of the engine model year, if the difference between the two is only one year, effectively adds at least several months and arguably a year to the economic life of the engine. So in effect, staff's action in 2008, allowing the use of the TRU manufacture date for determining the compliance deadline, provided a good measure of economic fairness to purchasers of new TRUs.

<u>Proposed Amendment: Section 2477.5(m)</u>
Staff is proposing an amendment to section 2477.5(m) that would extend the ULETRU compliance date for MY 2003 and older units if LETRU was met by the required compliance date. The compliance date for meeting ULETRU would be extended by one year if certain conditions are met. For example, if an MY 2002 engine met LETRU by December 31, 2009, then ULETRU would be required to be met by December 31, 2017, instead of the original December 31, 2016 deadline.

The conditions that would need to be met to qualify for this ULETRU extension would include: 1) the original engine was retrofit with a Level 2 VDECS, reducing diesel PM by at least 50 percent; 2) the unit was repowered with an engine that met LETRU (Tier 4f if the engine was rated at less than 25 hp or Tier 4i if the engine was rated at 25 hp or greater); or 3) the unit was replaced with a new unit that was equipped with an engine meeting LETRU (same tier standards as referenced immediately above); and 4) the unit is registered in ARBER. Affected owners would apply to the Executive Officer, providing company information, affected unit's ARB IDN, compliance documentation, and certifying statements that demonstrate the unit meets the conditions to qualify for the extension.

3. Clarify the Operational and Recordkeeping Requirements for Hybrid Electric, Electric Standby (E/S), and Hybrid Cryogenic TRUs

Background
As described above, in Section A.3. of this chapter, hybrid electric TRUs, electric standby-equipped (E/S) TRUs, and hybrid cryogenic temperature controlled TRUs may qualify as an Alternative Technology if they are used in a way that eliminates the diesel engine operation while at a facility, except during an emergency (as described above in section A.3. of this chapter). After a compliance date for a TRU engine has passed, owners must be able to demonstrate that they are operating E/S-equipped TRUs in a way that eliminates the diesel engine run time at facilities, otherwise E/S would not qualify as an Alternative Technology and the TRU would not be in compliance. Eliminating the diesel engine run time at facilities where TRUs congregate reduces the public's exposure near the facility where potential cancer risk is the highest.

The regulation's intent is that in order for E/S to qualify as an Alternative Technology, electric power plugs must be available at facilities that E/S-equipped TRUs visit with perishable goods, and they must be plugged into electric power within a few minutes of arrival and departure so that engine-driven refrigeration is avoided. As a practical matter, this means that E/S may only be a viable compliance option for private fleets where E/S-equipped TRUs are loaded with perishable goods at a "home" distribution facility under the same ownership as the TRUs and the TRUs return every day to the same "home" facility. That way, the home facility would be responsible for providing electric power plugs for the E/S-equipped TRUs they own or lease, ensuring in-use compliance. In addition, the private fleet E/S-equipped TRUs would not be able to pick up or drop off loads at distribution facilities that were not under the fleet owner's ownership or control, since electric power plugs are most likely not available at facilities the fleet owner does not own or control. Facilities are not required to provide electric power plugs for E/S-equipped TRUs that they do not own or lease. Therefore, TRU owners or operators that deliver perishable goods to facilities they do not own should not consider the E/S compliance option because it is unlikely they can arrange electric power plugs at all California facilities they pick up and deliver to over the life of the TRU. Similarly, E/S-equipped TRUs also may not be a practical compliance option for refrigerated carriers that use truck stops for fueling, meals, and rest periods as only a few truck stops have electric power plugs that are compatible for use by E/S-equipped TRUs.

It was staff's intent, under the original TRU ATCM, that recordkeeping was necessary to demonstrate that TRU engine operation has been eliminated at facilities. During implementation, staff worked with stakeholders regarding deliveries to retail delivery points, recordkeeping elements necessary to demonstrate compliance, and other criteria for qualifying E/S as an Alternative Technology compliance option. Guidelines were published in TRU Advisory 08-02 (ARB, 2008b). Manual recordkeeping has been used; however, ARB enforcement staff has reported significant gaps in these records and it is sometimes evident that records do not reflect actual hour meter readings.

Clarifications and recordkeeping requirements are needed to make this demonstration more enforceable.

Staff have met with GPS tracking system providers that are used on refrigerated trucks, trailers, shipping containers and railcars. These tracking systems connect to the TRU controller to monitor and report several TRU system parameters, including cargo temperatures, fuel levels, and TRU engine run status. According to GPS tracking system providers, monitoring and recording when the unit is plugged into electric shore power can easily be added to a system (Bartlett, 2011) (Crilly, 2011). Facility fence lines or property lines can be defined for each facility that an E/S-equipped TRU visits. The electronic tracking systems can detect when the unit is inside a defined facility's fence line using GPS coordinates and record the engine run time and time running under electric shore power while inside the fence line. The tracking system wirelessly sends reports to an on-line server and reports can be generated when engine run time occurs within a facility fence line that exceeds the limits for the facility type. Data transmission to the server can be through a wireless cell phone network or via satellite.

GPS tracking system providers have indicated the capital cost would be in the range of \$250 to \$1,300, installed, plus \$19 to \$27 per month for cellular connection and server service (Bartlett, 2011) (Crilly, 2011). At \$35 per hour (fully burdened labor rate for driver pay, benefits and bonuses) (Adams, 2011), staff analysis found that the labor costs to complete manual hour meter readings and records significantly exceeded the operating costs of the automated electronic tracking systems, providing payback on capital costs of less than one year.

Proposed Amendment: Sections 2477.5(a)(3), 2477.5(d)(3), and 2477.5(d)(4)
Staff is proposing amendments in sections 2477.5(a)(3), 2477.5(d)(3), and 2477.5(d)(4) regarding using E/S or hybrid electric and hybrid cryogenic in a way that qualifies as an Alternative Technology compliance option. The amendments contain provisions that allow TRUs to run under diesel engine power from the time they enter the facility fence line or property line until they are parked, from a parking spot to the gate upon leaving the facility, and when they are being moved to and from loading docks to parking spots by yard hostlers. Engine run time within the facility fence line would be limited to no more than five minutes each time the unit moves within the facility fence line or property boundary.

This amendment clarifies that to qualify as an Alternative Technology, facilities in California, where E/S-equipped TRUs are based must have electric power plugs located where TRUs are parked for the initial van chill-down and while awaiting dispatch. Power plugs are also required at the loading spaces. These power plug requirements also apply to any nonretail facility in California where an E/S-equipped TRU picks up or delivers goods if the van load includes perishable goods.

At retail delivery and pick-up points, including but not limited to restaurants, grocery stores, convenience stores, and cafeterias, TRU engine run time is allowed, but limited to no more than 30 minutes per delivery/pick-up point. Electric power plugs are required at retail delivery and pick-up points if more than 30 minutes of TRU engine run time is necessary.

To qualify as an Alternative technology, E/S-equipped TRUs must be equipped with non-resettable hour meters that record both engine and shore-powered electric motor run time (separately). This will facilitate hour meter reading records that are required. Staff is proposing a new requirement for electronic tracking systems that provide automated Global Positioning System (GPS) tracking, engine run time monitoring, recordkeeping and reporting. Staff believes that the use of automated tracking and reporting systems will result improve enforceability and labor savings that more than pay for the capital and operating costs of such systems. This will be discussed further in Chapter V.

Staff is proposing to phase in electronic recordkeeping. At least 50 percent of an owner's fleet of E/S-equipped TRUs that have passed an in-use compliance deadline would need to be equipped with electronic tracking systems by December 31, 2012, and the remainder of those units would meet this requirement by December 31, 2013. In addition, 100 percent of an owner's E/S-equipped TRUs that have a December 31, 2013 in-use compliance date would also have to meet the electronic tracking system requirement. Every year thereafter, all E/S-equipped units that are required to meet an in-use standard by the end of the year would be required to meet the electronic tracking system requirement.

Out-of-state owners that elect to use the E/S compliance option must register those TRUs in ARBER (in-state owners are already required to register all of their units). Registration is necessary to facilitate reporting, demonstrate compliance, and would ensure that ARB has E/S-equipped TRU owner contact information when E/S-specific communications and notices are necessary. When using this compliance option, owners must be able to plug in at California nonretail delivery and pick-up points. However, it should be noted that California facilities are not required to provide electric power plugs to TRUs they do not own or lease, so it is likely that plug-in opportunities would be unavailable. Therefore, staff expects very few (if any) out-of-state-based E/S-equipped TRUs will qualify as an Alternative Technology.

Staff is proposing that manual recordkeeping include the following records for each E/S-equipped TRU:

- ARB IDN;
- Date;
- Address of each stationary location. A location code may be used, provided the owner provides a cross-reference to look up physical address by location code;
- Time of arrival and departure, and the elapsed time or duration at each stationary location;

- Engine hour meter readings taken at arrival and departure and elapsed engine run time at each stationary location;

- Electric motor hour meter readings taken at arrival and departure and elapsed time when electric shore power is powering the refrigeration system at each stationary location; and

- Driver log for those stationary locations that are for meals or rest periods, not pick-up or delivery.

Similar records are required to be captured by the electronic tracking system for each E/S-equipped TRU that has passed an in-use compliance deadline and has been phased into the electronic tracking system requirement.

Hybrid cryogenic temperature control systems would have similar diesel engine run time limits, manual recordkeeping, and electronic tracking system requirements, except that instead of electric shore power hour meter readings, cryogenic system usage hour meter readings would be required.

4. Add requirements for drivers, brokers, freight forwarders, motor carriers, shippers and receivers if they are the party responsible for arranging perishable goods transport on California highways

Background
Operating noncompliant TRUs exposes the public to potential cancer risk and such noncompliant operation in California is a violation of State law. Table II-3 presents data from ARB's Equipment Registration (ARBER) database, showing compliance rates by the model year (MY) of the engine or unit[7] for engines that have passed a compliance deadline.

Table II-3: Compliance Rates for TRUs Registered in ARBER[1]

Model Year	Compliance Deadline	Total Number Registered	Number in Compliance	Percent Compliant
2001 & Older	12-31-2008[2]	16,290	13,290	82%
2002	12-31-2009[3]	2,780	1,770	64%
2003	12-31-2010	6,730	2,060	31%
MY 2003 and Older - Overall		**25,800**	**17,120**	**66%**

1. Reflects registration data as of July 7, 2011.
2. Enforcement delayed until January 2010.
3. Enforcement delayed until March 31, 2011.

As shown in Table II-3, compliance rates have declined from 81 percent to 31 percent. The overall compliance rate for MY 2003 and older units is 66 percent, meaning that emissions reductions are 33 percent less than are expected from the ATCM. When

[7] Unit manufacture year is used if Advisory 08-01 applies (ARB, 2008a)

shippers and receivers hire carriers that have noncompliant equipment, they contribute to the low compliance rates. Additionally, carriers with noncompliant equipment are able to offer lower refrigerated truck rates and, as a result, create an unfair competitive advantage against compliant carriers that need to charge higher rates to pay their in-use compliance costs.

Compliant carriers have expressed their frustration to staff about this unfair competition, and about seeing many noncompliant TRUs at loading docks. Compliant fleets and their trade associations have requested staff add requirements for brokers, freight forwarders, shippers, and receivers that would require them to only hire or contract with compliant carriers. This request is consistent with ARB's On-Road Truck and Bus Regulation and the Heavy Duty Greenhouse Gas (GHG) Regulation (also known as California's "SmartWay" regulation). These regulations included a provision that requires brokers and shippers to be responsible for ensuring that compliant equipment is used.

Staff have reviewed the broker/shipper provisions in the aforementioned regulations with respect to their feasibility for TRUs. The On-road Truck and Bus Regulation[8] requires brokers or any California resident that operates or directs the operation of any vehicle subject to that regulation to verify that each hired or dispatched vehicle is in compliance with that regulation. The Heavy Duty Vehicle GHG Emission Reduction Regulation[9] requires shippers to only dispatch compliant tractors and trailers and shippers are not allowed to ship freight from their California facilities unless the tractor and trailer are in compliance. Staff believes it is reasonable and appropriate that receivers should also have similar requirements if they are the business entity that makes the transport arrangements with the motor carrier. Furthermore, freight forwarders should also hire and contract with carriers to transport refrigerated goods and should also be subject to such requirements.

Staff have discussed these potential requirements with freight brokers, freight forwarders, shippers, and receivers and heard their concerns. These stakeholders are concerned about being required to inspect TRUs and turn them away from the loading dock if they are not compliant. Staff understands that it is more difficult to determine if a TRU is compliant than whether a tractor or trailer meets the GHG emission reduction requirements, where a quick and easy visual inspection is all that is needed (for TRUs, one would need climb on the trailer and open the TRU housing to perform an inspection). Also, staff does not intend to make brokers, forwarders, shippers, and receivers inspect TRUs to determine compliance or turn away noncompliant TRUs. Instead, staff believes that freight brokers, freight forwarders, shippers, and receivers should use due diligence to ensure that only compliant equipment is dispatched on California highways.

These stakeholders have requested guidelines with criteria, that if met, would be considered demonstrations of due diligence. During implementation, staff intend to

[8] Title 13, CCR, section 2022(x).
[9] Title 17, CCR, section 95303(f) and (h)

develop guidance for demonstrating due diligence. Examples of concepts that could be a part of this guidance include:

- Based on ARBER registration data, staff could develop a current list of 100 percent compliant TRU owners which would be made publicly available. Brokers, forwarders, shippers, and receivers could use this list as a starting place, in conjunction with the criteria listed below. If they notify all of the refrigerated fleets they work with in advance that they only hire or contract with carriers that are on this list, there would be greater incentive for carriers to ensure that they are compliant with the in-use requirements. In addition, there would be a greater incentive for owners to maintain complete, updated ARBER registration data so that they can be on the 100 percent compliant list.

- Brokers, forwarders, shippers, and receivers could pool their resources and establish their own clearinghouse to list carriers that have demonstrated compliance with the TRU ATCM. Conversely, these entities could establish a clearinghouse to track carriers that are known to have noncompliant TRUs or that have poor compliance histories. Brokers, forwarders, shippers, and receivers would then consult these clearinghouse lists to ensure they hire only carriers with clear histories of compliance.

- When a broker, forwarder, shipper, or receiver advertises an available load, they could specify that refrigerated transport equipment will travel on California highways and must be California-compliant. Staff understands that brokers and freight forwarders already post equipment specification requirements on their on-line load boards[10] that advertise available loads. These load boards include various equipment specification categories, such as the type of trailer required (e.g. reefer trailer). Load boards could add a type "ARB Reefer" so that carriers know up front that TRUs must be compliant with California's in-use standards in order to be hired.

- Document the steps during negotiations where the carrier was notified that a ARB-compliant TRU is required and that the carrier confirmed that they understand their contractual obligation to dispatch compliant TRUs to California if they are hired. For example, the ARBER certification page can be used show that dispatched unit is compliant.

- Include contract language that very clearly requires that only California-compliant TRUs can be dispatched on California highways. Highlight or bold this contract language and provide a space next to this language for the carrier or his representative to sign, acknowledging this requirement and certifying that they will only dispatch compliant equipment on California highways.

[10] See 123LOADBOARD at: http://www.123loadboard.com

Staff is committed to working with brokers, forwarders, shippers and receivers in developing other tools and guidance that could facilitate the implementation of these requirements.

Proposed Amendment: Sections 2477.7, 2477.8, 2477.9, 2477.10, and 2477.11
New requirements are being proposed in section 2477.7 for drivers, section 2477.8, for freight brokers and freight forwarders, section 2477.9 for motor carriers, section 2477.10 for California shippers, and section 2477.11 for California receivers. The business entity that arranges, hires, contracts for, or dispatches the transport of perishable goods in TRU-equipped trucks, trailers, shipping containers, or railcars must require the carriers they hire or contract with to only dispatch equipment with TRUs that comply with the TRU ATCM's in-use standards if they travel on California highways or railways. That business entity would also be required to provide the driver with their company contact information and a bill of lading that includes shipper, carrier, and receiver information. The driver, in turn would be required to provide this information to an ARB inspector, upon request.

5. Clarify compliance by repowering with a cleaner, new, or rebuilt engine

Background
State and federal laws[11] allow engine manufacturers to manufacture new replacement engines that do not meet the most current emissions standards in effect, if the manufacturer has determined that no engine manufacturer has certified an engine to the current tier standards with the appropriate physical and performance characteristics to repower the equipment. In other words, a replacement engine must be the cleanest engine available that will physically fit and perform in the equipment; but, if a current-tier engine will not fit or perform, then a prior-tier engine may be used. Federal law requires the engine manufacturer or its agent (e.g. original equipment manufacturer or dealer) to take possession of the old engine and confirm that the old engine has been destroyed.[12]

Owners of TRUs can comply with the TRU ATCM's in-use standards by repowering with a new, certified replacement engine that is the cleanest engine that will fit and perform in the TRU. Compliance is achieved because the compliance date for the replacement engine is seven years from the model year of the replacement engine. In some cases, the replacement engine may not actually meet an in-use standard, but still qualifies as a compliance option. For example, a new Tier 2 engine does not meet the LETRU or ULETRU in-use standards, but still qualifies as a compliance option if the compliance date is in the future. The owner needs to be aware that unless a replacement engine meets the ULETRU in-use standard,[13] the replacement engine will need to be retrofitted with a Level 3 VDECS, replaced again with a cleaner engine, or otherwise brought into

[11] Replacement engines must meet the requirements of Title 40, Code of Federal Regulations sections 89.1003 and 1068.240 and title 13 California Code of Regulations section 2423(j).
[12] Title 40 Code of Federal Regulations, section 1068.240(b)(4).
[13] Table II-1 shows that the Tier 4f standard will meet ULETRU for ≥25 hp engines. However, Tier 4f is not scheduled to become effective until January 1, 2013.

compliance with the ULETRU in-use standard by December 31st of the seventh year after the replacement engine's model year or effective model year.

Effective Model Year[14]

If the replacement engine was manufactured to meet a tier of the off-road emissions standards that was in effect at the time the engine was manufactured, then the model year of the replacement engine is used to determine in-use compliance deadlines. However, if the replacement engine was manufactured to meet a prior tier of the off-road emissions standards that was no longer in effect at the time of manufacture, the replacement engine's effective model year must be used. In this case, the effective model year is the last year that the prior-tier emissions standard was in effect. Table II-4 shows the years that the off-road engine emissions standard tiers were in effect for the horsepower categories of engines used in TRUs and the effective model years for prior-tier replacement engines.

Table II-4: Effective Model Year for Prior-Tier Off-Road Replacement Engines

Off-Road Engine Emissions Standard Tier	Tier Standard Effective Years	Effective Model Year for Prior-Tier Replacement Engines
Tier 1, ≥25 to <50 hp (trailer)	1999-2003	2003
Tier 1, <25 hp (generally truck)	2000-2004	2004
Tier 2, ≥25 to <50 Hp (trailer)	2004-2007	2007
Tier 2, <25 hp (generally truck)	2005-2007	2007
Tier 4i, ≥25 to <50 hp (trailer)[1]	2008-2012	2012

1. Tier 4i is in effect as of this writing (2011), but is included here to demonstrate what the effective model year will be after Tier 4f takes effect in 2013 for ≥25 to <50 hp engines.

TRU owners need to be aware that choosing a prior-tier replacement engine as a compliance option will result in a shorter operational life because in-use compliance is still required seven years after the effective model year of a prior-tier replacement engine. For example, if a TRU has a MY 2003 original engine that must comply by December 31, 2010, and the owner chooses to repower with a Tier 2 replacement engine, since the effective model year of this replacement engine is 2007, compliance with ULETRU would then be required by December 31, 2014. For this example, the operational life of this replacement engine would only be four years.

Clarification is needed to ensure owners understand how the effective model year affects the operational life of a replacement engine so they can plan accordingly. In addition, staff believes disclosures from replacement engine suppliers regarding the effective model year of engines they purchase is important so owners are fully aware of the operation life of the replacement engine they are looking to purchase.

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[14] Effective model year is defined in the TRU ATCM 2010 amendments at title 13, CCR 2477

Proposed Amendment: Section 2477.5(i) and 2477.16

Regulatory language is being proposed in section 2477.5(i) to clarify how repowering a TRU with a new replacement engine or rebuilt engine can maintain compliance with the in-use standards. New replacement engines and rebuilt engines used for repowering must meet more stringent emissions standards than the original engine. New replacement engines and rebuilt engines must then meet the TRU ATCM's in-use standards, based on the replacement engine's model year or effective model year. Current tier new replacement engines would use the engine model year shown on the engine emissions label to determine the in-use standard that must be met and the in-use compliance deadline. Prior-tier new replacement engines would use the effective model year of the engine, as defined, to determine the in-use standard that must be met and the in-use compliance deadline. In the case of the prior-tier engine, the year of manufacture and the installation year are not relevant to determine in-use requirements or compliance deadlines.

Rebuilt replacement engines must meet the requirements of a new section of the TRU ATCM, 2477.16, which clarifies federal and State requirements as they pertain to TRU engines. Regulatory language also clarifies that when a rebuilt engine meets a prior tier new engine emissions standard, the effective model year is used, which is the last year that the tier standard was in effect. However, if a rebuilt engine meets a tier standard for new engines that is currently in effect, then the model year, for the purposes of the TRU ATCM would be the year that the engine was rebuilt. Section 2477.16 also includes supplemental label requirements that include the model year.

6. Clarify TRU dealer requirements and allowances for noncompliant equipment

Background

Under the existing TRU ATCM, dealers are prohibited from selling noncompliant equipment to any person that could be reasonably expected to do business in California, but they are allowed to sell noncompliant equipment to persons outside of California that will not use that noncompliant equipment to conduct business in California. The existing TRU ATCM also prohibits dealers from purchasing, receiving, or otherwise acquiring noncompliant TRUs. Dealers have made staff aware that this is an issue because dealers that sell TRUs or refrigerated trucks and trailers need to be able to work with noncompliant TRUs in California as part of trade-ins when owners buy new or newer compliant equipment. Dealers often need to pick up the noncompliant trade-in equipment from the owner's terminal and move it to the dealer's yard before selling it out-of-state or bringing it into compliance prior to sale. Therefore, dealers need to be able to purchase, receive, or acquire and move noncompliant equipment on California highways. Regulatory language is needed to allow dealers to conduct their business without being cited, as long as certain conditions are met.

In addition, as mentioned briefly above, dealers have a role in passing the registration information document for new units, new replacement engines, and rebuilt engines on through to the ultimate purchaser at point of sale.

Proposed Amendment: Section 2477.14
Regulatory language is being proposed in section 2477.14 to allow dealers doing business in California to purchase, receive, or acquire and possess noncompliant TRUs in California. Dealers would also not be required to register TRUs in ARBER, except for TRUs they intend to rent or lease (see section 2477.12 for requirements that apply to lessors and lessees). However, conditions would have to be met for a dealer to qualify, such as:

- Noncompliant TRUs could not be sold for use in California prior to being brought into compliance with the in-use standards;
- Dealer sales of noncompliant TRUs must only be to persons that would not reasonably be expected to do business in California and a written disclosure to the buyer in the bill of sale is required in accordance with section 2477.18(b)(1);
- Noncompliant TRUs must not be rented or leased prior to being brought into compliance;
- Noncompliant TRUs must not be operated at the dealers place of business or on California highways when loaded with perishable goods, except during repairs by dealers to customer-owned equipment; and
- If a noncompliant TRU travels on California highways, the TRU cannot be operating, no temperature-sensitive goods can be loaded in the van, the dealer must provide the driver with a dealer-certified document that explains the purpose of the trip and provides dealer contact information, the driver must allow an inspector access to the payload space of the van, and all circumstances at the time of inspection must be consistent with the dealers document explaining the purpose of the trip.

Regulatory language is also being proposed in section 2477.14 that would require dealers that sell new units or replacement engines, whether new or rebuilt, to pass the registration information document to the ultimate purchaser at point of sale. The registration document would come with the new unit or new replacement engine from the TRU original equipment manufacturer (OEM), or from the rebuilt engine supplier. If a new replacement engine is not supplied with a registration information document, then the dealer must provide a registration information document, which would include all of the engine information needed to register the unit in ARBER.

7. Allow the Executive Officer to extend compliance dates up to one year when compliance technology is unavailable

Background
Staff have received several requests for compliance deadline extensions, where owners claimed there are no suitable in-use compliance options for TRUs. As envisioned by staff, extensions could be short, in the case where a little more time is needed for a developing compliance technology to be available on the market. Otherwise,

extensions could be up to a full year, if more time is needed for compliance technology to be developed.

As of this writing, one Level 3 VDECS is verified and on the market. A second Level 3 VDECS is expected to complete verification and be available on the market in fall 2011. A third Level 3 VDECS is being developed and is expected to be verified and market-ready sometime in 2012. Other compliance options, such as a replacement engine or a unit replacement, are also readily available. In fact, registration data indicates that engine replacements have been the dominate compliance method used by TRU owners (used about 70 percent of the time).

Staff strongly recommends owners start researching compliance options well in advance of a compliance date to ensure they can place control technology orders at least four months before a compliance deadline. Four months takes into account the "normal" lead times for control technology delivery, "normal" delays due to the holiday season, and "normal" delays due to higher year-end demand due to impending December 31st compliance deadline. Failure to begin the procurement process early and place orders that take into consideration normal lead times would not demonstrate good-faith attempts to comply. Staff believes applications for extensions should be submitted at least 120 days before a compliance deadline to show good faith compliance efforts have been made.

Proposed Amendment: Section 2477.5(k)
Staff is proposing an amendment in section 2477.5(k) that would give the Executive Officer the authority to grant an extension of up to one year to a compliance deadline for specific TRUs, if certain conditions are met. Owners would need to apply for compliance extensions at least 120 days before the affected equipment's compliance date, provide a detailed description in their application listing the reasons and factors that serve as the basis for their position that no suitable control technologies exist, and identify the specific units for which an extension is being requested. Such a demonstration would need to include adequate documentation, which may include detailed engineering drawings and/or calculations that support the applicant's claim. For example, if an applicant claims that an engine replacement is not available, the demonstration would need to show that there is no cleaner engine of any make or model that will fit and functionally perform in the equipment.

Extensions would not be available to fleets that have other equipment that is not compliant with the TRU ATCM's in-use requirements. Owners would need to be able to demonstrate that the rest of their fleet is in compliance.

8. Add an exemption for obviously non-operational equipment not covered by the dealer exemption

Background
Staff has received requests from stakeholders that want to leave the TRU in place and use the van to exclusively haul dry goods rather than bringing the TRU into compliance.

They have offered to remove key components to make their TRU obviously nonoperational. Staff agreed this was feasible, provided an inspector could easily determine there was no way the TRU could be operated. In 2008, staff published TRU Advisory 08-09 (ARB, 2008c), which explained how this could be achieved for truck and trailer TRUs.

TRU gen sets cannot be made obviously nonoperational, but stakeholders have notified staff that occasionally, noncompliant TRU gen sets mistakenly come into California. As soon as they discover the mistake, they remove them from service, but need to legally transport these units out-of-state. These stakeholders have requested some way to place these noncompliant TRU gen sets in a nonoperational status until they can be moved out-of-state, including during transit. Staff has agreed to sequestration, tagging, and labeling to accomplish this. Additionally, stakeholders have requested regulatory clarity for when a TRU is not attached to a van and for when a TRU has a major component removed (e.g. engine or fuel system).

Proposed Amendment: Section 2477.3
This amendment would add an exemption in section 2477.3 for obviously nonoperational TRUs and TRU gen sets that are noncompliant. The prohibitions against selling, renting, or leasing noncompliant equipment to a person that could reasonably be expected to operate in California would still be in effect for obviously nonoperational equipment. This exemption would apply to the following equipment if the included conditions are met:

- Any TRU that is removed or separated from the truck or trailer van, shipping container, or rail car; however, an exemption would not be allowed for TRU gen sets that are not attached to a shipping container or trailer chassis;

- Any trailer TRU housing that remains attached to a trailer van, but the fuel tank and battery have been removed and a label with the word "NONOPERATIONAL" has been affixed to the housing;

- Any truck TRU housing that remains attached to a truck van, but the positive and negative battery cables, fuel supply and return lines, and condensate drain line have been removed so that there are no visible ancillary connections to the TRU housing and a label with the word "NONOPERATIONAL" has been affixed to the housing;

- Any TRU that has no engine or fuel injection system installed, making the engine incapable of being started; and

- TRU gen sets that have been quarantined in a designated area that is separated from other compliant TRU gen sets by a cordon or barrier with signs that read "NONCOMPLIANT – DO NOT OPERATE IN CALIFORNIA". Bright red tags must be affixed to the TRU gen set control panel at all times while in California that read: "NONCOMPLIANT – DO NOT OPERATE IN CALIFORNIA". TRU gen sets may be stored in a shipping container in lieu of being quarantined in a cordoned area, provided the signage and tagging requirements are met.

9. Add an exemption for refrigeration systems not powered by an integral diesel engine

Background
Refrigeration systems that are not driven by an integral diesel engine do not fit the definition of TRU and would therefore not be subject to the requirements of the TRU ATCM. That said, staff continue to get many inquiries from stakeholders about refrigeration systems that do not meet the definition. These stakeholders have requested regulatory language that clarifies certain cases, such as refrigeration systems that are driven by gasoline engines, refrigeration systems that are driven by electric motors, and pure cryogenic temperature control systems.
Proposed Amendment: Section 2477.3
An amendment is being proposed to add an exemption to section 2477.3 to clarify that transport refrigeration systems that are not driven by an integral diesel internal combustion engine are exempt from the TRU ATCM. Examples of exempt equipment include, but are not limited to:

- Transport refrigeration systems that are driven by gasoline-fueled internal combustion engines;

- Transport refrigeration systems that are driven by electric motors with no integral diesel engine providing power; or

- Pure cryogenic temperature control systems with no diesel-engine-driven refrigeration system integration

10. Add an exemption for TRUs that are used during emergencies, as defined

Background
Stakeholders have requested an exemption for TRU-equipped refrigerated trucks and trailers used by mobile catering companies that feed emergency responders, such as firefighters suppressing wildfires. In the past, the Governor of California has suspended certain air quality regulations during disasters with the intent of expediting the work that needs to be done.

Staff have surveyed 12 mobile catering companies and learned that these TRUs are only used a few times a year for a relatively small number of days per incident. The annual engine operating hours are relative small compared to the TRUs that are used at grocery distribution centers. One or two trailers are typically dispatched to an incident response staging area, which is typically located in a remote area, away from the public. Staff evaluation has found that the public health impacts due to TRU operations at wildfire staging areas would therefore be insignificant, especially when compared to the smoke from the wildfire.

Proposed Amendment: Section 2477.5(o)
Staff is proposing an amendment in section 2477.5(o) that would add an exemption for TRUs that are used during an emergency. The exemption would apply to meeting the in-use standards. The exemption would not apply to the registration requirements for California-based TRUs. Mobile catering companies would be required to apply for the exemption annually to ensure they are meeting certain conditions:

- The mobile catering company would be required to be under contract with the National Interagency Fire Center to provide mobile catering food service to emergency incidents for the year that the exemption would apply and a copy of the contract would be required with each application;

- All California-based TRUs would still need to register in ARBER (as currently required) and all TRUs owned or leased by a mobile catering company that are based outside of California that the owner wants included in the mobile catering company exemption would also need to be registered in ARBER;

- The owner would be required to provide the driver with a copy of the current Mobile Catering Service Exemption that has been approved by ARB's Executive Officer and the Mobile Food and Shower Service Request Form issued by the National Interagency Fire Center for the incident they are traveling to or from; and

- During transit on California highways, the driver would be required to, upon request, present these documents to an inspector.

Staff believes that this exemption needs to expire in 2025, five years after all TRUs would be required to meet the ULETRU in-use standard. This is necessary in order to ensure that old, high-emitting TRUs are removed from service, as originally intended by the ATCM, so that the regulation's air quality goals can be met. In addition, the TRUs and insulated vans would be very inefficient due to wear and deterioration and staff expects there would be plenty of used TRUs available at a reasonable cost that meet ULETRU.

11. Clarify prohibitions on the sale of noncompliant units

Background
The existing prohibitions on the sale of noncompliant units focus on businesses that sell TRUs. The intent is to prevent noncompliant units from being sold into service in California. To ensure that the original intent of the ATCM is met, these prohibitions need to be extended to any person that sells TRUs, including owners, regardless of how many units they own.

For example, staff has learned that TRUs are sold at auctions with no regard to compliance status and no regard to whether they will be operated in California. Additionally, staff has received numerous calls from people living outside of California that have recently purchased (for example, at an auction) a TRU with plans to transport perishable goods on California highways. After their purchase, they learn that the unit is noncompliant and illegal to operate in California. Staff believes that when noncompliant units are sold to people outside of California, it is reasonable and appropriate for the seller to disclose to the buyer the unit's noncompliance status and that they cannot legally operate these units in California.

Similarly, TRUs equipped with electric standby are being sold as compliant without any explanation that they must be operated in a way that qualifies them as Alternative Technology (see Section B.3, above). Again, staff believes that it is reasonable and appropriate that sellers be prohibited from claiming that a unit is in compliance if it is equipped with an Alternative Technology, and that the seller needs to disclose to the buyer that such a unit is only compliant if it is used in a way that qualifies it as an Alternative Technology.

<u>Proposed Amendment: Section 2477.14(b)</u>
Dealers are exempted from the prohibition to import, deliver, purchase receive, or otherwise acquire noncompliant TRUs, provided the conditions of section 2477.14(b) are met. In addition, clarification is provided to expressly include auctioneers and motor carriers in the prohibition to sell noncompliant units to a person that could reasonably be expected to do business in California.

An amendment is being proposed that would make the existing prohibitions apply to any person instead of just businesses that sell TRUs. A definition for "person" is proposed in section 2477.4 to mean an individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, government, governmental subdivision, agency, or instrumentality, public corporation, or any other legal or commercial entity.

Another amendment would require the seller of a noncompliant unit to disclose to a potential buyer from outside of California that the unit is not compliant with the in-use requirements and cannot legally operate in California. Staff is also proposing an amendment that would prohibit an owner of a TRU that is equipped with an Alternative Technology, such as electric standby, from selling it, while claiming it is in compliance with the in-use requirements, without disclosing in writing that it must be used in a way that qualifies it as an Alternative Technology (see Section B.3).

12. Clarify and streamline requirements for lessors and lessees

<u>Background</u>
During implementation of the TRU ATCM's registration program, companies that lease or rent TRU-equipped trucks and trailers made staff aware that the operator reporting requirements may impose an excessive burden on them. These companies also

indicated they needed to be able to delegate registration responsibilities to lessees when contractually required to do so. Staff worked with industry to develop a streamlined process for rented and leased TRUs.

Under this streamlined process, lessors (who own the units they lease or rent) are responsible for bringing these TRUs into compliance with the in-use standards. The exception is for lessors that are banks or financial institutions, which typically never see the equipment they finance. In the case where the lessor is a bank or financial institution, compliance with the in-use standards falls on the lessee. Lessors are also responsible for registration of units in ARBER (again, except banks and financial institutions), unless the lease contract clearly delegates that responsibility to the lessee, in which case the lessor needs to submit third party agreement confirmation information to ARBER along with a copy of the contract and notify the lessee in writing of this delegation. The party responsible for registration would also be responsible for affixing the ARB IDN to the unit housing.

Lessors are also responsible for submitting an Operator Report for each terminal located in California and updates are required when information changes. Rental units, which have no contractual term or required rental duration, would be included on the lessor's Operator Report, but rental status would not be required to be updated each time the unit is rented or returned. Leased units, which have a contractual term or required minimum lease duration, would not need to be included on the lessor's initial Operator Report. However, when leased units are returned to the lessor and remain in the yard (not under lease) for more than 30 days, they would be considered to be assigned to the lessor's terminal; therefore, the lessor would be required to add the unit's ARB Identification Number (IDN) to their Operator Report.

Lessees would be required to register a leased unit if they are contractually required to do so and the lessor has notified them that they have been delegated to register in ARBER. The lessee would be required to submit a copy of the ARBER registration certificate, which is issued by ARBER upon successful registration, to the lessor. The lessee is also required to submit an Operator Report to ARBER for all California terminals that they assign TRUs to, listing the IDNs of the units they own or lease.

Proposed Amendment: Section 2477.12

Staff implemented this streamlined process on a pilot basis, with the cooperation of the lessor group, and published TRU Advisory 08-04 (ARB, 2008d) to explain ARB's policy with regard to registration, Operator Reports, and compliance with the in-use standards. These policies and procedures worked well during the pilot period; therefore, staff is proposing amendments in section 2477.12 that clarify the requirements that apply to lessors and lessees of TRUs by incorporating the these policies and procedures into the ACTM.

13. Allow the use of the unit manufacture year instead of the engine model year for determining compliance requirements and dates

Background

As adopted, the compliance dates for meeting the in-use performance standards of the TRU ATCM are based on engine model year. During implementation of the TRU ATCM, TRU original equipment manufacturers (OEM) and owners made staff aware that new TRUs, produced in January, February, or March, are typically equipped with engines from the prior model year. For example, TRUs manufactured in January 2008 are usually equipped with MY 2007 engines. TRU owners lose up to a year of useful life before TRU ATCM compliance is required when they take delivery of a new TRU that was manufactured in the first few months of a calendar year if that unit is equipped with an engine of the prior model year. In order to maximize useful life, many customers are likely to wait for the engines with a model year matching the unit manufacture year. This would result in disruption of the OEM's production cycle for several months and would negatively impact the availability of new TRUs.

In 2008, staff published TRU Advisory 08-01(ARB, 2008a), which explained ARB's policy on this issue. The advisory allows the manufacture year of the TRU unit to be used instead of the TRU engine model year to determine the TRU ATCM in-use performance standards that must be met and the related compliance dates; however, the TRU unit manufacture year shown on the unit label can be no more than one year later than the TRU engine model year shown on the engine label. OEMs are prohibited from stockpiling engines under federal law[15] to prevent circumvention when new, more stringent standards become effective. In addition, OEMs are supposed to use a "first-in-first-out" inventory control strategy, meaning that they use the oldest engines in their inventory first. Based on this, staff believes that the difference between unit manufacture year and engine model year should never be more than one year. If the difference is greater than one year, then the engine model year would be used in accordance with the TRU ATCM. For example, a TRU that is manufactured in 2002 with a model year 2001 engine may use 2002 to determine the in-use performance standard requirements and compliance date. However, if a TRU is manufactured in 2002 with a model year 2000 engine, the engine model year 2000 would be used to determine the applicable compliance date.

Proposed Amendment: Section 2477.5(b)(6)

This policy has worked well and staff is proposing an amendment in Section 2477.5(b)(6) to allow the TRU manufacture year to be used to determine the in-use performance standards that must be met and the related compliance deadline, provided the difference between the unit manufacture year and the engine model year is no more than one year. If the difference between unit manufacture year and model year is greater than one year, the engine model year must be used to determine compliance dates.

[15] Title 40 Code of Federal Regulations, section 1068.105. ARB plans to propose, in December 2011, amendments in title 13 CCR, section 2423, Off-Road Compression-Ignition Engines and Equipment, that would also prohibit engine stockpiling.

Under this amendment, TRU owners need to be aware that when a VDECS is verified, the Executive Order lists the engines by model year that the VDECS is compatible with. Therefore, the engine model year must be used when determining VDECS compatibility with an engine. In addition, when a TRU is registered in ARBER, the engine model year that is on the engine emissions label must be entered in the space for engine model year. In either of these cases, the unit manufacturer year cannot be used when registering in ARBER.

14. Add a provision to allow the use of unique equipment identification numbers instead of affixing an ARB Identification Number (IDN)

Background
The TRU ATCM requires owners of California-based[16] TRUs to apply for ARB IDNs and affix or paint the IDNs onto the TRU or TRU gen set housing. ARB IDNs are voluntary for out-of-state-based units.
During implementation, TRU owners made staff aware that some large TRU fleets and most (if not all) TRU gen set fleets use their own equipment numbers to help them track their equipment. Motor carriers, TRU gen set owners, and railroads requested they be allowed to use their company equipment number, BIC-Codes, and reporting marks in lieu of the ARB IDNs to avoid confusion, costs, duplication, and space limitations.

Staff evaluated this and learned that in the case of TRU gen sets and refrigerated shipping containers, the identification numbering system meets the ISO standard 6346 and is administered by the Bureau International des Containers (BIC), an international organization. The BIC publishes their assigned company codes in their Intermodal Equipment Registry. Railcars use a similar equipment numbering system with company codes, called reporting marks, assigned by the Association of American Railroads (AAR). These equipment numbers typically use a three to four alpha character prefix that is assigned to a company by the BIC or AAR, followed by a six-digit numeric serial number that the company assigns to a specific piece of equipment. The result is a unique identification number for each unit across all companies worldwide.

Railroads requested they not be required to apply the IDN or railcar's reporting mark to the TRU housing because the TRU is sometimes located inside a protective outer wall, such that a number on the TRU housing would not be visible from most angles. Staff believes this is practical and therefore an IDN affixed to both sides of the railcar should be acceptable; however, if the TRU is replaced, the owner must transfer the railcar reporting mark to the replacement IDN registration information within 30 days.

In the case of truck and trailer TRUs, staff learned that each company assigns its own equipment number without coordination with other companies. Therefore, these equipment numbers are not truly unique across all companies, so there could be

[16] "California-Based TRUs and TRU Gen Sets" means TRUs and TRU gen sets equipped on trucks, trailers, shipping containers, or railcars that a reasonable person would find to be regularly assigned to terminals within California. If a company sequesters or domiciles in California a portion of their equipment that complies with the TRU ATCM in-use performance standards to ensure there is a pool of compliant equipment available, these units would require IDN applications.

duplication, confusion, and misidentification of equipment. Therefore, staff found that it would be impractical to use truck and trailer equipment numbers in place of the ARB IDNs.

Proposed Amendment: Section 2477.5(e)
Staff proposes to add an amendment to section 2477.5(e) that would allow the use of BIC-Codes, or reporting marks in place of ARB IDNs, provided:

- The owner must still apply for an ARB IDN if the unit is California-based;
- The BIC-Code or reporting mark must be unique for each piece of equipment; and
- The BIC-Code or reporting mark must meet the same readability specifications currently required for ARB IDNs.

15. Allow the Executive Officer to grant a one-time compliance extension of no more than four months if financing, delivery, or installation are delayed

Background
Owners and trade groups have expressed concern over compliance delays that can occur even though the owner has made good-faith efforts to comply in a timely manner. Staff agrees that when an owner places orders for compliance technology within the normal lead time for both delivery and installation, there may be circumstances beyond the owner's control that prevents full compliance by a compliance deadline. It is therefore appropriate to have a regulatory process that provides some flexibility for ARB to evaluate and, if necessary, address these circumstances.

Staff has been monitoring the lead times for delivery and installation during implementation of the TRU ATCM and believes that orders that are placed two to four months in advance of compliance deadlines would provide sufficient time for delivery and installation, with additional time allowed for queuing (e.g. time waiting for an installation appointment) and holiday season-related delays. In other words, owners must anticipate "normal" lead times, "normal" delays due to the holiday season, and "normal" delays caused by higher year-end demand due to the impending December 31st compliance deadline. Staff believes that placing orders at least two months in advance of the deadline – by October 30th – may be a reasonable demonstration of acting in good faith for retrofit compliance technologies, but up to four months lead time – by September 1st - may be necessary for some compliance options, such as engine, unit, or trailer replacements.

Proposed Amendment: Section 2477.5(l)
To address this issue, staff is proposing an amendment in section 2477.5(l) that allows the Executive Offer to grant a **one-time** compliance extension of **no more than four**

months, to meet the in-use compliance standard, provided the following conditions are met.

1. The unit is registered in ARBER to enable ARB staff to easily identify any units that have been granted an extension.

2. The owner applies for the extension on or before the in-use standard compliance deadline (i.e. December 31st).

3. The extension application provides a clear and rational justification for the request, including:

   - Documentation showing the owner ordered the compliance technology at least two months before the compliance deadline for retrofit technologies and at least four months in advance for engine, unit, or trailer replacements;

   - If delivery is the cause for delay, the reason for the delay (including supporting documentation) and an updated delivery schedule;

   - If installation is the cause for delay, the date that compliance technology was delivered, the reason for the delay (including supporting documentation), and an updated installation schedule; and

   - If there are other circumstances causing the delay, such as financing, the reason for the delay (including supporting documentation), and an updated schedule.

The proposed amendments also allow the Executive Officer to request additional information, as necessary, to evaluate the extension request. This information may include, but is not limited to, documentation from equipment manufacturers, installers, and financial institutions that substantiate the applicant's request.

16. Add requirements for TRU original equipment manufacturers (OEM)

Background

Engine manufacturer "Replacement Engine" emissions labels typically do not include all of the information that is required on current-tier engine emission labels. The same is true for flexibility engines[17] that are installed by TRU OEMs in new units. So, information is missing from these engine emission labels that is needed by the owner to register in ARBER. Staff has provided guidance to owners, with assistance from TRU OEMs, explaining how to interpret engine emissions labels. However, many owners are still confused by these labels, which results in the entry of erroneous registration information in ARBER and exposes TRU owners to unnecessary citations. A supplemental label on prior-tier replacement engines and flexibility engines along with a

[17] A detailed background explanation of flexibility engines in the Staff Report for 2010 Amendments to the TRU ATCM, Chapter II, section E.1. (ARB, 2010b)

registration information document, which would provide owners with the information needed for registration in ARBER, would minimize these registration errors.

Staff believes the TRU OEMs should provide these supplemental engine emissions labels on new replacement engines and flexibility engines. TRU OEMs supply the new replacement engines that are used to comply with the TRU ATCM. OEMs understand how to locate and interpret the information that is on the emissions labels. TRU OEMs also have access to engine manufacturer liaisons that can provide missing information or clarification regarding these labels.

Staff also believes that ARBER registration entry errors by owners could be significantly reduced if they were provided an ARBER registration information document at point of sale for all new TRUs, and new replacement engines. OEMs could provide such a document that would be shipped with the new equipment, and would be passed through the dealers and repair shops to the ultimate purchaser at point of sale. The registration document for new TRUs would include all of the unit information and engine information needed for registration. The registration information document for new replacement engines would include the engine information that is needed for registration.

The TRU ATCM, as amended in 2010, requires flexibility engines that are installed after March 7, 2011, to use the effective model year of the engine to determine the in-use compliance requirements and deadlines. Flexibility engines are manufactured to meet an emissions standard that is no longer in effect at the time of manufacture (flexibility engines meet a less stringent, prior-tier emissions standard). The effective model year is the last year that a prior tier standard was in effect. The result is that the operational life of a unit that is equipped with a flexibility engine is shorter than if the unit had been equipped with an engine that meets the tier standard that is in effect at the time that the unit was manufactured. Staff believes it is necessary that if a TRU OEM chooses to equip new TRUs with flexibility engines, they should disclose this to potential buyers prior to sale and notify the buyer about the ULETRU compliance date. This disclosure would eliminate the issue staff brought to the Board in 2010 where many owners of TRUs with flexibility engines were not aware that such TRUs had shorter compliance lives.

<u>Proposed Amendment: Section 2477.13</u>
Staff is proposing amendments to Section 2477.13, that add requirements for TRU OEMs. The amendments are discussed below.

Flexibility Engines

- TRU OEMs that plan to equip TRUs with flexibility engines would be required to notify ARB at least 12 months in advance of the first flexibility engine installation in production. This notification ensures in-use and labeling requirements are being met, and that owners are being notified with regard to the effective model year and ULETRU compliance dates.

- Beginning 120 days after the effective date of the regulation, TRU OEMs would be required to provide a supplemental engine emissions label for each flexibility engine installed in new TRUs and attach this label to the engine in an easily accessible place. The supplemental labels would list all of the engine information needed to register the equipment in ARBER, if the engine manufacturer's emissions control label does not provide this information.
- OEMs would be required to provide a written disclosure to prospective buyers, prior to sale of new TRUs, notifying them when a TRU is equipped with a flexibility engine, the effective model year of the engine, the ULETRU compliance deadline, and that the effective model year must be entered for the model year when the unit is registered in ARBER.

Prior-Tier Replacement Engines

- Beginning 120 days after the effective date of the amendment, OEMs would be required to provide supplemental engine emissions labels, similar to those that are needed for flexibility engines, for each new replacement engine they supply. The supplemental labels would list all of the engine information needed to register the equipment in ARBER, if the engine manufacturer's emissions control label does not provide this information. Also, written disclosure with each prior-tier engine they supply would be required, which would be passed on to interested buyers, notifying them that they are buying a prior-tier replacement engine that was manufactured to meet a less stringent prior-tier emissions standard than is currently required. This notification would also provide the effective model year of the prior-tier replacement engine and the ULETRU compliance deadline.

- Beginning 120 days after the effective date of the amendments, OEMs would be required to provide a registration information document with each prior-tier replacement engine they supply that would be passed on to the end user. The registration information document would include all of the engine information needed to register the equipment in ARBER and be consistent with the information that is on the engine emissions label and supplemental engine label.

Current-Tier Replacement Engines and New TRUs and TRU Gen Sets

- Beginning 120 days after the effective date of the amendments, OEMs would be required to provide a registration information document with each current-tier replacement engine or new TRU or TRU gen set they supply that would be passed on to the end-user. This document would also include all of the engine information needed to register the equipment in ARBER and be consistent with the registration information that is on the engine emissions label and supplemental engine label.

17. Add requirements for dealers and repair shops

Background
As described in the proposed amendment immediately above, many owners are confused by unit and engine labels, which results in the entry of erroneous registration information in ARBER. The above proposal would require OEMs to provide and ship with each new unit and new replacement engine a registration information document that would be passed through the dealers and repair shops to the ultimate purchaser at point of sale. Engine rebuilders would have a similar requirement. Dealers and repair shops would have a role in making sure that these documents are passed on to the end-user. Although OEMs supply most of the new replacement engines through aftermarket parts programs, some dealers procure new and rebuilt replacement engines through other supply channels. In those cases, the responsibility for providing the registration information document would fall on the dealer or repair shop.

Proposed Amendment: Sections 2477.14 and 2477.15
Staff is proposing an amendment in section 2477.14 for dealers and section 2477.15 for repair shops that would require dealers and repair shops to pass the registration information documents, which would come with new units, new replacement engines, and rebuilt engines, through to the end-user. In the event that a registration information document was not included with a replacement engine, the dealer or repair shop would be required to provide it. The information on the registration information document would be consistent with the information that is on the unit label, engine emissions label, and supplemental engine label.

In most cases, the registration information document passed through from an OEM would contain the necessary engine and unit information required for registration in ARBER (pursuant to section 2477.5). A dealer or repair shop would just need to verify that the document is consistent with the applicable label information[18]. For replacement engines, however, the dealer or repair shop would also be required to add all of the unit information required under section 2477.5(e) to the registration information document (e.g. unit manufacturer, unit model, and unit serial number) for the unit that received the replacement engine. Additionally, if a new replacement engine is not supplied by a TRU OEM and the dealer or installer procures a replacement engine through another type of engine supplier, the dealer or installer would be required to provide both unit and engine information on the registration information document required for registration in ARBER.

18. Add requirements for engine rebuilders

Background
During implementation of the TRU ATCM, TRU owners requested staff to allow rebuilt engines as a compliance option, similar to repowering a TRU with a new replacement

[18] The registration information document for a prior-tier replacement engine would be the same as for the current-tier engine, except that the engine effective model year would be provided instead of the model year.

engine, as discussed in Section B.5. of this chapter. Staff evaluated the federal[19] and State[20] regulations that apply to rebuilt engines and found that it was difficult, but feasible in some cases, to replace a noncompliant engine with a rebuilt engine that meets a more stringent emissions standard tier than the original engine. In 2008, staff published TRU Advisory 08-05 (ARB, 2008e), which explains the requirements that must be met for rebuilt engines to be used as a TRU ATCM in-use standard compliance option and how to determine ULETRU in-use standard compliance dates for rebuilt engines.

Similar to repowering with a new replacement engine, repowering with a rebuilt engine resets the compliance deadline for meeting the TRU ATCM's ULETRU in-use performance standard to seven years after the rebuilt engine's effective model year, if the rebuilt engine meets a prior tier standard. If a rebuilt engine meets a tier standard that is currently in effect, then the model year for the rebuilt engine is the year that the engine was rebuilt, and the ULETRU compliance deadline is seven years after that model year. Section B.5. of this chapter discusses effective model year and Table II-4 in that section shows the effective model year for the various tiers of off-road replacement engines, which also apply to rebuilt engines.

Prior-tier rebuilt engines have the same issue with a shorter operational life, as described in the paragraph under Table II-4, because the effective model year is always one or more years in the past. For example, a 35 hp engine that is rebuilt in 2011 to meet Tier 2 would have an effective model year of 2007 (the last year that Tier 2 was in effect); therefore, compliance with ULETRU would then be required by December 31, 2014. For this example, the operational life of this rebuilt engine would only be four years.

Engine rebuilders must follow the federal and State engine rebuilding practices of Title 40, Code of Federal Regulations, Part 89.130 (40CFR89.130), 40CFR1068.120, and Title 13, California Code of Regulations, section 2423, subsection l (13CCR2423(l)). These practices include the following:

1. When rebuilding an engine, there must be a reasonable technical basis for knowing that the resultant engine is equivalent, from an emissions standpoint, to a certified configuration (i.e. tolerances, calibrations, specifications). A reasonable basis would exist if (a) parts installed, whether the parts are new, used, or rebuilt, are such that a person familiar with the design and function of engines would reasonably believe that the parts perform the same function with respect to emission control as the original parts; and (b) any parameter adjustment or design element change is made only in accordance with the original engine manufacturer's instructions or where data or other reasonable technical basis exists that such parameter adjustment or design element change, when performed on the engine or similar engines, is not expected to adversely affect in-use emissions.

[19] 40CFR89.130 and 40CFR1068.120
[20] 13CCR2423(l)

2. When an engine is being rebuilt, it must be rebuilt to a certified configuration of matched components. "Matched components" means a complete set of components corresponding to the certified emissions configuration (tier) of the engine that is being used as the reference for the rebuilt engine.

3. A replacement engine that is rebuilt to a more stringent emissions configuration must be relabeled and a supplemental label is required, which includes the name of the rebuilder, year of the rebuild, tier of the emissions standard that is met (e.g. Tier 2, Tier 4 Interim, etc.), and other pertinent information as determined by the rebuilder or specified by the Executive Officer.

In TRU Advisory 08-05, staff included additional information requirements for the supplemental label: engine model, engine effective model year (if prior-tier standard is met) or model year (if current tier standard is met), and horsepower rating. During implementation of the TRU ATCM, ARB enforcement staff discovered that many engine rebuilders were not following the required federal and State rebuilding practices cited above. Therefore, in order to sustain rebuilt engines as a compliance option, rebuild requirements need to be clarified.

<u>Proposed Amendment: Section 2477.16</u>
Staff is proposing an amendment that adds requirements for engine rebuilders to section 2477.16. The amendment would reinforce that engine rebuilders must follow the federal and State engine rebuild practices of 40CFR89.130, 40CFR1068.120, and 13CCR 2423(l). The basic requirements of these regulations were listed on the previous page (numbered 1, 2, and 3). However, the supplemental rebuilt engine labels required under item 3 would also be required to include engine model, engine effective model year (if prior-tier standard is met) or model year (if current tier standard is met), and horsepower rating. Supplemental engine labels would need to be affixed to the rebuilt engine in a readily accessible location in accordance with 40CFR89.110 (for Tier 2), 40CFR1039.135 (for Tier 4i).

Engine rebuilders would also be required to provide, within 30 days of request, documentation and engineering arguments that demonstrates they have complied with the engine rebuilding practices of 40CFR89.130, 40CFR1068.120, and 13CCR 2423(l). This technical demonstration would be required to be completed, signed, and stamped by a licensed mechanical engineer with knowledge of the design and function of diesel engines and the control of their emissions. As part of the evaluation of the demonstration, the Executive Officer may require an emissions test to be conducted if the documentation and engineering arguments are not found to be satisfactory.

In addition, engine rebuilders would be required to provide a registration information document with each rebuilt engine that provides all of the engine information required under section 2477.5(e), with instructions to the dealer or repair shop to pass this document through to the end-user. The information on the registration information document would need to be consistent with the information that is on the supplemental engine label and re-label.

19. Clarify registration requirements, consistent with current ARBER screens.

Background

During implementation, staff learned that additional information was needed to validate the registration information that was required by the original regulation. Staff believes that most of the additional data elements fall within the umbrella of existing data requirements and they are currently implemented in ARBER; however, adding them specifically would clarify the requirements and improve enforceability.

Proposed Amendment: Section 2477.5(e)

Staff is proposing amendments to section 2477.5(e) that add registration information requirements, consistent with current ARBER registration screens.

C. Alternatives Considered

The Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide the reasons for rejecting those alternatives. ARB staff evaluated three alternative strategies to the proposed amendments. Based on the analysis, none of the alternative control strategies were considered more effective in reducing emissions than the proposed amendments to the regulation. This section discusses each of the alternatives and provides reasons for rejecting those alternatives.

Alternative 1: Do Nothing (Do not amend the existing regulation)

This alternative would leave the regulation as it currently exists. The existing TRU ATCM would continue to be in effect. No action would be taken to address the need for clarification of requirements. Further, no action would be taken to improve compliance rates for existing requirements. We would also miss an opportunity to consider modifications that stakeholders have requested during implementation, which streamline the implementation of the ATCM and improve clarity. The adverse impacts of this alternative would be that emission reductions near distribution centers where TRUs congregate would be delayed (discussed in greater detail in Chapter IV) and enforcement efforts would be less efficient. Also, no economic fairness would be provided to pre-MY 2003 TRU owners who had to take actions during the recession or for TRUs used during emergencies (see amendment #2 and #10, above). In addition, the Executive Officer would not have the flexibility to address delays beyond the control of the owner by extending the compliance date up to four months. Based on these adverse impacts, staff rejected Alternative 1.

Alternative 2: Suspend the original regulation and rely on existing federal and State non-road/off-road engine emission standards to reduce diesel PM emissions and public health risks near distribution centers

This alternative would have the Board suspend the ATCM and instead rely on the new engine standards that are phased in by increasingly stringent emissions standard tiers. An emissions analysis prepared in the original staff report compared the original regulation to the then-pending Tier 4 new engine emissions standards and shows a dramatic difference in emission reductions between these two options (ARB, 2003). This analysis was updated for the 2011 TRU amendments and shows that the goal of reducing diesel PM emissions by 85 percent, and the corresponding potential cancer risks, would not be achieved by the 2020 deadline. Moreover, the Tier4 final new engine standards for <25 hp engines does not require PM aftertreatment control. Diesel PM emissions from these new engine will remain 10 times greater than the >25 hp engines. Based on this adverse impact, staff rejected Alternative 2.

Alternative 3: For MY 2004 and newer TRUs, delay compliance with the ULETRU in-use standard one, two, or three years, extending the operational life of TRU engines from the current seven years to eight, nine, or ten years

Industry requested this alternative at the November 2010 Board Hearing and the Board directed staff to evaluate this proposal. Staff updated the emissions inventory, as discussed in detail in Chapter III and Appendix B. The results of the emissions inventory update were used to update the public health impact analysis related to the existing regulation using the existing seven year operational life. The analysis showed that the public health risk at the seven-year operational life still resulted in potential cancer risk levels of concern in communities near facilities where TRUs congregate. Therefore, relaxing the in-use requirements by delaying compliance and extending the operational life of TRU engines would only make this risk greater and likely exacerbate concerns regarding elevated risk levels in nearby communities. In addition, owners of older TRUs (e.g. MY 2001 and older, MY 2002, and MY 2003) have been required to meet the in-use standards by 2008, 2009, and 2010, respectively, using a seven-year operational life, so there would be fairness issues if the operational life is changed at this point. Also, the retrofit device manufacturers that have invested significant resources into verifying diesel particulate filters would be left with no market for one or more years, which would most likely force them to abandon the TRU market. DPFs are a lower-cost compliance option and their total non-availability may cause the cost of other compliance options to increase. Additionally, the TRU ATCM's PM emissions reductions also contribute to ARB's 2014 State Implementation Plan for meeting the federal PM 2.5 standard, so any delayed implementation could jeopardize those commitments and result in loss of federal highway funding. Based on the adverse impacts identified above and discussed in greater detail in Chapter IV, staff rejected Alternative 3.

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III. EMISSIONS INVENTORY AND HEALTH RISK

This chapter provides estimates of the impact of the proposed amendments on the TRU emissions inventory. The emissions inventory for the proposed amendments is based on previously unavailable data for population, activity, engine load, turnover practices and emission factors.

In utilizing these new data sources, staff has improved both the baseline emissions inventory and the with-rule emissions inventory. The baseline emissions inventory represents the emissions from the activity of TRUs within California in the absence of any rule, including the 2004 ATCM. The with-rule inventory represents the emissions after the impact of the ATCM adopted in 2004. Staff also estimated the specific emissions impact for each of the proposed amendments. The impact of each amendment is discussed first; the combined impact of all amendments is presented in Section B of this chapter. The emissions impacts represent emission reductions that were anticipated but would not be realized if certain amendments to the TRU ATCM were adopted.

Details on how the updated inventory was developed and new data sources are discussed briefly here and in more detail in Appendix C.

A. TRU Engine Populations and Emissions

1. Extend ULETRU Compliance Date for MY 2001 and Older if LETRU Met by Original Compliance Date

a. Population

As discussed in Chapter II, staff is proposing to amend the in-use standards to allow those units of Model Year 2001 and older that complied with the LETRU in-use standard prior to December 31, 2008, to operate one additional year before complying with the ULETRU in-use standard. The owners of these units, which previously needed to meet the ULETRU standard by December 31, 2015, would be able to delay meeting the ULETRU requirements until December 31, 2016.

To estimate the population impacted by this amendment, staff first determined the population in operation at the end of 2011 that could be impacted by the amendment. This represented 197 units on trucks/trailers based in California. Staff projects that of the 2011 population, 142 units would remain in operation during 2016 and 125 of those would remain in operation in 2017. Thus under the amendment, 142 units were modeled as operating with LETRU control technology rather than ULETRU control technology in 2016.

b. Emissions from ULETRU Extension

Staff estimated the change in emissions from the affected engines due to the proposed amendments by multiplying the affected TRU population, the annual hours of engine operation, engine horsepower, load factor, and the change in emission factors between ULETRU and LETRU for 2016. The TRU population affected is comprised entirely of TRUs associated with trucks/trailers for California-based operations. TRUs visiting California from out of state and generator sets are both anticipated as no longer being in operation at the age necessary to receive these benefits. The average annual hours of engine operation, average engine power ratings, and load factors are presented in more detail in Appendix C. Table III-1 presents these parameters in summary format.

Table III-1: Annual Hours of Operation, Average Engine Power, and Load Factors for TRUs Eligible for ULETRU Extension

Annual Engine Operation in California (hours)	Average Engine Power (hp)	Load Factor
1,325	34	0.46

Emission factors for diesel PM and oxides of nitrogen (NO_x) were estimated from ARB's OFFROAD2007 model. These emission factors vary by engine size and engine tier, which is related to the model year of each engine.

The units that complied with the 2004 ATCM prior to December 31, 2008 could have done so in multiple ways. Some complied using VDECS technology that met LETRU requirements, and others complied by replacing engines or even entire units. All would need to replace their engine (or unit) with an engine that meets Tier 4i or Tier 4f standards (or a unit that contains such an engine). In any case, the emissions that result from the Tier 4i or Tier 4f engine will be less than the emissions generated with either of the options used to meet standards at the end of 2008. Delaying the transition to the Tier 4i or Tier 4f engine will lessen the emission reductions resulting from the rule.

As shown in Table III-2, the emission reductions that would be deferred by the proposed amendment are estimated to be 0.003 tons/day (tpd) of diesel PM and 0.03 tpd NO_x in 2016. After 2016, all surviving affected engines will be subject to the same requirements previously required, thus there will be no PM emissions difference after 2016.

Table III-2. Emissions Impact Resulting from Extension of ULETRU Compliance Deadline for Units Meeting Original Compliance Deadline

Calendar Year	Units Affected	Deferred PM Emission Reductions (tons/day)	Deferred NO_x Emission Reductions (tons/day)
2016	MY 2001 and older complying by December 31, 2008	0.003	0.03

2. Extend ULETRU Compliance Dates for MY 2003 and Older if Met LETRU by Respective Compliance Dates

a. Population

Staff is proposing to amend the in-use standards to allow those units of model year 2003 and older that complied with LETRU equipment prior to December 31, 2009 (for model year 2002 and older units) or December 31, 2010 (for model year 2003 units) to operate one additional year before complying with equipment that meets or exceeds ULETRU standards. The owners of those units that previously needed to meet ULETRU December 31, 2015, would be able to delay meeting the ULETRU requirements until December 31, 2016. The owners of those units that previously needed to meet ULETRU by December 31, 2016, would be able to delay meeting the ULETRU requirements until December 31, 2017. The owners of those units that previously needed to meet ULETRU by December 31, 2017, would be able to delay meeting the ULETRU requirements until December 31, 2018. The owners of units of model year 2001 and older that met LETRU prior to December 31, 2008, as described in the previous amendment, would receive two additional years of compliance at LETRU.

To estimate the population impacted by this amendment, staff first determined the population in operation at the end of 2011 that could be impacted by the amendment. This represented:

- 1,423 units on California-based trucks/trailers model year 2001 and older;
- 164 units on California-based trucks/trailers model year 2002; and
- 638 units on California-based trucks/trailers model year 2003.

Staff projected that of the model year 2001 and older population, 1,029 would remain in operation after 2016. Of the model year 2002 population, 144 would remain in operation after 2017. Of the model year 2003 population, 572 would remain in operation after 2018.

b. Emissions

Staff estimated the deferred PM and NO_x emission reductions resulting from the delay of ULETRU associated with on-time compliance. The results vary from year-to-year based upon the size of the population that would be affected by the amendment. The results are shown in Table III-3.

Table III-3: Annual Emissions Impact Resulting from Extension of Second Compliance Deadline for Units Meeting First Compliance Deadline

Calendar Year	Units Affected	Deferred PM Emission Reductions (tons/day)	Deferred NO_x Emission Reductions (tons/day)
2016	MY 2001 and older complying by December 31, 2009	0.042	0.35
2017	MY 2002 complying by December 31, 2009	0.004	0.04
2018	MY 2003 complying by December 31, 2010	0.012	0.12

This change is estimated by multiplying the TRU population registered as complying with the ATCM by certain dates, the annual hours of operation, engine horsepower, load factor, and the change in emission factors between the ULETRU and the relaxed levels. The factors used to estimate the emissions impact are identical to those used with the first proposed amendment. The factors were shown in Table III-1.

After 2018, no emissions are deferred by the amendment, since the units remaining in operation will have the same control technology requirements under the existing 2004 ATCM.

3. Exemption for TRUs that are Used During Emergencies

a. Population

Staff is proposing to exempt from the regulation those TRUs that are associated with transporting goods necessary during emergency situations. A survey of mobile caterers serving the emergency situations between 2006 and 2010 indicated that this industry represents less than one hundred truck or trailer TRUs. The average unit is used less than five hundred hours per year, or much less than staff anticipates the average unit as being used in other industries. The annual hours of operation were also shown to vary significantly between years, as the number of emergency situations (e.g. forest fires, earthquakes, floods, etc.) varies.

b. Emissions

Staff estimated the contribution to the statewide PM emissions resulting from TRUs associated with mobile catering companies that serve emergency needs in California as representing less than 0.02 percent of all TRU activity within California. Thus, the impact to emissions of allowing this exemption was assumed by staff to be negligible.

4. Allow the use of the Unit Manufacture Year instead of the Engine Model Year for Determining Compliance Requirements and Dates

a. Population

Staff proposed that owners of engines that had the model year earlier than the model year of the unit be allowed to face compliance deadlines based upon the later model year, that of the unit. As discussed Chapter II, this was initially implemented as a pilot program via Advisory 08-01 (ARB, 2008a) in October 2009 and is now being proposed for addition into the ATCM.

To estimate the impact of this amendment, staff estimated the population that would be affected by the rule. This is the population that has an engine model year one year earlier than the unit itself. Table III-4 shows the share of the population modeled in 2011 that would be impacted by the rule.

Table III-4: Population Modeled with Engine Model Year Older than Unit Model Year

Engine Model Year	Units Affected
2001 or earlier	29%
2002	23%
2003	32%
2004	23%
2005	17%
2006	18%
2007	9%
2008	10%
2009	7%
2010	10%
2011	1%
2012 or later	0%

b. Emissions

Since this amendment was initially implemented as a pilot program in October 2009, staff modeled the emissions from the existing regulation as already accounting for this amendment. The methodology and data behind the emissions estimation are presented in more detail in Appendix C.

Table III-5 presents the deferred emission reductions as estimated with the regulation that result from incorporating this amendment.

Table III-5: Impact to Emissions Resulting from Amending Regulation for Population with Engine Older than Unit

Engine Model Year	Deferred PM Emission Reductions (tons/day)	Deferred PM Emission Reductions
2009	0.02	4.4%
2010	0.02	2.8%
2011	0.04	6.5%
2012	0.01	2.7%
2013	0.02	1.9%
2014	0.02	2.1%
2015	0.01	1.5%
2016	0.01	1.1%
2017	0.00	0.0%
2018	0.01	0.9%
2019	0.00	-0.2%
2020	0.00	0.0%
2021	0.00	0.0%
2022	0.00	-0.1%
2023	0.00	0.0%
2024	0.00	0.0%
2025	0.00	0.0%

B. Total Combined Emissions Impacts from Proposed Amendments

Table III-6 provides a summary of the overall incremental annual statewide diesel PM changes that will result from the 2011 TRU amendments. Overall, the additive emissions impact from all proposed amendments is estimated to be 0.21 tons/day of diesel PM and 0.98 tons/day of NO_x in 2009 through 2018.

The deferred emission reductions from each proposed amendment do not always combine to represent the overall emissions because of the overlap between the parties affected by the individual amendments. The amendment related to emissions from units used for emergency response is negligible. Emission reductions that were anticipated are highest in 2016 and are approximately 0.050 tpd of diesel PM, or just over six percent of the anticipated emissions. The impact on emission reductions for NO_x is also largest in 2016, at just over 13 percent of the anticipated emission levels.

Table III-6: Statewide Diesel PM Emission Reductions Attributable to the Existing TRU Regulation and Reductions to be Deferred Under the Proposed 2011 TRU Amendments

Year	Emission Reductions to be Achieved by Existing TRU Regulation		Emission Reductions to be Deferred Under the Proposed 2011 TRU Amendments							
			MY 2001 and older engines that Complied by Dec 31, 2008		MY 2003 and older engines that Complied by Dec 31, 2010		Use of Unit Manufacture Year instead of Engine Model Year		Total	
	PM (tpd)	NO_x (tpd)	PM (tpd)	NO_x (tpd)	PM (tpd)	NO_x (tpd)	PM (tpd)	NO_x (tpd)	PM (tpd)	NO_x (tpd)
2009	0.56	1.48	0.000	0.00	0.000	0.00	0.024	0.06	0.024	0.06
2010	0.54	1.34	0.000	0.00	0.000	0.00	0.015	0.03	0.015	0.03
2011	0.57	1.25	0.000	0.00	0.000	0.00	0.037	0.06	0.037	0.06
2012	0.54	1.12	0.000	0.00	0.000	0.00	0.015	0.02	0.015	0.02
2013	0.84	2.37	0.000	0.00	0.000	0.00	0.016	0.04	0.016	0.04
2014	0.80	2.36	0.000	0.00	0.000	0.00	0.017	0.06	0.017	0.06
2015	0.84	2.67	0.000	0.00	0.000	0.00	0.012	0.03	0.012	0.03
2016	0.80	3.34	0.003[1]	0.03[1]	0.042	0.35	0.009	0.09	0.050	0.44
2017	0.68	3.01	0.000	0.00	0.004	0.04	0.000	0.00	0.006[1]	0.06[1]
2018	0.58	2.83	0.000	0.00	0.012	0.12	0.005	0.06	0.018	0.18
2019	0.50	2.69	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
2020	0.51	2.37	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
2021	0.40	1.83	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
2022	0.32	1.38	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
2023	0.25	1.02	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
2024	0.19	0.73	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
2025	0.14	0.51	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00

1. If both ULETRU extensions are accepted, as proposed, a number of units with engines MY 2001 and older will meet both categories and thus be allowed two one-year extensions. The smaller of the emission impacts associated with each extension, estimated at 0.003 tons per day for PM and 0.03 tons/day for NO_x, will be delayed until the second year. Thus, the emission impact is shown in the total for calendar year 2017 rather than 2016.

C. Health Risk Assessment

A health risk assessment (HRA) is an evaluation or report that a risk assessor (e.g., ARB, local air district, consultant, or facility operator) develops to describe the potential a person or population may have of developing adverse health effects, or respiratory illness. The exposure pathways included in an HRA depend on the toxic air contaminants (TACs) that a person (receptor) may be exposed to, and can include breathing, dermal exposure, or the ingestion of soil, water, crops, fish, meat, milk, and eggs. For this HRA, we are evaluating the cancer health impacts for diesel particulate via the breathing or inhalation pathway only.

1. Potential Health Risks from TRU diesel engines

This section examines the potential health risks associated with exposure to diesel PM emissions from TRUs. A brief qualitative summary is presented of the health risk assessment conducted to determine the 70-year potential cancer risks associated with exposures to diesel PM emissions from TRU engines at a distribution center. Additional details on the methodology and assumptions used to estimate the health risks are presented in Appendix D of this report

a. Health Risk Assessments

Risk assessment is a complex process that requires the analysis of many variables to simulate real-world situations. There are three key types of variables that can impact the results of a health risk assessment for TRU engine operations: the magnitude of diesel PM emissions, local meteorological conditions, and the length of time of exposure. Diesel PM emissions are a function of the age and horsepower of the engine, the emissions rate of the engine, and the annual hours of operation. Older engines tend to have higher pollutant emission rates than newer engines, and the longer an engine operates, the greater the total pollutant emissions. Meteorological conditions can have a large impact on the resultant ambient concentration of diesel PM, with higher concentrations found along the predominant wind direction and under calm wind conditions. How close a person is to the emissions plume and how long that person breathes the emissions (exposure duration) are key factors in determining potential risk, with longer exposures times typically resulting in higher risk.

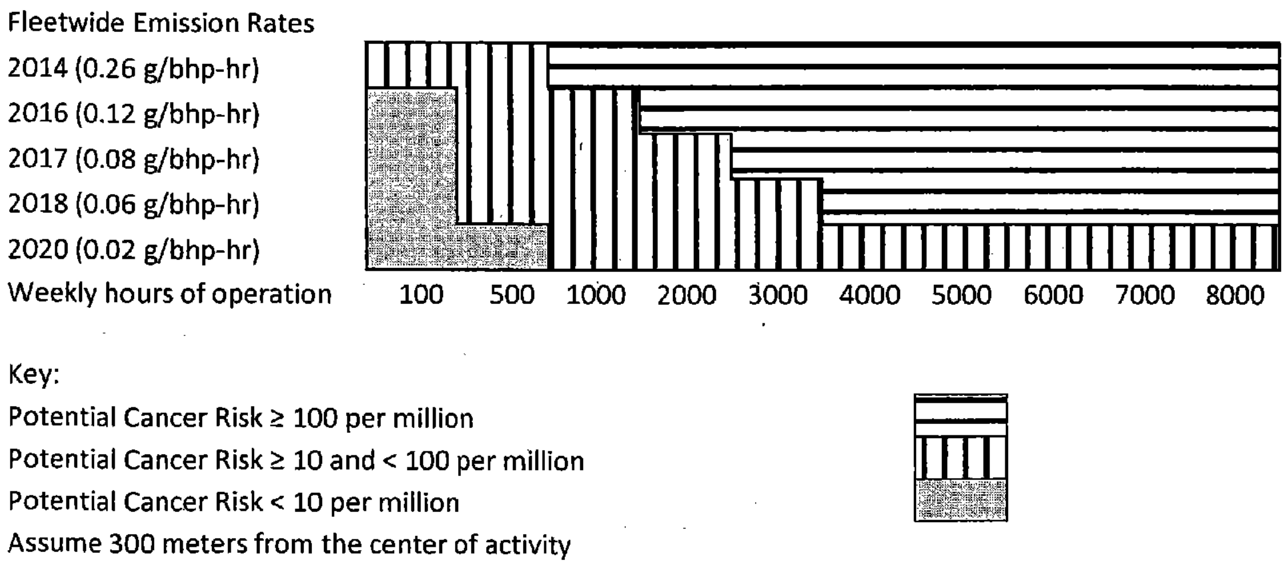
To examine the potential cancer risks for TRU engines at distribution centers, ARB staff conducted a cancer health risk assessment. The potential cancer risk is estimated using standard Office of Environmental Health Hazard Assessment (OEHHA) risk assessment procedures based on the annual average concentration of diesel PM predicted by the air dispersion model and a health risk factor (referred to as a cancer potency factor) that correlates cancer risk to the amount of diesel PM inhaled. The ARB recommended methodology used to estimate the potential cancer risks is consistent with the procedures presented in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA, 2003; OEHHA, 2009) and is shown in Appendix D. Following the OEHHA guidelines, we assumed that the most impacted individual would be exposed to modeled diesel PM concentrations for 70 years. This exposure duration represents an "upper-bound" of the possible exposure duration. The potential cancer risk was estimated by multiplying the inhalation dose by the cancer potency factor (CPF) of diesel PM (1.1 $(mg/kg\text{-}d)^{-1}$).

b. Cancer Risk Characterization

The cancer health risks were characterized using the California fleetwide emission rates for 2014, 2016, 2017, 2018, and 2020. Year 2014 is included because it is the year that California committed to in the SIP to meet the federal PM 2.5 standard. The 2016, 2017, and 2018 emission rates illustrate the impacts of extending ULETRU compliance for some 2003 and older model year equipment. The 2020 emission rate shows health risks when the TRU ATCM is fully implemented.

Based on the dispersion modeling and risk assessment, diesel PM emissions of TRU engines at a distribution center have a significant health risk impact to the general population surrounding a facility. Using the estimated 2014 fleetwide TRU engine emission rate of 0.26 g/hp-hr, the potential cancer risk shows risk levels of greater than 10 chances in a million at 300 meters from the source of emissions and operating only 100 hours per week. The average hours of TRU engine operation at a large distribution center are about 1,965 hours per week. The potential cancer risks are predicted to exceed 100 chances in a million at 1,000 engine hours per week at a point about 300 meters from the source. Figure III-1 summarizes the potential cancer risk due to TRUs at distribution centers.

Figure III-1: Potential Cancer Risk from TRUs at Distribution Centers



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IV. ENVIRONMENTAL IMPACTS

A. Introduction

This chapter describes potential environmental impacts of the proposed amendments to the regulation. The proposed amendments will have environmental impacts due to the extended ULETRU compliance date for model year (MY) 2003 and older TRU engines provided they met LETRU by their compliance deadline, and from providing an exemption for TRUs that are used during emergencies. With the proposed amendments, the TRU regulation would continue to substantially decrease diesel PM and NO_x emissions, but would defer a small portion of emissions toward the end of the in-use standards phase-in.

Also included in this chapter is a discussion of feasible mitigation measures identified that can address the potential adverse environmental impacts due to the proposed amendments. Further, feasible alternative means of complying that would reduce or eliminate any significant adverse impacts are also discussed.

B. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Because ARB's program involving the adoption of regulations has been certified by the Secretary of Resources pursuant to Public Resources Code section 21080.5 (exemption of specified regulatory programs), the CEQA environmental analysis requirements are included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, ARB may include a "functionally equivalent" document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, or an Environmental Impact Report. In addition, ARB's certified regulatory program tasks staff with responding to all significant environmental issues raised by the public during the public review period or at the Board public hearing. These responses will be contained in the Final Statement of Reasons for the regulation.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;

- An analysis of reasonably foreseeable feasible mitigation measures; and

- An analysis of reasonably foreseeable alternative means of compliance with the proposed regulation.

ARB staff's analysis of these requirements is presented below. Staff believes that changes are needed now to provide economic relief for operators who took specific compliance actions during 2008 through 2010. We have also concluded that implementation of the proposed amendments will have a potentially significant adverse air quality impact that will be fully mitigated by emission reductions from early compliance with the existing TRU ATCM requirements. Staff further finds that there are no alternative means of compliance that would achieve similar economic relief with less emissions or public health impacts.

C. Reasonably Foreseeable Environmental Impacts of Methods of Compliance

Implementation of the proposed regulation will not require any significant changes to the existing infrastructure in California. Staff finds that, no new facilities will need to be constructed, no existing facilities will need to be expanded beyond their current capacity, and no significant changes in the operation of existing facilities is likely to occur as a result of the proposed regulation. As a result, ARB staff finds that there will be no reasonably foreseeable environmental impacts on aesthetics, land-use/planning, population and housing, transportation, agricultural and forestry resources, cultural resources, mineral resources, public services, utility and service systems, geology and soils, hydrology and water quality, or recreation.

The proposed amendments would move the ULETRU compliance deadline for MY 2001 and older TRU engines from December 31, 2015 to December 31, 2016. The amendments extend the ULETRU in-use performance standard compliance date by one year, if the less stringent LETRU in-use performance standard was met by December 31, 2008. For MY 2003 and older TRU engines, the proposed amendments extend the ULETRU in-use standard compliance deadline by one year, if the LETRU in-use standard was met by the specified deadlines. The proposed amendments also use unit manufacture year instead of engine model year to determine compliance requirements and dates.

Within California, the proposed amendments will defer a small amount of PM and NO_x emission reductions for a ten-year period. The methodology and assumptions for estimating the emissions impacts can be found in Appendix C. Following is a discussion of the potential impacts on air emissions due to the proposed amendments.

1. Emissions from Proposed Amendments

Emissions of diesel PM and NO_x will continue to decrease each year even with the proposed amendments. However, when compared to the emission reductions anticipated for the original rule, there is a potential for small deferred reductions of diesel PM and NO_x in 2009 through 2018 from the proposed amendments. The combined emissions impacts of all of the proposed amendments are shown in Table IV-1. Staff has identified these emissions as an adverse environmental impact.

When addressing the amendment to add an exemption for TRUs that are used during emergencies, as defined, staff found that historically, those emissions contributed

0.01 percent to the statewide emissions. Overall, while the proposed amendments will delay the emission reductions anticipated from the implementation of the TRU ATCM, it will not conflict with 2014 PM 2.5 State Implementation Plan (SIP) commitments. These emissions are intermittent in nature, geographically diverse, and very small when they occur and are not expected to create an adverse air quality impact.

Table IV-1: Emission Reductions Not Realized for Proposed Amendments

Year	Emissions	
	PM (tpd)	NO_X (tpd)
2009	0.024	0.06
2010	0.015	0.03
2011	0.037	0.06
2012	0.015	0.02
2013	0.016	0.04
2014	0.017	0.06
2015	0.012	0.03
2016	0.050	0.44
2017	0.006	0.06
2018	0.018	0.18
2019	0.00	0.00
2020	0.00	0.00
Total	**0.210**	**0.98**

2. Impact on Greenhouse Gas Emissions

With the proposed TRU ATCM 2011 amendments, a small amount of diesel PM and NO_x emissions is expected to be deferred in the 2009 to 2018 time period. The effects of diesel PM and NO_x on global warming are not completely understood. Staff expects these small emission deferrals in that ten-year period to have a negligible effect, if any, on global warming. Discussed below are the known impacts of diesel PM and NO_x on global warming.

Particulate Matter (PM)

PM from diesel engine exhaust is composed of combustion particles consisting of elemental and organic carbon and sulfate, all of which contribute to atmospheric aerosols. Atmospheric aerosols play an important role in the climate system through modifications of the global energy budget: directly, by the scattering and absorption of radiation; indirectly, by the modification of cloud properties. Black carbon typically emitted as a fraction of PM from combustion processes, is the main light-absorbing component of aerosols and thereby causes global warming. In recent years, there has been increased attention to black carbon for its global warming potential through direct, semi-direct, and cloud absorption effects.

Overall, the climate impact assessment of PM emitted by diesel engines is rather complex: radiative forcing of black carbon is positive (climate warming impact), while radiative forcing of sulfate particles is negative (cooling impact) and the sum of the two is expected to be positive. The particles emitted from diesel engines represent a variety of compositions and sizes. The magnitude of the overall direct climate impact of black carbon emitted from diesel engines and information on emissions of diesel-exhaust particles, such as detailed characterization of chemical composition, microphysical characteristics and the fate of the particles in the environment are not well known. (ARB, 2008) A better characterization of diesel engine emissions is needed to improve the understanding of the climate change impacts from control strategies.

Nitrogen oxides (NO_x)

Through the production of tropospheric ozone, emissions of NO_x have a climate warming impact. However, NO_X also leads to particulate nitrate formation, which generally enhances cooling, particularly when the relative humidity is high. Further, by affecting the concentration of hydroxyl radical (OH), NO_x reduces the levels of methane, providing a cooling effect. The net climate impact of changes in NO_x emissions will depend on whether ozone or particle formation and methane production dominates. At this time, there is no consensus on which action is likely to dominate or on the overall magnitude of the impact due to changes in NO_x. (ARB, 2008)

3. Formation of Sulfates

Future Level 3 retrofit controls may include the use of diesel oxidation catalysts (DOC). A DOC reduces emissions of carbon monoxide (CO), hydrocarbons (HC), and the soluble organic fraction of diesel PM through catalytic oxidation alone. Exhaust gases are not filtered, as with a diesel particulate filter (DPF). In the presence of a catalyst material and oxygen, CO, HC, and the soluble organic fraction undergo a chemical reaction and are converted into carbon dioxide and water. Some manufacturers integrate HC traps (zeolites) and sulfate suppressants into their oxidation catalysts. HC traps enhance HC reduction efficiency at lower exhaust temperatures and sulfate suppressants minimize the generation of sulfates at higher exhaust temperatures. (ARB, 2003)

As is the case with most processes that incorporate catalytic oxidation, the formation of sulfates increases at higher temperatures. Depending on the exhaust temperature and sulfur content of the fuel, the increase in sulfate particles may offset the reductions in soluble organic fraction emissions. Using low sulfur diesel fuel can minimize this effect. While the proposed amendments do not require the use of DOCs for compliance, any increase in sulfates through the potential, future use of these devices is expected to be minimal as all TRUs fueled in California must use ultra-low sulfur diesel fuel.

4. Other Potentially Significant Environmental Impacts Associated With the Proposed Amendments

As discussed in the 2003 Staff Report, there is a potential for two adverse environmental impacts from the use of DOCs and DPFs with the potential creation of some hazardous waste materials from the ash and metals used in coatings of the catalysts. (ARB, 2003) The proposed amendments will not result in any significant changes in the use of these retrofit devices; therefore, no additional adverse impacts are expected.

D. Reasonably Foreseeable Feasible Mitigation Measures

Staff has determined that potentially significant adverse air quality impacts may occur from the proposed amendments due to a small amount of emission reductions that will be deferred due to the compliance extensions. However, the adverse air quality impacts from deferred reductions of diesel PM and NO_x have been fully mitigated by reductions from early compliance actions with the TRU ATCM.

Table IV-1 in Section C shows the incremental deferral of emission reductions for the amendments for the years 2010 to 2020. As shown, there are small deferrals in diesel PM and NO_x from 2009 through 2018.

These small deferred emission reductions have been offset by the "early" emissions reductions achieved by MY 2001 and older TRU engine owners that met the LETRU in-use standard by the original December 31, 2008, compliance date instead of delaying compliance until the end of 2009[1]. Table IV-2 shows the estimated emissions reductions achieved through the early compliance actions taken in 2008.

Table IV-2: Estimated Emission Reductions from Early Compliance

Year	Emission Reductions from Early Compliance	
	PM (tpd)	NO_x (tpd)
2009	0.56	1.48

As stated above, the diesel PM and NO_x emission deferrals due to compliance extensions have been mitigated by the early compliance actions taken in 2008. Table IV-3 shows the total emissions impact of diesel PM and NO_x from the proposed amendments for the 10-year period that emission deferrals are expected compared to the total emissions mitigated by early compliance.

[1]This compliance delay was necessary because of a delay in U.S. EPA's authorization approval.

Table IV-3: Mitigated Emissions from Early Compliance

Diesel PM Emissions		NOx Emissions	
Reductions from Early Compliance (tons)	Total Diesel PM Emissions from Proposed Amendments (tons)	Reductions from Early Compliance (tons)	Total NO_X Emissions from Proposed Amendments (tons)
205	77	539	358

As shown, the small deferrals of diesel PM and NO_X reductions are fully mitigated by the early compliance actions in 2008.

E. Reasonably Foreseeable Alternative Means of Compliance

Discussed below are the reasonably foreseeable alternative means of compliance considered by staff. Staff has concluded that there are no alternative means that will provide similar economic relief to stakeholders with less emissions or public health impacts.

1. No Project

A "no project" alternative would forego adoption of the proposed amendments. This alternative would leave the regulation as it currently exists with the existing TRU ATCM requirements in place. No economic relief would be provided to pre-MY 2003 TRU owners who had to take actions during the recession or for TRUs used during emergencies. No action would be taken to address the need to improve compliance rates for existing requirements, or to improve clarity. The adverse impacts of this alternative would be that emission reductions near distribution centers where TRUs congregate would be delayed and enforcement efforts would be less efficient. In addition, the Executive Officer would not have the flexibility to address delays beyond the control of the owner by, on a case-by-case basis, extending the compliance dates (see Chapter II). Based on these adverse impacts, staff rejected this alternative.

2. Extend Time for Full Implementation by 1 Year (for MY 2004 and Newer TRU Engines)

Industry requested this alternative, along with the following two alternatives, at the November 2010 Board Hearing and the Board directed staff to evaluate this proposal. Staff evaluated extending the operational life of MY 2004 and newer TRU engines by one year, from 7 (current) to 8 years. The emissions impacts of extending the final implementation by one year is shown in Table IV-4 for the years 2010 to 2020 (for further details on the emission impacts see Appendix C). While extending the implementation of the proposed regulation is less costly, the emission increases are more significant than the proposed amendments and could impact public health. The results of the emissions inventory update were used to update the public health impact analysis related to the existing regulation using the existing seven-year operational life. The analysis showed that the public health risk at the seven-year operational life still resulted in potential cancer risk levels of concern in communities near facilities where TRUs congregate. The analysis showed that this alternative amendment to increase operational life by one year would increase the potential health risks over 11 percent (for further details on the health risk impacts see Appendix D). Therefore, relaxing the in-use requirements by delaying compliance and extending the operational life of TRU engines would likely exacerbate concerns regarding elevated risk levels in nearby communities. The emission increases resulting from this operational life extension may result in the 2014 PM SIP goals not being achieved. Due to the increase in emissions and potential public health risks, this alternative was rejected.

Table IV-4: Emission Reductions Not Realized for Alternative 2 (1-Year Delay)

Year	One-Year Delay	
	PM (tpd)	NO_X (tpd)
2010	0.00	0.00
2011	0.00	0.00
2012	0.10	0.19
2013	0.11	0.35
2014	0.11	0.37
2015	0.17	0.68
2016	0.10	0.95
2017	0.01	0.16
2018	0.01	0.12
2019	0.02	0.26
2020	0.10	0.18

3. Extend Time for Full Implementation by 2 Years (for MY 2004 and Newer TRU Engines)

Staff also evaluated extending the operational life of MY 2004 and newer TRU engines by 2 years, from 7 (current) to 9 years. The emission impacts from this alternative are higher than Alternative 2 and are shown in Table IV-5 for the years 2010 to 2020. Again, while extending the implementation of the proposed regulation is less costly, the significant increase in emissions and potential public health risks made this alternative unacceptable. The updated public health analysis showed that this alternative amendment to increase operational life by two years would increase the potential health risks over 23 percent. Due to the increase in emissions and potential public health risks, this alternative was rejected.

Table IV-5: Emission Reductions Not Realized for Alternative 3 (2-Year Delay)

Year	Two-Year Delay	
	PM (tpd)	NO_x (tpd)
2010	0.00	0.00
2011	0.00	0.00
2012	0.10	0.19
2013	0.20	0.75
2014	0. 22	0.90
2015	0.28	1.22
2016	0.27	1.79
2017	0.11	1.19
2018	0.03	0.46
2019	0.04	0.55
2020	0.11	0.40

4. Extend Time for Full Implementation by 3 Years (for MY 2004 and Newer TRU Engines)

Staff also evaluated extending the operational life of MY 2004 and newer TRU engines by 3 years, from 7 (current) to 10 years. The emission impacts from this alternative are higher than Alternatives 2 and 3 and are shown Table IV-6 for the years 2010 to 2020. The updated public health analysis showed that this alternative amendment to increase operational life by three years would increase the potential health risks over 42 percent. Again, while extending the implementation of the proposed regulation is less costly, the significant increase in emissions and potential public health risks made this alternative unacceptable.

Table IV-6: Emission Reductions Not Realized for Alternative 4 (3-Year Delay)

Year	3-Year Delay	
	PM (tpd)	NO_X (tpd)
2010	0.00	0.00
2011	0.00	0.00
2012	0.10	0.19
2013	0.20	0.75
2014	0.31	1.26
2015	0.40	1.71
2016	0. 38	2.29
2017	0.29	1.98
2018	0.13	1.38
2019	0.08	0.87
2020	0.15	0.67

Table IV-7 compares the mitigating emissions from early compliance to the deferred emission reductions from the proposed amendments and the emission increases from the three alternatives which delay ULETRU compliance for MY 2004 and newer engines. As previously discussed, the deferred reduction of diesel PM and NO_x emissions from the proposed amendments are fully mitigated. However, the increased emissions are not mitigated for Alternatives 2, 3, and 4, which delay ULETRU compliance by 1, 2, and 3 years, respectively. This is another important consideration in staff's rejection of these alternatives.

Table IV-7: Comparison of Mitigating Emissions from Early Compliance to Alternatives 2, 3, and 4

	Diesel PM Emissions			NOx Emissions		
	Available Reductions from Early Compliance (tons)	Total Diesel PM Emissions from Alternative (tons)	Needed Reductions to Mitigate Emissions Increase (tons)	Available Reductions from Early Compliance (tons)	Total NO_x Emissions from Alternative (tons)	Needed Reductions to Mitigate Emissions Increase (tons)
Proposed Amendments	*205*	*77*	*none*	*539*	*358*	*none*
Alternative 2 (1-year delay)	128	268	140	181	1,189	1,008
Alternative 3 (2-year delay)	128	493	365	181	2,717	2,536
Alternative 4 (3-year delay)	128	743	615	181	4,048	3,867

5. Suspend the Original Regulation and Rely On Existing Federal and State Non-Road/Off-Road Engine Emission Standards to Reduce Diesel PM Emissions and Public Health Risks Near Distribution Centers

This alternative would have the Board suspend the ATCM and instead rely on the new engine standards that are phased-in by increasingly stringent emissions standard tiers. An emissions analysis prepared in the original 2003 Staff Report compared the original regulation to the then-pending Tier 4 new engine emissions standards and shows a dramatic difference in emission reductions between these two options (ARB, 2003). This analysis was updated for the 2011 TRU amendments and shows that the goal of reducing diesel PM emissions by 85 percent, and the corresponding potential cancer risks, would not be achieved by the 2020 deadline. Moreover, the Tier 4 final new engine standards for <25 hp engines does not require PM aftertreatment control. Diesel PM emissions from these new engines will remain 10 times greater than the >25 hp engines. Based on this adverse impact, staff rejected this alternative.

F. Community Health and Environmental Justice

1. Potential Health Impacts

The impacts associated with the proposed TRU ATCM amendments would result in small deferred reductions of diesel PM and NO_x in 2009 through 2018. Estimating the impact of the diesel PM emission due to the proposed TRU ATCM amendments on potential cancer risk depends on the location of the emission impacts. The potential cancer risk impacts from the proposed amendments are presented in Chapter III. As shown in Figure III-1, the fleetwide emission rate continues to drop even during the years of the minimal emission reduction deferrals from the proposed amendments; therefore, the overall potential cancer health risk will continue to decrease.

To evaluate the health impact of deferring these emission reductions, we conservatively assumed that an individual living near a large distribution center was exposed to the maximum increment of higher emissions for a full 70 years. The proposed amendments delaying the ULETRU compliance date would increase the maximum potential cancer risk by a negligible amount.

2. Environmental Justice

Environmental justice (EJ) is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. ARB is committed to integrating EJ into all of our activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for integration of EJ into ARB's programs, consistent with the directive of California state law. These policies apply to all communities in California, however, EJ issues have been raised specifically in the context of low-income areas and ethnically diverse communities (ARB, 2001). Further, AB 32 as outlined in HSC section 38562(2), also states that GHG regulations should not disproportionally impact low-income communities.

Our EJ policies are intended to promote the fair treatment of all Californians and cover the full spectrum of ARB's activities. Underlying these policies is recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. ARB recognizes its obligation to work closely with all communities, environmental organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these policies.

The proposed amendments are consistent with our EJ policy to reduce health risk in all communities, including those with low-income and ethnically diverse populations, regardless of location. Potential risks from exposure due to diesel PM and NO_x can affect both urban and rural communities. Therefore, reducing emissions of diesel PM will provide benefits to both urban and rural communities in the State, including low-income and ethnically diverse communities.

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V. ECONOMIC IMPACTS

This chapter discusses the estimated costs and economic impacts associated with the proposed 2011 TRU amendments. The updated expected equipment costs for potential compliance options, the cost and associated economic impacts on businesses, as well as an analysis of the cost-effectiveness of the original TRU ATCM are presented. Estimates in this chapter are based on the costs incurred and incremental emissions during the years of 2011 to 2029, except initial equipment labeling and documentation costs are based on 2011 to 2020. It is assumed that compliance methods would be installed from 2011 to 2020 with the capital costs being recovered until 2029. The costs and cost savings, presented in 2011 dollars, are included with an explanation of the methodology used in Sections C, E and H.

A. Summary of the Economic Impacts

In assessing the costs and savings associated with the proposed 2011 TRU amendments, ARB staff developed estimates using updated regulatory costs associated with the TRU ATCM in-use standards for engines for TRU operators, as well as the regulatory costs of the 2011 Amendments. The estimated regulatory costs for TRU operators include the capital cost of installing both Level 2 VDECS to meet LETRU, Level 3 VDECS for ULETRU, electric standby retrofits for ULETRU, and engine repower or TRU replacement to delay compliance deadlines adjusted for the estimated percentage of use of each method for compliance. All costs are adjusted for the time value of money to 2011 dollars.

There will be compliance cost savings due to extending the in-use standard for ULETRU on the model year 2003 and older engines which met LETRU by their respective compliance dates. The cost savings for both ULETRU extensions would be about $350,000. There also is cost savings of about $21 million for using the TRU model year rather than the engine model year to determine compliance dates. The cost savings from use of electronic recordkeeping for electric standby units is about $3.9 million and one-time cost savings for the exemption for TRUs used in emergencies is about $340,000. After considering the additional cost to OEMs, dealers, installers and rebuilders for providing labeling and documentation, and the cost to responsible parties for verifying compliance of TRUs which they dispatch, staff estimates that the net cost savings for compliance with the proposed 2011 TRU amendments to the regulation to be approximately $13 million (2011 dollars) from 2011 through 2029.

Staff evaluated the economic impacts the proposed 2011 TRU amendments would have on businesses by estimating the effect of the regulatory costs on small businesses and typical businesses. Compliance cost savings per unit of $1,325 is estimated from the average compliance cost savings of each amendment weighted by population. The OEMs, dealers, installers, and engine rebuilders incur approximately $200,000 in labeling and documentation costs annually with a total of $1.6 million over the years 2011 through 2020, and parties responsible for dispatch of TRUs incur approximately $900,000 annually with a total of $11 million over the years 2011 through 2029.

One State agency would be impacted by the proposed 2011 TRU amendments to the regulation. The California Department of Corrections operates refrigerated trucks and trailers used to service correctional facilities and have three TRUs which are impacted by the amendment to the ULETRU in-use engine standards compliance date. The California Department of Corrections also operates 14 TRUs which use electric standby as the compliance method. The cost savings to this state agency is estimated to be a maximum of $582 for the ULETRU extensions and $32,200 for the use of electronic recordkeeping. Refrigerated trucks and trailers are owned and operated by at least 25 local school districts. Of these, the San Marcos School District met LETRU on time and may have $388 in cost savings for the ULETRU delay in compliance dates. Elk Grove Unified School District, Kern High School District, San Diego Unified School District, and Los Angeles Unified School District have a total of 65 TRUs which utilize electric standby as the compliance method, and have an expected maximum cost savings of $149,500.

B. Legal Requirements

In this section, we explain the legal requirements that must be satisfied in analyzing the economic impacts of the proposed 2011 TRU amendments.

Section 11346.3 of the Government Code requires State agencies assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed amended regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states. Also, California State agencies are required to estimate the cost or savings to any State or local agency in accordance with instructions adopted by the Department of Finance (DOF). The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

In addition, Health and Safety Code section 57005 requires the ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding $10 million in any single year. Because the estimated cost of the 2011 TRU amendments to the TRU ATCM does not exceed $10 million in any single year, the proposed amendments do not constitute a major regulation.

The following is a description of the methodology used to estimate costs as well as ARB staff's analysis of the economic impacts on California businesses, as well as, federal, State, and local agencies.

C. Methodology for Estimating Costs Associated with the Proposed 2011 Amendments

In this section, the estimated costs associated with the proposed 2011 TRU amendments are discussed. Briefly, the methodology entailed:

- Estimating the regulatory cost savings associated with the proposed amendments for extending ULETRU deadlines for those which complied with LETRU on time;
- Estimating costs and cost savings for mandatory electronic recordkeeping for TRU operators that choose to comply with the TRU ATCM by using the electric standby alternative technology option;
- Estimating the cost savings for mobile catering TRUs which are dispatched to emergencies in California;
- Estimating the regulatory costs of additional recordkeeping and documentation for the TRU OEMs, drivers, brokers, freight forwarders, motor carriers, shippers, and receivers; and
- Costs were estimated in 2011 dollars and also adjusted to NPV using a five percent discount rate.

The following proposed amendments do not have any expected economic or emissions impact and will not be discussed in this section:

- Clarify compliance by repowering with a cleaner, new, or rebuilt engine;
- Clarify TRU dealer requirements and allowances for noncompliant equipment;
- Add an exemption for obviously non-operational equipment not covered by the dealer exemption;
- Add an exemption for refrigeration systems not powered by an integral diesel engine;
- Clarify prohibitions on the sale of noncompliant units;
- Clarify and streamline requirements for lessors and lessees;
- Add a provision to allow the use of unique equipment identification numbers instead of affixing an ARB Identification Number (IDN), and
- Clarify registration requirements, consistent with current ARBER screens.

The remaining proposed amendments, which do have an associated economic impact, are discussed below.

1. Extend ULETRU Compliance Date for MY 2001 and Older if LETRU Met by Original Compliance Date

If Level 2 VDECS are installed on MY 2001 and older engines, an additional ULETRU compliance step must be performed on surviving engines by December 31 of the 14th year after the model year of the engine (2015 for MY 2001 and older engines). If the TRU owner repowered the TRU with a Tier 4i engine or replaced the TRU with one containing a Tier 4i engine, the TRU also meets LETRU and an additional ULETRU compliance step must be performed on surviving engines by December 31 of the 7th year after the model year of the engine (2015 for MY 2008 replacement engines). This amendment extends the compliance date for ULETRU by one year if LETRU was met by the original compliance date of December 31, 2008. The compliance date and associated capital cost would be delayed by one year to December 31, 2016. Table V-1 presents estimates of the surviving number of TRUs in 2015 and 2016 based on estimates of TRUs in ARBER which met LETRU by December 31, 2008, and the cost savings associated with the delay. To arrive at the cost savings for each TRU, the weighted average cost of compliance over population, cost, and percentage of TRUs using a particular compliance method was calculated for calendar year 2015 and 2016 in 2011 dollars. This cost is based on the updated compliance costs of the TRU ATCM discussed in Section H. The difference in the weighted average costs for these years is reported as cost savings per TRU delayed.

Table V-1: Costs from Proposed Amendment Extending the ULETRU Compliance Date for MY 2001 and Older

Method of LETRU Compliance	TRU Model Year	Number of TRUs Expected to Meet ULETRU by 12/31/2015	Number of TRUs Expected to Meet ULETRU by 12/31/2016	Cost Savings per TRU Delayed (2011 Dollars)	Total Cost Savings (2011 Dollars)
Level 2 VDECS	2001 and older	29	24	$194	$4,656
Tier 4 Replacement or Repower	2001 and older	113	101	$180	$19,594
Total					**$24,250**

The cost savings associated with the delay in ULETRU requirements for MY 2001 and older TRUs which met LETRU by December 31, 2008 is estimated at about $24,000.

2. Extend ULETRU Compliance Date for MY 2003 and Older if met LETRU by respective compliance dates.

If Level 2 VDECS are installed on MY 2003 and older engines, an additional ULETRU compliance step must be performed on surviving engines by December 31 of the 14th year after the model year of the engine (2015 for MY 2001 and older engines up to 2017 for MY 2003 engines). If the TRU owner repowered the TRU with a Tier 4i engine, or replaced the TRU with one containing a Tier 4i engine, the TRU also meets LETRU and an additional ULETRU compliance step must be performed on surviving engines by December 31 of the 7th year after the model year of the engine (2015 for MY 2008 replacement engines). This amendment extends the compliance date for ULETRU by one year if LETRU was met by the compliance date of December 31, 2009 for MY 2002 and older engines and December 31, 2010 for MY 2003 engines. The capital cost would be delayed by one year to December 31 of year 2016, 2017, or 2018, respectively. This extension could be combined with the ULETRU extension for TRUs with engines that met LETRU by December 31, 2008 for a total extension of two years. Table V-2 presents estimates of the surviving number of TRUs in 2015, 2016, and 2017 based on TRUs in ARBER which met LETRU by their compliance dates, and the cost savings associated with the delay. To arrive at the cost savings for each TRU, the weighted average cost of compliance over populations, costs and percentage of using compliance methods was calculated for calendar year 2015, 2016, 2017 and 2018 in 2011 dollars based on the updated compliance cost methodology of the TRU ATCM. The difference in the weighted average costs for these years is reported as cost savings per TRU delayed.

Table V-2: Costs from Proposed Amendment Extending the ULETRU Compliance Date for MY 2003 and Older

Method of LETRU Compliance	TRU Model Year	Number of TRUs Expected to Meet ULETRU in Compliance Year	Number of TRUs Expected to Meet ULETRU in Year After Compliance Year	Cost Savings per TRU Delayed (2011 Dollars)	Total Cost Savings (2011 Dollars)
Level 2 VDECS	2001 and older	913	745	$194	$144,530
	2002	65	53	$185	$9,805
	2003	137	112	$176	$19,712
Tier 4 Repower or Replacement	2001 and older	510	284	$194	$55,096
	2002	99	91	$185	$16,835
	2003	501	460	$176	$80,960
Total					**$326,938**

The cost savings associated with the delay in ULETRU requirements for MY 2003 and older TRUs which met LETRU by their compliance date is estimated at about $330,000.

3. Clarify the Operational and Recordkeeping Requirements for Hybrid Electric/Electric Standby (E/S), and Hybrid Cryogenic Temperature Controlled TRUs to Quality as Compliant Under the Alternative Technology Option

Staff has estimated the costs and populations of TRUs affected by the proposed amendment to require recordkeeping for electric standby/hybrid electric, which is listed in Table V-3. Staff has also estimated the cost of both manual recordkeeping and electronic recordkeeping (see Matrix 1 of Appendix E). The capital costs and operating and maintenance costs of electronic recordkeeping are compared to the labor costs associated with manual recordkeeping. The costs of electronic tracking systems, and the time involved and labor rates of manual recordkeeping, were estimated following discussions with electronic recordkeeping companies as well as TRU operators using electric standby. The cost of manual recordkeeping exceeds the cost of electronic recordkeeping and this is, in fact, a cost savings measure with approximately $2,300 in annual savings per TRU. MY 1998 and older TRUs are not expected to be able to use this method as they generally do not have a compatible microprocessor, so they are not included in the cost savings estimate. These TRUs are at the point where they would normally be retired due to age and condition of the trailer. Their potential replacement is accounted for in the updated inventory. It is assumed 50 percent of each year's population of 1999 and newer TRUs would be required to install electronic recordkeeping; however, many TRU owners with newer electric standby options may change their compliance method until the TRU approaches a compliance deadline. The average total cost savings are $3.9 million.

Table V-3: Population and Cost Savings from Proposed Amendment Requiring Electronic Recordkeeping

TRU Model Year	Number of TRUs in 2011 Which Chose Electric Standby	Number of TRUs Which Must Install Electronic Recordkeeping in 2012	Number of TRUs Which Must Install Electronic Recordkeeping in 2013	Annual Cost Savings Associated with Electronic Recordkeeping per TRU
1998 and older	651	NA	NA	NA
1999 to 2003	739	312	273	$2,300
2004 to 2011	1,193	569	545	$2,300
Total	**1,932**	**881**	**818**	**$3.9 million**

4. **Add requirements for drivers, brokers, freight forwarders, motor carriers, shippers and receivers; the party responsible for arranging perishable goods transport on California highways would be required to only hire or contract with carriers that use compliant TRUs.**

The requirements for expanding compliance responsibility to the party who arranges transport will have economic impacts to the parties which will be included in the increased responsibility. This cost is estimated by looking at how much time the responsible party would take in performing due diligence that any carriers that they contract with have compliant TRUs. The inputs for estimating this cost are number of annual loads, time estimate of compliance check, and labor rate. These were arrived at by discussion with third-party logistics companies. However, the data received were limited and the numbers shown in Table V-4 below are rough estimates. The total cost of verification is estimated to be approximately $900,000 annually with a total cost of $11 million (2011 dollars) over 2011 through 2029.

Table V-4: Annual Cost for Compliance Verification by Responsible Parties

Weekly Number of Loads Arranged By Party Other Than Owner	Annual Number of Loads Arranged By Party Other Than Owner	Time Associated with Compliance Verification Check (min)	Labor Rate Associated with Compliance Verification Check ($/hr)	Annual Cost Associated with Compliance Verification Check
20,000	1,040,000	2	$25	$867,000

5. **Allow the Executive Officer to extend compliance dates up to one year when compliance technology is unavailable.**

The extension of compliance dates by the Executive Officer may have some small cost deferrals associated with delayed compliance. However, staff is unaware to what degree extension requests may be made. Although the potential economic impact of this amendment could not be quantified, its cost impact would not be noticeable.

6. **Add an exemption for TRUs that are used during emergencies.**

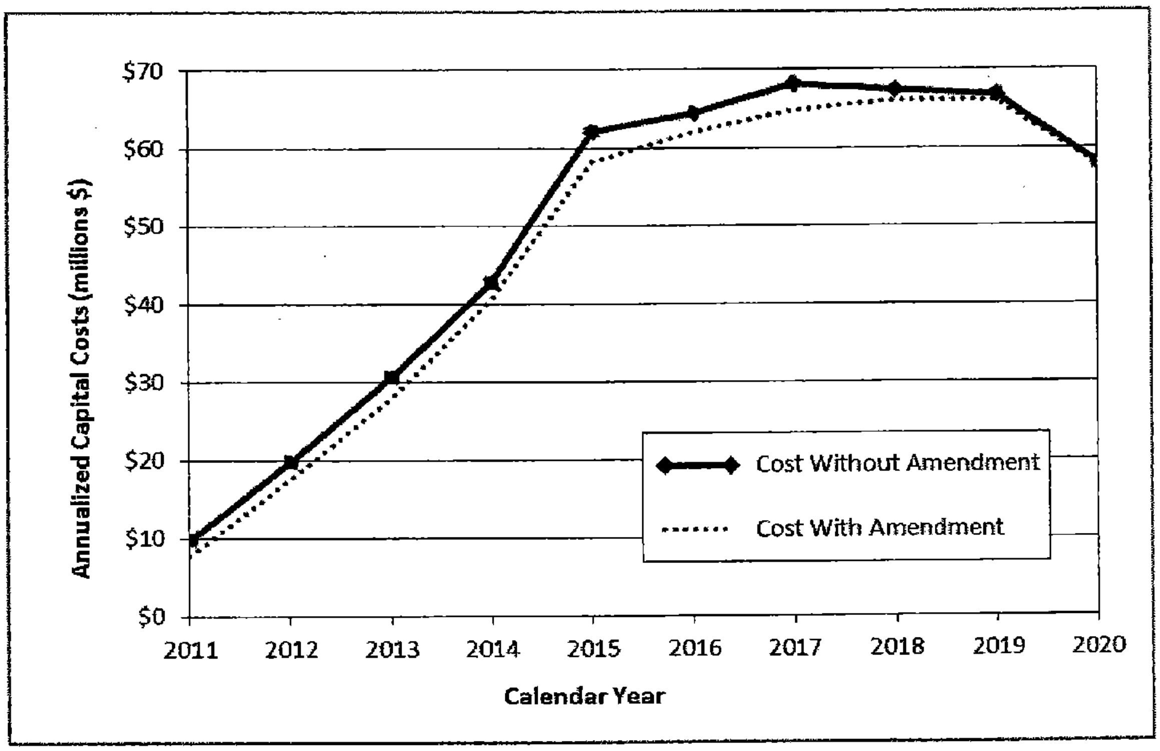
There are approximately 70 TRUs that are used during emergencies in California, as defined in the TRU ATCM. These 70 TRUs have very low hours of operation in California and using the average compliance cost of $4,900 based on the updated compliance costs of the TRU ATCM, the total cost savings is approximately $340,000.

7. Allow the use of the unit manufacture year instead of the engine model year for determining compliance requirements and date.

Allowing the use of the unit manufacture year instead of the engine model year to determine compliance requirements and dates was implemented by staff as a pilot program in October 2009. This allowance has a cost deferral for the approximately 25 percent TRUs with the previous model year engine. These percentages range from 1 percent to 32 percent in TRU MY 2001 through 2011, generally decreasing over time.

The cost savings for TRU owners and operators under the pilot program through 2010 was approximately $4.7 million. For the future cost savings of the amendment, the compliance cost of the TRU ATCM with and without the amendment were estimated based on the updated compliance costs of the TRU ATCM. The annualized cost savings per calendar year are also shown in Figure V-1. The total cost savings from this amendment is approximately $21 million over 2011 through 2029. Appendix E shows the methodology used to estimate the cost savings.

Figure V-1: Cost Savings from Proposed Amendment Using the TRU Manufacture Date to Determine Compliance



8. **Add a provision to allow ARB's Executive Officer to delay enforcement for up to four months if financing, delivery, and installation are delayed.**

The extension of compliance dates by the Executive Officer may have some small cost deferrals associated with delayed compliance. However, staff is unaware to what degree extension requests may be made. Therefore, staff is unable to estimate the potential economic impact of this amendment. Nonetheless, the deferred costs are not expected to be noticeable.

9. **Add a requirement for TRU OEMs to provide supplemental labels with new prior-tier replacements engines and flexibility engines.**

Supplemental labels will have a minor cost impact on the OEMs, although there will be no emissions impacts. The cost estimates are presented in Appendix E and show a cost of $30,200 annually with a total cost of $240,000 (2011 dollars) over 2011 through 2020.

10. **Add requirements for TRU OEMs, dealers, and repair shops that sell and/or install TRUs, install replacement engines, and/or install in-use compliance technologies to provide documentation.**

Documentation will have a minor cost impact on the TRU OEMs, dealers and repair shops, although there will be no emissions impacts. Cost estimates for documentation are discussed in Appendix E and show a cost of $17,200 annually with a total cost of $140,000 (2011 dollars) over 2011 through 2020.

11. **Add requirements for engine rebuilders to provide supplemental labels, emissions demonstration to ARB and documentation to assist registration in ARBER.**

Supplemental labels, documentation and emissions demonstrations will have a cost impact to the engine rebuilders, although there will not be an emissions impact. These cost estimates are discussed in Appendix E and show $152,000 annually with a total cost of $1.2 million (2011 dollars) over 2011 through 2020. The need for emissions demonstrations is undeterminable, so it was applied to all rebuilders.

D. Total Regulatory Costs

Table V-5 provides the regulatory costs attributed to the proposed amendments. The net total regulatory cost savings over the years 2011 to 2029 are estimated to be about $13 million (2011 dollars).

Table V-5: Total Estimated Regulatory Costs for the Proposed 2011 TRU Amendments

Proposed 2011 TRU Amendments	Regulatory Cost or (Savings) (in $1000s of dollars)
ULETRU Extension for ≤ MY 2001 LETRU Compliance prior to December 31, 2008	(24)
ULETRU Extension for ≤ MY 2003 Timely LETRU Compliance	(330)
Electronic Recordkeeping for Hybrid Electric/Electric Standby Compliance Method	(3,900)
Compliance Verification for Responsible Parties	11,000
Exemption of TRUs used During Emergencies	(340)
Use of TRU Manufacture Year Rather than Engine Model Year	(21,000)
Supplemental Labels for OEMs	240
Documentation for OEMs, Dealers and Repair Shops	140
Supplemental Labels and Demonstration for Engine Rebuilders	1,200
Net Total Cost or (Savings)	**($13,014)**

All values rounded and in 2011 dollars.

E. Methodology for Estimating Costs Associated with Alternatives

The economic impacts and emission benefits not realized were evaluated for one, two, and three-year delays in compliance dates for MY 2004 and newer engines. These impacts were estimated based on the updated compliance costs of the TRU ATCM discussed in Section H.

The emission benefits decreased and the cost savings increased as the compliance dates were delayed as shown in Table V-6. This is due to several factors including the decreased cost of money as time from the baseline year increases, the greater chance that TRUs would not survive during the delay period, and the decreasing amount of capital costs for engine repowers and TRU replacements that are attributable to the TRU ATCM.

Table V-6: Costs for Alternatives to the 2011 TRU Amendments

Alternative	Capital Cost Savings 2011-2029 ($ million)	Decrease in Emission Benefits 2011-2029 (tons)
1-year delay in ULETRU Compliance for MY 2004 and Newer Engines	$270	298
2-year delay in ULETRU Compliance for MY 2004 and Newer Engines	$430	558
3-year delay in ULETRU Compliance for MY 2004 and Newer Engines	$530	852

F. Estimated Costs to Businesses

The costs and economic impacts on businesses are presented in this section. The overall impact on business competitiveness, employment, and other impacts on business are also presented.

1. Potential Impact on Employment, Business Creation, Elimination, or Expansion

a. <u>Potential Impact on Employment</u>

Lower compliance costs for TRU owners and operators will have a positive effect on the preservation of jobs. However, TRU dispatchers and OEMs, dealers, TRU repair facilities and engine rebuilders may experience some cost increase for selective dispatching of only compliant TRUs, and labeling and documentation requirements. The cost increase may adversely impact few jobs in these businesses. Overall, the proposed 2011 TRU amendments have a net positive impact on job preservation.

b. <u>Potential Impact on Business Creation, Elimination, or Expansion</u>

The proposed 2011 TRU amendments would likely prevent the elimination or downsizing of TRU businesses. The additional compliance time allowed by the 2011 TRU amendments is expected to lower the compliance costs for many businesses. The cost savings from the proposed 2011 TRU amendments could allow some businesses who lacked adequate resources additional time to comply in the short run, to continue their operations. The amendments, however, may increase costs to TRU dispatchers and to OEMs, dealers, TRU facilities, and engine rebuilders for supplemental labeling and documentation. The cost increase is not expected to have a noticeable impact on these businesses. Nonetheless, there is potential for loss of a few businesses. On balance, the proposed 2011 TRU amendments are expected to have a net positive impact on businesses.

c. Potential Impact on Business Competitiveness

The proposed 2011 TRU amendments would have no significant impact on the ability of California businesses to compete with businesses in other states. The proposed 2011 TRU amendments are likely to result in no change in business competitiveness as non-California-based TRUs operating in California are required to meet the same regulatory requirements as California-based TRUs.

2. Estimated Regulatory Cost for Small and Typical Business

About 80 percent of the companies that own TRUs are considered small businesses, having less than 20 TRUs. The estimated regulatory cost for small and typical business is presented in Table V-7. The regulatory cost savings represents a weighted average of cost savings associated with the ULETRU extension, electric standby electronic recordkeeping requirements, and use of the unit manufacture year to determine compliance. The estimated regulatory cost savings from the 2011 TRU amendments for a small business ranges from $1,325 for one unit to $26,500 for 20 units. If the amendments affect approximately 18 percent of the TRUs, a small business with an average of 4 affected TRUs is expected to experience $4,770 in cost savings. The estimated regulatory cost savings for a typical business ranges from $27,825 for 21 units to $66,250 for 50 units. If the amendments affect approximately 18 percent of the TRUs, a typical business with an average of 9 affected TRUs is expected to experience $11,925 in cost savings. The estimated regulatory costs for OEMs, dealers, repair shops and engine rebuilders are estimated at about $200,000 and to responsible parties is $900,000. These respective costs are divided by approximately 50 OEMs, dealers, repair shops, and engine rebuilders and 50 parties responsible for arranging transport to arrive at an average annual cost per business.

Table V-7: Estimated Regulatory Cost Savings for Small and Typical Business

	Cost Savings to Small Business	Cost Savings to Typical Business	Average Annual Cost to Business	
	1 Unit to 20 units	21 Units to 50 Units	OEMs, Dealers, Repair Shops	Party Which Arranges Transport
Weighted Average Capital Cost Savings for Amendments	$4,770	$11,925	N/A	N/A
Average OEM, Dealer Repair Shop and Rebuilder Documentation, Labeling, Demonstration Costs	N/A	N/A	$4,000	N/A
Average Party Responsible for Transport Costs	N/A	N/A	N/A	$18,000

All values rounded and in 2011 dollars.

G. Cost to Local and State Agencies

One State agency would be impacted by the proposed 2011 TRU amendments. The California Department of Corrections operates refrigerated trucks and trailers to service correctional facilities, and owns three TRUs which are impacted by the amendment to the ULETRU in-use engine standards compliance date. The California Department of Corrections also operates 14 TRUs which use electric standby as the compliance method. The capital cost savings to this state agency is estimated to be a maximum of $582 for the ULETRU extensions and $32,200 for the use of electronic recordkeeping. Refrigerated trucks and trailers are also owned and operated by at least 25 local school districts. Of these, San Marcos School District met LETRU on time and may have $388 in cost savings for the ULETRU delay in compliance dates. Elk Grove Unified School District, Kern High School District, San Diego Unified School District, and Los Angeles Unified School District have a total of 65 TRUs which utilize electric standby as the compliance method and have an expected maximum cost savings of $149,500.

The proposed 2011 TRU amendments are not expected to add significant costs to ARB above those already required to implement and enforce the proposed amended regulation. ARB's administrative costs for outreach, educational efforts, and technical assistance would be absorbed within existing budgets and resources.

H. Methodology for Estimating Updated Costs Associated with the TRU ATCM

The Board directed ARB staff on November 18, 2010, to update the cost of the in-use standards associated with the TRU ATCM. This was in response to stakeholder comments that the compliance costs differed from the estimates in the 2003 Staff Report. Costs were calculated for 2008 through 2029 as the TRU ATCM in-use standards compliance methods were installed starting in 2008. It is assumed that compliance methods would continue to be installed until 2020 with the capital costs being recovered until 2029.

In this section, the estimated updated costs associated with the in-use standards of the TRU ATCM are discussed. Briefly, the methodology entailed:

- Estimating the updated regulatory costs associated with the compliance methods used to comply with the in-use standards for the TRU ATCM;

- Estimating the operating and maintenance costs for equipment used to comply with the TRU ATCM;

- Estimating the compliance methods used by each category of affected TRUs;

- Adjusting costs to NPV using a five percent discount rate and presented in 2011 dollars; and

- Adjusting the updated costs associated with the in-use performance standards to 2003 dollars in order to establish the updated cost-effectiveness and compare with the cost-effectiveness estimate presented in the 2003 Staff Report.

1. Updated Cost of Compliance Options

a. Updated Capital Costs of Equipment

The estimated costs for purchasing and installing compliance options in an in-use TRU were determined using manufacturers suggested cost data from Level 2 VDECS manufacturers, Level 3 VDECS manufacturers, engine manufacturers and TRU manufacturers. There are currently two Level 2 VDECS manufacturers with two sizes of VDECS and three Level 3 VDECS manufacturers[1]. The estimated costs included the cost of the filter, new injectors if required by the VDECS verifications, and installation. Staff's estimate of the average costs for purchase and installation of a VDECS retrofit, add on of an electric standby option (for new TRUs), engine repower, and TRU replacement are shown in Table V-8.

Table V-8: Estimated Average Compliance Capital Costs by Equipment Type (2011 Dollars)

Equipment Type	Horsepower Category (hp)	Cost of Level 2 VDECS[1]	Cost of Level 3 VDECS[1]	Electric Standby Option	Engine Repower	TRU Replacement
California-based truck van	Less than 11	$3,600	$5,600	$675	$5,750	$16,300
California-based truck van	11-<25	$3,600	$5,600	$675	$5,750	$16,300
California-based semi-trailer	25-<50	$4,705	$5,450	$3,000	$8,400	$21,600
Out-of-state semi-trailer	25-<50	$4,705	$5,450	$3,000	$8,400	$21,600
Railcar	25-<50	$4,705	$5,450	$3,000	$8,400	$21,600
California-based container on semi-trailer/railcar	25-<50	NA	NA	NA	NA	$14,500

1. Includes VDECS, labor, and ancillary equipment costs.

b. Updated Annual Maintenance Costs of Equipment

The operating and maintenance costs associated with the above compliance methods were estimated for costs in excess of standard maintenance of a diesel engine. Engine repower and TRU replacement do not add additional costs to the standard maintenance

[1] One manufacturer has a Level 3 product on the market. The other two are in various stages of the verification process, with one expected to have product available fall 2011.

of a diesel engine. Any costs associated with use of an electric standby are assumed to be reduced by cost savings in using electric power rather than diesel. Updated average costs for maintenance and operation of a VDECS of $109 for Level 2, $868 for Level 3 25-50 hp and $917 for Level 3 <25 hp were considered in the updated cost estimate.

c. Updated Population Distributions

Table V-9 presents estimates of the percentages of affected engines in 2008 through 2020 utilizing each method of compliance. This percentage determination is based on a weighted average of the compliance percentages for 2001-2003 TRUs seen in ARBER. Staff has adjusted the costs assuming that TRU operators are expected to comply with the TRU ATCM by the percentage associated with each compliance method listed.

Table V-9: Percentages of Compliance Methods Chosen by Affected 2001 to 2003 TRUS

Equipment Type	Horsepower Category (hp)	Percent VDECS	Percent Engine Repowers	Percent Electric Standby Option	Percent TRU Replacements
California-based truck van	Less than 11	21	37	32	10
California-based truck van	11-<25	21	37	32	10
California-based semi-trailer	25-<50	20	69	1	10
Out-of-state semi-trailer	25-<50	20	69	1	10
Railcar	25-<50	20	69	1	10
California-based container on semi-trailer/railcar	25-<50	0	0	0	100

The detailed calculations associated with the updated cost estimate are located in Matrix 1 of Appendix F.

2. Updated Cost-Effectiveness of TRU ATCM In-Use Standards

Cost-effectiveness is expressed in terms of costs in dollars per unit of emissions reduced (pounds or tons). As part of the updated cost analysis, the cost of the updated TRU ATCM was adjusted to 2003 dollars, as used in the 2003 Staff Report, and the updated cost-effectiveness was estimated. Updated costs and emission benefits estimated as part of the updated inventory are used in the cost-effectiveness estimation and are summarized in Matrix 2 of Appendix F.

Cost-effectiveness for the updated cost analysis of the TRU ATCM during the years of 2008 through 2029 has a weighted average of $83 per pound. The cost-effectiveness has decreased approximately five-fold due to an unexpected increase in the costs of the compliance methods and different compliance method utilization than originally anticipated. However, as the proposed 2011 TRU amendments will generate cost savings and deferred emission reductions, it is not practical to describe the impacts of the proposed amendments in terms of cost-effectiveness.

Table V-10 shows the range of cost-effectiveness for ARB regulations, including the updated cost-effectiveness analysis for the TRU ATCM. The cost savings and emission reductions lost from the proposed 2011 TRU amendments are negligible and do not affect the original cost-effectiveness range of the TRU ATCM as presented.

Table V-10: Comparison of Diesel PM Cost-Effectiveness of the TRU ATCM In-Use Standards Updated Costs to Other ARB Regulations

Regulation or Airborne Toxic Control Measure	Diesel PM Cost-Effectiveness (dollars/pound PM)
In-Use Off-Road Diesel Vehicles	$40
Cargo Handling ATCM	$21
Solid Waste Collection Vehicle Rule	$32
Public Fleets Rule	$159
Ocean Going Vessels At-Berth	$173
Bus and Truck Rule	$46
Transport Refrigeration Unit ATCM (2004)	$10 - $20
Transport Refrigeration Unit ATCM In-Use Standards (2004) Updated Costs[1]	**$83**[2]

1. The cost savings and emission reductions deferred from the proposed 2011 TRU amendments are small and do not affect the cost-effectiveness of the TRU ATCM.
2. Cost-effectiveness was estimated using costs in 2003 dollars in order to compare to the estimate presented in the 2003 Staff Report.

VI. PUBLIC OUTREACH AND FUTURE ACTIVITIES

A. Public Outreach

Staff developed the proposed amendments to the TRU ATCM through consultations with stakeholders, members of the public, environmental group representatives, and trade associations. Stakeholders that would be affected by the proposed amendments were consulted and invited to participate in rule development, including but not limited to, refrigerated trucking companies, independent truckers, original equipment manufacturers, engine manufacturers, retrofit manufacturers, auctioneers, TRU dealers, truck and trailer dealers, repair shops, retrofit installers, truck and trailer leasing and rental companies, freight brokers and forwarders, shippers, receivers, mobile catering service companies, engine rebuilders, and intermodal freight transportation companies.

In addition to discussions with these stakeholders, over the last year and a half, staff held six workshops to discuss the proposed amendments. In 2010, staff conducted three of the six workshops. As we progressed through the first two workshops, the number of potential amendments grew, as did the number of possible approaches to address issues and concerns. It became clear that additional data collection and analysis would be needed before we would be in a position to recommend specific rule changes to the Board. However, there were several amendments that required Board action in 2010 because of compliance dates that became effective at the end of the year. As a result, staff decided to bring the rulemaking forward in two phases. Phase 1 addressed the time-critical amendments that urgently needed Board approval before the end of 2010. Phase 2 would address the remaining issues and concerns that were not considered as time-critical. Phase 2 rule development began in early 2011. Staff conducted the remaining three workshops in March, May, and June of 2011. Notification for these workshops was distributed to more than 5,300 companies, organizations, and individuals through email notification using ARB's "TRU" electronic list serve.

B. Future Activities

Soon after the Board takes action on the 2011 TRU amendments, staff will publish a TRU regulatory advisory that explains in general terms what affected stakeholders need to do as a result of the 2011 amendments.

More detailed guidance will also be published for OEMs, dealers, and repair shops to explain what is required from them for the registration information document. Guidance is also planned for explaining how to apply for a ULETRU extension for MY 2001 and older engines if they met LETRU; how to apply for a ULETRU extension for MY 2003 and older engines if they met LETRU; how to apply for an extension due to no suitable control technology being available; how to apply for an extension due to delayed delivery, installation, or financing; how to apply for a mobile catering service exemption; how to meet engine rebuilder requirements; and specifications for electronic tracking systems.

Staff will conduct outreach with freight brokers and forwarders, shippers, receivers to work out the details for the 100 percent compliant company list and clarify which actions will meet a due diligence test for efforts to hire or contract for compliant equipment. In addition, staff is committed to working with these stakeholders in developing other tools and guidance that could facilitate the implementation of these requirements.

Staff will continue to work with electronic tracking system suppliers to ensure these systems are ready when they will be phased in, starting in 2013. Staff anticipates needing to refine system specifications to ensure compliance detection and consistent user interface and reporting. Workgroup meetings with system providers will be necessary.

ARBER enhancements are planned that will further simplify registration. The registration information documents will simplify the information gathering, but ARBER screens will also be updated to improve the data entry process.

Staff will evaluate the course of action that is necessary for <25 horsepower (hp) TRU compliance with ULETRU. An evaluation of potential retrofit control technologies appropriate for <25 hp engines will be conducted to determine if the in-use requirements need to be moderated. Also, an evaluation of potential new engine control technologies will help staff understand if more stringent new engine standards are feasible that would meet ULETRU.

Also on the horizon, staff believe that engine maintenance practices will need to improve to ensure diesel PM emissions do not deteriorate beyond the original tier standard. Such a strategy, in conjunction with Level 2 VDECS, may be what is necessary and feasible for the <25 hp engines. However, staff believes that a periodic smoke inspection program (PSIP) program for all TRU engines may be needed to ensure emission reductions continue to be achieved and to ensure reliable operations with diesel particulate filters.

Staff has been, and will continue to follow development, verification, installation, and use of diesel emission control technologies to ensure successful, reliable implementation. Staff will also look for opportunities to reduce ozone precursor emissions, such as NO_x and greenhouse gas emissions.

VII. RECOMMENDATION

ARB staff recommends the Board approve the proposed 2011 TRU amendments to the regulations, as presented in Appendix A, for the following reasons:

1. Extend ULETRU Compliance Date for MY 2001 and Older if LETRU Standard was Met by Original Compliance Date

- U.S. Environmental Protection Agency's (EPA) delayed waiver approval created uncertainty, yet some owners brought their model year (MY) 2001 and older TRUs into compliance with the in-use standard by the applicable December 31, 2008, compliance date. U.S. EPA approved ARB's waiver on January 16, 2009. ARB then delayed enforcement of the requirements for MY 2001 and older TRUs until December 31, 2009, due to the uncertainty created by the delayed approval. Those that complied on time believe that ARB's enforcement delay created unfair competition because the compliant owners made capital investments to comply with the regulation while their competitors did not, thus avoiding significant capital expenditures and gaining a competitive advantage. Staff believes that compliant owners deserve a compensatory regulatory provision to restore competitive fairness and encourage timely compliance with future compliance deadlines.

- This one year extension would only be provided if the compliance action met the LETRU limits by reducing PM emissions by at least 50 percent.

- Staff estimates about 200 units would qualify and very few of these would remain in operation in 2016-2017 time frame; therefore, emissions impacts are expected to be insignificant.

2. Extend ULETRU compliance date for MY 2003 and Older if the LETRU Standard was Met

- Industry requested an extension of operational life for MY2004 and newer TRUs; up to 10 years before a TRU was required to reduce emissions instead of the current 7 years. Staff re-evaluated the emissions and potential public health impacts of an extension using the most current air dispersion model, engine activity, and emissions factors. We found that extending the operational life beyond the current 7 years would likely result in potential cancer risk levels of concern in communities near distribution centers. In addition, owners of older TRUs (e.g. MY 2003 and older) have been required to meet the in-use standards in 2008, 2009, and 2010 using a seven-year operational life, so there would be fairness issues if the operational life is changed at this point. Also, the retrofit device manufacturers that have invested significant resources into verifying diesel particulate filters would be left with no market for one or more years, which would most likely force them to abandon the TRU market. The TRU ATCM's PM emissions reductions also contribute to ARB's 2014 State Implementation Plan for meeting the federal PM 2.5 standard, so any delayed implementation could jeopardize those commitments and result in loss of federal highway funding. Therefore, staff is recommending no change in operational life for MY 2004 and newer TRU engines.

- This proposed amendment for MY 2003 and older TRU engines is a compromise that delays emission reductions toward the end of the phased in program, after the majority of risk near distribution centers has been significantly reduced. The TRUs affected by this amendment would be those that already met the Low-Emission TRU (LETRU) in-use standard. MY 2003 and older units meeting LETRU met the intent of the regulation - reducing PM emissions at least 50 percent.

- Because the affected units would be 14 years old, very few of these would remain in operation in 2017-2018-2019 time frame. Staff estimates there would be 1,420 MY 2001 and older units in 2016; 164 MY 2002 units in 2017, and 640 MY 2003 units in 2018 that would qualify. The delayed emissions reductions would be 0.042 tons per day (tpd), 0.004 tpd, and 0.012 tpd, respectively, which would be delayed for only one year.

- Extending the operational life of these few remaining units an additional year is not expected to cause a significant public health risk impact.

3. **Clarify the Operational and Recordkeeping Requirements for Hybrid Electric/Electric Standby (E/S), and Hybrid Cryogenic Temperature Controlled TRUs**

- It was staff's intent, under the original TRU ATCM, that recordkeeping was required to demonstrate that TRU engine operation has been eliminated at facilities. Manual recordkeeping has been used; however, inspection staff has reported significant gaps in these records and it is sometimes evident that records don't reflect actual hour meter readings. Clarifications and recordkeeping requirements are needed to make this demonstration more enforceable.

- Electronic tracking systems provide automated Global Positioning System (GPS) tracking, engine run time monitoring, recordkeeping and reporting.

- Staff believes that the use of automated tracking and reporting systems will result in improved enforceability and labor savings that more than pay for the capital and operating costs of such systems.

4. **Add requirements for drivers, brokers, freight forwarders, motor carriers, shippers and receivers if they are the party responsible for arranging perishable goods transport on California highways**

- Compliance rates are low, preventing the expected emissions reductions that are needed to reduce potential cancer risk near distribution centers and other areas where TRUs congregate. When shippers and receivers hire carriers that have noncompliant equipment, they contribute to the low compliance rates. Additionally, carriers with noncompliant equipment are able to offer lower refrigerated truck rates and, as a result, create an unfair competitive advantage against compliant carriers that need to charge higher rates to pay for their in-use compliance costs.

- Compliant fleets and their trade associations support requirements for brokers, freight forwarders, shippers, and receivers that would require them to only hire or contract with compliant carriers.

- Staff believes that freight brokers, freight forwarders, shippers, and receivers could screen the carriers they hire and contract with and require they only dispatch compliant equipment on California highways.

5. **Clarify compliance by repowering with a cleaner, new, or rebuilt engine**

- Owners of TRUs can maintain compliance with the TRU ATCM's in-use standards by repowering with a new, certified replacement engine that is the cleanest engine that will fit and perform in the TRU. Compliance is achieved because the compliance date for the replacement engine is seven years from the model year of the replacement engine. However, the replacement engine would still need to be retrofitted with a Level 3 VDECS to meet ULETRU by December 31st of the seventh year after the replacement engine's model year or effective model year.

- The proposed amendments ensure that TRU owners understand how the effective model year affects the operational life of a replacement engine. In addition, staff believes that owners need disclosures from replacement engine suppliers regarding the effective model year of engines they purchase.

6. **Clarify TRU dealer requirements and allowances for noncompliant equipment**

- Dealers need to be able to work with noncompliant TRUs in California as part of trade-ins when owners buy new or newer compliant equipment. Dealers often need to pick up the noncompliant trade-in equipment from the owner's terminal and move it to the dealer's yard before selling it out-of-state or bringing it into compliance prior to sale. Therefore, dealers need to be able to purchase, receive, or acquire and move noncompliant equipment on California highways.

- The proposed amendments establish a framework that allows dealers to conduct their business without being cited.

7. Allow the Executive Officer to extend compliance dates up to one year when compliance technology is unavailable

- The proposed amendments allow the Executive Officer to approve temporary compliance deadline extensions if owners are not able to find suitable compliance technology, and staff finds that there is a genuine lack of compliance technology.

- This amendment provides flexibility in addressing issues related to VDECS and other compliance options which may not be fully available on the market immediately prior to a compliance date. For example, one Level 3 VDECS is verified and on the market and a second Level 3 VDECS is expected to complete verification and be available on the market October 2011.

- The compliance deadline for greater than 25 hp model year 2004 TRU engines is December 31, 2011, so this amendment allows ARB to provide additional time to accommodate availability issues.

8. Add an exemption for obviously non-operational equipment not covered by the dealer exemption

- This amendment clarifies that owners can haul dry goods with a TRU still installed on a van, if the TRU is obviously nonoperational.

9. Add an exemption for refrigeration systems not powered by an integral diesel engine

- This amendment clarifies that transport refrigeration systems that are not driven by an integral diesel internal combustion engine are exempt from the TRU ATCM.

10. Add an exemption for TRUs that are used during certain emergencies

- The proposed exemption only applies to a small number of refrigerated trucks and trailers equipped with TRUs that are used by mobile catering companies that feed emergency responders, such as firefighters suppressing wildfires.

- Public health impacts due to TRU operations at wildfire staging areas are insignificant, especially when compared to the smoke from the wildfire.

- This exemption would expire after all ULETRU compliance dates have passed.

11. Clarify prohibitions on the sale of noncompliant units

- Clarifies that the prohibition regarding selling noncompliant TRUs for use in California includes any person that sells TRUs, not just people in the business of selling TRUs.

- Sellers should disclose to buyers if a TRU is not compliant for use in California or if special conditions apply to qualify as compliant.

12. Clarify and streamline requirements for lessors and lessees

- The proposed amendments incorporate policies and procedures that were developed in conjunction with lessors and lessees during an implementation pilot period in order to clarify regulatory responsibilities for each party.

13. Allow the use of the unit manufacture year instead of the engine model year for determining compliance requirements and dates

- The proposed amendments incorporate policies and procedures that were developed in conjunction with TRU owners and manufacturers during an implementation pilot period.

14. Add a provision to allow the use of unique equipment identification numbers instead of affixing an ARB Identification Number (IDN)

- The proposed amendments incorporate policies and procedures that were developed in conjunction with TRU owners during an implementation pilot period.

15. Add a provision to allow ARB's Executive Officer to delay enforcement for up to four months if financing, delivery, and installation are delayed

- The proposed amendments give the Executive Officer authority to grant a short compliance extension for unforeseen obstacles that prevented on-time compliance. In order to qualify, the owner must demonstrate that good-faith efforts to comply by the appropriate compliance deadline considered adequate lead times for delivery, installation, holiday-related delays, and greater demand near compliance dates.

16. **Add requirements for TRU original equipment manufacturers (OEM) to notify the Executive Officer in advance of plans to install flexibility engines in new units, provide supplemental engine labels with new prior-tier replacement engines and flexibility engines, and provide registration information documents with replacement engines and new units supply**

- The use of flexibility engines by TRU OEMs needs to be monitored to ensure in-use requirements and labeling requirements are being met, and owners are being notified with regard to the effective model year and ULETRU compliance dates.

- Flexibility engine labels and prior-tier replacement engine labels do not include the information that is needed to register in ARBER, which, in some cases, results in data entry errors. Supplemental labels and registration information documentation would address this issue.

- The proposed amendments ensure the ARB staff are aware of the use of flexibility engines by TRU manufacturers and that TRU owners have all the information they need to successfully register in ARBER.

17. **Add requirements for dealers and repair shops that sell and/or install TRUs, install replacement engines, and/or install in-use compliance technologies to provide documentation**

- The proposed amendments require dealers and repair shops to provide a registration information document at the point of sale for new TRUs, new replacement engines, and other compliance technologies.

- This document, normally supplied to the dealers and repair shops by the original equipment manufacturer, would assist TRU owners in ensuring that accurate information about their TRUs is entered into ARBER.

18. **Add requirements for engine rebuilders to provide supplemental labels, emissions demonstration to ARB, and documentation**

- The proposed amendments clarify engine rebuilder requirements, and require engine rebuilders to provide supplemental labels and registration information documents to facilitate registration in ARBER.

- Additionally, the proposed amendments clarify that documentation is required to demonstrate that the rebuilder has satisfied the applicable federal and California engine rebuilder requirements.

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Supplemental Documentation for Economic Analysis.

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APPENDIX A

PROPOSED AMENDMENT OF AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

TITLE 13, CALIFORNIA CODE OF REGULATIONS SECTION 2477

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Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate

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Amend article 8, Off-Road Airborne Toxic Control Measures, and section 2477 and adoption of sections 2477.1, 2477.2, 2477.3, 2477.4, 2477.5, 2477.6, 2477.7, 2477.8, 2477.9, 2477.10, 2477.11, 2477.12, 2477.13, 2477.14, 2477.15, 2477.16, 2477.17, 2477.18, 2477.19, 2477.20, and 2477.21, within division 3, chapter 9, title 13, California Code of Regulations (CCR), to read as follows: (Note: Proposed amendments are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions.)

Article 8. Off-Road Airborne Toxic Control Measures

Section 2477. Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate.

~~(a)~~2477.1 Purpose.

Diesel particulate matter (PM) was identified in 1998 as a toxic air contaminant. This regulation implements provisions of the Diesel Risk Reduction Plan, adopted by the Air Resources Board in October, 2000, as mandated by the Health and Safety Code Sections 39650-39675, to reduce emissions of substances that have been determined to be toxic air contaminants. Specifically, this regulation ~~will~~ uses a phased approach to reduce the diesel PM emissions from in-use transport refrigeration units (TRUs) and TRU generator (gen) set equipment used to power electrically driven refrigerated shipping containers and trailers that are operated in California.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(b)~~2477.2 Applicability.

~~(1)~~(a) Owners and operators: Except as provided in ~~sub~~section ~~(c)~~2477.3, section 2477.5 of this regulation applies to owners and operators of diesel-fueled TRUs and TRU gen sets (see definition of operator and owner in ~~sub~~section ~~(d)~~2477.4) that operate in the State of California, regardless of where the vehicle is based. This specifically includes California-based and non-California-based TRUs and TRU gen sets that are installed on trucks, trailers, shipping containers, and railcars.~~:~~

~~(A) Operators and owners of California-based TRUs and TRU gen sets that are installed on trucks, or trailers, shipping containers, or railcars; and~~

~~(B) Operators and owners of non-California-based TRUs and TRU gen sets that are installed on trucks, trailers, shipping containers, or trailers.~~

(b) Terminal operators: Section 2477.6 of this regulation applies to operators of terminals located in California where TRU-equipped trucks, trailers, or shipping containers, or TRU gen sets are regularly garaged, maintained, operated, or dispatched from, including a dispatch office, cross-doc facility, maintenance shop, business, or private residence.

(c) Drivers: Section 2477.7 applies to drivers (as defined in section 2477.4) that drive trucks or trailers that use TRUs or TRU gen sets on California highways.

(d) Freight brokers and freight forwarders: Section 2477.8 applies to freight brokers and freight forwarders (as defined in section 2477.4) that arrange, hire, tender contracts for, or dispatch the transport of perishable goods on California highways or railways in trucks, trailers, shipping containers, or railcars that are equipped with TRUs or TRU gen sets.

(e) Carriers: Section 2477.9 applies to motor carriers (as defined in section 2477.4) that use, cause to be used, or dispatch TRU-equipped trucks, trailers, or railcars, or trailer chassis or shipping containers with TRU gen sets that are driven on California highways or railways.

(f) California-based shippers: Section 2477.10 applies to California-based shippers (as defined in section 2477.4) that arrange, tender contracts for, or dispatch the transport of perishable goods from any location in California in TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars.

(g) California-based receivers: Section 2477.11 applies to California-based receivers (as defined in section 2477.4) that arrange, tender contracts for, or dispatch the transport of perishable goods to any location in California in TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars.

(h) Lessors and Lessees: Section 2477.12 applies to any person that rents or leases (lessor) TRUs or TRU gen sets and those persons renting (renter) or leasing (lessee) such equipment that is operated in California or that is based in California.

(i) TRU and TRU gen set original equipment manufacturers: Section 2477.13 applies to original equipment manufacturers (as defined in section 2477.4) that direct TRU or TRU gen set sales to the California market.

(j) TRU, TRU gen set, and TRU-equipped truck and trailer dealers located in California: Section 2477.14 applies to TRU, TRU gen set, and TRU-equipped truck and trailer dealers that maintain a business location in California and sell, maintain, or repair new or in-use TRUs, TRU gen sets, or TRU-equipped trucks or trailers.

(k) Repair shops located in California that work on TRUs or TRU gen sets: Section 2477.15 applies to repair shops that maintain a business located in California and install replacement engines in TRUs or TRU gen sets, or retrofit TRUs or TRU gen sets with verified diesel emissions control strategies to comply with this subarticle.

(l) Engine rebuilders: Section 2477.16 applies to TRU or TRU gen set engine rebuilders that sell to the California market.

~~(2)~~(m) Facilities: Section 2477.17 ~~This regulation~~ applies to facilities located in California with 20 or more loading dock ~~doors~~ spaces serving refrigerated areas where perishable goods are loaded or unloaded for distribution on trucks, trailers, shipping containers, or rail cars that are equipped with TRUs and TRU gen sets and that are owned, leased, or contracted for by the facility, its parent company, affiliate, or subsidiary that are under facility control (see definition).

~~(3)~~(n) To the extent not already covered under subsections ~~(b)(1) and (b)(2)~~ (a) through (m), above, ~~sub~~section ~~(g)~~ 2477.18 of this regulation shall apply to any person ~~engaged~~ in this State ~~in the business of~~ selling to an ultimate purchaser, or renting or leasing new or used TRUs or TRU gen sets, including, but not limited to, manufacturers, distributors, ~~and~~ dealers, auctioneers, carriers, private fleets, independent owner-operators, and rental and leasing companies.

(o) For purposes of this subarticle, the terms "lease," "leased," "lessor," and "lessee" mean the same as "rental agreement," "rented," "owner of rented vehicle," and "renter," respectively.

~~(4) Severability. If any subsection, paragraph, subparagraph, sentence, clause, phrase, or portion of this regulations is, for any reason, held invalid, unconstitutional, or unenforceable by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of the regulation.~~

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(c)~~2477.3 **Exemptions.**

(a) This regulation does not apply to military tactical support equipment.

(b) Obviously non-operational TRUs or TRU gen sets are exempt from certain sections of this subarticle, as specified below, except that the prohibitions in section 2477.18 apply with respect to selling, renting, or leasing to a person that could be reasonably expected to operate the TRU in California:

(1) Any TRU that is removed or separated from the truck or trailer van, shipping container, or rail car. This exemption does not include TRU gen sets that are not attached to a shipping container or trailer chassis.

(2) Any trailer TRU housing that remains attached to a trailer van, but the fuel tank and battery have been removed and a label with the word "NONOPERATIONAL" has been affixed or attached to the housing in letters that contrast sharply with the color of the TRU housing and can be seen from 50 feet during daylight hours when the vehicle is stationary.

(3) Any truck TRU housing that remains attached to a truck van, but the positive and negative battery cables, fuel supply and return lines, and condensate drain line have been removed so that there are no visible ancillary connections to the TRU housing and a label with the word "NONOPERATIONAL" has been affixed or attached to the housing in letters that contrast sharply with the color of the TRU housing and can be seen from 50 feet during daylight hours when the vehicle is stationary.

(4) Any TRU or TRU gen set that has no engine or fuel injection system installed, making the engine incapable of being started.

(5) TRU gen sets that have been quarantined in a designated area that is separated from other compliant TRU gen sets by a cordon or barrier with signs that read "NONCOMPLIANT – DO NOT OPERATE IN CALIFORNIA". Bright red tags must be affixed to the TRU gen set control panel at all times while in California that read: "NONCOMPLIANT – DO NOT OPERATE IN CALIFORNIA". TRU gen sets may be stored in a shipping container in lieu of being quarantined in a cordoned area.

(c) Transport refrigeration systems that are not driven by an integral diesel internal combustion engine are exempt from the requirements of this subarticle. Examples of exempt equipment include, but are not limited to:

(1) transport refrigeration systems that are driven by gasoline-fueled internal combustion engines;

(2) transport refrigeration systems that are driven by electric motors with no integral diesel engine providing power; or

(3) Pure cryogenic temperature control systems with no diesel engine driven refrigeration system integration.

(d) TRUs that are used during an emergency (as defined) are exempt from the in-use performance standards of section 2477.5(a) of this subarticle, provided the requirements of subsection 2477.5(o) are met. This exemption expires on January 1, 2025. California-based TRUs are not exempt from the ARBER registration requirements in section 2477.5(e).

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(d)~~2477.4 Definitions.

(a) For purposes of this regulation, the following definitions apply:

(1) "Affiliate or Affiliation" refers to a relationship of direct or indirect control or shared interests between the subject business and another business.

(2) "Alternative Fuel" means natural gas, propane, ethanol, methanol, or advanced technologies that do not rely on diesel fuel, except as a pilot ignition source at an average ratio of less than 1 part diesel fuel to 10 parts total fuel on an energy equivalent basis. Alternative fuels also means any of these fuels used in combination with each other or in combination with other non-diesel fuels. Alternative-fueled engines shall not have the capability of idling or operating solely on diesel fuel at any time.

(3) "Alternative-Fueled Engine" means an engine that is fueled with a fuel meeting the definition of alternative fuel.

(4) "Alternative Diesel Fuel" means any fuel used in diesel engines that is not ~~commonly or commercially known, sold or represented as~~ a reformulated diesel fuel ~~No. 1-D or No. 2-D, pursuant to the specification for Diesel Fuel Oils D975-81~~ as defined in sections 2281 and 2281 of title 13, California Code of Regulations (CCR), and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g. recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel, Fischer Tropsch fuels, and emulsions of water in diesel fuel. Natural gas is not an alternative diesel fuel. An emission control strategy using a fuel additive will be treated as an alternative diesel fuel based strategy unless:

(A) The additive is supplied to the vehicle or engine fuel by an on-board dosing mechanism, or

(B) The additive is directly mixed into the base fuel inside the fuel tank of the vehicle or engine, or

(C) The additive and base fuel are not mixed until vehicle or engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine or vehicle.

(5) "ARB" means the California Air Resources Board.

(6) "ARBER" means the ARB's Equipment Registration system.

~~(6)~~(7) "B100 Biodiesel Fuel" means 100% biodiesel fuel derived from vegetable oil or animal fat and complying with American Society for Testing Materials (ASTM) D 6751-02 and commonly or commercially known, sold, or represented as "neat" biodiesel or B100. B100 biodiesel fuel is an alternative diesel fuel.

~~(7)~~(8) "B100 Biodiesel-Fueled" (compression-ignition engine) means a compression-ignition engine that is fueled by B100 biodiesel fuel.

(9) "Broker" means a person, other than a motor carrier or an employee or agent of a motor carrier, that as a principal or agent sells, offers for sale, negotiates for, or holds itself out by solicitation, advertisement, or otherwise as selling, providing, or arranging for, transportation by motor carrier for compensation.

~~(8)~~(10)"Business" means an entity organized for profit including, but not limited to, an individual, sole proprietorship, partnership, limited liability partnership, corporation, limited liability company, joint venture, association or cooperative; or solely for purposes of the Prompt Payment Act (Government Code 927 et seq.), a duly authorized nonprofit corporation.

(11) "California-based shipper" means a shipper that operates a facility in California where wholesale freight is located prior to its transportation.

(12) "California-based receiver" means a receiver that operates a facility in California where wholesale freight is received.

~~(9)~~(13)"California-Based TRUs and TRU Gen Sets" means TRUs and TRU gen sets equipped on trucks, trailers, shipping containers, or railcars that a reasonable person would find to be regularly assigned to terminals within California.

~~(10)~~(14)"CARB Diesel Fuel" means any diesel fuel that is commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specification for Diesel Fuel Oils D975-81 and meets the specifications defined in *13 CCR 2281, 13 CCR 2282, and 13 CCR 2284.*

~~(11)~~(15)"Carbon Monoxide (CO)" means a colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels.

~~(12)~~(16)"Carrier" means ~~any person, party, or entity who undertakes the transport of goods from one point to another~~ "motor carrier".

~~(13)~~(17)"Certification" means the obtaining of an Executive Order for a new off-road compression-ignition engine family that complies with the off-road compression-ignition emission standards and requirements specified in ~~the~~ title 13 California Code of Regulations~~, Title 13~~, ~~S~~section 2423. A "certified engine" is an engine that belongs to an engine family that has received a certification Executive Order.

~~(14)~~(18)"Certification Data" means the ARB Executive Order number and related exhaust emission data for each test cycle mode used to certify the engine family and obtain the certification level shown in the certification Executive Order. Such data includes modal exhaust emissions data for nitrogen oxides, nonmethane hydrocarbons, carbon monoxide, and particulate matter includes, as a minimum, torque, engine speed, weighting factor, power, mass emission rate (grams per hour), and certification test fuel.

~~(15)~~(19)"Compression Ignition (CI) Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

~~(16)~~(20)"Consignee" (see receiver).

~~(17)~~(21)"Consignor" (see shipper).

~~(18)~~(22)"Cryogenic Temperature Control System" means a heating and cooling system that uses a cryogen, such as liquid carbon dioxide or liquid nitrogen that is routed through an evaporator coil that cools air blown over the coil. The cryogenic system uses a vapor motor to drive a fan and alternator, and a propane-fired heater superheats the carbon dioxide for heating and defrosting. Electrically driven fans may be used instead of a vapor motor and heating and defrost needs may be met by using electric heaters and/or vehicle engine coolant.

(23) "Delegation" means entrusting by contract another party to act on the owner's behalf without forfeiture of any rights or property.

~~(19)~~(24)"Deterioration Factor (DF)" means a factor that is applied to the certification emission test data to represent emissions at the end of the useful life of the engine. Separate DFs apply to each measured pollutant, except that a combined NMHC+NOx DF applies to engines that do not use aftertreatment devices. Decreasing emissions over time would not be allowed to offset increasing emissions of the other pollutant in this combined DF.

~~(20)~~(25)"Diesel Fuel" means any fuel that is commonly or commercially known, sold, or represented as diesel fuel, including any mixture of primarily liquid hydrocarbons – organic compounds consisting exclusively of the elements carbon and hydrogen – that is sold or represented as suitable for use in an internal combustion, compression-ignition engine.

~~(21)~~(26)"Diesel-Fueled" means fueled by diesel fuel or CARB diesel fuel in whole or in part, except as allowed for a pilot ignition source under the definition for "alternative fuel".

~~(22)~~(27)"Diesel Oxidation Catalyst (DOC)" means the use of a catalyst to promote the oxidation processes in diesel exhaust. Usually refers to an emission control device that includes a flow-through substrate where the surfaces that contact the exhaust flow have been catalyzed to reduce emissions of the organic fraction of diesel particulates, gas-phase hydrocarbons, and carbon monoxide.

~~(23)~~(28)"Diesel Particulate Filter (DPF)" means an emission control technology that reduces PM emissions by trapping the particles in a flow filter substrate. Periodically the collected particles are either physically removed or oxidized (burned off) in a process called regeneration.

~~(24)~~(29)"Diesel Particulate Matter" means the particles found in the exhaust of diesel-fueled CI engines. Diesel PM may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(30) "Dispatch" means to coordinate delivery, pickup, and drop-off schedules of vehicles; and monitor the delivery of freight from these vehicles.

(31) "Dispatched driver" means the driver of a truck or tractor-trailer combination that has been dispatched by a motor carrier, freight broker or forwarder, shipper, or receiver.

(32) "Driver" means a person who physically operates a truck or tractor. Drivers may also be an owner or an operator. Drivers are not railroad engineers.

~~(25)~~(33)"Dual-Fuel Engine" means an engine designed to operate on a combination of alternative fuel, such as compressed natural gas (CNG) or liquefied petroleum gas (LPG), and conventional fuel, such as diesel or gasoline. These engines have two separate fuel systems, which either inject both fuels simultaneously into the engine combustion chamber or fumigate the gaseous fuel with the intake air and inject the liquid fuel into the combustion chamber.

~~(26)~~(34)"Effective model year" or "effective engine model year" is an alternative model-year designation (see definition of "model year") for a new replacement engine, rebuilt replacement engine, or flexibility engine when the engine does not meet, at the time of manufacture, the most stringent emission tier standard for a new engine in effect for the horsepower rating of the engine. When an engine is manufactured to meet a less stringent prior-tier emissions standard than is currently in effect, the effective model year is the last year that the prior-tier emission standard was in effect. Table 1 lists the tier standards that apply to TRUs and TRU gen sets and the corresponding effective model years.

Table 1
Effective Model Year

Prior-Tier Engine Emissions Standard	Tier Standard Effective Years	Effective Model Year
Tier 1, 25-50 Hp (trailer)	1999-2003	2003
Tier 1, under 25 Hp (truck)	2000-2004	2004
Tier 2, 25-50 Hp (trailer)	2004-2007	2007
Tier 2, under 25 Hp (truck)	2005-2007	2007
Tier 4i, 25-50 hp (trailer)	2008-2012	2012[1]

(35) "Electric-Standby-Equipped TRU" means a TRU that is equipped with an integral diesel-fueled internal combustion engine and electric-powered motor and the refrigeration system may be driven by either the diesel-fueled internal combustion engine or the integral electric motor.

(36) "*Electronic Tracking System*" means a system that meets the following criteria:

(A) The tracking device must acquire, at a minimum, date, time, TRU engine hour meter reading, and location data at a rate of at least one reading per minute, with no more than 10 minutes data gap.

(B) The tracking device must be capable of determining if the TRU or TRU gen set location is within California and determining the TRU engine run time in California for each day.

[1] Effective model year applies for this tier only after Tier 4f becomes effective in 2013 for 25 to less than 50 hp engines.

(C) The tracking records must be collected by an independent entity with no business relationship to the owner or operator of the TRU or TRU gen set being tracked, other than to provide the tracking service. The data shall be stored on a server that is secure from tampering and inaccessible to the TRU or TRU gen set owner or operator, other than to download reports over the Internet. An inspector shall have free access to download reports from this website over the Internet that show the TRU or TRU gen set engine operation in California for each day.

~~(27)~~(37)"Emergency" means any of the following times:

(A) A failure or loss of normal power service that is not part of an "interruptible service contract" (see definition in ~~subsection (d)~~section 2477.4);
(B) A failure of a facility's internal power distribution system, provided the failure is beyond the reasonable control of the operator;
(C) When an affected facility is placed under an involuntary "rotating outage" (see definition in ~~subsection (d)~~section 2477.4).
(D) When the President of the United States or the Governor of the State of California declares a state of emergency related to any type of disaster where TRU-equipped trucks or trailers provide foodservice to incident responders, including but not limited to, forest fires and earthquakes.
(E) When the National Interagency Fire Center dispatches mobile catering service businesses with TRU-equipped trucks or trailers to provide foodservice to incident responders located in California.

(38) "Emissions Control Group" has the same meaning as defined in title 13 CCR, section 2701

~~(28)~~(39)"Emission Control Strategy" means any device, system, or strategy employed with a diesel-fueled CI engine that is intended to reduce emissions. Examples of emission control strategies include, but are not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, alternative fuels, fuel additives used in combination with particulate filters, alternative diesel fuels, and combinations of the above.

~~(29)~~(40)"Emissions Rate" means the weight of a pollutant emitted per unit of time (e.g., grams per second).

~~(30)~~(41)"Executive Officer" means the Executive Officer of the California Air Resources Board or his or her delegate.

~~(31)~~(42)"Facility" means any facility where TRU-equipped trucks, trailers, shipping containers or railcars are loaded or unloaded with perishable goods. This includes, but is not limited to, grocery distribution centers, food service distribution centers, cold storage warehouses, and intermodal facilities. Each business entity at a commercial development is a separate facility for the purposes of this regulation, provided the businesses are "independently owned and operated" (see definition in ~~sub~~section ~~(d)~~2477.4).

~~(32)~~(43)"Facility Control (of TRUs or TRU Gen Sets)" means the TRUs or TRU gen sets located at the facility are owned or leased by the facility, its parent company, affiliate, or a subsidiary, or under contract for the purpose of providing carrier service to the facility, and the TRUs' or TRU gen sets' arrival, departure, loading, unloading, shipping and/or receiving of cargo is determined by the facility, parent company, affiliate, or subsidiary (e.g. scheduled receiving, dispatched shipments).

~~(33)~~(44)"Fischer-Tropsch Diesel Fuel" See "ultra-low-aromatic synthetic diesel fuel".

~~(34)~~(45)"Flexibility engine" means an engine installed in new equipment by an original equipment manufacturer under the Transitional Program for Equipment Manufacturers in accordance with title 40 Code of Federal Regulations (40 CFR) sections 89.102 and 1039.625, and title 13 CCR section 2423(d). Such engines shall use the "effective model year" designation for purposes of compliance with this subarticle, except as allowed under ~~subsection (e)(1)(B)5.a.~~section 2477.5(b)(5)(A).

(46) "Freight Broker" means "broker", as defined herein.

(47) "Freight Forwarder" means a person holding itself out to the general public (other than as a pipeline, rail, motor, or water carrier) to provide transportation of property for compensation and in the ordinary course of its business does the following:
(A) Assembles and consolidates, or provides for assembling and consolidating, shipments and performs or provides for break-bulk and distribution operations of the shipments;
(B) Assumes responsibility for the transportation from the place of receipt to the place of destination; and
(C) Uses for any part of the transportation a motor carrier or rail carrier.

~~(35)~~(48)"Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related engine systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the engine; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of the engine.

~~(36)~~(49)"Generator Set (gen set)" means a CI engine coupled to a generator used as a source of electricity.

(50) "Highway" has the same meaning as defined in California Vehicle Code section 360.

(51) "Hybrid electric TRU" means a TRU that is powered by an integral diesel-fueled internal combustion engine coupled to an electric generator that provides electric power to an electric motor-driven refrigeration system and fans within the same housing and is designed to control the environment of temperature sensitive products that are transported in trucks and refrigerated trailers. Hybrid electric TRUs may be capable of both cooling and heating.

~~(37)~~(52)"Hybrid Cryogenic Temperature Control System" means a temperature control system that uses a cryogenic temperature control system in conjunction with a conventional TRU.

~~(38)~~(53)"Independently Owned and Operated" means a business concern that independently manages and controls the day-to-day operations of its own business through its ownership and management, without undue influence by an outside entity or person that may have an ownership and/or financial interest in the management responsibilities of the applicant business or small business.

~~(39)~~(54)"Intermodal Facility" means a facility involved in the movement of goods in one and the same loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes. Such a facility is typically involved in loading and unloading refrigerated shipping containers and trailers to and from railcars, trucks, and ocean-going ships.

~~(40)~~(55)"Interruptible Service Contract" means any arrangement in which a nonresidential electrical customer agrees to reduce or consider reducing its electrical consumption during periods of peak demand or at the request of the System Operator in exchange for compensation, or assurances not to be blacked out or other similar non-monetary assurances.

~~(41)~~(56)"In Use TRU, TRU gen set, or engine" means a TRU, TRU gen set, or engine that is not a "new" TRU, TRU gen set, or engine.

~~(42)~~(57)"Low Emission TRU (LETRU or L)" means a TRU or TRU gen set that meets the performance standards described under ~~paragraph (e)(1)(A)1. or (e)(1)(A)2.~~section 2477.5(a)(1) and (2).

~~(43)~~(58)"Manufacturer" means a business as defined in Government Code § 14837(c).

~~(44)~~(59)"Military tactical support equipment (TSE)" means equipment that meets military specifications, owned by the U.S. Department of Defense and/or the U.S. military services, and used in combat, combat support, combat service support, tactical or relief operations, or training for such operations.

~~(45)~~(60) "Model Year (MY)" means the following:

(A) The designation used for engines manufactured to meet the emissions tier standard in effect for new engines at time of manufacture (see alternative designation, "effective model year, defined above); and

(B) The diesel-fueled engine manufacturer's annual production period, which includes January 1st of a calendar year, or if the manufacturer has no annual production period, the calendar year.

(61) "Motor Carrier" means a person providing motor vehicle transportation for compensation.

~~(46)~~(62)"New TRU, TRU Gen Set, or Engine" means any TRU, TRU gen set, or engine that has never been subject to a retail sale or lease to an "ultimate purchaser" (see definition in ~~sub~~section ~~(d)~~2477.4).

~~(47)~~(63)"Nitrogen Oxide (NOx)" means compounds of nitric oxide (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition.

~~(48)~~(64)"Non-California-Based TRUs and TRU Gen Sets" means TRUs and TRU gen sets that are equipped on or used in trucks, trailers, shipping containers, or railcars that a reasonable person would find to be regularly assigned to terminals outside of California and operate in California from time to time for the purpose of transporting perishable goods into or out of the state.

~~(49)~~(65)"Non-methane Hydrocarbons (NMHC)" means the sum of all hydrocarbon air pollutants except methane. NMHCs are precursors to ozone formation.

(66) "Nonretail Delivery or Pick-up Point" means wholesale perishable goods distribution facilities or businesses in the supply chain prior to retail facilities or businesses. This includes, but is not limited to, food manufacturing facilities, shipper warehouses, transfer points, distribution centers, cold storage warehouses, and intermodal facilities where perishable goods are loaded or unloaded.

~~(50)~~(67)"Operate" means to start, cause to function, program the temperature controller, select an operating program or otherwise control, fuel, monitor to assure proper operation, or keep in operation. A TRU that is operational (e.g. capable of being operated) shall be considered to operate if it is in California.

~~(51)~~(68)"Operator" means any person (as defined), party or entity that operates a TRU or TRU gen set for the purposes of transporting perishable goods, excluding an employee driver and third party maintenance and repair service, and including but not limited to a~~: (A) M~~manufacturer, producer, supplier, carrier, shipper, consignor, consignee, receiver, distribution center, or warehouse of perishable goods~~;~~: An operator may also be the driver if it is also the owner (e.g. independent owner-operator).

~~(B) An individual, trust, firm, joint stock company, business concern, partnership, limited liability company, association, or corporation including but not limited to, a government corporation;~~

~~(C) Any city, county, district, commission, the state or any department, agency, or political subdivision thereof, any interstate body, and the federal government or any department or agency thereof to the extent permitted by law.~~

(69) "Original equipment manufacturer (OEM)" means any person that originally manufactured new equipment for sale in commerce. This does not include a dealer who receives new equipment for sale in commerce.

~~(52)~~(70)"Owner" ~~means any person that legally holds the title (or its equivalent) showing ownership of a TRU or TRU gen set, excluding a bank or other financial lending institution, and including but not limited to:~~

~~(A) Manufacturer, producer, supplier, carrier, shipper, consignor, consignee, receiver, distribution center, warehouse;~~

~~(B) An individual, trust, firm, joint stock company, business concern, partnership, limited liability company, association, or corporation including but not limited to, a government corporation;~~

(C) ~~Any city, county, district, commission, the state or any department, agency, or political subdivision thereof, any interstate body, and the federal government or any department or agency thereof to the extent permitted by law.~~

means, except as modified by paragraphs (A) or (B) below, the person legally holding title (or its equivalent) to the TRU or TRU gen set, or either the person (see definition) registered as the owner or lessee of a vehicle by the California Department of Motor Vehicles or its equivalent in another state, province, or country, as evidenced on the vehicle registration document carried in the vehicle to which the TRU is attached, unless such person, can clearly demonstrate, with written documentation, that another person (e.g., a lessee) is financially responsible for the maintenance of the TRU or TRU gen set, including responsibility for installing and maintaining the emissions control technologies on the TRU or TRU gen set, and registering the TRU with the California Air Resources Board's Equipment Registration (ARBER) system, as required by this subarticle. An owner may also be a driver or operator.

(A) Banks, other financial lending institutions, or other entities engaged in the act of financing TRUs are not owners, for the purposes of this subarticle unless they otherwise have an obligation to comply with this regulation (e.g., contractually responsible for the maintenance of a TRU under a sales or lease agreement) .

(B) For a TRU-equipped truck or trailer, or TRU gen set owned by the federal government and not registered in any state or local jurisdiction, the owner means the department, agency, branch, or other entity of the United States, including the United States Postal Service, to which the vehicles in the fleet are assigned or which have responsibility for maintenance of the vehicles.

~~(53)~~(71)"Owner/Operator" means a requirement applies to the owner and/or operator of a TRU or TRU gen set, as determined by agreement or contract between the parties if the two are separate business entities.

~~(54)~~(72)"Parent Company" means a company that has a controlling interest in another company, usually through ownership of more than one-half the voting stock.

~~(55)~~(73)"Particulate Matter (PM)" means the particles found in the exhaust of CI engines, which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(74) "Person" means an individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, government, governmental subdivision, agency, or instrumentality, public corporation, or any other legal or commercial entity.

(75) Prior-Tier Replacement Engine" means a new replacement engine manufactured under title 40 CFR, section 89.1003 and 1068.240; and title 13 CCR, section 2423(j), as those sections existed on [date the Board adopted the 2011 TRU amendments] that meets a prior tier of the new engine emissions standards than the tier of standards currently in effect at the time of manufacture.

(76) "Rail Carrier" means a person providing common carrier railroad transportation for compensation, but does not include street, suburban, or interurban electric railways not operated as part of the general system of rail transportation

~~(56)~~(77)"Rated Brake Horsepower" means the power delivered, according to the statement of the engine manufacturer, at the rated speed.

~~(57)~~(78)"Real Emission Reductions" means that an action is taken that results in reductions in the PM emission rate of an in-use engine (e.g. a VDECS is installed that reduced the PM emissions rate by more than 50%).

~~(58)~~(79)"Receiver" means the person~~, party, or entity~~ that receives shipped goods, cargo, or commodities.

~~(59)~~(80)"Refrigerated Trailer" means a trailer van, railcar, or shipping container equipped with a TRU or TRU gen set. Pursuant to Health and Safety Code section 39618, refrigerated trailers are mobile sources and shall be regulated by the ARB on a statewide basis.

(81) "Repower" means to replace an existing engine in a vehicle or piece of equipment with another engine that is within the same category as the original engine and that is certified to emissions standards that are more stringent than the emission standards of the original engine (e.g. replacing a Tier 1 engine with a Tier 2 or later engine).

(82) "Retail Delivery Point" means facilities or businesses where perishable goods are delivered to retail businesses that sell these goods to end users. This includes, but is not limited to, grocery stores, convenience stores, drug stores, restaurants, and prison or school cafeterias.

~~(60)~~(83)"Rotating Outage" means a controlled involuntary curtailment of electrical power service to consumers as ordered by the system operator - see definition in ~~sub~~section ~~(d)~~2477.4.

(84) "Semitrailer" means a "Semitrailer" as defined in section 550 of the California Vehicle Code.

~~(61)~~(85)"Shipper" means the person, party, or entity who usually owns or supplies the commodities ~~shipped~~transported by a carrier, or that has possession of freight prior to its transportation. This may include, but is not limited to, food manufacturers, processers, packing plants, temporary cold storage facilities, and distribution centers.

~~(62)~~(86)"System Operator" means one of the several organizations that control energy in California. System operators include, but are not limited to, the California Independent System Operator, the Los Angeles Department of Water and Power, the Imperial Irrigation District, the Sacramento Municipal Utility District.

~~(63)~~(87)"Terminal" means any place where a TRU or TRU gen set equipped truck, trailer, shipping container, railcar or TRU gen set is regularly garaged, maintained, operated, or dispatched from, including a dispatch office, cross-dock facility, maintenance shop, business, or private residence.

(88) "Terminal Operator" means the person that owns a terminal.

~~(64)~~(89)"Tier 4 Nonroad/Off-road Emission Standards" means the emission standards and associated procedures promulgated by U.S. Environmental Protection Agency in "Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel; Final Rule" (Vol. 69, No. 124 Fed.Reg. pp. 38957-39273 (June 29, 2004).

(90) "Third Party Agreement Confirmation Information" means the information used to notify ARB that responsibility for registering a TRU in ARBER has been delegated to the lessee or to a consultant.

~~(65)~~(91)"Transport Refrigeration Unit (TRU)" means refrigeration systems powered by integral internal combustion engines designed to control the environment of temperature sensitive products that are transported in trucks and refrigerated trailers. TRUs may be capable of both cooling and heating.

(92) "Trailer" means a semitrailer.

~~(66)~~(93)"TRU Generator Set (TRU gen set)" means a generator set that is designed and used to provide electric power to electrically driven refrigeration units of any kind. This includes, but is not limited to gen sets that provide electricity to electrically powered refrigeration systems for semi-trailer vans and shipping containers.

~~(67)~~(94)"Ultimate Purchaser" means with respect to a new TRU, TRU gen set, or engine, the first person who in good faith purchases a new TRU, TRU gen set, or engine for purposes other than resale.

~~(68)~~(95)"Ultra-Low-Aromatic Synthetic Diesel Fuel" means fuel produced from natural gas, coal, or biomass by the Fischer-Tropsch gas-to-liquid chemical conversion process, or similar process that meets the following properties:

Table 2

Property	ASTM	Value
Sulfur Content (ppmw)	D5453-93	<1
Total Aromatic Content (wt %)	D5186-96	<1.5%
Polynuclear Aromatic Content (wt %)	D5186-96	<0.5%
Natural Cetane Number	D613-84	>74

~~(69)~~(96)"Ultra-Low Emission TRU (ULETRU or U)" means a TRU or TRU gen set that meets the performance standards described under subparagraphs ~~(e)(1)(A)1.~~2477.5(a)(1) and ~~(e)(1)(A)2.~~2477.5(a)(2) or that uses an "alternative technology" in accordance with subparagraph ~~(e)(1)(A)3.~~ 2477.5(a)(3).

~~(70)~~(97)"Verification Classification Level" means the classification assigned to a Diesel Emission Control Strategy by the Executive Officer as defined in the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emission from Diesel Engines (13 CCR Sections 2700-2710)*. PM reductions correspond as follows: Level 1: ≥25%; Level 2: ≥50%; Level 3: ≥85% or 0.01 g/hp-hr.

~~(71)~~(98)"Verified Diesel Emission Control Strategy" (VDECS) means an emission control strategy designed primarily for the reduction of diesel particulate matter emissions that has been verified per the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (13 CCR Sections 2700-2710).* Examples of diesel retrofit systems that may be verified include, but are not limited to, diesel particulate filters, diesel oxidation catalysts, fuel additives (e.g. fuel-borne catalysts), alternative fuels (e.g. dual fuel), alternative diesel fuels, and combinations of the above.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(c)~~2477.5 Requirements for Owners or Owner/Operators.

~~(1) In-Use Operation:~~

~~(A)~~(a) **In-Use Performance Standards:** In accordance with the schedule set forth below in paragraph (~~c~~b)~~(1)(B)~~, no owner or owner/operator shall operate a TRU or TRU gen set in California unless it meets the in-use emission category performance standards set forth below.

~~1.~~(1) In-Use performance standard categories for TRU and TRU gen set engines with rated brake horsepower less than 25 horsepower (<25 hp) are shown in Table 3, along with the engine certification standards or the level of Verified Diesel Emission Control Strategy (VDECS) (see definition) that is necessary to qualify for each category.

Table 3
<25 HP TRU and TRU Gen Set In-Use PM Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS Equipped with
Low Emission TRU (LETRU or L)	0.30[2]	Level 2
Ultra-Low Emission TRU (ULETRU or U)	NA[3]	Level 3

~~a.~~(A) Compliance with the in-use performance standards can be achieved by:

[2] The Engine Certification value for the Low Emission TRU category corresponds to the ~~"Interim"~~ Tier 4 Nonroad/Off-road Emission Standards that are to go into effect in 2008.
[3] Not Applicable – must choose another compliance option.

~~I.~~1. Using a certified engine meeting the applicable nonroad/off-road emissions standards for all regulated pollutants and the in-use PM performance standard. Only engines for which certification data and deterioration factors have been provided to ARB shall be considered when determining compliance. The Executive Officer will consider such submittals, publish, and make available a list of qualifying engines.

~~II.~~2. Equipping the engine with the required Level of VDECS.

~~2.~~(2) In-Use performance standard categories for TRU and TRU gen set engines with rated brake horsepower greater than or equal to 25 horsepower ($\geq$25 hp) are shown in Table 4, along with the engine certification standards or the level of VDECS that is necessary to qualify for each category.

Table 4
$\geq$25 HP TRU and TRU Gen Set In-Use PM Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS Equipped with
Low Emission TRU (LETRU or L)	0.22[4]	Level 2
Ultra-Low Emission TRU (ULETRU or U)	0.02[5]	Level 3

~~a.~~(A) Compliance with the in-use performance standards can be achieved by:

~~I.~~1. Using a certified engine meeting the applicable nonroad/off-road emissions standards for all regulated pollutants and the in-use PM performance standard. Only engines for which certification data and deterioration factors have been provided to ARB shall be considered when determining compliance. The Executive Officer will consider such submittals, publish, and make available a list of qualifying engines.

~~II.~~2. Equipping the engine with the required Level of VDECS.

~~3.~~(3) As an alternative to meeting the ULETRU in-use performance standards in subsections 2477.5(~~e~~a)(1)~~(A)1.~~ and (2)~~.~~, an owner/operator may operate a TRU or TRU gen set in California meeting one of the *Alternative Technology*

[4] The Engine Certification value for Low Emission TRU category corresponds to the "Interim" Tier 4 Nonroad/Off-road Emission Standards that are to go into effect in 2008.
[5] The Engine Certification value for the Ultra-Low Emission TRU category corresponds to the Tier 4 "final" Nonroad/Off-road Emission Standards that will go into effect in 2012 or 2013.

options listed below. Alternative Technologies qualify to meet the ULETRU in-use performance standard only if the TRU or TRU gen set is operated under the conditions included in the description listed below.

~~a.~~(A) Hybrid Electric TRU or ~~E~~electric standby~~-~~equipped TRU may qualify as an Alternative Technology, provided the following conditions are met:

1. ~~that t~~The TRU shall not operate under diesel engine power while at a nonretail facility, except during
   a. ~~a~~An emergency (as defined);
   b. Normal ingress, egress, and yard maneuvering, limited to 5 minutes per movement inside the facility fenceline or property boundary; or
   c. Unit/engine pre-trip inspections, troubleshooting diagnostics, and post-repair check-out (however, this exception does not apply to the initial van chill-down before loading);
2. The facility or facilities that a TRU is normally based or frequents to load or unload perishable goods shall be equipped with electric power plugs located in the parking areas and loading spaces and the TRU shall be plugged into these power plugs during initial chill-down and whenever the refrigerated van or container contains perishable products;
3. All nonretail delivery and pick-up points (as defined) that the E/S-equipped TRU frequents to load or unload goods shall be equipped with electric power plugs if the van load includes perishable goods. Electric power plugs shall be located in the parking areas and loading spaces and the TRU shall be plugged into these power plugs during initial chill-down and whenever the refrigerated van or container contain perishable goods and may need to operate;
4. The TRU engine run time at retail delivery points (as defined) shall not exceed 30 minutes, otherwise electric power plugs are also required at those retail delivery points and must be used to prevent engine operations that exceed 30 minutes at the delivery point;
5. The TRU shall be equipped with non-resettable engine hour meters and electric power use hour meters;
6. At least 50 percent of an owner's hybrid electric or electric standby-equipped TRUs shall be equipped with an electronic tracking systems by December 31, 2012, and 100 percent of an owner's hybrid electric or electric standby-equipped TRUs shall be equipped with electronic tracking systems by December 31, 2013; and
7. The TRU shall be registered in ARBER in accordance with section 2477.5(e).

~~b.~~(B) ~~Cryogenic temperature control systems or h~~Hybrid cryogenic temperature control systems may qualify as an Alternative Technology, provided the following conditions are met:

1. ~~that t~~The TRU does not operate under diesel engine power while at a nonretail facility, except during:
    a. ~~a~~An emergency;
    b. Normal ingress and egress yard maneuvering; or
    c. Unit/engine pre-trip inspections, diagnostics, and repair operations;
2. The TRU engine run time at retail delivery points (as defined) shall not exceed 30 minutes, otherwise purely cryogenic temperature control shall be used at those retail delivery points to prevent engine operations that exceed 30 minutes at the delivery point ;
3. The TRU shall be equipped with non-resettable engine hour meter and cryogenic system use hour meter;
4. The TRU shall be equipped with an electronic tracking system; and
5. The TRU shall be registered in ARBER in accordance with section 2477.5(e).

~~c.~~(C) Alternative-fueled engines (see definition in ~~sub~~section ~~(d)~~2477.4). If the engine is a CI engine, a VDECS is required.

Note: If the engine is not a compression ignition diesel fueled engine, this regulation would not apply, but the engine may have to meet other emission standards (e.g. large spark-ignited engine standards if >25 hp).

~~d.~~(D) Fuel exclusively with an alternative diesel fuel (see definition in ~~sub~~section ~~(d)~~2477.4) that has been verified as a VDECS, provided it is used in accordance with the requirements of subsection 2477.5(~~e~~h)(~~2~~1)~~(A)~~ and the alternative diesel fuel contains no conventional diesel or CARB diesel fuel, except in trace amounts.

~~e.~~(E) Power by fuel cells. If a reformer is used with diesel fuel as the source of hydrocarbons, then emissions must be evaluated and verified through the *Verification Procedure Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (13CCR section 2700 – 2710).*

~~f.~~(F) Equip with any other system approved by the Executive Officer to not emit diesel PM or increase public health risk while at a facility.

~~(B)~~(b) **In-Use Compliance Dates**: In-use compliance dates are based upon the engine model year or effective model year (as defined in section 2477.4, as listed below, except as allowed in subparagraphs ~~(e)(1)(B)5.a.~~2477.5(b)(5)(A) and (C)[6][7]. Compliance dates may also be extended if the requirements of subparagraphs 2477.5(f), (g), (k), (l) or (m) are met.

~~1.~~(1) No owner or owner/operator shall operate a 2001 and older model year (MY) TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in ~~paragraph (e)(1)(A)~~ subsection 2477.5(a) for

~~a.~~(A) LETRU on or before December 31, 2008, and

~~b.~~(B) ULETRU on or before December 31, 2015, as shown in Tables 5 and 6.

~~2.~~(2) No owner or owner/operator shall operate a 2002 MY TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in ~~paragraph (e)(1)(A)~~ subsection 2477.5(a) for

~~a.~~(A) LETRU on or before December 31, 2009, and

~~b.~~(B) ULETRU on or before December 31, 2016, as shown in Tables 5 and 6.

~~3.~~(3) No owner or owner/operator shall operate a 2003 MY TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in subsection ~~(e)(1)(A)~~2477.5(a) for

~~a.~~(A) LETRU on or before December 31, 2010, and

~~b.~~(B) ULETRU on or before December 31, 2017, as shown in Tables 5 and 6.

~~4.~~(4) No owner or owner/operator shall operate a 2004 MY and subsequent MY TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in ~~paragraph (e)(1)(A)~~ subsection 2477.5(a) for ULETRU on or before December 31st of the seventh year past the engine's model year, as shown in Tables 5[8] and ~~6~~[~~6~~],6[8] with the following exception:

[6] Further explanation is provided in section 2477.5(i).

[7] Compliance dates may also be extended if the requirements of subparagraphs 2477.5(f), (g), (k), (l) or (m) are met.

[~~6~~8] Model years 2013, and subsequent (not shown in tables 5 and 6), shall meet ULETRU by December 31st of the seventh year after the engine model year or effective model year, except as allowed under ~~(e)(1)(B)5~~section 2477.5(b)((5).

~~a.~~(A) Less than 25 hp model year 2004 engines shall meet the in-use performance criteria set forth in ~~paragraph (e)(1)(A)~~section 2477.5 (a), shown in Table 5, for:

~~I~~1. LETRU on or before December 31, 2011, and

~~II~~2. ULETRU by December 31, 2018.

Table 5: <25 HP TRU and TRU Gen Set Engines
In-Use Compliance Dates

MY	In-Use Compliance Year[9]													
	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
'01 & Older		L	L	L	L	L	L	L	U	U	U	U	U	U
'02			L	L	L	L	L	L	L	U	U	U	U	U
'03[8]				L	L	L	L	L	L	L	U	U	U	U
'04					L	L	L	L	L	L	L	U	U	U
'05[10]						U	U	U	U	U	U	U	U	U
'06							U	U	U	U	U	U	U	U
'07								U	U	U	U	U	U	U
'08									U	U	U	U	U	U
'09										U	U	U	U	U
'10											U	U	U	U
'11												U	U	U
'12													U	U
'13[6]														U

~~7~~9 Compliance date is December 31st of the compliance year shown. "MY" means model year. Black shaded areas are years with no in-use performance standard requirements since in-use compliance year precedes engine model year . Dark shaded areas without letter codes have no in-use performance standard requirements, pending in-use compliance date. "L" means must meet LETRU in-use performance standards. "U" means must meet ULETRU in-use performance standards.

~~8~~10 TRUs and TRU gen sets with MY 2005 engines and subsequent MY engines shall be required to comply with ULETRU requirements by the end of the seventh year after the model year or effective model year, except as allowed under ~~subparagraph (e)(1)(B)5~~subsection 2477.5(b)(5)(A).

Table 6: ≥25 HP TRU and TRU Gen Set Engines
In-Use Compliance Dates

MY	In-Use Compliance Year[11]													
	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
'01 & Older		L	L	L	L	L	L	L	U	U	U	U	U	U
'02			L	L	L	L	L	L	L	U	U	U	U	U
'03[8]				L	L	L	L	L	L	L	U	U	U	U
'04[12]					U	U	U	U	U	U	U	U	U	U
'05						U	U	U	U	U	U	U	U	U
'06							U	U	U	U	U	U	U	U
'07								U	U	U	U	U	U	U
'08									U	U	U	U	U	U
'09										U	U	U	U	U
'10											U	U	U	U
'11												U	U	U
'12													U	U
'13														U

~~5.~~(5) Requirements for TRUs or TRU gen sets that are equipped with flexibility engines and operated in California.

~~a.~~(A) Flexibility engines installed in TRUs and TRU gen sets manufactured prior to March 7, 2011, and operated in California shall meet the in-use performance standards of ~~subsection (e)(1)(A)~~section 2477.5(a) by December 31st of the seventh year after the TRU or TRU gen set engine's manufacture year instead of the effective model year provided the TRU or TRU gen set owner registers the flexibility engine equipped TRU or TRU gen set in ARBER in accordance with ~~subsection (e)(1)(E)~~section 2477.5(e) by May 6, 2011.

~~b.~~(B) To allow TRU and TRU gen set owners to meet the registration requirements of ~~subparagraph (a)~~subsection (A) above, the original equipment manufacturer shall by April 6, 2011:

~~9~~11 Compliance date is December 31st of the compliance year shown. "MY" means model year. Black shaded areas are years with no in-use performance standard requirements since in-use compliance year precedes engine model year. Dark shaded areas without letter codes have no in-use performance standard requirements, pending in-use compliance date. "L" means must meet LETRU in-use performance standards. "U" means must meet ULETRU in-use performance standards.

~~10~~12 TRUs and TRU gen sets with MY 2004 engines and subsequent MY engines shall be required to comply with ULETRU requirements by the end of the seventh year after the model year or effective model year, except as allowed under ~~subparagraph (e)(1)(B)5.~~subsection 2477.5(b)(5)(A). Tier 4 final standards go into effect in 2013 which would meet ULETRU in-use performance standards in the 25 to less than 50 hp category. If the engines installed by original equipment manufacturers do not meet ULETRU in 2013, then ~~subparagraph (e)(1)(A)5.~~subsection 2477.5(b)(5)(C) applies.

~~I~~1. Provide the following unit and flexibility engine information to ARB in electronic format:
~~i~~a. TRU or TRU gen set manufacturer;
~~ii~~b. TRU or TRU model name;
~~iii~~c. TRU or TRU gen set serial number;
~~iv~~d. TRU manufacture date;
~~v~~e. Engine manufacturer;
~~vi~~f. Engine Family;
~~vii~~g. Engine manufacture year; and
~~viii~~h. Engine serial number~~;~~.

~~II~~2. Notify the TRU or TRU gen set owners in writing that:
~~i~~a. The unit they own is equipped with a flexibility or TPEM engine; and
~~ii~~b. The owner must register the TRU or TRU gen set that is equipped with a flexibility engine in ARBER by May 6, 2011~~;~~.

~~III~~3. Provide directly or through its dealers instructions and assistance on registration in ARBER to all owners of TRUs and TRU gen sets equipped with flexibility engines that request such help, which shall include specific instructions and assistance that ensures that information entered in ARBER is consistent with what appears on the unit label and engine emissions label, including the model year.

~~c.~~(C) The following requirements shall apply to flexibility engines installed in TRUs and TRU gen sets manufactured after March 7, 2011, and operated in California:

~~I~~1. The owner of a TRU or TRU gen set that is operated in California shall comply with the in-use performance standards set forth in ~~sub~~section ~~(e)(1)(A)~~2477.5(a) by December 31st of the seventh year after the engine's effective model year.

~~II~~2. The original equipment manufacturer shall provide ~~the following~~ a written disclosure~~s~~ to the ~~interested~~ ultimate purchaser of a TRU or TRU gen set that is equipped with a flexibility engine prior to its sale~~:~~ in accordance with section 2477.13(a)(3).
~~i. The TRU or TRU gen set has a flexibility engine that meets a less stringent emissions standard than was in effect at the time the flexibility engine was manufactured;~~
~~ii. The effective model year of the flexibility engine;~~
~~iii. If the owner registers the unit in ARBER, the owner must report the effective model year of the engine, not the model year of engine manufacture, and failure to do so may result in the owner being cited;~~

~~iv. If the TRU or TRU gen set is operated in California, the owner will be responsible at a future date for the engine meeting the ULETRU in-use standard based on the effective model year of the engine, in accordance with subsection (e)(1)(B~~

(6) The manufacture year of the TRU unit may be used instead of the TRU engine model year to determine the TRU ATCM in-use performance standards that must be met and the related compliance dates; however, this exception only applies if the unit manufacture year shown on the TRU unit label is no more than one year later than the engine model year shown on the TRU engine emissions label. If the difference between the engine model year on the engine emissions label and the unit manufacture year is greater than one year, then the engine model year shall be used in accordance with subsection 2477.5(b)(1), (2), (3), and (4).

(A) If the owner complies with the TRU ATCM in-use performance standard by retrofitting with a VDECS, the engine model year shown on the engine emissions label shall be used to determine engine compatibility with the VDECS, in accordance with the Executive Order for that VDECS.

(B) If the owner of a TRU is required to apply for an ARB Identification Number (IDN), in accordance with section 2477.5(e), the engine model year that is shown on the engine emissions label shall be entered on the IDN application in the engine model year space.

~~(C)~~(c) Replacements Due to VDECS Failures.

~~1.~~(1) If a VDECS fails within its warranty period, the owner/operator of the TRU or TRU gen set must replace it with the same VDECS or a higher verification classification level, if available.

~~2.~~(2) If a VDECS fails outside its warranty period and a higher verification classification level VDECS is available, then the owner/operator of the TRU or TRU gen set shall upgrade to the highest level VDECS required under paragraphs 2477.5(~~e~~a)(1)~~(A)1.~~ and 2477.5(~~e~~a)(~~1~~2)~~(A)2.~~ that is determined to be cost-effective by the Executive Officer.

~~(D)~~(d) In-Use Recordkeeping and Reporting. In-use recordkeeping and reporting shall be completed by the owner or operator in accordance with the~~ requirements of subsection (f)(1)~~ following:~~.~~

(1) An owner that is also an operator, shall complete and maintain the operator report in accordance with section 2477.6(a).

(2) An owner that has elected to comply by using a verified alternative diesel fuel shall comply with the recordkeeping requirements in subsection 2477.5(h)(1).

(3) An owner that has elected to comply by using a hybrid electric TRU or electric standby-equipped TRU must meet the following recordkeeping, and reporting requirements for each unit.

(A) Beginning [30 days after the amendments become effective] manual recordkeeping is required for all such units until automated monitoring, recordkeeping, and reporting is required under the phased compliance schedule in subparagraph (B), below. Manual records shall include the following, for each TRU that is equipped with electric standby or hybrid electric:
(1) ARB Identification Number of the unit, issued under section 2477.5(e);
(2) Date;
(3) Address of each stationary location lasting more than 5 minutes. This record may be a location code for each stationary location, provided the owner or operator also provides a cross-reference of location codes with the corresponding physical addresses;
(4) Time of arrival and departure, and the elapsed time calculated from those readings to show the duration of the stationary position;
(5) Engine hour meter readings taken at arrival and departure and the elapsed time calculated from those readings to show the TRU engine run time while the vehicle is at the stationary location; and
(6) Electric shore power driven electric motor hour meter readings taken at arrival and departure and the elapsed time that electric shore power drove the refrigeration system while the vehicle is at the stationary location.

(B) Automated monitoring, recordkeeping, and reporting is required for at least 50 percent of an owner's TRUs by December 31, 2012 and 100 percent of an owners TRUs by December 31, 2013. Automated monitoring, recordkeeping and reporting is required with an electronic tracking system (as defined in section 2477.4) and shall include data that includes the following for each stationary location lasting more than 5 minutes (300 seconds):
(1) ARB Identification Number of the unit, issued under section 2477.5(e);
(2) Date;
(3) Address of each stationary location lasting more than 5 minutes (300 seconds). This record may be the GPS coordinates and a location code for each stationary location, provided the owner or

operator also provides a cross-reference of location codes with the corresponding physical addresses;

(4) Time of arrival and departure, and the elapsed time calculated from those readings to show the duration of the stationary position;

(5) Engine hour meter readings taken at arrival and departure and the elapsed time calculated from those readings to show the TRU engine run time while the vehicle is at the stationary location; and

(6) Electric motor hour meter readings taken at arrival and departure and the elapsed time that electric shore power is powering the refrigeration system while the vehicle is at the stationary location.

(7) The electronic tracking system shall generate a report that lists all stationary locations lasting more than 5 minutes where the TRU engine operated for more than 30 minutes, resulting in a violation.

(C) Records shall be kept available for a minimum of three (3) years and shall be compiled and made available to ARB upon request.

(D) Record submittals shall include the owner's or responsible official's signature after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

(4) Hybrid cryogenic temperature control recordkeeping. An owner that has elected to comply by using a hybrid cryogenic temperature control system must meet the following automatic monitoring, recordkeeping, and reporting requirements with an electronic tracking system (as defined in section 2477.4). Automated recordkeeping shall include data that includes the following for each stationary location lasting more than 300 seconds (5 minutes):

(A) ARB Identification Number of the unit, issued under section 2477.5(e);

(B) Date;

(C) Location: GPS coordinates or coded, with full address in code look-up table;

(D) Time of arrival and departure, and the elapsed time calculated from those readings to show the duration of the stationary position;

(E) Engine hour meter readings taken at arrival and departure and the elapsed time calculated from those readings to show the TRU engine run time while the vehicle is stationary;

(F) Cryogenic system use hour meter readings taken at arrival and departure and the elapsed time calculated from those readings to show the cryogenic system run time while the vehicle is stationary;

(G) The electronic tracking system shall generate a report that lists all stationary locations lasting more than 5 minutes where the TRU engine operated for more than 30 minutes, resulting in a violation;

(H) Records shall be kept available for a minimum of three (3) years and shall be compiled and made available to ARB upon request; and

(I) Record submittals shall include the owner's or responsible official's signature after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

~~(E)~~(e) **ARB Identification Numbering Requirements.** Identification numbers (IDN) will be issued to help expedite the inspection procedure and prevent shipping delays[13].

~~1.~~(1) California-based TRUs and TRU gen sets:

~~a.~~(A) On or before January 31, 2009, owners or owner/operators of all California-based TRUs and TRU gen sets subject to this regulation shall apply for an ARB IDN for all California-based TRUs or TRU gen sets operated by the owner or owner/operator by submitting an application that includes the information listed below.

~~I~~1. Company Information

a. ~~Operator~~ Company/business name, address, and contact information for the responsible official (e.g. title, phone number, email address~~, fax number~~).

b. Company/business tax identification number/federal employer identification number (EIN) or equivalent for other country (e.g. Canadian Business Number).

~~II. Owner name, address, and contact information (if other than operator).~~

2. Rental or lease status. Indicate if the unit is a rental unit (no contract term) or a lease unit (under contract term, typically more than one year)

3. Applicant identity indication. Indicate who is filling out application, either:

a. The owner (or an employee of owner), or

b. A third party entering the application information under a third party agreement between the owner or lessor and a consultant or lessee.

~~III~~4. TRU or TRU gen set unit information:

a. Unit Type:

i. Truck TRU;

ii. Trailer TRU;

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[13] IDNs are obtained by registering a TRU or TRU gen set in the ARB's Equipment Registration (ARBER) system.

iii. Refrigerated railcar TRU;
iv. Refrigerated domestic shipping container TRU; or
v. TRU generator set.
b. ~~make~~ Unit manufacturer,
c. Unit model,
d. Unit model year, and
e. Unit serial number.
5. Other TRU or TRU generator set identifying numbers. Provide all that apply:
a. If unit is installed on a truck or trailer, provide:
i. Vehicle Identification Number (VIN), and
ii. Vehicle license number, country of issuance, and state or province of issuance;
iii. Unique Bureau International de Container (BIC) Code, if trailer is multimodal
b. If unit is installed on refrigerated railcar, provide railcar reporting mark;
c. If unit is installed on domestic refrigerated shipping container, provide unique BIC Code;
d. If unit is a TRU gen set, provide unique BIC Code;
e. Provide company equipment number if company has labeled the equipment.
6. TRU status information. Indicate if the unit is:
a. Active (unit is operational);
b. Removed from service (unit is scrapped or inactive for foreseeable future); or
c. Sold. If last registered owner sold unit, then they must provide:
i. Date of sale, and
ii. New owner's company name, address, and contact information
~~IV~~7. TRU engine information. Provide the following:
a. Engine ~~make~~ manufacturer;
b. Engine model;
c. Engine model year, or "M.Y."; ~~and~~
d. Engine serial number;
e. Engine power rating. Indicate either:
i. Under 25 hp (under 19 kW), or
ii. 25 hp or greater (19 Kw or greater);
f. Engine family; and
g. Emissions standard tier that engine meets.
~~V. Terminal or terminals that the TRU-equipped truck or trailer is assigned to, with address and contact information.~~
~~VI. Other associated identification numbers, which may include (as applicable):~~
~~i. Vehicle Identification Number (VIN) of the TRU-equipped truck or trailer.~~

~~ii. Vehicle license number of the TRU-equipped truck or trailer.~~
~~iii. Railcar recording mark and car number.~~
~~iv. Shipping container number (for TRU-equipped shipping containers only).~~
~~v. Company equipment number (if any).~~

~~VII~~8. Compliance status with in-use performance standards, under ~~paragraph (e)(1)(A) requirements~~ subsections 2477.5(a) and (b). ~~If compliance not as yet required, mark N/A.~~

~~i. Date when compliance was achieved.~~
~~ii. What performance standard was met (e.g. LETRU or ULETRU).~~
~~iii. How compliance was achieved (e.g. new compliant TRU, TRU engine replacement, or description of VDECS that was used).~~
~~iv. Identify who did the installation work (if applicable).~~

a. Indicate if the ULETRU Early Compliance Extension has been granted
b. Indicate if compliance was achieved with an engine option:
   i. Indicate if the engine currently in the unit is an original engine;
   ii. Indicate if the engine currently in the unit is a new replacement engine and if so, provide:
      I. Emissions standard tier that the engine meets; and
      II. Installation date.
   iii. Indicate if the engine currently in the unit is a rebuilt replacement engine installed to comply with the in-use requirements and if so, provide:
      I. Emissions standard tier that the engine meets;
      II. Rebuild year; and
      III. Installation date.
c. Indicate if compliance was achieved with VDECS retrofit, and if so:
   i. Provide the following from the VDECS label:
      I. VDECS manufacturer name;
      II. VDECS Family Name;
      III. VDECS serial number;
      IV. VDECS manufacture year; and
   ii. Provide the VDECS installation date.
d. Indicate if compliance was achieved by using an Alternative Technology option under subsection 2477.5(a)(3), and if so provide the type used and the date installed or employed:
   i. Electric standby-equipped TRU or hybrid electric TRU;
   ii. Hybrid cryogenic temperature controlled system;
   iii. Alternative–fueled engine;
   iv. Fueled exclusively with pure alternative diesel fuel;
   v. Powered by fuel cells; or

vi. Other system approved by the Executive Officer.

e. If compliance was achieved by replacing an engine or retrofitting with a VDECS, provide the installer's company name, physical address, and contact information.

9. Indicate what state or province that the TRU or TRU gen set is based in:
   a. California; or
   b. Outside of California. If based outside of California identify:
      i. U.S. state;
      ii. Mexican state; or
      iii. Canadian province

10. Owner's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

~~b.~~(B) Applications shall be submitted by one of the following methods:

~~I.~~1 Mail or deliver a physical report to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (~~TRU~~SSD/ARBER)
P.O. Box 2815
Sacramento, CA 95812

~~II.~~2. Electronically submit through ~~ARB's~~ the ARBER web site~~. The web address will be identified in an advisory.~~ at: http://www.arb.ca.gov/arber/arber.htm

3. Electronically submit by email to: arber@arb.ca.gov

~~c.~~(C) TRUs and TRU gen sets added to an owner's or owner/operator's TRU operations after January 31, 2009 shall be brought into compliance with ~~sub~~section 2477.5(e)~~(1)(E)~~. An application shall be submitted to ARB within 30 days of the unit entering the operator's control:

~~I.~~1. Requesting an ARB I.D. number for a new TRU or TRU gen set that was not previously numbered, or

~~II.~~2. Requesting a change in owner or owner/operator (or other pertinent application information) for used equipment that already has an ARB I.D. number.

~~d.~~(D) Failure to apply or submittal of false information is a violation of ~~state law~~this rule subject to civil penalty.

~~e.~~(E) On or before February 1, 2009, the Executive Officer shall begin issuing identification numbers to TRU and TRU gen set owners or owner/operators for each unit based in California for which a complete application has been filed. The number will include a 2-digit prefix for model year (e.g. 2001 model year would have a prefix 01); a 6-digit serial number~~;~~ and a check-digit~~, and a letter~~

~~indicating compliance status with in-use performance standards (either "L" or "U")~~. In the event that an operator applies for an early compliance certificate in accordance with subsection ~~(e)(1)(F)~~2477.5(f), ARB will also issue a certificate which acknowledges early compliance per ~~(e)(1)(F)3~~subparagraph 2477.5(f)(3).

~~f.~~(F) Within 30 days of receipt of the ARB-issued identification number, owners or owner/operators shall permanently affix or paint the identification number on the TRU or TRU gen set chassis housing in clear view according to the following specification:

~~I.~~1. The ARB identification number shall be preceded by the letters "**ARB**".

~~II.~~2. Letters and numbers shall contrast sharply in color with the color of the background surface on which the letters are placed.

~~III.~~3. The location of the I.D. number shall be as follows:

~~i.~~a. Truck and trailer TRUs - both sides of TRU chassis housing.

~~ii.~~b. Rail car and shipping container TRUs– both sides of the TRU.

~~iii.~~c. TRU gen sets – both sides of gen set housing.

~~IV.~~4. Letters and numbers shall be readily legible during daylight hours, from a distance of 50 feet (15.24 meters) while unit is stationary.

~~V.~~5. Marking shall be kept maintained in a manner that retains the legibility required by the subparagraph immediately above.

~~2.~~(2) Non-California-based TRUs and TRU Gen Sets:

~~a.~~(A) Owners or owner/operators of non-California-based TRUs and TRU gen sets may voluntarily apply for ARB identification numbers for TRUs that are based outside of California but operate within California during the normal course of business. Non-California-based owners or owner/operators may voluntarily submit the same application information listed above in subparagraph 2477.5(e)(1)~~(E)1.a.~~, above, using the same methods of submittal listed in subparagraph 2477.5(e)(1)(B)~~(e)1.b.~~, above. Upon application approval, ARB would issue identification numbers to the operator in accordance with subparagraph 2477.5(e)(1)(E)~~1.e.~~, above. The non-California-based owner or owner/operator would then permanently affix or paint the identification number on the TRU or TRU gen set chassis in clear view, in accordance with subparagraph 2477.5(e)(1)~~(E)1.f.~~(F), above.

(3) Owners or owner/operators may use alternative unique equipment identification markings instead of affixing an ARB IDN, provided the following conditions are met:

(A) The owner or owner/operator registers the TRU or TRU gen set in ARBER and enters the unique equipment number in ARBER.

(B) The alternative identification number shall be truly unique. Examples of unique identification numbers include the Reporting Marks that are issued by the American Association of Railroads' contractor, Raillnc, for their UMLER system and the BIC Codes issued by Bureau International de Containers. Company equipment numbers that are not truly unique on a worldwide basis do not qualify.

(C) Alternative identification numbers must be affixed or attached to both sides of the TRU gen set, shipping container (if the TRU is permanently attached), semitrailer, or railcar and meet all of the requirements of subparagraph 2477.5.(e)(1)(F).

(D) The ARB IDN shall be used in the Operator Report under subsection 2477.6(a).

~~(F)~~(f) Early Compliance with LETRU In-Use Performance Standards.

~~1.~~(1) For 2002 and older MY TRU and TRU gen set engines, owners or owner/operators ~~or owners~~ that meet the LETRU in-use performance standard earlier than required in paragraph ~~(e)(1)(B)~~2477.5(b) may apply to the Executive Officer for a delay in the ULETRU in-use performance standard. Except as provided below, early compliance would be achieved through any of the options available in paragraph ~~(e)(1)(A)~~2477.5(a).

~~a.~~(A) This delay would not be available to the owner or owner/operator ~~or owner~~ if the engine manufacturer of the replacement engine is using the early compliance with engine emissions standards in U.S. EPA's Averaging, Banking, and Trading Program (or California's equivalent program).

~~b.~~(B) Early compliance is conditioned upon real emission reductions (refer to definition in ~~sub-~~section ~~(d)~~2477.4) occurring earlier than the applicable compliance deadline.

~~c.~~(C) This delay may not be available to the owner or owner/operator ~~or owner~~ if public funds were used for early compliance. The applicant shall disclose whether public funds were used for any portion of early compliance and what program the funding came from.

~~2.~~(2) Early LETRU compliance with real emission reductions would allow specific units to delay compliance with ULETRU in-use performance standards by up to three years, according to the rounding conventions and examples listed below.

~~a.~~(A) Each year of early compliance with the LETRU in-use performance standards would be rewarded with 1 year delay in the ULETRU in-use performance standard.

~~I.~~1. One full year early compliance qualifies for one full year delay in meeting ULETRU compliance.

~~II.~~2. Two full years early compliance qualifies for two full years delay in meeting ULETRU compliance.

~~III.~~3. Three full years early compliance qualifies for three full years delay in meeting ULETRU compliance.

~~b.~~(B) A partial year of early LETRU compliance would be rounded to the nearest full year for the delayed ULETRU requirements.

~~I.~~1. Early LETRU compliance of 183 days or more in a calendar year would count toward a one year ULETRU delay.

~~II.~~2. Early LETRU compliance of 182 days or less in a calendar year would not count toward a ULETRU delay.

~~3.~~(3) Upon receipt of an application to delay ULETRU compliance, the Executive Officer shall determine if the application demonstrates early compliance with LETRU in-use performance standards in accordance with subsection ~~(e)(1)(F)1.~~2477.5(f)(1), and if the application is approved, shall delay the in-use ULETRU compliance date for specific TRUs and TRU gen sets operating in California in accordance with subparagraph ~~(e)(1)(F)2.~~2477.5(f)(2).

~~4.~~(4) Upon approval of the application, ARB shall issue a certificate and ARB identification number in accordance with subsection ~~(e)(1)(E)1.e.~~2477.5(e)(1)(E) which acknowledges early compliance with LETRU requirements and discloses the number of years delay granted, and resulting ULETRU compliance date.

~~5.~~(5) The owner or owner/operator shall maintain a legible copy of the certificate in a water-tight sleeve mounted inside the TRU or TRU gen set chassis housing. The owner or owner/operator shall paint the identification number in clear view in accordance with subsection ~~(e)(1)(E)1.f.~~2477(e)(1)(F) on the specific TRU or TRU gen set that was granted the compliance extension.

(g) ULETRU Extension for Compliance by Original Compliance Date

(1) An owner of model year 2001 and older TRUs or TRU gen sets that complied by the original December 31, 2008, compliance date may qualify

for a one year extension to the ULETRU compliance date, provided the following conditions are met:

(A) The original engine was retrofit with a Level 2 VDECS, or

(B) The original TRU was repowered with a replacement engine meeting either:
1. Tier 4 final Non-Road/Off-Road Emission Standards, if the engine is rated at less than 25 hp, or
2. Tier 4 interim Non-Road/Off-Road Emission Standards, if the engine is rated between 25 hp and less than 50 hp, or

(C) The original TRU was replaced with a new unit equipped with an engine meeting either:
1. Tier 4 final Non-Road/Off-Road Emission Standards, if the engine is rated at less than 25 hp, or
2. Tier 4 interim Non-Road/Off-Road Emission Standards, if the engine is rated between 25 hp and less than 50 hp, and

(D) The TRU or TRU gen set is registered in ARBER, the compliance information is complete and correct, and the IDN has been affixed to both sides of the TRU or TRU gen set housing.

(2) Owner must apply for the ULETRU extension at least 90 days before the ULETRU compliance date by submitting an ARB application that includes the following information:

(A) Owner name and Owner-Operator Number (OON);

(B) The affected unit's IDN;

(C) A statement that the unit was in compliance on or before December 31, 2008, and the IDN has been affixed to both sides of the TRU or TRU gen set housing in accordance with section 2477.5(e)(1)(F);

(D) Documentation that demonstrates that the LETRU in-use standard was met before December 31, 2008;

(E) In the case of a unit replacement, documentation on the old noncompliant unit that was replaced; and

(E) Owner's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

(3) The owner or responsible official must submit an application for "ULETRU Extension for Compliance by the Original Compliance Date" to the Executive Officer by one of the following methods:

(A) Mail or deliver to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (ARBER/TRU)
P.O. Box 2815
Sacramento, CA 95812

(B) Electronically submit by email to: arber@arb.ca.gov

(4) Upon receipt of application for ULETRU extension, the Executive Officer shall determine if the application demonstrates the unit qualifies for ULETRU extension.

(5) Upon approval of the application, the Executive Officer shall:

(A) Change the "Compliant Through" date in ARBER; and

(B) Notify the owner with a revised ARBER TRU Certification showing the new "Compliant Through" date.

~~(2)~~(h) **Fuel Requirements.**

~~(A)~~(1) **Owners or owner/operators Choosing to Use Alternative Diesel Fuels.** Owners or owner/operators choosing to use alternative diesel fuels in compression ignition TRU and TRU gen set engines to meet the requirements of ~~sub~~section ~~(e)(1)~~2477.5(a) shall:

~~1.~~(A) Maintain records ~~in accordance with subsection (f)(1)(B) of this regulation~~that document exclusive use of the chosen fuel or additive for each affected engine and hours of engine operation. Appropriate records would be copies of receipts or invoices of appropriate fuel and/or fuel additive and engine hour meter logs.

1. Records shall be kept available for a minimum of three (3) years and shall be compiled and made available to the ARB upon request.

~~2.~~(B) Use only fuel that is a VDECS alternative diesel fuel that contains no conventional diesel or CARB diesel fuel in TRUs or TRU gen sets operated in California.

~~3.~~(C) Permanently affix a label in clear view near the fill spout that identifies the proper fuel that is required to be in compliance.

~~4.~~(D) In the event that the owner or owner/operator decides to revert to using conventional diesel or CARB diesel fuel, the owner or owner/operator shall comply with the requirements of ~~sub~~section ~~(e)(1)~~2477.5(a) within 10 days of discontinuation of alternative diesel fuel use. Within 10 days of discontinuation, the owner or owner/operator shall notify the Executive Officer in writing of this change in fuel use and shall include an update to ~~any ARB I.D. number application~~ the compliance information submitted to ARBER~~or annual report~~ submitted to comply with subsections ~~(e)(1)(E),~~2477.5(e)~~(e)(1)(F)~~2477.5(f), or ~~(f)(1)~~2477.6.

~~(B)~~(2) **Owners or Owner/Operators that Retrofit TRUs or TRU Gen Sets with a VDECS.** Owners or owner/operators that retrofit TRUs or TRU gen sets with a VDECS that requires certain fuel properties to be met in order to achieve the required PM reduction or PM emissions shall only fuel the subject TRU or TRU gen set with fuel that meets these specifications when operating in the state of California. In addition, owners or owner/operators that choose a VDECS that requires certain fuel properties to be met in order to prevent damage to the VDECS or an increase in toxic air contaminants, other harmful compounds, or in the nature of the emitted PM shall only fuel the subject TRU or TRU gen set with fuel that meets these specifications.

(i) Compliance by Replacing Engines.

A new or rebuilt replacement engine shall meet more stringent emissions standards than the original engine. The new or rebuilt replacement engine must subsequently meet the in-use performance standard requirements of subsection 2477.5(a) by the compliance dates of subsection 2477.5(b), which are based on the new or rebuilt replacement engine's model year or effective model year (see definition).

(1) Current tier new replacement engines. Current tier new replacement engines shall use the engine model year to determine requirements and compliance dates. The engine model year is shown on the engine emissions label if the engine is manufactured when an emissions standard tier is in effect. Emissions label language examples include, but are not limited to:

(A) "THIS ENGINE MEETS 2008 INT. TIER 4 EMISSION REGULATIONS FOR U.S. EPA AND CALIFORNIA NONROAD CI ENGINES." This label language indicates the engine is a current-tier 2008 model year engine for the purposes of in-use requirements and registration.

(B) "THIS ENGINE COMPLIES WITH U.S. EPA AND CALIFORNIA REULATIONS FOR 2009 M.Y. NONROAD AND STATIONARY/OFF-ROAD DIESEL ENGINES." This label language indicates the engine is a current-tier 2009 model year engine for the purposes of in-use requirements and registration.

(2) Prior tier new replacement engines. Prior-tier new replacement engines shall use the effective model year (see definition) to determine requirements and compliance dates. The manufacture year and the installation year of a prior tier replacement engine shall not be used to determine the in-use requirements and the compliance dates. Prior-tier new replacement engine emissions labels typically do not clearly show the effective model year, but provide dates that indicate the prior-tier emissions standard that the engine meets. The year in the first sentence of the replacement engine emission label is the first year of the tier met. The date in the second sentence of the replacement engine label is the first day of the next tier standard. Table 1 in section 2477.4 and the following example of replacement engine emissions label language show how these labels shall be interpreted for this subarticle:

(A) "THIS ENGINE COMPLIES WITH CALIFORNIA OFF-ROAD AND U.S. EPA NONROAD EMISSION REQUIREMENTS FOR 2004 ENGINES UNDER 13 CCR 2423(j) AND 40 CFR 89.1003(b)(7). SELLING OR INSTALLING THIS ENGINE FOR ANY PURPOSE OTHER THAN TO REPLACE AN OFF-ROAD ENGINE BUILT BEFORE JANUARY 1, 2008 MAY BE A VIOLATION OF CALIFORNIA AND FEDERAL LAW SUBJECT TO CIVIL PENALTY." The first sentence includes the year 2004 (the first year of the tier). The second sentence indicates the next tier started on January 1, 2008, so the last year of the tier the engine met would be 2007. The center column of Table 1 shows the effective years 2004 to 2007 matches a Tier 2 engine in the 25-50 hp (trailer) category.

(3) Rebuilt replacement engines. Rebuilt replacement engines must meet the requirements of section 2477.16.

(A) Prior tier rebuilt replacement engines. If the rebuilt engine meets a prior tier emissions standard, then the effective model year (see definition) shall be used to determine the requirements and compliance dates. The rebuild year and the installation year of a prior tier replacement engine shall not be used to determine the in-use requirements and the compliance dates.

(B) Current tier rebuilt replacement engines. It the rebuilt engine meets the tier standard that is currently in effect, then the model year is the year that the rebuild is completed and this year shall be used to determine the requirements and compliance dates.

(j) Mobile Catering Company Exemption Requirements.

(1) The Executive Officer may grant a one year exemption to mobile catering companies for TRUs that are not compliant with the in-use performance standards under section 2477.5(a) if the following conditions are met:

(A) The mobile catering company must be under contract with the National Interagency Fire Center to provide mobile catering food service to emergency incidents for the year that the exemption would apply.

(B) All California-based TRUs shall comply with the ARBER registration requirements under section 2477.5(e) and have an ARB Identification Number (IDN) affixed to both sides of the TRU housing. All TRUs owned or leased by the mobile catering company that are based outside of California that the owner wants included in the mobile catering company exemption must be registered in ARBER in accordance with section 2477.5(e).

(C) The mobile catering company must submit an application each year for a Mobile Catering Company Exemption to the Executive Officer by one of the following methods:

1. Mail or deliver to ARB at the address listed immediately below:

   California Air Resources Board
   Stationary Source Division (ARBER/TRU)
   P.O. Box 2815
   Sacramento, CA 95812

2. Electronically submit by email to: arber@arb.ca.gov.

(D) Applications for Mobile Catering Service Exemption shall include the following information:

1. Business name;
2. Business street address, state, zip code;
3. Business phone number;
4. Responsible official's name;
5. Responsible official's mobile phone number;
6. Federal Tax Identification Number (EIN) and Owner-Operator Number (OON) issued to the owner by ARBER when they registered in ARBER.
7. A list of ARB IDNs issued by ARBER for all TRUs that are to be included under the exemption. For TRUs that are not in compliance with the in-use standards under section 2477(a) that do not have ARB IDNs, provide the unit serial number instead of the IDN on this list.
8. A copy of the mobile catering company's contract with the National Interagency Fire Center shall be provided with the application.
9. Owner's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

(E) The owner shall update the application information within 30 days of any changes to the information submitted. For example, if the owner buys, sells, or leases TRUs, the IDN and unit serial number list required under subparagraph (o)(1)(C)7. shall be amended.

(F) The owner shall provide the driver with a copy of the current Mobile Catering Service Exemption that has been approved by the Executive

Officer and the Mobile Food and Shower Service Request Form issued by the National Interagency Fire Center for the incident they are traveling to or from.

(G) During transit on California highways, the driver must, upon request:

1. Present to the ARB inspector the Mobile Catering Service Exemption that has been approved by the Executive Officer and the Mobile Food and Shower Service Request Form issued by the National Interagency Fire Center, and
3. Allow the ARB inspector to inspect the TRU to confirm the Mobile Catering Service exemption applies to the equipment.

(H) All circumstances at the time of inspection shall be consistent with the Mobile Catering Service Exemption that has been approved by the Executive Officer and the Mobile Food and Shower Service Request Form issued by the National Interagency Fire Center.

(I) Mobile Catering Company Exemptions shall expire on December 31st of each year. Mobile catering companies shall re-apply for this exemption annually.

(k) Compliance Extension for In-Use Performance Standards Based on Unavailability of Compliance Technology.

(1) If there is no compliance technology available for a specific TRU or TRU gen set within six months of a compliance date, the Executive Officer may grant a one year extension of the compliance deadline, provided the following conditions are met:

(A) A person or applicant must submit a written application to the Executive Officer that demonstrates the absence of any suitable compliance option that can be used on the specific equipment and the owner cannot otherwise meet the requirements of subsection 2477.5(a) by the compliance dates of subsection 2477.5(b). The application for and issuance of any extension pursuant to this subsection shall be subject to the following requirements:

1. Except for the units for which the extension is sought, the applicant shall demonstrate that all other units subject to the owner or operator's direct control meet the requirements of subsections 2477.5(a) and (b);
2. The application shall be submitted to and received by the Executive Officer no later than six months before the compliance date of the engine for which the extension is requested;
3. The application shall identify each unit and engine for which the extension is requested;
4. For each engine identified in paragraph 2477.5(k)(1)(A)3., immediately above, the applicant shall provide a detailed description of the reasons and factors that serve as the basis for the applicant's claim that no suitable control technologies are available. The description shall include, without limitation, detailed engineering diagrams and calculations that

support the applicants claim that there are no suitable control technologies available.

a. For a replacement engine to be determined suitable or unsuitable, the concerns that will be considered are if the replacement engine will physically fit and functionally perform in the equipment.

5. Owners or responsible officials shall provide their signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

6. The owner or responsible official must submit an application for Compliance Extension to the Executive Officer by one of the following methods:

a. Mail or deliver to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (ARBER/TRU)
P.O. Box 2815
Sacramento, CA 95812

b. Electronically submit by email to: arber@arb.ca.gov.

(B) The Executive Officer may grant additional one-year extensions provided the same procedures are followed, as described in subsection 2477.5(k)(1), immediately above.

(l) Compliance Extension for In-Use Performance Standards Based on Delays Due to Private Financing, Equipment Manufacture Delays, or Installer Delays.

(1) The Executive Officer may grant a one-time, maximum four month extension to the normal compliance date set forth in subsection 2477.5(b) for meeting the in-use performance standards set forth in subsection 2477.5(a), provided certain conditions are met:

(A) The owner must have ordered the compliance technology from the manufacturer no later than two months before the compliance date for VDECS retrofit compliance technologies and no later than four months before the compliance date for engine replacements, unit replacements, and trailer replacements, and the purchase order must be consistent with these limits;

(B) The TRU or TRU gen set is registered in ARBER;

(C) An extension application is submitted before the compliance deadline that explains in detail why a compliance extension is needed and how much additional time to comply is needed, including:

1. If delivery is the cause for delay, explain the status, and provide documentation from the manufacturer to demonstrate this is true, along with an updated delivery schedule.

2. If installation is the cause for delay, report the date that compliance technology was delivered, explain the installation status and provide documentation from the installer to demonstrate the facts, along with an updated installation schedule.
3. If there are other circumstances causing the delay, such as financing, explain the status and provide documentation from the financier to demonstrate this is true, along with an updated schedule.
4. The owner or responsible official shall provide their signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."
5. The owner or responsible official must submit an application for Compliance Extension to the Executive Officer by one of the following methods:
   a. Mail or deliver to ARB at the address listed immediately below:

      California Air Resources Board
      Stationary Source Division (ARBER/TRU)
      P.O. Box 2815
      Sacramento, CA 95812

   b. Electronically submit through ARB's ARBER web site at: http://www.arb.ca.gov/arber/arber.htm.

(m) ULETRU Extension for Compliance with LETRU.

(1) The ULETRU compliance dates required under subparagraphs 2477.5(b)(1) through (4) may be extended one year for TRUs or TRU gen sets equipped with MY 2003 or older engines if they complied by meeting the LETRU In-Use Performance Standard by the compliance dates listed below and the following qualifications are met:

(A) Compliance with LETRU was achieved by the following compliance dates:
1. December 31, 2009 for MY 2001 and older engines;
2. December 31, 2009 for MY 2002 engines; and
3. December 31, 2010 for MY 2003 engines

(B) The original engine met the LETRU in-use standard by being retrofit with a Level 2 VDECS; or

(C) The unit was repowered with a replacement engine meeting the LETRU in-use standard:
1. Tier 4 final Non-Road/Off-Road Emission Standards, if the engine is rated at less than 25 hp
2. Tier 4 interim Non-Road/Off-Road Emission Standards, if the engine is rated between 25 hp and less than 50 hp

(D) The original TRU or TRU gen set was replaced with a new TRU or TRU gen set that is equipped with an engine that meets the LETRU in-use performance standard:

1. Tier 4 final Non-Road/Off-Road Emission Standards, if the engine is rated at less than 25 hp, or
2. Tier 4 interim Non-Road/Off-Road Emission Standards, if the engine is rated between 25 hp and less than 50 hp, or

(E) The unit is registered in ARBER under subparagraph 2477.5(e)

(F) Owner must apply for the ULETRU extension by submitting an application to the Executive Officer at least 90 days before the ULETRU compliance date that includes the following information:

1. Owner name and Owner-Operator Number (OON);
2. The affected unit's IDN;
3. A statement that the unit was in compliance on or before the compliance date required under section 2477.5(m)(1)(A), above;
4. Documentation that demonstrates that the LETRU in-use standard was met before the compliance date required under section 2477.5(m)(1)(A), above;
5. In the case of a unit replacement that meets LETRU, additional information that demonstrates the old noncompliant unit that was replaced, including:
   a. A statement that the owner replaced a MY 2003 or older (actual model year must be specified) TRU or TRU gen set with a new TRU or TRU gen set that was equipped with an engine that is certified to meet a new engine emissions standard that meets the LETRU in-use performance standard;
   b. Receipts for the purchase of the new TRU or TRU gen set, dated on or before the compliance date required under section 2477.5(m)(1)(A), above;
   c. Documentation for the old, replaced TRU or TRU generator set that supports the statement in subparagraph 2477.5(m)(1)(F)5.a., above; and
6. Owner's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

(G) The owner or responsible official must submit an application for ULETRU Compliance Extension for Compliance with LETRU for TRU or TRU gen set replacement under subparagraph 2477.5(m)(1)(C), above, to the Executive Officer by one of the following methods:

1. Mail or deliver to ARB at the address listed immediately below:

   California Air Resources Board
   Stationary Source Division (ARBER/TRU)
   P.O. Box 2815
   Sacramento, CA 95812

2. Electronically submit by email to: arber@arb.ca.gov.

(n) Safe Passage for Noncompliant Equipment Traveling in California.

(1) The Executive Officer may grant a safe passage permit to a TRU or TRU gen set owner to travel on California highways with a specific noncompliant TRU or TRU gen set, provided the following conditions are met:

(A) The purpose of traveling on California highways is to take the noncompliant equipment to a dealer or installer to bring the equipment into compliance.
(B) Only one permit shall be allowed if the specific TRU or TRU gen set must comply with the ULETRU in-use standard, and two permits shall be allowed if the specific TRU or TRU gen set must comply with both the LETRU and ULETRU in-use standards.
(C) The TRU or TRU gen set shall not be operating (with the engine running) while in a noncompliant state in California;
(D) No temperature-sensitive products shall be transported in a vehicle with a noncompliant TRU or TRU gen set;
(E) The owner shall submit an application for a safe passage permit to the Executive Officer. Safe passage permit applications shall be submitted by one of the following methods:
1. Mail or deliver a physical report to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (ARBER/TRU)
P.O. Box 2815
Sacramento, CA 95812

2. Electronically submit by email to: arber@arb.ca.gov
(F) Applications for safe passage permits shall include the following information:
1. Owner's name;
2. Business name (if different);
3. Owner's street address, state, zip code;
4. Contact person's name;
5. Contact person's business phone number;
6. Date(s) transport will take place;
7. Statement that the reason for transporting the noncompliant equipment on California highways is strictly to take the noncompliant equipment to a dealer or installer to bring the equipment into compliance;
8. TRU or TRU gen set serial number;
9. Vehicle Identification Number (VIN), BIC Code (for TRU gen sets and domestic shipping containers), or railcar reporting mark;
10. Physical address of starting location or point of entry into California;
11. Dealer's or installer's business name and physical address where compliance technology will be installed; and

12. Owner's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

(G) The Executive Officer shall provide a decision within 15 days of the application submittal.

(H) The owner shall provide the driver with a copy of the safe passage permit that has been approved by the Executive Officer.

(I) During transit on California highways, the driver must, upon request:

1. Show an inspector that no temperature-sensitive products are being transported,
2. Present to the inspector the safe passage permit for the noncompliant TRU or TRU gen set that has been approved by the Executive Officer, and
3. Allow the inspector to inspect the TRU or TRU gen set to confirm the permit applies to the noncompliant equipment.

(J) All circumstances at the time of inspection shall be consistent with the safe passage permit.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(f)~~ **~~Monitoring, Recordkeeping, and Reporting Requirements.~~**

~~TRU and TRU Gen Set Operator Recordkeeping and Reporting.~~

2477.6 Requirements for Terminal Operators.

~~(A)~~(a) Operator Reporting.

~~1.~~(1) All terminal operators subject to this regulation shall submit an Operator Report to ARB by January 31, 2009, for each terminal located in California that shall include the following information:

~~a.~~(A) Terminal ~~O~~operator name, address, and contact information for the responsible official (phone number, email address, fax number).

~~b.~~(B) ~~List of all terminals owned or leased by the operator located within California, with~~ Terminal address, phone number, and terminal contact name for each California terminal where TRUs or TRU generator sets are garaged, maintained, operated, or dispatched from.

~~c.~~(C) ~~TRU and TRU gen set inventory information~~List of ARB Identification Numbers issued in accordance with section 2477.5(e) for ~~each~~all TRUs and TRU gen sets ~~based in California that is~~

~~owned or leased by the operator~~assigned to each California terminal~~:~~.

~~I. TRU or gen set make, model, model year, and serial number.~~

~~II. TRU owner, and if other than operator, owner name, address, and contact.~~

~~III. Engine make, model, model year, and serial number.~~

~~IV. Terminal(s) that the TRU is assigned to.~~

~~V. ARB TRU or TRU gen set identification number, if already issued. If the ARB identification number has not been issued or there has been a change in the other identification numbers listed below since the prior annual report, then provide the following identification numbers (as applicable):~~

~~i. Vehicle Identification Number.~~

~~ii. Vehicle license number.~~

~~iii. Railcar recording mark and car number.~~

~~iv. Shipping container number (for TRU-equipped shipping containers only).~~

~~v. Company equipment number.~~

~~VI. Compliance status with paragraph (e)(1)(A) requirements.~~

~~2.~~(2) The Operator Report shall be updated within 30 days when changes to any of the above operator information occur. An Operator Report shall be submitted to ARBER within 30 days of the start-up of any new facility and shall be removed from ARBER within 30 days of a terminal shutting down.

~~a.~~(A) Operator Reports shall be submitted by one of the following methods:

~~I.~~1. Mail or deliver a physical report to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (ARBER/TRU)
P.O. Box 2815
Sacramento, CA 95812

~~II.~~2. Electronically submit through ARB's ARBER web site at: http://www.arb.ca.gov/arber/arber.htm. ~~The web address will be identified in an advisory.~~
3. Electronically submit by email to: arber@arb.ca.gov

~~3.~~(3) Failure to report or submittal of false information is a separate violation ~~of state law~~of this rule subject to civil penalty.

~~**(B) Alternative Diesel Fuel Use and Fuel Additive Recordkeeping and Reporting.**~~

~~1. Operators that choose a compliance pathway that involves the use of alternative diesel fuel in accordance with subparagraph (e)(1)(A)3.d. (e.g. B100 biodiesel fuel or ultra-low-aromatic synthetic diesel fuel) and/or a VDECS that includes the use of a fuel additive (e.g. fuel-borne catalyst) shall maintain records that document exclusive use of the chosen fuel or additive for each affected CI engine and hours of operation. Appropriate records would be copies of receipts or invoices of appropriate fuel and/or fuel additive and daily operating hour logs.~~

~~2. Records shall be kept available for a minimum of three (3) years and shall be compiled and made available to the ARB upon request.~~

~~3. Failure to keep records or submittal of false information is a violation of state law subject to civil penalty.~~

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.7 Requirements for Drivers.

(a) Beginning January 1, 2013, a driver shall not operate a TRU-equipped truck or tractor-trailer equipped with a TRU or TRU gen set on a California highway unless the TRU or TRU gen set complies with section 2477.5(a).

(b) A driver must, upon request, provide the following available information to authorized enforcement personnel:

(1) Driver's license;
(2) Truck or tractor registration;
(3) Trailer registration;
(4) Bill of lading or freight bill with origin and destination of freight being transported, the consignor (shipper) and consignee (receiver);
(5) The company name and contact information of the carrier that dispatched

the driver;

(6) The company name and contact information of the business entity (e.g. shipper, freight broker, freight forwarder, or receiver) that arranged, hired, or contracted for the transport of the perishable goods being hauled, subject to the requirements in sections 2477.8, 2477.9, 2477.10, and 2477.11.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.8 Requirements for Freight Brokers and Freight Forwarders.

(a) Beginning January 1, 2013, freight brokers and freight forwarders that arrange, hire, contract for, or dispatch the transport of perishable goods in TRU-equipped or TRU gen set-equipped trucks, tractor-trailers, shipping containers, or railcars on California highways or railways must:

(1) Require the carriers they hire or contract with for transport of perishable goods, to only dispatch TRU-equipped trucks, trailers, shipping containers, and railcars or TRU gen sets that comply with section 2477.5(a) if they travel on California highways or railways.

(2) Provide the following information to the carrier for their dispatched driver who will be traveling on a California highway or railway:

(A) Freight broker's or freight forwarder's business name;

(B) Freight broker's or freight forwarder's street address, state, zip code;

(C) Freight broker's or freight forwarder's contact person's name; and

(D) Freight broker or freight forwarder contact person's business phone number.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.9 Requirements for Motor Carriers.

(a) Beginning January 1, 2013, motor carriers that dispatch TRU-equipped trucks, trailers, or shipping containers equipped with a TRU or TRU gen set that travel on a highway within California must:

(1) Only dispatch TRUs or TRU gen sets that comply with section 2477.5.

(2) Provide the following information to a dispatched driver who will be traveling on a highway within California:

(A) Carrier's business name;

(B) Carrier's street address, state, zip code;
(C) Carrier contact person's name; and
(D) Carrier contact person's business phone number.

(3) Provide the dispatched driver with the business name, address, contact person, and phone number of the business entity (e.g. freight broker, freight forwarder, shipper or receiver) that arranged, hired, contracted for, or dispatched the transport of the perishable goods being hauled.

(b) Carriers may also have to comply with terminal operator requirements, under section 2477.6, if they have terminals located in California.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.10 Requirements for California-Based Shippers.

(a) Beginning January 1, 2013, California-based shippers that that arrange, hire, contract for, or dispatch the transport of perishable goods in TRU-equipped trucks, trailers, shipping containers, or railcars, or TRU gen sets on California highways or railways must:

(1) Dispatch TRUs or TRU gen sets that comply with section 2477.5(a) if they travel on California highways or railways; or

(2) Require the carriers they hire or contract with for transport of perishable goods, to only dispatch TRUs or TRU gen sets that comply with section 2477.5(a) if they travel on California highways or railways; and

(3) Provide the following information to the carrier or a dispatched driver who will be traveling on a highway within California:
(A) Shipper's business name and address.
(B) Receiver's business name and address.
(C) Freight broker or forwarder business name and address (if any).
(D) Contact person's name, and phone number at the shipper, broker, or receiver with knowledge of the transport arrangements.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.11 Requirements for California-Based Receivers.

(a) Beginning January 1, 2013, California-based receivers that that arrange, hire, contract for, or dispatch the transport of perishable goods in TRU-equipped trucks, trailers, shipping containers, or railcars; or TRU gen sets on California highways or railways must:

(1) Dispatch TRUs or TRU gen sets that comply with section 2477.5(a) if they travel on California highways or railways; or

(2) Require the carriers they hire or contract with for transport of perishable goods, to only dispatch TRUs or TRU gen sets that comply with section 2477.5(a) if they travel on California highways or railways; and

(3) Provide the following information to the carrier or a dispatched driver who will be traveling on a highway within California:

(A) Shipper's business name, address.

(B) Receiver's business name, address.

(C) Freight broker or forwarder business name and address (if any).

(D) Contact person's name, and phone number at the shipper, broker, or receiver with knowledge of the transport arrangements.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.12 Requirements for Lessors and Lessees.

(a) Lessors shall be subject to all of the following:

(1) The lessor is responsible for the owner requirements set forth in subsection 2477.5. See the definition of "owner" in section 2477.4 for clarification related to banks and financial institutions.

(A) The lessor may delegate the responsibility for applying for an IDN (registering in ARBER) under section 2477.5(e) to the lessee, if the following conditions are met:

1. The lease contract must show clear delegation of the ARBER registration requirements to the lessee;

2. The lessor must submit third party agreement confirmation information for leased units to ARB at least 10 days prior to the lessee applying for an IDN. The following information is required:

a. Unit serial numbers for each TRU or TRU gen set;

b. Unique company equipment number;

c. Vehicle license number;

d. Vehicle Identification Number (VIN);

f. Lessor company name, address, federal tax ID (EIN), contact person, and contact information;

g. Lessee company name, address, federal tax I.D (EIN), contact person, and contact information;

e. Copy of the contract pages of the lease contract with the language highlighted that identifies the lessee as the responsible party for registration;

f. Owner's/lessor's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

3. The lessor must submit third party agreement confirmation information for leased units to the Executive Officer by one of the following methods:

a. Mail or deliver to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (ARBER/TRU)
P.O. Box 2815
Sacramento, CA 95812

b. Electronically submit by email to: arber@arb.ca.gov

4. The lessor must notify the lessee in writing of this delegation.

(B) The lessor shall not delegate owner requirements for complying with the in-use standards under section 2477.5(a) to the lessee unless the lessor is a bank or financial institution (see definition of "owner" in section 2477.4).

(2) When TRUs or TRU gen sets are at a lessor's California terminal for 30 or more days, the lessor shall be subject to the operator report requirements set forth in subsection 2477.6.

(b) Lessees shall be subject to all of the following:

(1) The terminal operator requirements set forth in subsection 2477.6 if a leased or rented TRU or TRU generator set has been assigned to the lessee's California terminal for 30 or more days.

(2) If delegated by contract and the lessor has submitted third party agreement confirmation information for leased units to ARB under section 2477.12(b)(1)(A) and notified the lessee of delegation under section 2477.12(a)(1)(A)3., the lessee is responsible for the registration requirements of subsection 2477.5(e) and shall complete all of the following:

(A) Submit a registration application for an IDN after at least 10 days of the lessor submitting the third party agreement confirmation information for leased units to ARB, but no more than 30 days after the lessor's notice;

(B) Submit a copy of the ARBER TRU Certification to the lessor within 30 days after registration in ARBER is completed and an ARBER TRU Certification is issued.

(C) Affix (attach) the IDN to the TRU or TRU gen set housing within 30 days in accordance with subparagraph 2477.5(e)(1)(F).

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.13 Requirements for TRU and TRU Gen Set Original Equipment Manufacturers.

(a) TRU and TRU original equipment manufacturers that equip TRUs or TRU gen sets with flexibility engines, as defined in section 2477.4, shall do all of the following:

(1) Beginning [30 days after amendment effective date], provide written notification to the Executive Officer of their intent to equip TRUs or TRU gen sets with flexibility engines. This notification shall be submitted at least 12 months in advance of the first flexibility engine being installed in production, to:

California Air Resources Board
Stationary Source Division (TRU)
P.O. Box 2815
Sacramento, CA 95812

(2) Beginning [120 days after the effective date of the amendment] provide supplemental labels that list all of the engine information needed to register the TRU or TRU gen set in ARBER under section 2477.5(e), if the engine manufacturer's emissions label does not provide this information.

(A) The supplemental label shall be permanently affixed to the flexibility engine in an easily accessible place, in accordance with 40 CFR 89.110 (for Tier 1 or Tier 2) or 40 CFR 1039.135 (for Tier 4). Alternative supplemental label locations and font sizes may be necessary, such as on the equipment frame, subject to Executive Officer approval.

(3) Beginning [120 days after the effective date of the amendment] The original equipment manufacturer shall provide written disclosures to the ultimate purchaser, prior to sale of new TRUs or TRU gen sets that are equipped with flexibility engines. The following disclosures are required:

(A) The TRU or TRU gen set is equipped with a flexibility engine. Flexibility engines meet less stringent emissions standards than the emission standards that were in effect at the time the flexibility engine was manufactured.

(B) Provide the effective model year of the flexibility engine, as shown in section 2477.4, Table 1.

(C) Notify the ultimate purchaser that if they register the TRU or TRU gen set in ARBER under section 2477.5(e), they are required report the effective model year of the engine, not the year that the engine was manufactured. Noncompliance may result in penalty.

(D) If the TRU or TRU gen set is operated in California, the owner will be required to bring the engine into compliance with the ULETRU in-use standard seven years after the effective model year of the engine, in accordance with section 2477.5(a) and (b).

~~(3)~~(b) Original Equipment Manufacturer Reporting

~~(A)~~(1) Current Production Reports: Beginning April 6, 2011, and by January 1st and June 30th of each calendar year thereafter, TRU and TRU gen set original equipment manufacturers shall provide to ARB the information listed below for all TRUs and TRU gen sets that will be manufactured and marketed for sale in the following markets: California, United States, Canada, and Mexico. The following data shall be provided for TRUs and TRU gen sets that will be produced during the six month period following the report due date for each market area:

~~1.~~(A) TRU or TRU genset manufacturer and model name, as it appears on the unit label; and

~~2.~~(B) The following engine information for each TRU or TRU gen set model:

~~a.~~1. Engine manufacturer;
~~b.~~2. Engine model, as it appears on the engine emissions label;
~~c.~~3. Engine model, as it appears on the serial number label, if different;
~~d.~~4. Engine Family;
~~e.~~5. Rated horsepower and rated speed;
~~f.~~6. Displacement (liters);
~~g.~~7. Exhaust Emissions Control System;
~~h.~~8. Tier standard met; and
~~i.~~9. ARB's Executive Order that the engines are manufactured under.

~~3.~~(C) Current Production Reports shall be submitted by one of the following methods:

~~a.~~1. Mail or deliver a physical report in electronic format to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (TRU)
1001 I Street
Sacramento, CA 95814

~~b.~~2. Electronically submit to ARB's TRU Program via email at: ~~tru~~arber@arb.ca.gov

~~4.~~(D) Original equipment manufacturers that produce less than 100 TRUs or TRU gen sets per calendar year may submit Current Production Year Reports within ten days of installing the first engine in a production run of a new model.

~~(B)~~(2) Prior Production Reports:

~~1.~~(A) Prior unit and engine data. TRU and TRU gen set original equipment manufacturers shall:

~~a.~~1. By April 6, 2011, provide a production report to ARB with the information listed below in subparagraph ~~3~~2477.13((b)(2)(C) for the previous five calendar years for each TRU or TRU gen set produced for sale in California, North America, Canada, and Mexico; or

~~b.~~2. If the TRU or TRU gen set original equipment manufacturer elects not to provide the information in subparagraph ~~(f)(3)(B)1.a.~~2477.13(b)(2)(A)1., then within 30 days of any request from ARB, the TRU or TRU gen set original equipment manufacturer shall provide a production report to ARB with the information listed below in subparagraph ~~3~~2477.13((b)(2)(C) for the unit and engine serial numbers provided in ARB's request.

~~2.~~(B) Monthly production reports. TRU and TRU gen set original equipment manufacturers shall either:

~~a.~~1. Beginning April 6, 2011, provide by the 15th of each calendar month, a monthly production report to ARB with the information listed below in subparagraph ~~3~~2477.13((b)(2)(C) for the previous calendar month for each TRU or TRU gen set produced for sale in California, North America, Canada, and Mexico; or

~~b.~~2. As an alternative, the TRU or TRU gen set original equipment manufacturer may request reporting that is equivalent to and at least as effective as subparagraph ~~(f)(3)(B)2.a.~~2477.13(b)(2)(B)1., immediately above, subject to Executive Officer approval.

~~3.~~(C) Original equipment manufacturers shall provide the following information for each TRU and TRU gen set:

~~a.~~1. TRU or TRU gen set model name, as it appears on the unit label;
~~b.~~2. TRU or TRU gen set serial number;
~~c.~~3. Engine manufacturer;
~~d.~~4. Engine model, as it appears on the engine emissions label;
~~e.~~5. Engine model, as it appears on the serial number label, if different;
~~f.~~6. Engine Family;
~~g.~~7. Engine serial number;
~~h.~~8. Rated horsepower and rated speed; and
~~i.9.~~ Tier standard met.

~~4.~~(D) Prior Production Reports and Flexibility Engine Reports shall be submitted on CD or DVD to:

California Air Resources Board
Stationary Source Division (TRU)
1001 I Street
Sacramento, CA 95814

~~(C)~~(3) Confidentiality of current and prior production reports. TRU and TRU gen set original equipment manufacturers may designate current and prior production report information as confidential or trade secret, and such information will be handled in accordance with title 17 CCR, section 91000.

(c) Beginning [120 days after the effective date of the amendment] TRU and TRU gen set original equipment manufacturers (OEM) that sell TRUs, TRU gen sets, or replacement engines in California shall:

(1) Provide a supplemental label with all new and rebuilt replacement engines that provides the information that is required to register the unit in ARBER under section 2477.5(e), if the engine manufacturer's emissions label does not provide this information. If a prior-tier replacement engine (as defined in section 2477.4) is used, the effective model year (as defined in section 2477.4) shall be listed on the supplemental label.

(A) The supplemental label shall be permanently affixed to the replacement engine in an easily accessible place, in accordance with 40 CFR 89.110 (for Tier 1 or Tier 2 engines) or 40 CFR 1039.135 (for Tier 4 engines). Alternative supplemental label locations and font sizes may be necessary if accessible engine surface space is not available, subject to Executive Officer approval.

(2) Provide a registration information document with each new TRU and TRU gen set, that includes:

(A) All of the TRU or TRU gen set unit information that is needed to register the TRU or TRU gen set in ARBER under section 2477.5(e). This information must be the same as the information on the unit label that is attached to the unit.

(B) All of the TRU or TRU gen set engine information needed to register in ARBER under section 2477.5(e). This information must be the same as the information on the engine labels that are attached to the engine.

(C) The registration information document shall include a certification statement by the TRU OEM stating that the unit registration information provided is exactly the same as listed on the TRU or TRU gen set unit label and the engine registration information provided is exactly the same as listed on the engine labels.

(3) Provide a registration information document with each new and rebuilt replacement engine supplied by the OEM that includes:

(A) All of the engine information needed to register in ARBER under section 2477.5(e). This information must be the same as the information on the new replacement engine labels or rebuilt replacement engine supplemental labels (see section 2477.16(b)) that are attached to the engine or an alternative location approved by the Executive Officer.

(B) The registration information document shall include a certification statement by the TRU OEM stating that the engine registration information provided is exactly the same as listed on the replacement engine labels.

(C) Include entry spaces and instructions for the dealer or installer to fill in the unit information that is needed to register the unit in ARBER pursuant to section 2477.5(e)(1)(A)4. Include a certification statement for the dealer or installer to sign under, stating that the unit information entered is exactly the same as listed on the unit label that the replacement engine is installed into.

(d) Beginning [30 days after the effective date of the amendment], OEMs shall provide written disclose with each prior-tier replacement engine they supply that shall be passed on to interested buyers prior to sale of a prior-tier replacement engine notifying them that the engine was manufactured to meet less stringent emissions standards than are currently required. This notification must also provide the effective model year of the prior-tier replacement engine and the ULETRU compliance deadline.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.14 Requirements for TRU, TRU Gen Set, and TRU-Equipped Truck and Trailer Dealers.

(a) Beginning [120 days after amendment effective date], dealers that sell and/or install TRUs, TRU gen sets, or replacement engines in California shall:

(1) Pass the registration information document provided by the TRU or TRU gen set OEM (under section 2477.13) to the ultimate purchaser upon sale of a new TRU or TRU gen set that includes the TRU or TRU gen set unit information and the TRU engine information required for registration under section 2477.5(e).

(2) Pass the registration information document provided by the TRU or TRU gen set OEM under (section 2477.13) or engine rebuilder (under section 2477.16) to the ultimate purchaser upon sale of a new replacement engine, or rebuilt replacement engine that includes the engine information required for registration under section 2477.5(e).

(3) If an engine is not supplied by a TRU OEM, the dealer shall provide a registration information document that lists all of the TRU or TRU gen set engine information needed to register in ARBER under section 2477.5(e)(1)(A)7. This information must be exactly the same as the information on the engine emissions label that is attached to the engine. The registration information document must include a certification statement by the dealer stating that the engine information provided is exactly the same as listed on the engine emissions label.

(b) Dealers that sell TRUs or TRU gen sets from businesses located in California may purchase, receive, or otherwise acquire and have in their possession, TRUs or TRU gen sets that are noncompliant with the in-use performance standards of section 2477.5(a) and the registration requirements of section 2477.5(e), if the following conditions are met:

(1) The noncompliant TRUs or TRU gen sets are not sold for use in California prior to being brought into compliance with the requirements;

(2) The noncompliant TRU or TRU gen set is sold to a person that would not be reasonably expected to do business in California and a written disclosure to the buyer in the bill of sale is required in accordance with section 2477.18(b)(1);

(3) The noncompliant TRUs or TRU gen sets are not rented or leased prior to being brought into compliance with these requirements;

(4) The noncompliant TRUs or TRU gen sets are not operated at the dealers place of business or on California highways for the purposes of controlling the environment of temperature sensitive products while in California. This condition applies to TRU or TRU gen sets under the dealer's control. This condition does not apply to TRUs or TRU gen sets owned by others that are being repaired by the dealer.

(5) If a noncompliant TRU or TRU gen set is in transit on California highways:
(A) The TRU or TRU gen set shall not be operating;
(B) The dealer shall be responsible for ensuring that no temperature-sensitive products are transported in the vehicle;
(C) The dealer shall provide the driver with written evidence that the noncompliant TRU or TRU gen set is under the control of the dealer, including the following information:
1. Dealer's business name;
2. Dealer's street address, state, zip code;
3. Dealer contact person's name;
4. Dealer contact person's business phone number;
5. Date(s) transport will take place;
6. Statement of the reason for transporting the noncompliant equipment
7. TRU or TRU gen set serial number
8. Physical address of starting location;
9. Physical address of ending location; and
10. Dealer owner's or responsible official's signature, after the statement: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."
(D) During transit on California highways, the driver, upon request, must show an inspector that no temperature-sensitive products are being transported and must present written evidence provided by the dealer that the noncompliant

TRU or TRU gen set is under the control of a dealer; and

(E) All circumstances at the time of inspection shall be consistent with the requirements under section 2477.14(b)(5).

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.15 Requirements for Repair Shops Located in California that Work on TRUs or TRU Gen Sets.

(a) Repair shops located in California that sell and/or install new or rebuilt replacement engines into TRUs or TRU gen sets shall:

(1) Pass the registration information document provided by the TRU or TRU gen set OEM (under section 2477.13) or engine rebuilder (under section 2477.16) to the ultimate purchaser upon sale of a new or rebuilt replacement engine that includes the engine information needed to register in ARBER, as listed in section 2477.5(e)(1)(A)7.

(2) Beginning [120 days after amendment effective date], if an engine is not supplied by a TRU OEM, the installer shall provide a registration information document that lists all of the TRU or TRU gen set engine information needed to register in ARBER, as listed in section 2477.5(e)(1)(A)7.

(A) This information must be exactly the same as the information on the engine emissions label that is attached to the engine.

(B) The registration information document shall provide a certification statement by the repair shop responsible official stating that the engine information provided is exactly the same as listed on the engine emissions label.

(3) Beginning [120 days after amendment effective date], provide the unit information on the registration information document that is needed to register the unit in ARBER for TRU or TRU gen set that the new or rebuilt replacement engine is installed into. The unit information that is required is listed in section 2477.5(e)(1)(A)4.

(A) The repair shop responsible official shall provide a certification statement on the registration information document stating that the unit information provided is exactly the same as listed on the unit label.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.16 Requirements for Engine Rebuilders.

(a) If a TRU engine is being rebuilt to remain in compliance with the in-use standards of section 2477.5(a), it must be rebuilt in accordance with the 40 CFR, sections 89.130 and 1068.120, and 13 CCR, section 2423(l), as these sections existed on [date Board adopts amendments] and shall meet the following requirements:

(1) To remain in compliance with the in-use performance standards, the engine must be rebuilt to a configuration of a more stringent emissions standard tier than the original engine;

(2) The engine must be rebuilt to a certified configuration of matched components. "Matched components" means a complete set of components corresponding to the certified emissions configuration (tier) of the engine that is being used as the reference for the rebuilt engine.

(b) Beginning [30 days after amendment effective date], engine rebuilders shall provide a supplemental label with each rebuilt engine that includes the following information:

(1) Name of the engine rebuilder;

(2) Engine manufacturer of the original engine

(3) Engine model;

(4) Engine model year:

(A) Prior tier engines. If the rebuilt engine meets a prior-tier emissions standard, then the effective model year is required (see definition of effective model year in section 2477.4);

(B) Current tier engines. It the rebuilt engine meets the tier standard that is currently in effect, then the model year is the year that the rebuild is completed.

(5) Horsepower rating of the certified configuration of the rebuilt engine;

(6) Emissions standard tier met by the certified configuration (e.g. Tier 4i);

(7) Calendar year that the rebuild was completed;

(c) Supplemental labels shall be permanently affixed to the rebuilt engine in an easily accessible place, in accordance with 40 CFR, section 89.110 (for Tier 1 or Tier 2) or 40 CFR, section 1039.135 (for Tier 4). Alternative supplemental label locations and font sizes may be necessary if surface space is not available, subject to Executive Officer approval.

(d) Beginning [90 days after amendment effective date], engine rebuilders shall provide the following documentation, within 30 days of request, that demonstrates they have complied with the engine rebuilding practices of 40 CFR, sections 89.130 and 1068.120, and 13 CCR, section 2423(l):

(1) Information that demonstrates there is a reasonable technical basis for knowing that the rebuilt engine is equivalent, from an emissions standpoint, to an engine that complies with the certification standards applicable to the emissions tier standard of the rebuilt engine (i.e. tolerances, calibrations, specifications). Such equivalency would exist if the following two conditions are met:

(A) Parts installed (whether the parts are new, used, or rebuilt) are such that a person familiar with the design and function of engines would reasonably believe that the parts perform the same function with respect to emission control as the original parts; and

(B) Any parameter adjustment or design element change is made only in accordance with the original engine manufacturer's instructions or where data or other reasonable technical basis exists that such parameter adjustment or design element change, when performed on the rebuilt engine, is not expected to adversely affect in-use emissions.

(2) The technical demonstration must be signed and stamped by a licensed professional mechanical engineer.

(e) Beginning [120 days after amendment effective date], engine rebuilders shall provide a registration information document with the rebuilt engine that includes:

(1) All of the TRU or TRU gen set engine information needed to register in ARBER pursuant to subparagraph 2477.5(e)(1)(A)7 except that engine family may be omitted for rebuilt engines. This information must be the same as the information on the rebuilt engine's re-label and supplemental emissions label that is attached to the engine. The registration information document would include a certification statement by the engine rebuilder, or third party installer stating that the engine information provided is exactly the same as listed on the engine emissions label.

(2) A separate section of the registration information document shall include entry spaces for all of the TRU or TRU gen set unit information that is required to register the unit in ARBER pursuant to subparagraphs 2477.5(e)(1)(A)4 and 5. The registration information document would include a certification statement, with a signature space for the third party installer, stating that the unit information provided is exactly the same as listed on the unit label.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(2) Facility Monitoring, Recordkeeping, and Reporting.~~

~~(A)~~2477.17 Facility Reporting.

~~(A)~~(a) All facilities subject to this subsection shall submit a Facility Report to ARB by January 31, 2006, containing the following information~~,~~ as of December 31, 2005:

~~1.~~(1) Contact information for the facility's responsible official.

~~2.~~(2) Provide all North American Industrial Classification System codes (NAICS) applicable to the facility.

~~3.~~(3) The number of loading dock doors serving refrigerated storage space.

~~4.~~(4) The number of square feet of refrigerated storage space.

~~5.~~(5) The number of TRUs or TRU gen sets under facility control by model year and horsepower category.

~~6.~~(6)The number of refrigerated trucks, trailers, shipping containers, or railcars leased or rented.

~~7.~~(7) The total annual TRU engine operating hours for all TRUs or TRU gen sets under facility control during 2005 (e.g. total TRU engine operating time for both on-road and off-road operations).

~~8.~~(8) The average weekly number of inbound refrigerated trucks, trailers, shipping containers, and railcars delivering goods to the facility during 2005, calculated by dividing the annual total inbound refrigerated loads by 52.

~~9.~~(9) The average weekly number of outbound refrigerated trucks, trailers, shipping containers and railcars delivering goods from the facility during 2005, calculated by dividing the annual total outbound refrigerated loads by 52.

~~10.~~(10) The average total number of hours per week that outbound TRU or TRU gen set engines operate while at the facility during 2005. Average TRU or TRU gen set engine operating time at facility for outbound refrigerated loads may be used if the result is representative of the outbound TRU or TRU gen set operations at facilities, as determined by the Executive Officer. Average values would be determined for outbound loads based on recordkeeping, conducted in accordance with subparagraph (f)(2)(B)2., and applied to the total annual number of refrigerated outbound loads, and then weekly averages calculated as follows: Average TRU or TRU gen set engine operating time per outbound refrigerated load multiplied by the total annual number of outbound loads, divided by 52 weeks equals the average total number of hours per week that outbound TRU or TRU gen set engines operate while at the facility.

~~11.~~(11) The average total number of hours per week that inbound TRU or TRU gen set engines operate while at the facility during 2005. Average TRU or TRU gen set engine operating time at facility for inbound refrigerated loads may be used if the result is representative of the inbound TRU or TRU gen set operations at facilities, as determined by the Executive Officer. Average values would be determined for inbound loads based on recordkeeping, conducted in accordance with subparagraph (f)(2)(B)2., and applied to the total annual number of refrigerated inbound loads, and then weekly averages calculated as follows: Average TRU or TRU gen set engine operating time per inbound refrigerated load multiplied by the total annual number of inbound loads, divided by 52 weeks equals the average total number of hours per week that inbound TRU or TRU gen set engines operate while at the facility.

~~12.~~(12) The number of refrigerated trailers (as defined) that are used at the facility for cold storage, the total annual number of hours of TRU engine operation associated with these refrigerated trailers, and the total annual number of hours of operation using electric standby associated with these refrigerated trailers.

~~(B)~~(b) Recordkeeping.

~~1.~~(1) Recordkeeping that substantiates the information reported in the Facility Report shall be maintained and shall be compiled and made available to State inspectors upon request for a minimum of three (3) years.

~~2.~~(2) The Executive Officer may approve alternative recordkeeping and calculation procedures for determining the average weekly hours of TRU engine operation at a facility for inbound and outbound refrigerated loads, provided the Executive Officer finds that the alternative procedures meet the intent of ~~subparagraph (f)(2)~~section 2477.17.

~~(C)~~(c) Facility Report Submittals. Facility Reports shall be submitted by one of the following methods:

~~1.~~(1) Mail or deliver a physical report to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division (TRU)
P.O. Box 2815
Sacramento, CA 95812

~~2.~~(2) Electronically submit ~~through ARB's web site. The web address will be identified in an advisory.~~ by email to: tru@arb.ca.gov

~~(D)~~(d) Failure to ~~r~~Report or ~~s~~Submittal of ~~f~~False ~~i~~Information. Failure to report or submittal of false information is a separate violation of ~~state law subject to civil penalty~~this rule.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(g)~~2477.18 Prohibitions.

~~(1)~~(a) Except as allowed under subsection 2477.14(b), ~~N~~no person ~~who is engaged in this State in the business of selling to an ultimate purchaser, or renting or leasing new or used TRUs or TRU gen sets~~, including, but not limited to, manufacturers, distributors, ~~and~~ dealers, auctioneers, and motor carriers shall intentionally or negligently import, deliver, purchase, receive, or otherwise acquire a new or used TRU or TRU gen set engine that does not meet the performance requirements or alternatives set forth in subsection 2477.5(~~e~~a)~~(1)~~ above.

~~(2)~~(b) Except as allowed under subsection 2477.14(b), ~~N~~no person ~~who is engaged~~ in this State ~~in the business of selling to an ultimate purchaser new or used TRU or TRU gen set engines~~, including, but not limited to, manufacturers, distributors, ~~and~~ dealers, auctioneers, and motor carriers shall sell, or offer to sell, to an ultimate purchaser who is a resident of this State or a person that could reasonably be expected to do business in this State a new or used TRU or TRU gen set engine that does not meet the performance requirements or alternatives set forth in subsection 2477.5(~~e~~a)~~(1)~~ above.

(1) If a noncompliant TRU or TRU gen set is sold to a person who is a resident outside this State, then the bill of sale shall disclose to the buyer that the TRU or TRU gen set is not compliant for use in California and the TRU or TRU gen set must meet the in-use performance standards of section 2477.5 before operating in the State, and if the TRU is based in the State, then it must be registered in ARBER. The following statement must be included in the bill of sale of any noncompliant TRU or TRU gen set: "This TRU does not currently meet California's in-use performance standards under title 13, California Code of Regulations, section 2477.5, and is therefore not compliant for use in California."

(2) No owner of a TRU that is equipped with an Alternative Technology under section 2477.5(a)(3) (e.g. hybrid electric or electric standby) shall sell the TRU or TRU gen set, without disclosing in writing that it must be used in a way that qualifies it as an Alternative Technology in accordance with section 2477.5(a)(3) in order to be compliant.

~~(3)~~(c) No person ~~who is engaged~~ in this State ~~in the business of renting or leasing new or used TRU or TRU gen set engines~~, including, but not limited to, manufacturers, distributors, ~~and~~ dealers, and carriers shall lease, offer to lease, rent, or offer to rent, in this state any new or used TRU or TRU gen set engine that does not meet the performance requirements or alternatives set forth in section 2477.5(~~e~~a)~~(1)~~ above.

~~(4)~~(d) Operators of affected facilities and operators of affected TRUs and TRU gen sets are prohibited from taking action to divert affected TRUs to alternative staging areas in order to circumvent the requirements of this section.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

~~(h)~~2477.19 Penalties.

~~(1)~~(a) All persons, as defined in section 19 of the Health and Safety Code, found to be in violation of title 13, CCR, sections 2477 through 2477.18 may be cited and subject to the penalty provisions set forth in Health and Safety Code sections 39674, 39675, 42400et seq., , 42402 et seq., and 42410. Where a violation involves multiple TRUs, TRU gen sets, or TRU engines, there is a separate violation for each such unit.

(b) Failure to keep records, report, or submittal of false information is a violation of this rule subject to penalty.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.20 Authority to Request Additional Information.

The Executive Officer may request that additional information be submitted as part of the review of any extension application, exemption, or other action that delays or defers a compliance date or action.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

2477.21 Severability. If any subsection, paragraph, subparagraph, sentence, clause, phrase, or portion of this regulation is, for any reason, held invalid, unconstitutional, or unenforceable by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of the regulation.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 40717.9, 43013, and 43018.

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APPENDIX B

SUMMARY OF 2006 FACILITY REPORTS

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APPENDIX B

SUMMARY OF 2006 FACILITY REPORTS

A. Introduction

As adopted in 2004, the original Transport Refrigeration Unit (TRU) Airborne Toxic Control Measure (ATCM) included facility reporting requirements. These facility reports were needed because comprehensive information regarding facilities where TRUs operate was not available during rule development. Staff visited a number of facilities in 2001 through 2003 to learn about TRU operations and activity levels, but found that there was a broad range of responses to questions staff asked. This was especially true about the amount of TRU engine activity that occurred at the facility.

Staff believed that formal facility reports were necessary to gather data that would be more accurate than the anecdotal information previously received. Specifically, data was needed that could be used to more accurately update the TRU emissions inventory and refine the health risk assessments at distribution centers and other facility types where TRUs and TRU generator sets operate.

B. Background

The TRU ATCM's facility reporting requirements only applied to certain facilities. If all of the following criteria were met any time in 2005, the facility was applicable:

1. TRUs operate at the facility;
2. The facility had 20 or more loading dock spaces serving refrigerated storage areas;
3. Perishable goods were loaded and unloaded for distribution on trucks, trailers, shipping containers, or railcars;
4. The TRUs or TRU gen sets operating at the facility were owned, leased, or contracted for by the facility, its parent company, affiliate, or subsidiary; and
5. One or more of the TRUs or TRU gen sets were under facility control[1]

This was a one-time report, covering only one year of TRU operations at the facility. Recordkeeping was required to substantiate the TRU activity data that was reported. Staff believed large facilities would have the resources necessary to gather the type of information needed. Staff considered facilities with 20 or more doors to be "large," and that at this threshold a sufficient number of reports for a statistically valid sample would be submitted.

[1] "Facility Control (of TRUs or TRU Gen Sets)" means the TRUs or TRU gen sets located at the facility are owned or leased by the facility, its parent company, affiliate, or a subsidiary, or under contract for the purpose of providing carrier service to the facility, and the TRUs' or TRU gen sets' arrival, departure, loading, unloading, shipping and/or receiving of cargo is determined by the facility, parent company, affiliate, or subsidiary (e.g. scheduled receiving, dispatched shipments).

The facility reports collected a variety of information. Facility reports included information about the company and contact information. The facility could indicate that they considered the information being submitted to be confidential information. Facilities information data included refrigerated area and the number of loading dock spaces serving refrigerated storage space as of December 31, 2005. The type of facility was reported as a North American Industry Classification System (NAICS) code. Refrigerated fleet information included the number of TRU-equipped trucks, trailers, shipping containers, or railcars that were owned or leased by the facility. TRU engine inventory information included the number of TRUs under facility control by engine model year and horsepower category.

Recordkeeping for TRU activity data for calendar year 2005 was required and included:

- Total annual engine run time for all TRUs under facility control was required, based on engine hour meter readings taken 12 months apart;
- Average number of refrigerated loads per week for inbound and outbound loads (calculated from the annual totals for each, divided by 52 weeks);
- Engine hour meter reading data had to be collected over two weeks in summer, (June 21st to September 21st) and two weeks in winter (December 31st to March 19th). Readings at entry and exit provided the engine run time while at the facility. Data from these two periods were averaged together to provide the average weekly total engine hours that occurred at the facility for inbound loads as well as for outbound loads; and
- If the facility used TRU-equipped trucks, trailers, shipping containers, or railcars for cold storage at the facility, then those engine hours were reported separately. Cold storage data collection was triggered after equipment had been loaded and refrigerated for 24 or more hours at the facility.

C. Results

A total of 80 facilities submitted facility reports. Of these, 22 facilities had missing data or unusable data. For example, data was missing when the facility contracted for carrier service, the carrier sent equipment from their "pool" of equipment, so the same equipment was not used consistently and data for the annual hours of TRU engine run time attributable to the facility was not available. There were also cases where it was too difficult to log engine hours at a "campus" type facility where there are several adjacent or nearby properties with facilities and no gates or logical points for taking hour meter readings.

Cold storage facilities that occasionally used a facility-owned unit to shuttle a customer's goods triggered applicability, but had to be placed in a separate category because this is not normal for distribution center activity. As a result of such screening, there were 56 facilities that operated as a "normal" distribution center with complete, usable data. About 70 percent of these facilities indicated the data was considered confidential.

Staff reviewed all data that was submitted and called the facility when data looked questionable. Staff requested corrections or clarifications if the data appeared to fall outside of normal ranges. These contacts allowed staff to learn more about the facilities and their operations. For example, the NAICS codes submitted did not consistently give staff the type of distribution center (e.g. dairy, foodservice, grocery, meat, produce) so staff were able to supplement the data with this information.

Late submittals occurred. Some of these had been visited during the original rule development and were notified well in advance of the pending requirements, but still failed to comply on time. As a result, some facility reports covered calendar year activity other than 2005. The majority of reports were submitted on time in 2006, with 2005 data, but some were submitted in 2007 and 2008, and a few of the final submittals were received in 2009.

The 56 facilities submitted complete, usable data. The spreadsheet in Attachment 1 displays the data from these 56 facilities. Due to the requests for confidentiality, this spreadsheet has been redacted. Company and contact information have been removed. The 56 facilities fell into five facility types, as displayed in Table B-1, below, which shows the percent of facilities in each facility type, the percent of TRUs in each facility type, and the average annual TRU engine operation hours for each facility type.

Table B-1: Facility Types Reporting and Average Annual TRU Engine Activity

Distribution Facility Type	Number of Facilities	Percent of Total Facilities	Number of TRUs	Percent of Total TRUs	Average Annual Activity (hrs/yr/TRU)
Dairy	3	5%	440	6%	1,620
Foodservice	16	29%	1,420	21%	1,930
Grocery	25	45%	3,990	57%	1,520
Meat	2	4%	500	7%	3,150
Produce	10	18%	610	9%	1,320
Totals	**56**		**6,960**		**1710**

The 6,960 TRUs under the control of the 56 facilities operated a total of 11,927,000 engine hours over a 12-month period, resulting in an average 1,710 hours per year per TRU (hrs/yr/TRU). This includes activity at and away from the facility. Appendix C describes how truck and trailer activity, using statistical methods, were disaggregated to arrive at averages for trucks (1,360 hrs/yr/TRU) and trailers (1,768 hrs/yr/TRU) and a weighted average for both of 1,697 hrs/yr/TRU. That discussion is not repeated here.

Refrigerated load and TRU engine activity at the facility for the 56 distribution facilities are shown in Table B-2. Separate data was reported for inbound and outbound loads to provide the contribution from each to the total activity at the facility.

Table B-2: Inbound and Outbound Refrigerated Loads and TRU Activity at Distribution Facilities

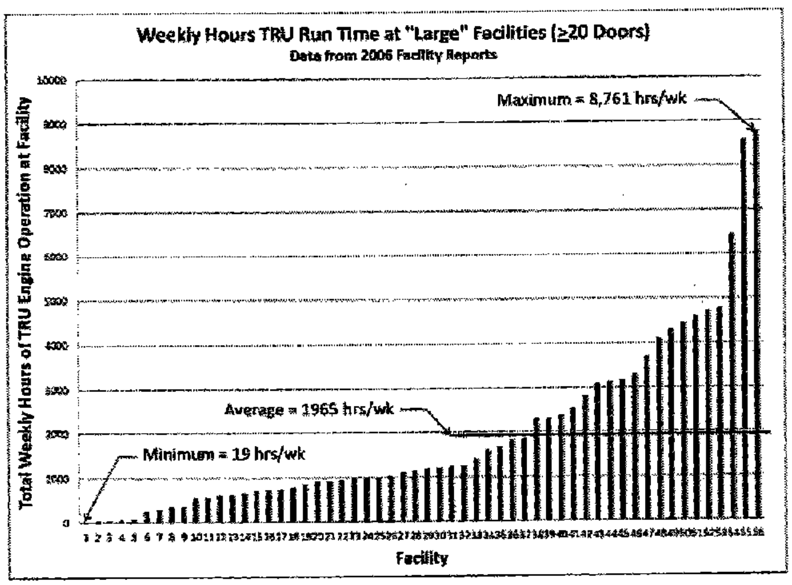
	Inbound Loads	Outbound Loads	Inbound and Outbound Loads
Average Weekly Load Activity (loads/wk)	370	400	770
Average Weekly Engine Activity at Facility (hrs/wk)	600	1,370	1,965
Average Hours per Load at Facility (hrs/load)	1.6	3.1	2.4[1]

1. The weighted average engine run time for inbound and outbound loads is 2.4 hours per load.

As expected, the number of outbound loads is greater than the number of inbound loads. This is due to more compact cargo loading that results from "truckload" inbound loads as compared to less compact, multi-product and multi-customer outbound loads that may also include dry goods for foodservice and grocery distribution. Also, as expected, the TRU engine run time at the facility for outbound loads is greater due to the engine run time for pre-chilling the van prior to loading and time parked loaded and running while waiting for dispatch.

The aggregate average engine run time at a facility due to summing both inbound- and outbound-related loads was 1,965 hours per week for the data from the 2006 facility reports. This average is shown in Figure B-1, which illustrates that many facilities operate TRU engines well above the aggregated average for large facilities.

Figure B-1



The data shown in Table B-2 and Figure B-1 do not include TRU engine run time associated with cold storage operations at the facility. TRU use that is related to engine run time for cold storage adds to these values. All TRU engine run time for a load counts toward cold storage run time after the TRU is in the yard for 24 hours while loaded with perishable goods. Cold storage run time can be significant for facilities that don't have enough built-in cold storage space at the distribution center. More typically, cold storage accrues during the holiday seasons when product is moved from rented cold storage space to the distribution center. Cold storage engine run time was reported by 15 of the 56 facilities, totaling 327,200 hours annually. If this activity is aggregated to the previous data, the average TRU run time at the facility is over 2,000 hours per week.

The results discussed immediately above do not include the cold storage engine run time that occurs at grocery stores during the holiday season when it is very typical to park refrigerated trailers behind retail stores to store holiday foods, such as frozen turkeys, hams, and beverages. These trailers are typically older units that are no longer reliable for road use and therefore have deteriorated insulation and door seals, and declining refrigeration system efficiency. These cold storage trailers have been observed during the four- to six-week period before all of the major holidays (e.g. Thanksgiving, Christmas, Easter, Memorial Day, Independence Day, Labor Day, and sometimes others).

D. Conclusions

The number of facility reports received was not as many as staff had anticipated. At this time, we don't have a good estimate of how many should have reported, but failed to do so. However, there was a large enough sample to provide representative results for refrigerated fleets that are controlled by distribution centers.

The results from the facility reports do not cover common carrier operations. A separate survey would be necessary for common carriers operating refrigerated fleets. Such a survey may be necessary in the future so that TRU activity that is associated with long-haul and interstate transport can be better understood.

The average annual TRU engine operation per TRU at distribution centers is greater than the average that staff used for the 2003 emissions inventory (1710 hrs/yr/TRU compared to 1,465 hrs/yr/TRU, respectively. However, the methodology used by ARB's emissions inventory staff (see Appendix C) to model the statewide emissions inventory used improved approaches for allocating activity from in-state and out-of-state TRUs, so this comparison may not be meaningful.

TRU activity at a "large" distribution facility was much greater than staff anticipated. The public health risk associated with the full range of TRU engine operation that occurs at distribution centers needs to be considered carefully when rule relaxations are requested. Near-source emissions from TRUs and their associated public health risk near facilities may carry more weight than statewide emissions from TRUs and their impact on State Implementation Plans for PM.

Table B-3 shows the loads per week associated with the weekly TRU engine activities shown in Figure III-1 in Chapter III, which shows potential cancer risk near distribution centers. This calculation uses the weighted average TRU engine run time per load shown in Table B-2 (2.4 hrs/load) to calculate the loads per week. Annual TRU engine run times are also shown.

Table B-3: Weekly Loads Resulting from TRU Engine Activity

Engine Hours Per Week	Engine Hours Per Year	Loads Per Week
100	5,200	40
500	26,000	200
1,000	52,000	400
2,000	104,000	800
3,000	156,000	1,250
6,000	312,000	2,500
7,000	364,000	2,900
8,000	416,000	3,300

Appendix B
Attachment 1

Facility Reports Spreadsheet

Appendix B, Attachment 1

2006 Facility Reports from "Normal" Distribution Centers with Complete data — Redacted 6-1-11

Sorted by total inbound + total outbound TRU engine hours at facility (C of W)

Facility ID Code	9 Confid?	Total TRUs	12A Trucks UFC	12B Trucks Leased	13A Trailers UFC	13B Trailers Leased	14A Containers UFC	14B Containers Leased	15A Railcars UFC	16 Annual TRU Hrs	Hours/yr/TRU	17 Wkly Inbnd Lds	18 Wkly Inbnd Hrs	[illegible]
1	N	28	22	7	4	1	2	2	0	18421	566	10	9	0.5
2	Y	33	13	6	26	9	0	0	0	2702	82	163	11.8	0.1
3	N	28	5	1	23	1	0	0	0	20769	1063	43	0	0.0
4	Y	4	0	0	4	0	0	0	0	10580	2640	455	52	0.1
5	Y	31	1	0	30	0	0	0	0	[illegible]	1135	[illegible]	14	0.1
6	Y	19	4	0	15	11	0	0	0	32619	1685	112	105	0.9
[redacted]														
8	Y	59	42	13	17	0	0	0	0	51460	873	147	54	0.4
9	Y	159	6	0	153	0	0	0	0	271750	1700	633	69	0.1
10	Y	22	0	0	22	6	0	0	0	33030	1501	89	98	1.1
11	Y	94	0	0	94	0	0	0	0	150317	1605	45	110	3.4
12	N	78	71	71	8	8	0	0	0	63958	810	310	42	0.1
[redacted]														
14	N	76	3	3	73	34	0	0	0	73468	967	259	132	0.5
[redacted]														
17	Y	27	0	0	27	10	0	0	0	51205	1896	248	114	0.4
[redacted]														
20	N	76	2	1	74	12	0	0	0	143388	1887	80	50	1.0
21	Y	81	32	51	79	2	0	0	0	144068	1768	90	116	2.3
22	Y	71	2	0	69	5	0	0	0	124200	1749	20	226	12.5
23	Y	96	2	2	94	43	0	0	0	250031	2604	108	35	0.3
24	Y	61	21	15	40	11	0	0	0	123838	2032	90	103	1.1
25	Y	218	0	0	218	0	0	0	0	316812	1464	169	120	0.3
[redacted]														
27	Y	267	127	0	140	0	0	0	0	384512	1441	17	12	0.7
[redacted]														
29	N	28	0	0	28	0	0	0	0	63319	2133	322	767	2.4
[redacted]														
33	N	84	3	3	81	81	0	0	0	174480	2728	190	351	1.8
[redacted]														
36	N	66	0	0	66	66	0	0	0	197395	2239	219	410	1.9
[redacted]														
38	Y	146	7	7	139	139	0	0	0	232380	1592	458	495	1.1
39	Y	250	7	7	243	243	0	0	0	370881	1484	330	483	1.3
40	N	58	11	5	47	47	0	0	0	219531	3785	295	1082	3.6
[redacted]														
42	Y	78	2	0	78	17	0	0	0	149039	1911	285	721	2.5
[redacted]														
44	Y	158	0	0	158	68	0	0	0	456240	2888	563	558	1.0
[redacted]														
47	N	86	28	36	58	58	0	0	0	157650	1841	265	1581	5.4
[redacted]														
49	Y	430	0	0	426	0	13	13	0	1102852	2612	902	2036	4.1
[redacted]														
54	Y	67	13	13	54	54	0	0	0	141810	2117	300	636	2.1
[redacted]														
		124							Average	212954.7	1605.1	368.6	595.2	1.6
		563							Max	1104320	3785.0	1315	3575	12.5
		4							Min	2702	81.8	17	0	0.0
		6963	458		6471				Total	11,927,142				
									Count	56				

Appendix B, Attachment 1, Pg 2

18 Wkly Outbnd Lds	20 Wkly Outbnd Hrs	Outbnd Hrs/load	Facility I.D. Code	Wkly Offsite/stand Hrs	21 Ann. Hrs ColdStore	Total Wkly TRU Eng Hrs@Facil	22 OperHrsRfy	Facility/Fleet Category	23A NAICS	23B NAICS	23C NAICS	23D NAICS	23E NAICS	23F NAICS
108	10	0.1	1	10	0	10	0	Produce Distribution	424470					
157	47.9	0.1	2	29	0	29.4	0	Produce Distribution	424480					
180	85.5	0.2	3	39	0	39	0	Produce Distribution	424480					
147	16	0.1	4	48	4520	131	0	Produce Distribution	493110	484220	493110	493120		
459	55	0.1	5	59	0	69	0	Foodservice Distribution	484220	493120				
303	445	1.3	6	250	0	250	0	Produce Distribution	424480					
[redacted]														
248	303	1.2	8	357	0	357	1040	Produce Distribution	493120					
563	272	0.5	9	361		361	0	Foodservice Distribution	48-49	49312	49311			
120	158	2.6	10	653	0	653	0	Foodservice Distribution	424410					
363	448	1.2	11	658		658	0	Foodservice Distribution	424410	484220				
577	577	1.0	12	619	0	619	0	Produce Distribution	424480	[illegible]	493110			
[redacted]														
109	435	3.2	14	658		658	0	Foodservice Distribution	424400					
[redacted]														
214	623	2.9	17	735		735	0	Foodservice Distribution	493110	493120	493110			
[redacted]														
200	865	4.3	20	924		924	0	Foodservice Distribution	424410					
455	810	1.8	21	935	22400	1357	0	Dairy Distribution	311511					
107	616	5.8	22	941	480	950	0	Foodservice Distribution	424410	424470	424450	424440	424430	424420
302	962	3.2	23	955		925	424	Foodservice Distribution	424400					
694	554	4.6	24	997	3700	1006	14160	Foodservice Distribution	423440	424410	424420	424490		
372	872	2.3	25	1001		1001	0	Produce Distribution	454220					
[redacted]														
890	1125	1.0	27	1137		1137	0	Dairy Distribution	311511					
[redacted]														
187	439	2.3	29	1196		1196	0	Foodservice Distribution	424410	484220				
[redacted]														
250	1036	4.0	33	1397	0	1397	0	Foodservice Distribution	424410	484110	484220			
[redacted]														
315	1417	4.5	36	1827		1827	0	Foodservice Distribution	424410					
[redacted]														
640	1765	3.3	38	2293		2293	0	Foodservice Distribution	424410					
737	1845	2.5	39	2206		2206	0	Foodservice Distribution	424410	424470	424450	424440	424430	424420
350	1375	3.9	40	2307	0	2307	0	Meat Distribution	311612					
[redacted]														
828	2044	2.5	42	2806	0	2806	0	Produce Distribution	493120					
[redacted]														
500	2824	5.6	44	3132	0	3132	0	Foodservice Distribution	424410					
[redacted]														
410	2616	6.6	47	3607	0	3607	0	Dairy Distribution	493120					
[redacted]														
804	2260	2.8	49	4259	35040	4970	0	Meat Distribution	311615	484220	311613			
[redacted]														
1152	6910	6.0	54	6449	0	6448	0	Produce Distribution	424480					
[redacted]														

404.1	1369.3	3.1	1964.6	6915.2	2077
1292	6952	11.3	6761.0	99006	8881.615369
107	10	0.1	10.0	0	10
			110016	327,200	116,307.21
					5,047,974.80

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APPENDIX C

EMISSIONS INVENTORY UPDATE AND RESULTS

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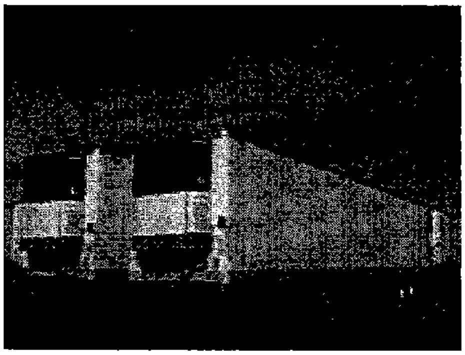
Appendix C: Emissions Inventory Update and Results



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I. EMISSIONS INVENTORY DEVELOPMENT FOR TRANSPORT REFRIGERATION UNITS

A. Overview

Diesel particulate matter (PM) is a significant public health concern throughout the state. In August 1998, the ARB identified particulate emissions from diesel-fueled engines as a toxic air contaminant. It is, by far, the largest contributor of known ambient air toxics cancer risk in California (ARB, 2009b).

Following the identification process, the ARB developed the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel Risk Reduction Plan) in September 2000, paving the way for the development of control measures designed to reduce toxic diesel PM emissions. Through this plan, staff identified strategies; including air toxics control measures and other regulations, to reduce diesel emissions by 75 percent by 2010, and by 85 percent by 2020. The goal of each regulation is to make diesel engines as clean as possible to reduce emissions and their associated cancer risk. The Transport Refrigeration Unit (TRU) regulation is a component of the Diesel Risk Reduction Plan.

Transport refrigeration units (TRUs) are diesel-powered refrigeration units that are installed on vehicles used in transporting produce, meat, dairy products, and other perishable goods. TRUs are found on refrigerated vans, trucks, trailers, railroad cars and containers. This technical appendix details the data and methods behind the emissions inventory developed for TRUs.

The original inventory was completed in 2003 to support the TRU Airborne Toxic Control Measure (ATCM) which was adopted in February 2004 and went into effect in December 2004. In-use standards went into effect the end of 2008. In November 2010, the Board requested staff analyze a number of options to potentially amend the 2004 regulation. To support an analysis of possible amendments to the TRU ATCM staff have updated the TRU emissions inventory. The updated inventory is based on previously unavailable data for population, activity, engine load, turnover practices, and emission factors.

The TRU inventory includes analysis of emissions from the following diesel sources:

- TRUs for trailers,
- TRUs on trucks and vans,
- generator sets used to provide electric power to electrically-driven refrigerated trailers or shipping containers,
- TRUs used in railcars or containers.

The updated emissions inventory inputs and their impact on the emissions inventory are described in detail throughout this appendix. Table 1 below provides an overview of these changes.

Table 1: TRU Emissions Inventory Update Summary

Population	The reporting database for TRUs, ARBER, has detailed information on the population of TRUs registered in California. Overall the California-based population is about 20 percent lower than projected in the original inventory. The number of out of state TRUs that operate daily in California also increased by a similar amount. The population recognized as visiting California from out of state annually increased significantly.
Activity	A facility survey in 2006 provided data from 6,600 TRUs on annual activity at distribution centers. Although TRU use is about 15 percent higher than previously estimated for each unit, staff also now attribute 22 percent of activity to other states. This led to an approximately 8 percent reduction for California-based TRU activity for each unit, relative to the original inventory.
Engine Load	Updated engine characteristics and control units and new information on engine performance led staff to decrease engine load factors by about 13 percent.
Growth	Data from ARBER and national sales information led to an updated growth estimate that is significantly slower than previously estimated. The updated growth more closely follows population growth, one to two percent annually.
Emission Factors	Emission factors now include Tier 4 final standards, which significantly reduce the inventory emissions estimates once Tier 4 final engines become a prominent portion of the population. Tier 4 final engines are expected to be available in 2013.

B. Methodology for Estimating Emissions

The PM and NOx emissions from TRUs, generator sets, and railcars are calculated using the following equation:

Equation 1:

$$\textit{Emissions in tons/day} = Pop * HP_{ave} * LF * Activity * EF$$

Where:

Pop is the number (population) of units generating emissions
HP_{ave} is the maximum rated average horsepower (hp) of the units
LF is the load factor associated with the units' activity, unitless

Activity is the measure of activity, often measured in hours, associated with each unit, usually within a time period
EF is the emission factor associated with each unit of activity and is usually proportioned by a unit's size (g/hp-hr)

This equation is performed on every model year of TRU in every calendar year.

For this updated inventory a 2011 base year population is projected into the future and backcast to estimate emissions for calendar years 2005 through 2020. Emissions are estimated for a business-as-normal case (baseline) and a scenario taking into account the impacts of the rule (with rule).

Since the original rulemaking inventory was developed a number of new data sources have become available. Staff have compiled this new information for each input from a wide variety of sources. Wherever possible, staff gathered multiple sources of data to compare and corroborate estimates. These new data and methods are described in the subsequent sections.

C. Emissions Inventory Inputs

Using newly available data sources, staff updated each and every input in the TRU inventory. These sources include the reporting database for TRUs, a survey of annual TRU activity by facility, engine manufacturer data on load, engine performance information, sales and recession data, updated emissions factors from the OFFROAD model (ARB, 2010a), and technical research from SAE and the National Renewable Energy Laboratory.

The previous emissions inventory for TRUs was released in October 2003 in support of the rule development for the Airborne Toxic Control Measure (ATCM) for diesel TRUs. The 2003 inventory relied largely on data collected from a survey of TRU manufacturers. Population, activity, load factor, horsepower, and survival rates were based on the survey results. Emission factors were based on the OFFROAD model emission factors for off-road diesel engines, but total PM emissions were reduced by 25 percent based on manufacturer's comment that TRU engines produced PM at a reduced rate compared to the average off-road engine at that time.

1. Baseline Population and Age

Due to the variety of applications and uses of TRUs, it is necessary to categorize TRUs by both application and horsepower. Staff used these categorizations because each category was determined to have one of more of the following unique characteristics: activity, average age, or engine load. These categories are shown in Table 2.

Table 2: TRU Categories and Bins

Category	Horsepower Bin	Principal Application or Use
California-based TRU	25-50	Trailers based in California.
California-based TRU	11-25	Refrigerated trucks used in California
California-based TRU	<11	Refrigerated trucks and vans used in California
Out-of-State TRU	25-50	Trailers used for long-haul or interstate commerce.
Generator sets	25-50	Trailers or containers based in California (generator sets provide electrical power to a non-integrated refrigeration unit)
Out-of-State Generator sets	25-50	Trailers or containers used for long-haul, interstate or international commerce.
Railcars	25-50	Refrigerated railcars or containers transported principally by rail.

a) Source: ARBER Reporting Database

Under the TRU ATCM, owners of TRUs based within California are required to report their TRUs to ARB, with an initial reporting deadline of July 31, 2009. Owners of TRUs that are based outside California may report their TRUs to ARB to facilitate travel within the state but are not required to do so. The TRU reporting database, ARBER, maintains a record of all the TRUs reported to ARB. The ARBER database provides a complete record of California-based TRUs from July, 2009, to the present, and a partial record of TRUs that entered the state but were not based in California.

For each TRU, the ARBER database includes information on the model year of the unit, the model year of the engine within the unit, and actions taken such as retrofitting the unit with a filter or replacing the engine. The database does not include information on annual activity, the amount of fuel used, or the load factor. The ARBER data can therefore be used to analyze population and age distributions, but not activity.

ARB staff queried the ARBER database on March 3, 2011, and the results of that query were used as a primary input for the population and age distribution of the TRUs contributing to the emissions inventory. Any reports or updates after March 3, 2011, were not reflected in the inventory.

b) Analysis

The TRU ATCM, while requiring owners of TRUs based in California to report to ARBER, does not require them to change the records associated with TRUs that have been retired since reporting. ARB staff has recently contacted users in regard to changing the records associated with TRUS that are no longer active, but the impact of these changes were not available at the time staff begun their analysis. The population analysis described above is based on a data query of March 2011 – 1-1/2 years after the reporting deadline. Due to normal turnover, which is a measure of the number of vehicles leaving a fleet, a number of TRUs in the database likely have been retired. Therefore, staff performed a series of adjustments to derive from the ARBER data the population of TRUs that would still be actively operating in California. The adjustments remove the impacts of the TRU ATCM and recession on California sales and retirements. Staff performed the following steps, in order, to perform this analysis.

(1) ARBER Query

Staff first queried the ARBER data base for all reported fields for both TRUs and generator sets. The primary fields that were used were the engine model year and the model year of the unit itself. The unit model year corresponds to the year of manufacturer of the entire unit. For example, if a model year 2004 diesel engine was placed in a refrigeration unit of model year 2005, the engine model year would be 2004 and the unit model year would be 2005. The engine model year and the unit model year are often not identical, and one does not necessarily always precede the other.

(2) Missing or Incomplete Data

The engine model year was the principal field used to determine the age and therefore tier and emission factor for each TRU. If the engine model year was not entered or appeared to have been entered improperly, the unit model year was used as the engine model year. For example, where an engine model year was missing but the unit model year was 2004, the engine model year was assumed to be 2004 as well. For California-based TRUs, there were approximately 535 cases where the engine model year was not entered.

If neither the unit model year nor the engine model year were valid, staff assumed that the TRU was manufactured in 1985, as 1985 units are the oldest units seen in the inventory. For California-based TRUs, only four records existed with neither a unit model year nor an engine model year.

(3) Engine Replacements with Newer Engine Models to Meet Regulatory Requirements

Because reporting was not required until the TRU ATCM requirements were in progress, it is inevitable that the ARBER database reflects, in part, the impact of the ATCM on the TRU populations. If a TRU owner indicated the installation of verified diesel emissions control strategy (VDECS) to comply with the 2004 ATCM, staff assumed that the action would not have occurred without the regulation and that the TRU would not otherwise be altered or have a model year different than was reported. However, if a TRU owner replaced his/her TRU engine with a newer engine to comply, the engine model year reported does not reflect the normal course of business. Staff adjusted the data to account for these events.

To determine a baseline inventory population, staff adjusted the population as reported in ARBER to "undo" engine or replacements that are likely to have occurred to meet the ATCM requirements. The following criteria were used to determine whether an engine replacement was performed to comply with the ATCM:

- The initial emissions reduction requirement for the ATCM that ARB enforced (ARB, 2011) was the December 31, 2009, requirement to control all units with effective model year 2002 and earlier. As such, an engine replacement to anything older than a 2002 engine would not have provided any regulatory benefit. For example, replacing a 1990 engine with a 2002 engine in a 1990 unit would provide no compliance benefit, since both 1990 and 2002 engines had the same initial compliance date. Staff therefore modeled only 2003 and newer engine replacements as being actions taken to comply with the ATCM.
- Engine replacements were attributed to compliance purposes only if the engine model year was more than 2 years newer than the unit model. TRU engines are commonly placed in units one or even two years earlier or later than their year of manufacture. In the ARBER database, approximately 1,670 TRU engines with model years 2005 to 2010 were installed in units one to two years older than the TRU engine. It is unlikely these units are engine replacements performed for compliance purposes, as the owner would only have delayed their requirements by one or two years with such an engine replacement.

Example: A 2002 TRU with a 2008 engine was assumed to have replaced its engine to comply with the regulation, and in the baseline emissions inventory, would be assumed to have a 2002 engine.

(4) Retirements Not Reported to ARBER

Owners of TRUs reported in ARBER, regardless of whether the TRU is based in California or not, are not required to remove record of these TRUs from ARBER upon retirement. One can reasonably assume that some of the TRUs registered in ARBER as of March 2011 have been retired. One can also assume that the record associated with the retired unit may not have been updated in ARBER; if not the ARBER database would indicate that the unit was still in service.

Staff addressed this discrepancy by modeling the likelihood of turnover in the ARBER population between the date on which the unit was first registered in ARBER and the date on which staff queried the ARBER database (March 2011). Effectively, this adjustment estimated the likelihood that a TRU owner would have retired or sold a particular unit after they registered it in ARBER but before ARB staff queried the corresponding record from ARBER. For perspective, a 20-year-old TRU registered in March 2009 had a significant chance of being retired in the subsequent two years before staff queried the data in March 2011. Alternatively, a 2 year old TRU registered in January 2011 had a relatively low chance of being retired between January 2011 and March 2011. Thus the likelihood assigned by staff for a unit still being in use as of March 2011 would be much lower for the first unit than for the second.

Table 3 shows the survival curve that was associated with TRUs in the earlier inventory. (This curve was slightly modified later after the population had been estimated, but the modifications were not significant. An initial survival curve needed to be applied to estimate the population, which could then be used later to validate the survival curve.) Each row shows the likelihood of a particular unit remaining in use after a particular period of time.

Table 3: Previous Inventory Survival Curve for TRUs

Age	Survival Rate
0	100%
1	98%
2	97%
3	95%
4	92%
5	90%
6	87%
7	83%
8	80%
9	75%
10	67%
11	59%
12	49%
13	38%
14	26%
15	12%
16	8%
17	5%
18	3%
19	2%
20	0%

Because some retirements were reported, ARB staff did not fully apply the retirement curve shown in Table 3 to those units still registered in ARBER. The ARBER database did indicate that some retirements, or removals from service in California, had been reported. As of March 2011, ARBER users had reported over 1,700 such removals. Staff actually applied a reduced retirement curve to the units registered in ARBER, reducing the likelihood that the unit would have been retired within the time period by 15%. For example, a three-year old unit that had been registered in ARBER exactly one year before the query, without the adjustment, would have a (95%/97%=) 97.9% likelihood of still being in use at the time of the query. This is equivalent to a 2.1% likelihood that the unit registered at age two would still be active at age three. ARBER data showed that some users actually did change the status of their units within ARBER upon retirement, and staff reduced this factor by 15% (to 1.8%). Staff determined this adjustment factor after interviewing the parties associated with the largest fleets registered in ARBER and examining individual records more closely. In the earlier example, the likelihood would have been reduced from 37.5% to 31.9%.

Staff applied the following equation to each TRU record:

Equation 2:

$$Retirement = 1 - (Survival_{query}) / (Survival_{register})] * Adj_{unreported}$$

Where:

Retirement is the likelihood that a TRU of a specific model year would have been retired under the normal course of business during the period between the date on which the TRU was registered in ARBER and the date on which staff extracted data from ARBER

$Survival_{query}$ is the likelihood that a TRU of a specific model year would be in service when ARB staff queried ARBER (March 2011).

$Survival_{register}$ is the likelihood that a TRU of a specific model year would still be in service at the time that TRU was registered in ARBER

$Adj_{unreported}$ is an adjustment factor included to account for those retired units for which the registration was adjusted properly in ARBER by the unit's owner. This factor is set at 85% (or 100%-15%).

Again, staff used the survival curve from the earlier inventory for TRUs for this analysis, since the adjustment needed to be made before the survival curve could be estimated with the ARBER data (this is described later). Comments from industry had also indicated that the survival curve for an individual unit was unlikely to have been significantly affected by the recession.

Although the earlier inventory's survival curve was capped at 20 years, the ARBER database indicated that a number of TRU owners kept TRUs in service beyond 20 years. To account for these, staff allotted to these units a survival chance equivalent to that between the 18^{th} and 19^{th} year (the last anticipated year of use) of the previous survival curve.

Example: A TRU that was registered in March 2009 as being 9 years old at the time would be 11 years old if still active in March, 2011. Staff would apply **Equation 2** to that TRU, or,

[1 - (Survival at 11 years: 59%) / (Survival at 9 years: 75%)] * 85% = 18%

Staff modeled this particular TRU as having an 18% chance of being retired in the normal course of business between March 2009 and March 2011.

(5) Sales and Retirements Through 2011

The ARBER query used for the emissions inventory was run on March 3, 2011, supplying information on population in the middle of a calendar year. To provide a baseline 2011 population, staff projected this midyear population to the end of 2011. Sales data, discussed further in section I.C.5, project that approximately 2,400 TRUs will be sold in California in 2011. The March 3, 2011, inventory included approximately 850 TRUs with engine model year 2011. To match the projected sales, staff modeled an additional 1,550 TRUs turned over to 2011 units. These 1,550 units were removed from previous model year populations according to their relative likelihood of being retired using the earlier inventory's survival curve, shown in Table 3.

This adjustment was separate from that used to estimate retired units that needed to be removed from the registry. The adjustment in section (4) brought the database forward in time from the date of registry for each record to the time of the query (March 3, 2011). The adjustment described in this section brought the database forward in time from the data of the query (March 3, 2011) to the end of 2011, to ensure that a shortened year of sales was not mistakenly accounted for as a full year.

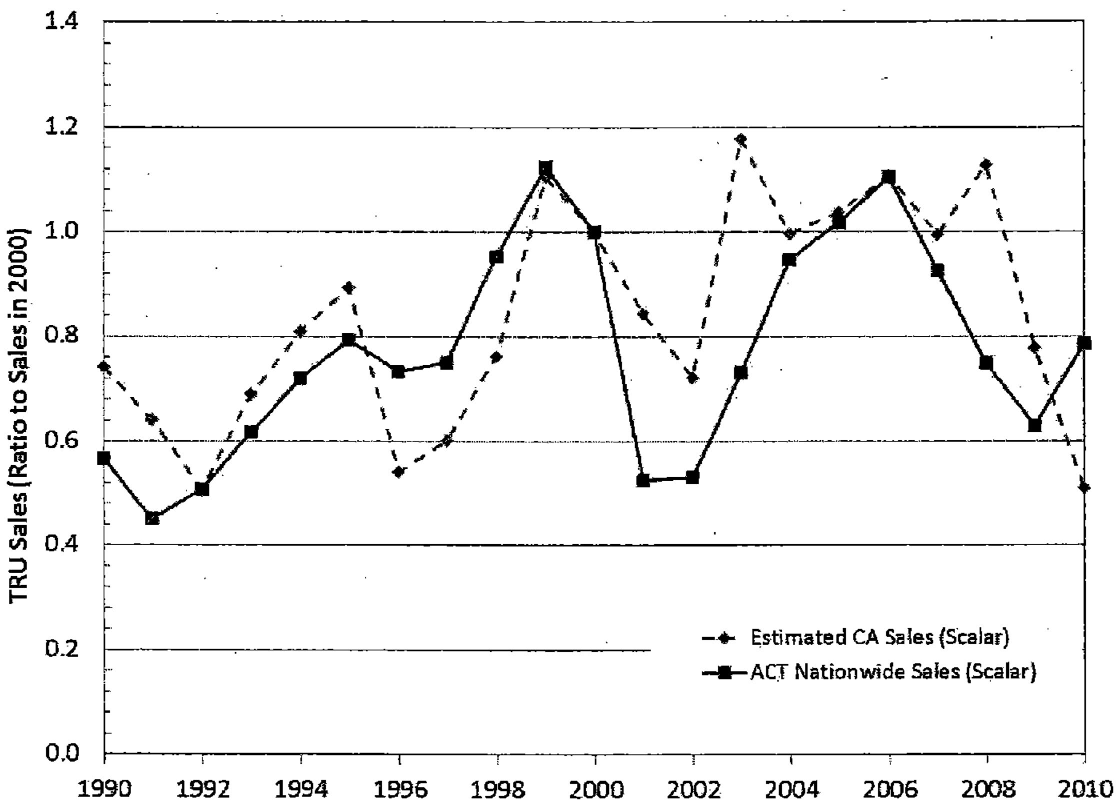
(6) Sales in 2008 to 2010 to Meet Regulatory Requirements

In addition to the engine replacements and engine retrofits that have been discussed, TRU owner also have the ability to comply by replacing entire units. The replacement units would be registered in ARBER at the time of the staff's query, but the units replaced by the new units, those that might have continued to operate in California had the ATCM not encouraged the unit replacements, would not. At the same time, not all unit replacements likely occurred in response to the rule. So staff needed to estimate the number of replacements that could be attributed primarily to the 2004 ATCM.

To this end, staff used the relationship between nationwide unit sales and the sales estimated for California (which are described in a later section) to estimate the number of sales likely to have resulted from the regulation in 2008 and 2009. In addition, staff looked at the number of sales that may not have occurred in 2010 as a result of the uncertainty surrounding the rule. The 2004 ATCM was amended at the November 2010 board meeting to account for the lack of availability or certain equipment, and industry members may have been waiting to hear the decision of the Board before adopting a compliance strategy.

To estimate the number of TRUs that would have been purchased from 2008 to 2010 in the normal course of business, staff compared the trend in estimated California sales against the trend in national refrigerated trailer sales (ACT, 2011). Staff assumed that if the trend in California sales had followed the trend in national sales in most years, but not from 2008 to 2010, the difference could be attributed to the impact of the regulation. Figure 1 shows the relation between nationwide sales, as estimated by ACT Research, and California sales, which are explained more thoroughly in a later section. (ACT Research is an independent organization that collects proprietary data from the trucking industry and provides that data to its subscribers. ARB purchased data from ACT Research as part of the inventory update process.)

Figure 1: California and National TRU Sales Trends



From 1990 to 2007, in 14 of the 17 annual periods, the trend in estimated California sales (either increasing or decreasing) matched the trend in national sales, in direction if not exact magnitude. In 2008 and 2009, the California estimated sales exceed the trend in national sales, and in 2010, the California sales are significantly below the trend seen in the national data. Staff assume that both trends resulted from the TRU ATCM's impact on California sales. Sales in 2008 and 2009 increased relative to US sales as owners tried to comply with the ATCM, sales in 2010 decreased relative to US sales as owners awaited the clarification of the options available.

To estimate the magnitude of the impact had by these circumstances, staff reviewed ARBER data to compare TRU unit model year with the trailer vehicle identification number (VIN) reported for that TRU, looking for TRUs of model year

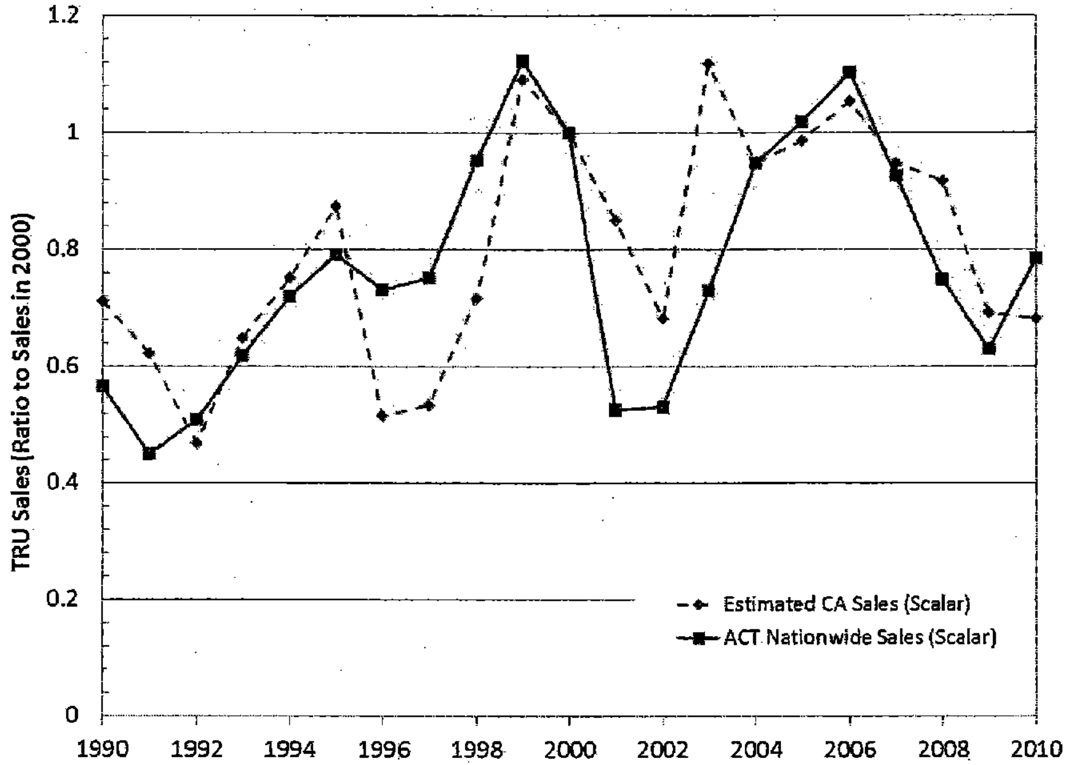
7 years newer than the trailer. Such would occur if a TRU paired with an equivalent model year trailer (for example, a 2001 TRU in a 2001 trailer) was replaced with a new TRU in 2008, per the TRU ATCM. Approximately 600 TRUs had a trailer VIN issued seven years prior to the TRU engine model year reported.

Because the nationwide sales data from ACT supported the assumption that the regulation had increased California sales in 2008 and 2009, but the previous years did not support a 100 percent correlation between California and national sales, staff assumed that the pattern exhibited in ARBER, namely that of 600 engines being seven model years newer than the units in which they were placed, represented the owners who had chosen to replace their units entirely to comply.

As the difference in TRU sales in California compared to national sales was three times larger in 2008 (18%) than in 2009 (6%), three regulation-induced unit replacements were assumed to have occurred in 2008 for each one that occurred in 2009. Staff distributed these 600 units among the pre-2002 population (those facing a compliance requirement). To do this, for every model year 2008 or 2009 unit that was "removed", staff added a unit from a pre-2002 year, the specific year being related to the distribution of the pre-2002 model year engines still registered in ARBER.

To remove the impact of the uncertainty surrounding the rule on sales in 2010, staff increased 2010 sales. As the 2008 and 2009 sales were not reduced to completely match the national data due to the ARBER query, the 2010 sales were not increased to match national sales, but were proportioned equivalently to the decrease in 2008 and 2009. After adjustment to remove the impact of the regulation, California sales would be closer in 2008 and 2009 to the national trend; staff assumed that the adjustment to the sales trend in 2010 would be of similar impact to California sales in comparison to the national trend. In both cases, sales in California approached the sales anticipated from nationwide data but did not quite reach that level. Using the same proportional as the assumed sales decrease in 2008 and 2009, staff increased sales in 2010 by 570 units to account for the uncertainty of the rule on the sales in 2010. The California sales adjusted to represent the baseline model are shown in Figure 2.

Figure 2: Adjusted California and National TRU Sales Trends



(7) Reporting Non-Compliance

To determine the percent of TRU owners operating within California that did not comply with the TRU ATCM reporting requirements, ARB staff reviewed the logs of TRU inspections by ARB enforcement personnel. The results of this analysis are shown in Table 4 below.

Table 4: TRU Inspections and Citations

TRU Inspections:	811
Assumed portion of Inspections on California-based TRUs (ARB, 2003)	75%
Assumed Registrations Required of Inspected TRUs	608
Non-registered TRUs	19
Reporting Non-Compliance Rate	3.12%

Enforcement logs showed that 3.12% of California-based TRUs inspected were not registered in ARBER. Therefore staff increased the population as reported in ARBER by 3.12% to account for those that have not registered.

c) California-based TRU Population

To estimate the number of California-based TRUs, staff considered two methods of estimating the populations. With the first, staff could use the state of address associated with each record to determine the number of address in California. With the second, staff could use the state of license associated with each unit to determine the location of its primary residence. As to the first method, 36,231 units had a California-based address associated with them; for no units was this field left incomplete. As to the second method, 33,803 units were listed with a state of registration as California; however, 5,471 units were registered with this field being incomplete. Staff attempted to assign those with incomplete fields in proportion to those with completed fields, bringing the population estimate to 35,742 California-registered units. These numbers were close to one another. Staff chose to use the first number, which was associated with the address, in part because that field was filled more accurately and in part because many units are used exclusively in the vicinity of the owner's operations.

The results of this analysis are shown below in Table 5.

Table 5: California-based TRU Population Query Results

Method	California TRUs	Unknowns or No Entry	Adjusted TRU Population	Total Population of TRUs Registered
State of Address	36,231	-	36,231	100,812
State of License	33,803	5,471	35,742	100,812

Table 6 shows the population distributions that demonstrate the effect of the adjustments made on ARBER data for California-based TRUs.

Table 6: California-based TRU ARBER Query and Adjustments

Model Year	ARBER Query Result	Engine/ Unit Replace-ments Removed	Ongoing Turnover Modeled	Population Projected to End of 2011	Remove Reg Impact in 2008 to 2010	Non-Reporting Adjustment
2011	1,335	845	845	2,393	2,393	2,470
2010	2,412	1,460	1,448	1,437	2,007	2,072
2009	4,569	2,229	2,192	2,165	2,011	2,076
2008	4,375	3,175	3,097	3,072	2,612	2,696
2007	4,025	2,773	2,667	2,634	2,624	2,709
2006	3,084	2,985	2,873	2,823	2,810	2,901
2005	2,717	2,672	2,565	2,530	2,511	2,592
2004	2,466	2,485	2,352	2,296	2,283	2,357
2003	2,307	2,788	2,641	2,534	2,514	2,595
2002	881	1,605	1,493	1,426	1,408	1,454
2001	1,039	1,835	1,615	1,512	1,590	1,642
2000	1,070	2,045	1,744	1,596	1,667	1,721
1999	1,122	2,160	1,754	1,545	1,596	1,648
1998	836	1,510	1,150	916	902	931
1997	571	1,056	697	609	565	583
1996	547	995	521	447	445	460
1995	719	1,182	683	580	592	611
1994	429	734	450	393	382	394
1993	259	455	269	235	231	238
1992	153	241	145	127	123	127
1991	154	240	138	120	122	126
1990	141	194	114	99	100	103
1989	79	143	81	71	71	73
1988	105	140	80	70	71	74
1987	61	86	52	45	44	46
1986	38	66	38	33	33	34
1985	28	38	23	20	19	20
Pre-1985	709	96	17	15	15	15
Population	**36,231**	**36,233**	**31,743**	**31,743**	**31,743**	**32,767**
Average Age	**6.6**	**8.1**	**7.4**	**6.8**	**6.8**	**6.8**

The left-most column in the preceding table represents the data pulled directly from ARBER, while the right-most column represents the baseline truck/trailer TRU population staff estimates would exist in the absence of the regulation. This baseline population in the right-most column accounts for all the adjustments discussed above. The results show that in calendar year 2011, in the absence of the regulation there would have been 32,767 units with an average age of 6.8 years. This average age is slightly older than 6.6 year average age reported to ARBER since the replacement engines have been removed for the baseline inventory, but not so much older since staff has also removed records for those units likely no longer active. Those units likely no longer active would tend to be older.

d) Out-of-State TRU Population

Out of state TRUs are defined as those units that are not registered within the state but operate a fraction of their time within California. Since out-of-state TRUs do not face mandatory reporting requirements, ARBER data cannot be used to directly provide a population of TRUs visiting from out-of-state. ARBER can provide a lower bound for the population, however. Using the state of address to query the database, there were approximately 64,600 TRUs registered in ARBER from out-of-state.

To estimate the actual number of out-of-state TRUs, staff compared the TRU population to the 2010 In-Use On-Road Rule inventory for California-based and out-of-state trucks (ARB, 2008). The On-Road Rule inventory contains a population for calendar year 2011 of approximately 530,000 out-of-state heavy-duty diesel tractors that enter the state annually, and 133,300 heavy-duty diesel tractors that operate principally within the state. Based on the assumption that refrigerated goods generally travel interstate with the same relative traffic patterns as overall goods movement, staff used the ratio between California-based and out-of-state trucks, along with estimated population of California-based TRUs, to estimate the number of out-of-state TRUs that visit California at least once annually. Staff did discuss this assumption with industry members at a workgroup in April 2011, and industry members said that the assumption sounded reasonable.

Applying the ratio (530,000 divided by 133,300) to the California-based population of refrigerated trailers produces a net population of 102,500 out-of-state TRUs. (Note that for this analysis, the California-based population of TRUs associated with trailers, or those between 25 and 50 horsepower, was used, and not TRUs associated primarily with refrigerated trucks or vans. This population is discussed further in Section I.C.2)

While ARBER does not account for all out-of-state TRUs it can be used to determine the age distribution of those units. Staff queried and adjusted the out-of-state population using the same methods described in section I.C.1.b. Table 7 shows the population as scaled from ARBER and the impact of the adjustments.

Table 7: Out-of-State TRU ARBER Query and Adjustments

Model Year	ARBER Query Result	Unit/Engine Replacements Removed	Ongoing Turnover Modeled	*Population Projected to End of 2011*
2011	7,504	6,843	7,118	*10,603*
2010	9,435	8,666	8,954	*8,836*
2009	11,434	9,101	9,327	*9,139*
2008	8,346	7,826	7,956	*7,846*
2007	13,759	12,975	13,035	*12,758*
2006	15,032	14,871	14,939	*14,502*
2005	14,161	14,180	14,225	*13,898*
2004	10,178	10,415	10,316	*9,906*
2003	8,893	10,192	10,031	*9,351*
2002	1,768	2,280	2,207	*2,040*
2001	457	1,693	1,595	*1,424*
2000	331	780	715	*613*
1999	396	899	786	*628*
1998	178	432	362	*238*
1997	99	278	217	*171*
1996	80	308	186	*141*
1995	135	254	178	*133*
1994	105	167	120	*95*
1993	75	118	87	*69*
1992	40	57	44	*35*
1991	22	41	28	*22*
1990	24	41	28	*22*
1989	18	29	21	*17*
1988	37	40	28	*22*
1987	8	13	9	*7*
1986	6	6	5	*4*
1985	8	22	15	*11*
1984	8	10	7	*5*
Population	**102,536**	**102,536**	**102,536**	***102,536***
Average Age	**4.5**	**4.9**	**4.8**	***4.6***

The results show that in calendar year 2011, in the absence of the regulation the TRUs visiting California would represent would have been 102,536 units with an average age of 4.6 years. To determine if the average age was reasonable in comparison to the California-based TRU population which had an average age of

6.8, staff reviewed the truck and bus inventory for heavy duty diesel tractors and out-of-state tractors. California-based tractors had an average age of 7.9 years, while out-of-state tractors had an average age of 3.9 years. This compares to an average of 6.8 years for California-based TRUs and an out-of-state average age of 4.6 years. Overall, this supports the finding that TRUs traveling from out-of-state should be significantly newer, on average, than California-based TRUs. Thus staff scaled the model year distribution of the out-of-state TRU population registered in ARBER to represent the estimated population visiting California from out-of-state, using the ratio from the Statewide Truck and Bus inventory as described. (Recall that registration in ARBER for out-of-state TRUs visiting California is optional, and thus ARBER is not expected to represent a complete list.)

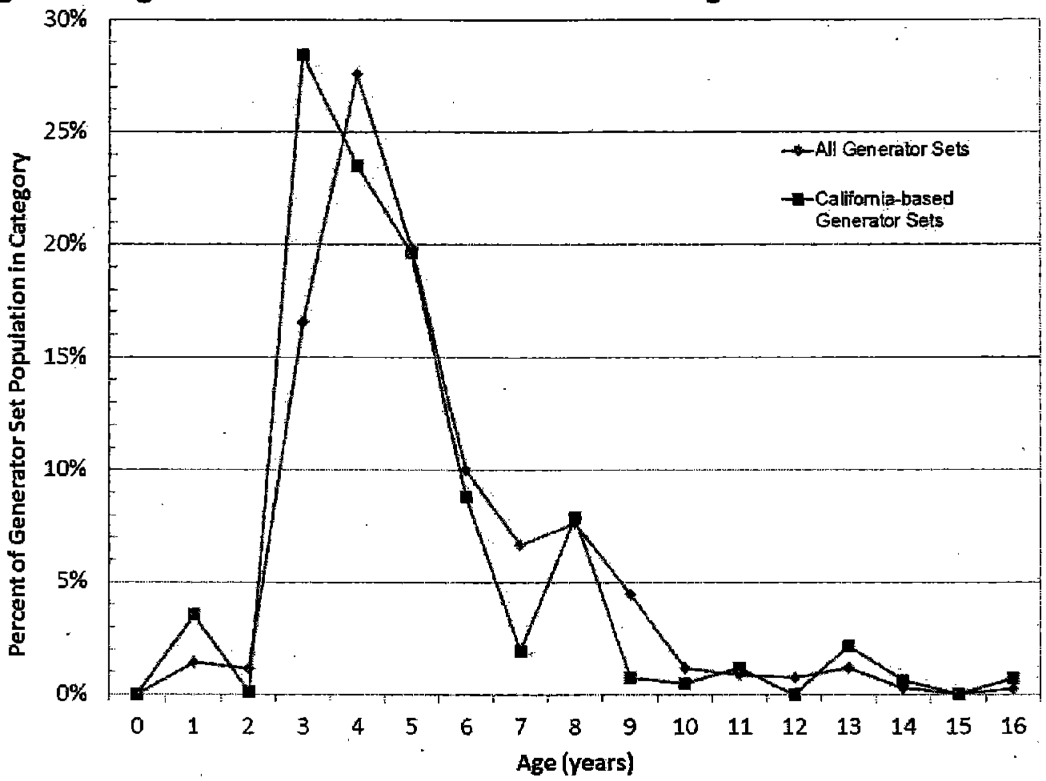
e) Generator Set Population

Generator sets face the same reporting requirements and exemptions as TRUs. That is, generator sets based in California must register in ARBER, while those visiting from out-of-state are not required to do so but may register voluntarily. Staff queried ARBER for the California-based generator set population and performed the same adjustments described for California-based TRUs, except that no adjustment was made to remove the impacts of the regulation, due in part to the relatively lower average age of generator sets and therefore reduced impact of the regulation, and a lack of any data suggesting an impact due from regulatory requirements. Similarly, no adjustment was made for noncompliance with the reporting requirements as, unlike TRUs, no data suggested a noncompliance rate.

A query of generator sets in California using state of address as the identifier produced 6,650 California-based units. Using the same ratio from the truck and bus inventory applied to trailer-based TRUs, staff estimated a total of 26,450 generator sets visiting California from out-of-state on annual basis.

Instead of developing separate age distributions for California-based and out-of-state generator sets, staff queried California-based generator sets as well as the entire population of generator sets and compared the age distributions. This analysis is shown below in Figure 3.

Figure 3: Age Distribution of California vs All Registered Generator Sets



As shown in Figure 3, the age distributions of both groups were sufficiently close to each other. Thus staff modeled generator sets with a single age distribution. This age distribution and population, and the impacts of the adjustments on generator sets, are shown in Table 8.

Table 8: Generator Set ARBER Query and Adjustments

Model Year	ARBER Query Result	Unit/Engine Replacements Removed	Ongoing Turnover Modeled	Population Projected to End of 2011
2011	2	2	2	2,498
2010	471	465	490	476
2009	376	374	390	373
2008	5,480	5,475	5,631	5,465
2007	9,140	9,135	9,255	8,837
2006	6,587	6,585	6,652	6,237
2005	3,318	3,319	3,349	3,185
2004	2,210	2,208	2,187	2,001
2003	2,537	2,538	2,502	2,140
2002	1,481	1,482	1,443	1,210
2001	394	394	361	278
2000	291	296	257	178
1999	254	254	207	118
1998	393	396	293	79
1997	97	102	67	37
1996	13	14	8	4
1995	77	80	35	16
1994	0	0	0	0
1993	2	2	1	0
1992	13	13	7	4
1991	6	6	3	2
1990	0	2	1	1
Population	**33,140**	**33,140**	**33,140**	**33,140**
Average Age	**5.27**	**5.28**	**5.17**	**4.63**

f) Railcar Population

Based on data from the UMLER railcar database and a conversation with Railinc, the database manager (Moran, 2011), staff learned that the western US rail lines that operate within California maintain an inventory of 7,900 refrigerated railcars. However, only 990 railcars were registered in ARBER as of March 3, 2011. Based on discussions with rail line operators, staff determined that very few of the railcars operating in California have been reported. Therefore, staff relied on data provided by UMLER.

To determine the age distribution, staff relied on the out-of-state TRU populations since both engage in long-haul and interstate transportation of refrigerated goods.

g) Population and Age Distribution Comparison

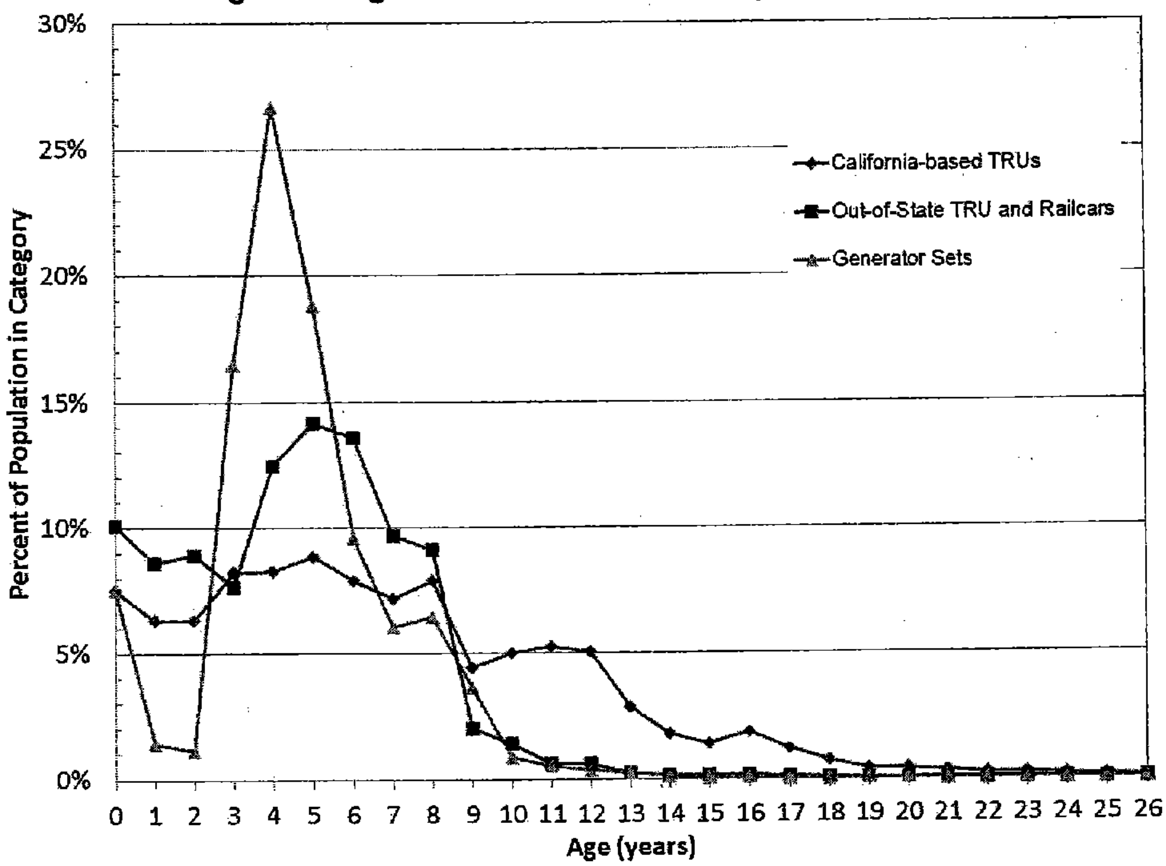
In total, staff estimate that 176,300 units, California-based or visiting from out-of-state, would be subject to the TRU ATCM, split between the categories shown below in Table 9. As discussed further in the regulatory modeling and impacts, not all TRUs will face regulatory requirements prior to turnover that would have occurred during the normal course of business.

Table 9: TRU Population Totals by Category

Category	Total Annual Population
Out-of-State TRUs	102,500
California-based TRUs	32,800
Out-of-State Generator sets	26,500
California-based Generator Sets	6,700
Railcars	7,900
Total	**176,300**

The age distributions by category are shown in Figure 4, with California-based and out-of-state generator sets combined, and railcars combined with out-of-state TRUs.

Figure 4: Age Distribution of TRUs by Category



2. Horsepower

When an owner of a TRU registers in ARBER he selects a field that indicates whether his TRU is "Over 25 Horsepower" or "Under 25 Horsepower". Unfortunately, the reported engine model often did not match the reported engine size.

For example, ARBER registrants often incorrectly categorized two of the most common engine models used in TRUs:

- Yanmar TK486, a four cylinder engine used in the ThermoKing SB200, SB300, and SB400 TRU lines, with 34 horsepower (Yanmar, 2008),
- Kubota V2203, a four cylinder engine used in the Carrier Transicold Ultra XT, XTC, and other prominent Carrier TRU models, with 32 to 36 horsepower, depending on application (Kubota, 2008).

ARBER registrants often mistakenly categorized the engine as being less than 25 horsepower when registering one of those models. Thus staff classified the engine models directly by size and categorized them according to the necessary bins for later modeling rather than using the ARBER registry directly.

To accurately determine the horsepower of engines reported in ARBER, staff queried each entry for the reported engine model and unit model. Some models are shown in Table 10. Staff then searched for matches with the most common TRU models, including the following.

Table 10: TRU Models Used to Identify Horsepower

Manufacturer	Unit Model	Engine Model
ThermoKing	SB190, SB200, SB210, SB300, SB400, SBIII	Yanmar TK486
Carrier	Ultra, Ultra XT, Ultra XTC, Ultima, Phoenix Ultra	Kubota V2203
Carrier	Supra 644, 650, 744, 750, 850, 944	Kubota D722
Carrier	Supra 550	Kubota Z482
ThermoKing	MD100, MD200, MD300, TS500, MDII	Yanmar Tk370, Tk374, TK376
ThermoKing	TS200, TS300, TS500	Yanmar TK374, Tk376

Using these data, staff matched 93 percent of the engines reported with a known unit or engine model. Staff then applied the manufacturer's specified horsepower to that entry (ThermoKing, 2011b, Carrier 2011c). Table 11 shows the horsepower distribution for the modeled 2011 California-based population that resulted from this analysis.

Table 11: Horsepower Bins and Population for California-based TRUs

Horsepower Bin	Population	Average Horsepower	Share of Population
25-50	25,659	34.0	78.6%
11-25	6,751	14.1	20.7%
>11	245	9.0	0.8%

Because engines with less than 25 horsepower are used primarily for local deliveries or trips of shorter length, staff modeled all out-of-state TRUs, generator sets, and railcars as being in the 25-50 horsepower bin.

Staff estimated the engine size of generator sets using previous work performed in surveying TRU and generator set manufacturers (ARB, 2003). Staff estimated the average engine size of generator sets at 31 horsepower.

3. Activity

Between 2006 and 2009, 80 facilities within California participated in a survey to track the activity of TRUs under control of the facility. Staff used the responses of 56 facilities to analyze the activity at the facilities; the 56 facilities were selected for reasons discussed in Appendix B. The majority of survey data related to activity in calendar year 2005, though some related to later years. Because industry members indicated at a workgroup meeting that activity per unit did not vary much across years, staff combined these data for analysis.

Activity at the facility was aggregated by total hours, and total number of trailer and trucks under the facility control during the survey period. In all, activity data for 6,963 TRUs were collected, split between trailers and refrigerated trucks. Table 12 provides data from the facility survey. Although nineteen container units were included in the survey, staff did not use these results to determine railcar or generator set activity, as the sample size was considered insufficient.

Table 12: Facility Activity Survey

Distribution Facility Type	TRU	Trailer	Trucks	Annual Hours
Dairy	267	140	127	384,812
Dairy	81	29	52	144,868
Dairy	96	58	38	157,560
Foodservice	27	27	0	51,265
Foodservice	31	30	1	35,069
Foodservice	61	40	21	123,935
Foodservice	66	66	0	187,395
Foodservice	96	94	2	250,031
Foodservice	76	74	2	143,388
Foodservice	217	217	0	470,798
Foodservice	64	61	3	174,460
Foodservice	250	243	7	370,881
Foodservice	94	94	0	159,317
Foodservice	159	153	6	271,752
Foodservice	71	69	2	124,200
Foodservice	22	22	0	33,020
Foodservice	76	73	3	73,466
Foodservice	158	158	0	456,240
Foodservice	146	139	7	232,380
Foodservice	25	25	0	53,319
Grocery	198	198	0	201,135
Grocery	113	113	0	95,558
Grocery	80	80	0	136,006
Grocery	286	286	0	143,729
Grocery	97	97	0	158,256
Grocery	73	73	0	146,173
Grocery	17	17	0	17,100
Grocery	85	85	0	59,540
Grocery	115	115	0	110,176
Grocery	235	235	0	274,010
Grocery	301	300	1	349,800
Grocery	70	70	0	81,620
Grocery	563	544	0	1,104,320

Distribution Facility Type	TRU	Trailer	Trucks	Annual Hours
Grocery	218	218	0	316,912
Grocery	218	218	0	316,912
Grocery	35	32	3	55,848
Grocery	122	122	0	168,290
Grocery	87	87	0	59,675
Grocery	35	35	0	86,240
Grocery	162	162	0	399,168
Grocery	415	415	0	1,022,560
Grocery	126	126	0	446,004
Grocery	67	67	0	49,049
Grocery	52	52	0	93,851
Meat	58	47	11	219,531
Meat	439	426	0	1,102,852
Produce	19	15	4	32,019
Produce	59	17	42	51,480
Produce	78	76	2	149,039
Produce	4	4	0	10,560
Produce	79	8	71	63,959
Produce	28	4	22	16,421
Produce	28	23	5	29,769
Produce	33	20	13	2,702
Produce	67	54	13	141,810
Produce	218	218	0	316,912
Totals	**6,963**	**6,471**	**458**	**11,927,142**

a) Analysis

The total annual hours at each facility included the hours from refrigerated trucks as well as trailers. While staff considered using an average activity and applying it to all TRUs, feedback from industry stakeholders suggested that activity for refrigerated trucks would likely be lower than activity from TRUs used on trailers. To disaggregate the total hours between trucks and trailers, staff analyzed the data for those facilities with both trucks and trailers. For these 24 facilities, staff used a linear regression (or method of least squares) to determine if there was a statistically significant relationship between the activity allocated to trucks and the activity allocated to trailers at a facility.

The linear regression returned an R-squared value of 0.93, demonstrating a strong relationship between the distribution of trucks and trailers and the total activity. The estimated values for trucks and trailer activity from the linear regression analysis are shown below in Table 13.

Table 13: Truck and Trailer Average Activity from Joint Facilities

Type	Activity (hours/year)
Trailer	1,514
Truck	1,360

While this analysis included all the facilities that had reported trucks in the survey, a number of facilities had reported only trailer TRUs. Staff took a unit-weighted average between the trailer activity from the joint facilities and the trailer-only facilities. This analysis is shown below in Table 14.

Table 14: Trailer TRU Unit Weighted Average Activity

Type	Activity (hours/year)	TRUs
Trailer (Joint Facility)	1,514	1,799
Trailer (Trailer-only Facility)	1,768	4,672
Weighted Average Activity	**1,697 hours/year**	

A number of the facilities that responded had registered their TRUs in ARBER. Using the average age of the facility determined from ARBER, and the activity average for that individual facility from the survey, staff analyzed the relationship between TRU age and annual activity at each facility. The analysis showed no statistically significant relationship.

Additionally, staff considered the impact the global economic recession on TRU activity. At an industry workgroup meeting in April 2011, staff discussed this possibility and received consistent feedback from TRU industry representatives that, although the recession had changed some business practices (such as purchasing fewer new TRUs), the average activity per TRU had not been significantly impacted by the recession.

b) California-based TRUs and CA IRP Activity

Staff modeled the activity for California-based TRUs on the Statewide Truck and Bus inventory (ARB, 2008). The Statewide Truck and Bus inventory attributes 51 percent of California-based heavy duty diesel trucks as operating in California only. The remainder of California-based heavy duty diesel trucks are registered in the California IRP program, with 55 percent of their total activity within California and the remaining 45 percent outside California. Effectively, 78 percent of all activity by California-based heavy duty diesel trucks is allocated within California, and 22 percent is allocated outside California. Staff modeled the activity allocation for California-based TRUs over 25 horsepower as following the activity of these heavy duty diesel trucks.

Since few or no refrigerated trucks or vans perform regular long haul or interstate goods movement, all of the activity allocated to TRUs with engines less than 25 horsepower from the facility survey analysis is assumed to occur within California. The activity for California-based truck/trailer TRUs is shown in Table 15.

Table 15: Annual Activity for California-based TRUs

Horsepower Bin	Total Activity (hours/year)	California-based Activity (hours/year)
25-50	1,697	1,325
11-25	1,360	1,360
>11	1,360	1,360

c) Out-of-State Activity

Activity for out-of-state TRUs was based on the facility report, with the estimate of activity within California allocated based on the Statewide Truck and Bus inventory for heavy duty out-of-state tractors. Based on that inventory, tractors from neighboring states spend 39.3 percent of their annual activity within California, and account for 8.5 percent of the total out-of-state population. Tractors from non-neighboring states spend only 9.9 percent of their annual activity within the state but account for 91.5 percent of out-of-state tractors visiting California. Combining these two categories, and weighting them by representation, staff estimated that the average out-of-state TRU spends 12.4 percent of its annual activity within California. Modeling overall out-of-state TRU use on the facility survey and the California-based portion as described produces the annual and California-based hours shown below in Table 16.

Table 16: Annual Activity for Out-of-State TRUs

Horsepower Bin	Total Activity (hours/year)	California-based Activity (hours/year)
25-50	1,697	210

d) Generator Set Activity

Since generator sets were not included in the facility report, staff contacted a number of manufacturers or point-of-sale retailers for estimates of average generator set use (Carrier, 2011b; ThermoKing, 2011). The resulting average, 1,000 hours, is shown below in Table 17. Because generator sets are generally used for larger containers or trailers, similar to the 25 to 50 horsepower TRU units, staff applied the same adjustment to California-based generator set activity that was applied to the California-based TRU population. Specifically, only 78 percent of California-based generator set annual activity is assumed to occur within California. For out-of-state generator sets, staff applied the same adjustment that was applied to out-of-state TRUs, attributing 12.4 percent of the annual activity to California. The results are shown in Table 17.

Table 17: Annual Activity for Generator sets

	Survey Average Activity (hours/year)	California-based Activity (hours/year)
California-based Generator set	1,000	781
Out-of-State Generator set	1,000	124

e) Railcar TRUs

As described in the railcar population section of this report, staff modeled railcar TRUs similarly to out-of-state TRUs due to similarities in goods transported. For this reason out-of-state activity was assigned to this category with the exception of the fraction of annual activity spent within California. Analysis of the Commodity Flow Survey conducted for the original inventory had indicated that approximately 19 percent of railcar annual activity in the U.S. occurs within California (ARB, 2003). Staff maintained that estimate with the current inventory. Using these factors, Table 18 below shows the estimated annual activity and portion of activity spent within California for railcar TRUs.

Table 18: Annual Activity for Railcar TRUs

Total Activity (hours/year)	California-based Activity (hours/year)
1,697	322

4. Engine Load Factor

Engine load is the average operational level of an engine in a given application, as a fraction or percentage of the engine manufacturer's maximum rated horsepower. Since emissions are directly proportional to engine horsepower, load factors are used in the inventory calculations to adjust the maximum rated horsepower to normal operating levels.

a) Data Sources

In the original TRU inventory, the load factors for TRU engines were based off a 2003 survey of manufacturers. Table 19 shows the load factors from the original inventory by engine horsepower category (ARB, 2003).

Table 19: Original Inventory TRU Load Factors

Horsepower Group	>15 Hp	15-25 Hp	25-50 Hp
Load Factor	0.64	0.64	0.53

In the U.S. EPA NONROAD model, the load factors for TRUs were taken from the Power Systems Research (PSR) reports (US EPA, 2008). PSR reports estimate a significantly lower load factor for diesel engines used for refrigeration and air conditioning; however their estimates for generator sets are higher than the load factors for TRU engines reported by manufacturers. Table 20 shows the 2008 PSR estimates for load factors for both categories.

Table 20: 2008 PSR Load Factors for Applicable Categories

Horsepower Group	>15 Hp	15-25 Hp	25-50 Hp
Diesel Refrigeration/ AC Load Factor	0.25	0.26	0.28
Diesel Generator Load Factors	0.65	0.69	0.74

To understand the difference between these two sources, and corroborate or identify conflicting information for the manufacturer survey responses, staff reviewed the available data on TRU engine operator parameters and their impact on TRU estimates, beginning with the basic engine functions by which power output is determined. The engine performance data, along with an updated survey of TRU manufacturers, were used to develop a new load factor, as described below.

b) Analysis

(1) Engine Performance

The power produced by a diesel engine is a function of two variables; the speed of the engine (rpm) and the torque or force produced. Horsepower can be derived from both variables using the following equation (Majewski, 2006);

Equation 3:

$$\textit{Power output} = \textit{Torque} \times \textit{Engine speed} / 5{,}252$$

Where:

Power output is measured in horsepower
Torque is measured in lb-ft
Engine speed is measured in rpm
5,252 is a constant unit-conversion factor, in (lb-ft)*rpm / hp

To understand the power output, it is important to note that torque may be controlled separately from engine speed. That is, at any given speed, the engine may produce a range of torque values, and therefore a range of power outputs. For inventory purposes, this also means that a single operating speed could represent a range of load factors. Thus, the two speeds at which TRUs are often seen as operating could actually represent many more than two levels of power output, or load factor points.

Figure 5 shows the relationship between engine speed, torque and engine horsepower for a 37.8 horsepower diesel engine from Isuzu. The top curve represents the maximum torque that the engine can produce across the engine's range of operating speeds. The maximum torque decreases slightly as the engine speed increases, which is typical of diesel engines.

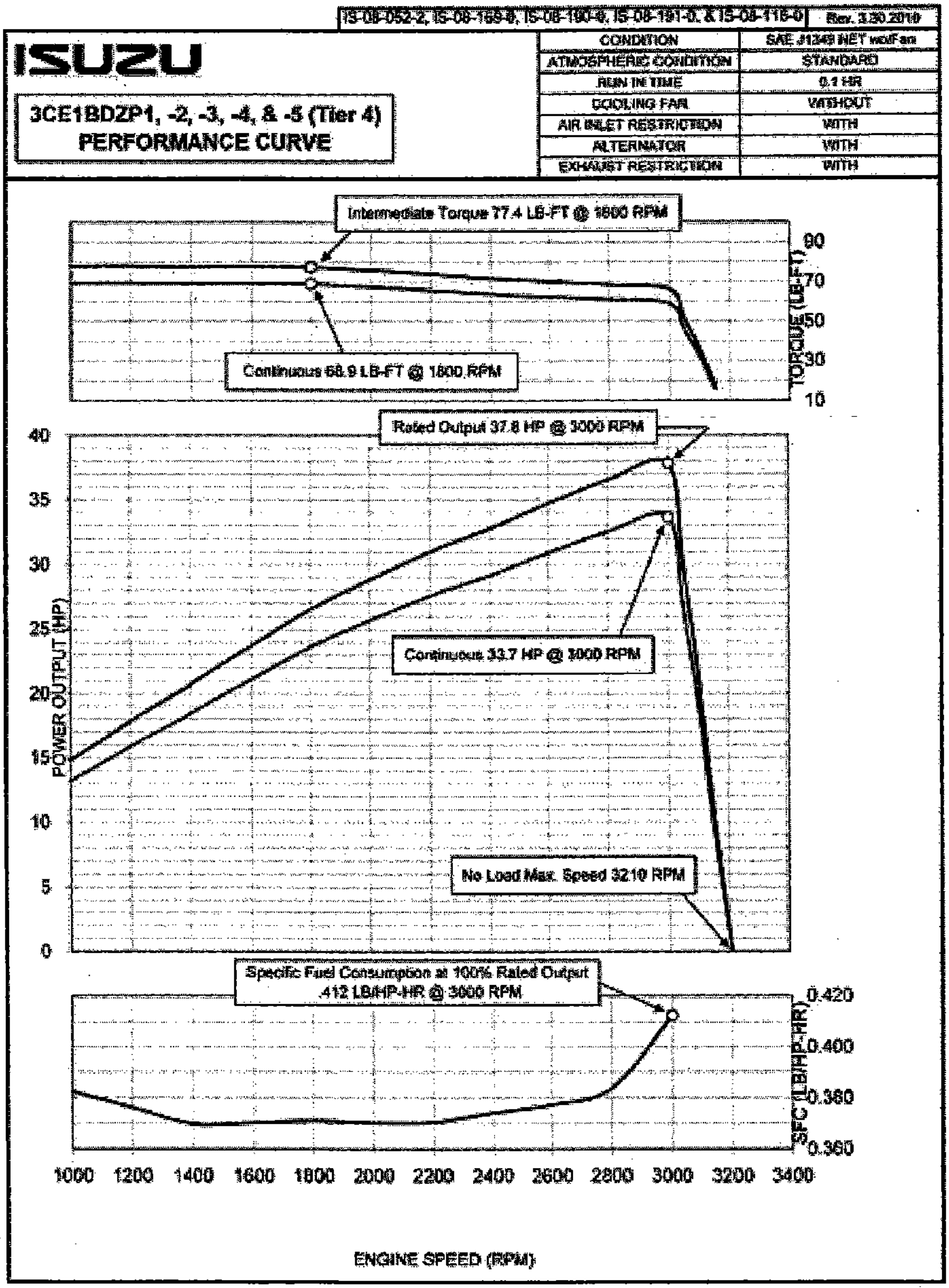
The power output curve in the middle of the figure is simply the maximum torque value multiplied by the engine speed. For instance, at 1,800 rpm, the top curve shows that the engine can produce a maximum of 77.4 lb-ft of torque. Using the equation above, this produces a maximum of 26.5 horsepower, which is the maximum power output shown for 1,800 rpm.

Again, it is important to note the torque at 1,800 rpm may range from 77.4 lb-ft to 0 lb-ft, and therefore the power output may range from 26.5 horsepower to 0 horsepower.

The significance of both the equation and the figure is that if the engine speed and torque at that speed are defined, the power output may also be defined, and therefore the load factor as well.

Defining the load factor for a diesel engine using this method requires three pieces of information; (1) the engine speed and torque values the engine operates at, (2) the fraction of operating time the engine for each speed and torque range (i.e. a weighting factor), and (3) the engine performance curve.

Figure 5. Diesel Engine Performance Curve



The average speed and torque for a diesel engine depends on both the application and (in modern diesel engines) the engine control unit settings. Where field data on operational conditions are not available, the U.S EPA defines, as part of its engine certification program, operational parameters for an engine. As noted in title 40 Code of Federal Regulations (40 CFR) Part 1065.10(c)(1) with regards to the engine parameters used for testing,

> "The objective of the procedures in this part is to produce emission measurements equivalent to those that would result from measuring emissions during in-use operation using the same engine configuration as installed in a vehicle, equipment, or vessel. However, in unusual circumstances where these procedures may result in measurements that do not represent in-use operation, you must notify us if good engineering judgment indicates that the specified procedures cause unrepresentative emission measurements for your engines."

For diesel engines used in multiple applications (some industrial diesel engines are used in cranes, loaders, tractors, dozer, pumps, compressors, and other applications) the engine certification parameters may be accurate on average but are unlikely to represent the in-use conditions of the engine in any one specific application.

For TRU engines, the operating parameters in the engine certification testing procedure might more accurately reflect in-use operating conditions than many other, more general, applications. The U.S. EPA, following a discussion with engine manufacturers, allowed 2008 and newer model year TRU engine applications to be certified under a four-mode test that applies only to TRU engines. The four-mode test is defined by engine speed and torque in the following Table 21.

Table 21: Discrete Mode Cycle for TRU Engines (CFR §1039.645)

Mode number	Engine speed[1]	Torque (percent)[2]	Weighting factors
1	Maximum test speed	75	0.25
2	Maximum test speed	50	0.25
3	Intermediate test speed	75	0.25
4	Intermediate test speed	50	0.25

[1] Speed terms are defined in 40 CFR part 1065.
[2] The percent torque is relative to the maximum torque at the given engine speed.

Additionally, per 40 CFR Part 1039.645(f)(3), such certification is not allowed where "(t)he engine is sold in a configuration that allows the engine to operate in any mode not covered by the test cycle described in this section. This section only applies to engines sold with a governor limiting operation only to those modes covered by the test cycle described above."

Per the U.S. EPA certification database, the Yanmar TK486V TRU engine was certified under the four-mode test cycle shown in the table above. Based on the creation of a testing cycle specific to TRU engine operating parameters and the certification of one of the most common engines in production for TRUs to such parameters, the specifications of the TRU engine certification from the U.S. EPA will be used here as a surrogate for in-use data.

The ARBER reporting database shows that 18 of the 20 most commonly reported engine models are either in the Yanmar TK486V engine family or the Kubota V2203 engine family (with the two exceptions being the Yanmar TK486E and the Isuzu D201).

Using the engine performance curve for the Kubota V2203 engine family (Kubota, 2008) and the four mode test cycle the resultant power can be estimated. Table 22 shows the estimated power output at each of the four modes, and their weighted average.

Table 22: Power Output at Four Mode Test, Kubota V2203

Speed	Mode	Load	Weight	Power(Hp)
Rated		*100*		*35.9*
Rated	1	75	0.25	26.9
Rated	2	50	0.25	18.0
Intermediate		*100*		*25.2*
Intermediate	3	75	0.25	18.9
Intermediate	4	50	0.25	12.6
Four Mode Weighted Average				19.1

The maximum rated power output for this engine curve is 35.9 horsepower, at 100 percent torque at the maximum rated speed (for the engine performance curve used, although it should be noted the V2203 is commonly tuned to a lower maximum speed and a total of 31.9 horsepower). Dividing the average output of 19.1 horsepower by the maximum rated power of 35.9, results in a 0.53 load factor for this engine family.

The same calculation was done for the most popular engine families by horsepower bin. These results are provided in Table 23.

Table 23: Load Factor for Most Common TRU Engines by Horsepower

Manufacturer	Eng. Model	Rated Horsepower	Estimated Load
Yanmar	TK486V	33.9	0.53
Kubota	V2203	35.9	0.53
Yanmar	TK486E	31.9	0.52
Isuzu SE2.2	SE2.2	33.0	0.51
Kubota	D722	20.0	0.57
Yanmar	Tk3.74	22.1	0.53
Yanmar	TK370	13.4	0.56
Kubota	Z482	13.4	0.57

While these data rely on equal weighting for engine operation at each of the four modes in the EPA certification test, it should be noted that even if the engine operated only at Mode 4, with the lowest power output, the load factor would generally fall between 0.33 and 0.37. This value is significantly higher than the 0.28 load factor assigned by the PSR reports to engines between 25 and 50 horsepower used for refrigeration.

Engines below 25 horsepower will display higher load factor values using this method because their intermediate speeds are closer to the rated speed, and therefore the engine power output is higher at the intermediate speeds. The higher value of the intermediate speed is based on the trend in smaller engines for maximum torque to be found in the range of 70 to 75 percent of the maximum rated speed, as opposed to larger engines where the maximum torque is found at or below 60 to 65 percent of the maximum rated speeds

(2) Engine Manufacturer Responses

In addition to reviewing engine performance literature, staff contacted both major manufacturers of TRUs and discussed engine load with their technical staff (ThermoKing, 2011; Carrier, 2011a). Each manufacturer had performed in-use testing on TRU units in field conditions and provided staff an average load factor from this data. Staff combined the recent responses from TRU manufacturers with the responses collected from manufacturers with the 2003 inventory and the engine performance assessment described above. As there are two primary manufacturers that account for over 90 percent of the industry and their responses were confidential, and each manufacturer could estimate the response of the other given their own, the average of the manufacturer engine load factor data cannot be shown.

c) TRU Load Factors

Averaging the inputs mentioned in the previous section, staff estimated the load factors shown in Table 24 for TRU engines.

Table 24: TRU and Generator Set Load Factors

Model	Horsepower Bin	Load Factor
TRU (California-based and Out-of-State)	25-50	0.46
TRU	11-25	0.56
TRU	> 11	0.56
Generator set	All	0.33
Railcar	All	0.46

5. Sales and Growth

In the preceding sections, staff has presented much information about the characteristics of transport refrigeration units and the distribution of these units in 2011. The modeled distributions have represented the population by age, the average horsepower, and the average activity of the units in use in 2011. Staff modeled distributions for different unit types such as the traditional units attached to trucks/trailers and the generator sets that are used with intermodal transport. Staff modeled distributions for different categories of unit types, such as truck/trailer units that are registered in California and those that are registered outside California but visit California. This section will describe how staff projects these distributions to change with time. Projecting these distributions historically and into the future will provide an estimate of the emission reduction benefits already achieved, and emission reduction benefits that can be anticipated for future years.

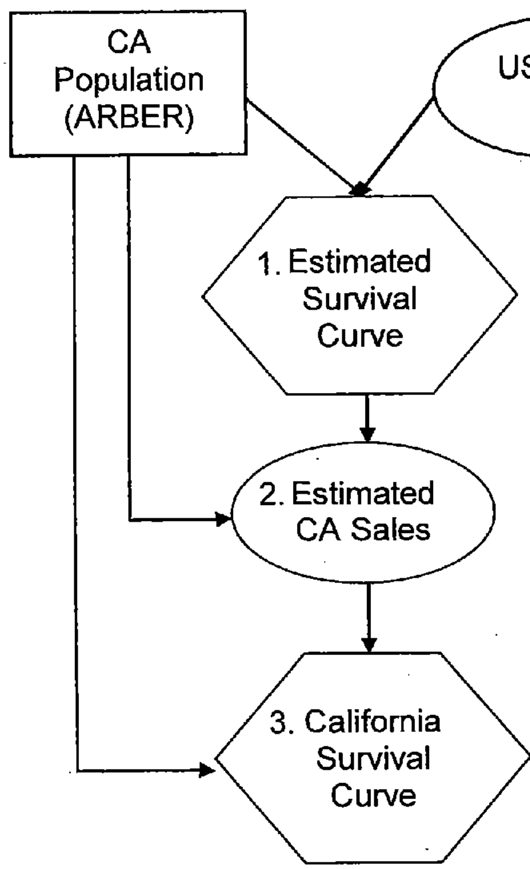
To estimate the impact of the existing rule and the proposed amendments, staff modeled the TRU population for calendar years 2000-2025. Staff used information on sales of new units and the survival of these units. Survival can be described as the likelihood of an individual unit still being in use a certain number of years after the unit was originally manufactured. The survival curve will show the likelihood of a unit remaining in use over a period of 20-25 years.

Staff estimated sales associated with each of the classes of transport refrigeration units (truck/trailer units, generator sets, railcar units) and each category (California-based, visiting from out of state). Staff then projected the population of new sales into the future to determine, for each calendar year, how many were likely to still be in operation based on the survival curve. For example, emissions for calendar year 2011 were based on the population of pre-2011 model years (in some categories as far back as 1990) that are still in operation.

To estimate the likelihood of a unit remaining in operation as it ages (i.e. the survival curve), staff used the sales estimated for all applicable model years in combination with the population considered to be active today as reported to ARBER. For example, if sales data indicated that two thousand 2001 model year units were sold in 2001 and reporting data indicated that one thousand units remained active in calendar year 2011, then a survival rate of 50% (or 1000/2000) could be modeled for all ten-year-old units. As another example, if 2,500 units were sold in 2011, the curve would indicate that 1,250 units, or 50% of them, would likely remain active ten years later in 2021.

The overall process is shown in Figure 6.

Figure 6: Process to Estimate Sales and Survival of California TRUs



Because sales, survival, and the current population are all related, no two can be used exclusively to estimate the third. The availability of detailed ARBER registration data probably makes the current California-based population the most accurate of the three data sources. Thus, staff modeled the survival curve and sales data from each other iteratively until the changes between iterations were minimized.

In summary, staff first used the current population data from ARBER with an estimate of California sales to estimate a survival curve for California-based units (step 1 in Figure 6). Staff then used the California-based population from ARBER with the developed survival curve to estimate sales of California-based units (step 2). Staff then used the California-specific sales estimates with the

ARBER population to refine the survival curve (step 3). Staff could continue these iterations until the differences between each iteration were sufficiently minor. As the changes between the first and second iteration were minor, staff performed only two iterations.

The process is described in more detail, with all necessary supporting data, in the remainder of this section. The process is also described for each of the different unit types (truck/trailer, generator set, railcar, out-of-state units).

a) Truck/Trailer Transport Refrigeration Units

This first section details the process used to model the population by age distribution for TRUs used on trucks and trailers. As the inventory will later show, these represent the largest share of the emissions in California. This section also focuses only on those units that are based in California. The units that are based outside California but anticipated as visiting California are modeled separately.

(1) Past sales

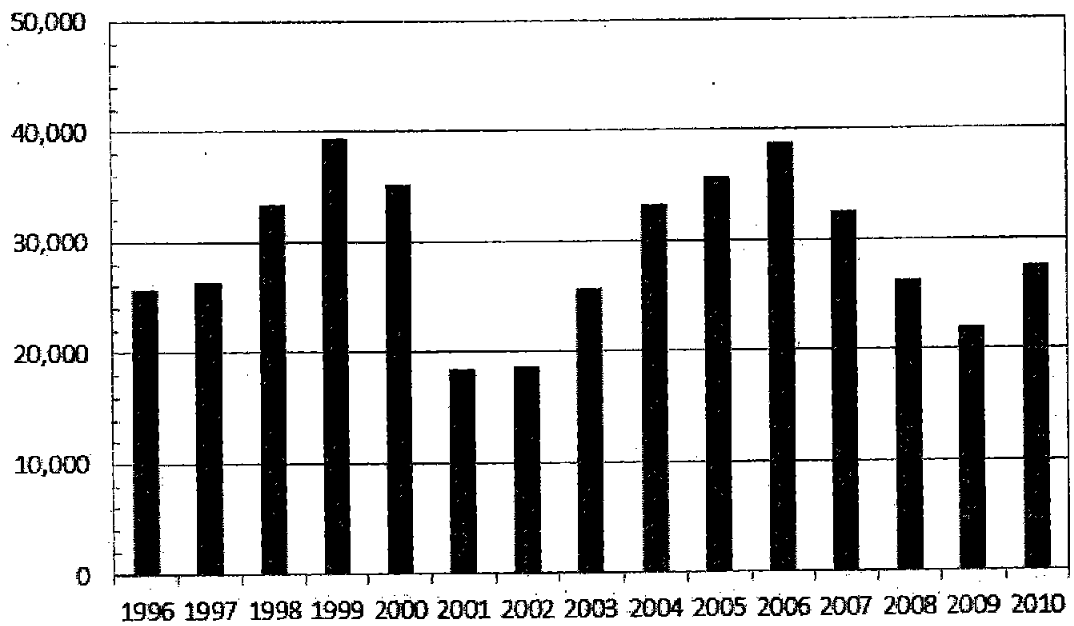
As indicated earlier, staff needed both the current population from ARBER and the estimated California sales to develop the survival curve associated with the units. To model sales initially, staff used data related to national refrigerated trailers sales for calendar years 1996 to 2011 that was acquired from ACT (ACT Research, 2011) and national truck sales data for 1985 to 2010 from Wards (Wards, 2011). Staff used these sales data and the active TRU population as registered in ARBER in 2011 to estimate the survival curve for these units. These data were not available when the original inventory was developed in 2003.

Table 25 shows the nationwide refrigerated trailer build-activity data reported by ACT Research for 1996-2010, normalized to calendar year 2000 build-activity. Table 25 also shows the build-activity projected by ARB staff for 2011. Staff estimated 2011 activity using the January/February activity that had already been reported by ACT in March 2011 and the share of annual sales that had been represented by January and February between 1996 and 2010. The data are also shown in Figure 7.

Table 25: National Refrigerated Trailer Sales
(normalized to calendar year 2000)

CY	Refrigerated Trailers
1996	0.73
1997	0.75
1998	0.95
1999	1.12
2000	1.00
2001	0.53
2002	0.53
2003	0.73
2004	0.95
2005	1.02
2006	1.10
2007	0.93
2008	0.75
2009	0.63
2010	0.78
2011	0.63

Figure 7: Nationwide Refrigerated Trailer Sales as Estimated by ACT Research, 1996-2010.

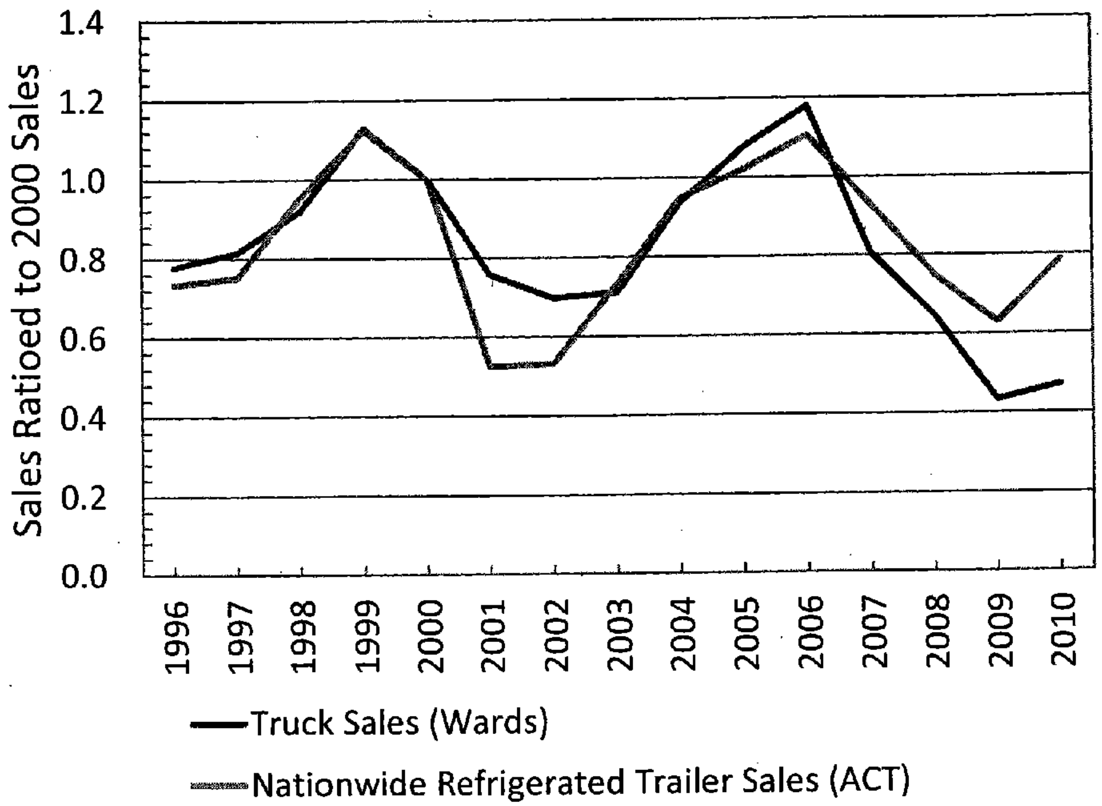


To estimate national sales of transport refrigeration units prior to 1996, staff used the relationship shown between past refrigerated trailer sales and general truck sales. Table 26 shows the nationwide truck sales for 1985-1996 from the Wards Truck database, normalized to 2000 sales. As shown by Figure 8, the trend in truck sales on a nationwide basis is similar to refrigerated trailer sales on a nationwide basis. (Both data sets are normalized to calendar year 2000 sales in Figure 8.) Thus staff used the trend in truck sales prior to 1996 to model the sale of TRUs prior to 1986. For example, if truck sales were reported to have been 8% lower in 1995 than in 1996, staff assumed that TRU sales in 1995 were also 8% lower in 1995 than in 1996.

Table 26: Truck Sales Reported by Ward's Truck Sales

CY	Medium/Heavy Truck Sales
1985	0.62
1986	0.57
1987	0.62
1988	0.72
1989	0.68
1990	0.60
1991	0.48
1992	0.54
1993	0.66
1994	0.76
1995	0.84
1996	0.78

Figure 8: Nationwide Truck and Refrigerated Trailer Sales



The methods described above provided estimates of national TRU sales. To estimate the sales of CA-based TRUs relative to nationwide sales, staff first used the ARBER data and the population of model year 2009 TRUs that were registered in ARBER. Staff used model year 2009 units since they appeared less impacted by the rule relative to sales in 2008 and 2010, and a reasonable survival curve would likely have nearly all sales from 2009 remaining active in 2011. Staff did evaluate the use of 2008 or 2010 as a reference year in the initial step and observed little difference in the estimated survival curve. After the adjustments that were described earlier in this appendix (Section I.C.1.b)(5)), 2,165 model year 2009 truck/trailer TRUs were anticipated to be registered at the end of 2011. The adjustments that were described earlier were intended to remove the impact of the 2004 ATCM from the population that the ARBER registry represents, since the current ARBER registry could be assumed to be impacted by the presence of the 2004 rule. The number of model year 2009 units was slightly reduced to account for those sales that likely occurred as a result of the regulation that was in place.

In the second step, staff removed the impact of attrition from the existing model year 2009 population of 2,165 units to estimate the sales that were likely to have occurred in 2009. To do this, staff used the survival curve that was developed for the original inventory (ARB, 2003) as a first iteration. The survival rate is 97% for TRUs two years old. Adjusting for the impact of early attrition, staff estimated

2009 sales at 2,232 units (or 2,165/0.97). Staff assumed the survival curve from the original inventory would be appropriate since comments from industry had indicated that the activity, and thus the likely attrition rates, of individual TRUs were unlikely to have been significantly impacted by the recession. In the first iteration, staff needed to make an assumption about either the survival curve or sales from a single calendar year.

Finally, data from ARB's Enforcement Division indicated that just over 3% of the California-based units were not being registered in ARBER as required by the 2004 ATCM (described in Section I.C.1.b)(7)). To account for those units not registered, staff increased the estimated model year 2009 population from 2,232 units to 2,302 units (an increase of 70 units, or 3.12%).

In the first iteration, staff assumed that the share of nationwide sales represented by California's 2,302 units remained the same between 1996 and 2011 and was 10.4% (=2,322/22,109). Staff felt that this number was reasonable first, because a representative from ACT Research had suggested that California represented about 11% of the US economy and because about 12% of the U.S. population resides in California (Veith, 2011; California Department of Finance, 2007). For 1985-1995 staff used the ratio of refrigerated trailer sales to truck sales as a first estimate of the nationwide truck/trailer TRU sales. To estimate sales in California staff applied the ratio of 10.4% to the nationwide truck/trailer TRU sales. Table 27 shows the sales of California-based TRUs estimated between1985 and 2011 and the population estimated to still be active for each model year.

Table 27: Initial Estimate of California-based Truck/Trailer TRU Sales

Model year	Age, as of 2011	Estimated CA Truck/Trailer TRU Sales – First Iteration	2011 Population
1985	26	2,126	35
1986	25	1,977	34
1987	24	2,146	46
1988	23	2,496	74
1989	22	2,328	73
1990	21	2,071	103
1991	20	1,649	126
1992	19	1,860	127
1993	18	2,261	238
1994	17	2,633	394
1995	16	2,898	611
1996	15	2,679	460
1997	14	2,748	583
1998	13	3,484	931
1999	12	4,107	1,648
2000	11	3,657	1,721
2001	10	1,923	1,642
2002	9	1,942	1,454
2003	8	2,672	2,595
2004	7	3,464	2,357
2005	6	3,724	2,592
2006	5	4,037	2,901
2007	4	3,387	2,709
2008	3	2,737	2,696
2009	2	2,302	2,076
2010	1	2,870	2,072
2011	0	2,295	2,470

(2) Survival curve

For a first approximation of the survival curve, staff compared the ARBER registry data associated with each model year and the sales data, both shown in Table 27.

Staff used the population estimated from ARBER for each model year and the initial sales estimate for each calendar year to estimate the first iteration of the survival curve associated with truck/trailer TRUs. Based on the results of the individual model years, or ages, staff used a polynomial equation to estimate this curve. The polynomial fit allows the curve to assume the necessary shape. Staff then adjusted this curve as necessary to meet three specific constraints, namely that:

i) survival at age zero was 100%,
ii) survival at age 25 was zero, and
iii) that the likelihood of survival would decrease with age

Figure 9 shows the best-fit survival curve that resulted from the first iteration and the survival curve that was used in the original 2003 ATCM inventory. Table 28 shows the data. The second column shows the data behind the survival curve resulting from the first iteration. The third column, included for comparison, shows the survival rate that was associated with each age category in the original inventory developed in 2003.

Figure 9: Initial Survival Curve Estimate Compared to Previous Inventory Survival Curve

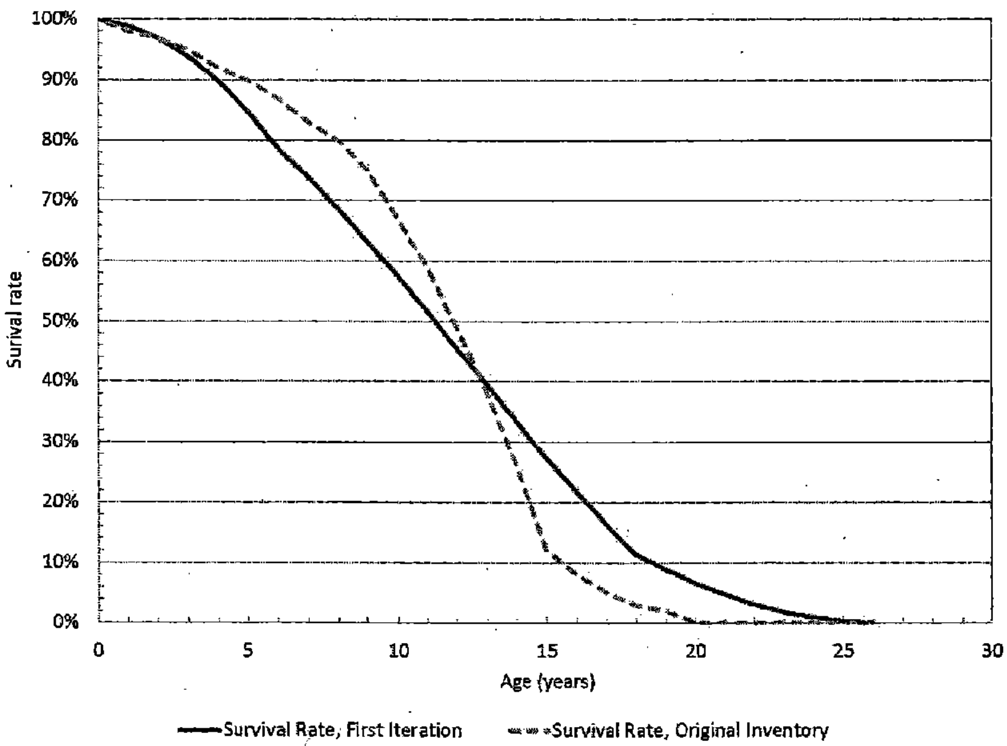


Table 28: Initial Survival Curve Estimate and Previous Inventory Survival Curve

Age	Survival Rate, First Iteration	Original Inventory Survival Rate
0	100%	100%
1	99%	98%
2	97%	97%
3	94%	95%
4	90%	92%
5	85%	90%
6	79%	87%
7	74%	83%
8	69%	80%
9	63%	75%
10	58%	67%
11	52%	59%
12	46%	49%
13	39%	38%
14	33%	26%
15	27%	12%
16	22%	8%
17	16%	5%
18	11%	3%
19	9%	2%
20	7%	0%
21	5%	0%
22	3%	0%
23	2%	0%
24	1%	0%
25	0%	0%
26	0%	0%

Recognizing that the survival curve, past sales estimates, and the current model year distribution are all related to one another, ARB staff went through the methods that were just described one more time. Staff assumed that this second iteration would allow the results to more precisely model to the actual underlying data being estimated. If the results were found to vary, staff would have continued to further refine the estimates. (The results did not vary significantly.)

In the second iteration, staff used the survival curve that was estimated in the first iteration in combination with the existing-population data from ARBER to estimate sales of CA-based equipment. Staff recalculated sales for calendar years 1985 to 1995 by using the 2011 population and the survival rate from the first iteration. (As the survival curve gets smaller in earlier years, the impact of just a few units still being active could have a significant impact on the sales estimated. These pre-1996 units represent a small portion of the population, less than 6 percent.) The sales estimated are shown in the last column in Table 29.

Table 29: California-based Truck and Trailer TRU Sales Re-estimated

MY	Age, as of 2011	2011 Population	Survival Rate, First Iteration	Estimated CA Truck/Trailer TRU Sales – Second Iteration
1985	26	35	0%	1,955
1986	25	34	0%	1,818
1987	24	46	1%	1,973
1988	23	74	2%	2,295
1989	22	73	3%	2,140
1990	21	103	5%	1,904
1991	20	126	7%	1,516
1992	19	127	9%	1,710
1993	18	238	11%	2,078
1994	17	394	16%	2,421
1995	16	611	22%	2,664
1996	15	460	27%	1,675
1997	14	583	33%	1,745
1998	13	931	39%	2,358
1999	12	1,648	46%	3,614
2000	11	1,721	52%	3,332
2001	10	1,642	58%	2,853
2002	9	1,454	63%	2,299
2003	8	2,595	69%	3,778
2004	7	2,357	74%	3,192
2005	6	2,592	79%	3,296
2006	5	2,901	85%	3,423
2007	4	2,709	90%	3,016
2008	3	2,696	94%	2,871
2009	2	2,076	97%	2,141
2010	1	2,072	99%	2,093
2011	0	2,470	100%	2,470

On average, the estimated California sales represent 9.6% of nationwide sales from ACT between 1996 and 2011. Staff then used these second-iteration sales estimates of the California-based TRU sales in conjunction with the 2011 population to estimate the second iteration of the survival curve. Staff then compared the results from the second and first iterations of the survival curve were then compared to one another. The resulting data are shown in Figure 10 and Table 30.

Figure 10: California-based Truck Trailer TRU Survival Curve

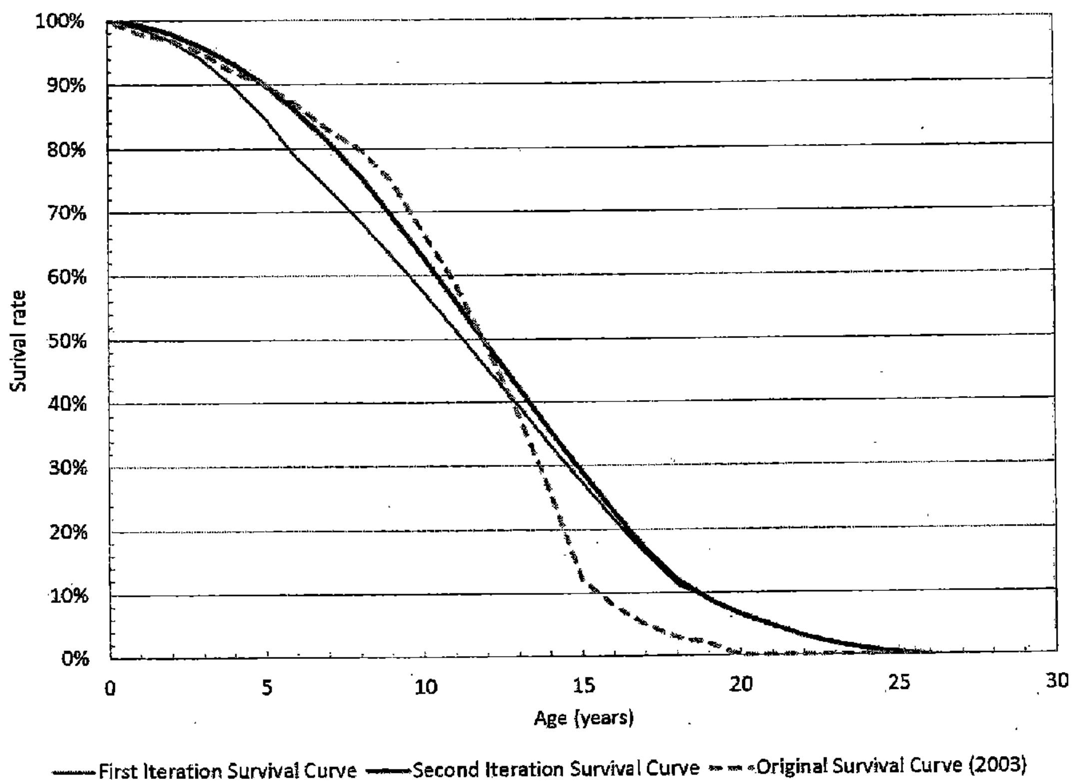


Table 30: Survival Curve Estimated and Used for Modeling TRU Populations in Previous and Future Years

Age	First Iteration Survival Curve	Second Iteration Survival Curve	Original Survival Curve (2003)
0	100%	100%	100%
1	99%	99%	98%
2	97%	98%	97%
3	94%	96%	95%
4	90%	93%	92%
5	85%	90%	90%
6	79%	86%	87%
7	74%	81%	83%
8	69%	76%	80%
9	63%	70%	75%
10	58%	63%	67%
11	52%	56%	59%
12	46%	49%	49%
13	39%	42%	38%
14	33%	36%	26%
15	27%	29%	12%
16	22%	23%	8%
17	16%	17%	5%
18	11%	12%	3%
19	9%	9%	2%
20	7%	7%	0%
21	5%	5%	0%
22	3%	3%	0%
23	2%	2%	0%
24	1%	1%	0%
25	0%	0%	0%
26	0%	0%	0%

In comparing the second iteration survival curve to the first and that used in the original inventory, two observations can be made. First, survival at younger ages follows that from the survival curve used in the original inventory. Second, the primary difference between the second iteration survival rates estimated and the original survival rates is that these units, on average, live longer than projected in the previous inventory. Industry stakeholders indicated that individual units were not being used differently as a result of the recession, supporting the idea that changes in the estimated survival curve represent improvements in the available data and methods.

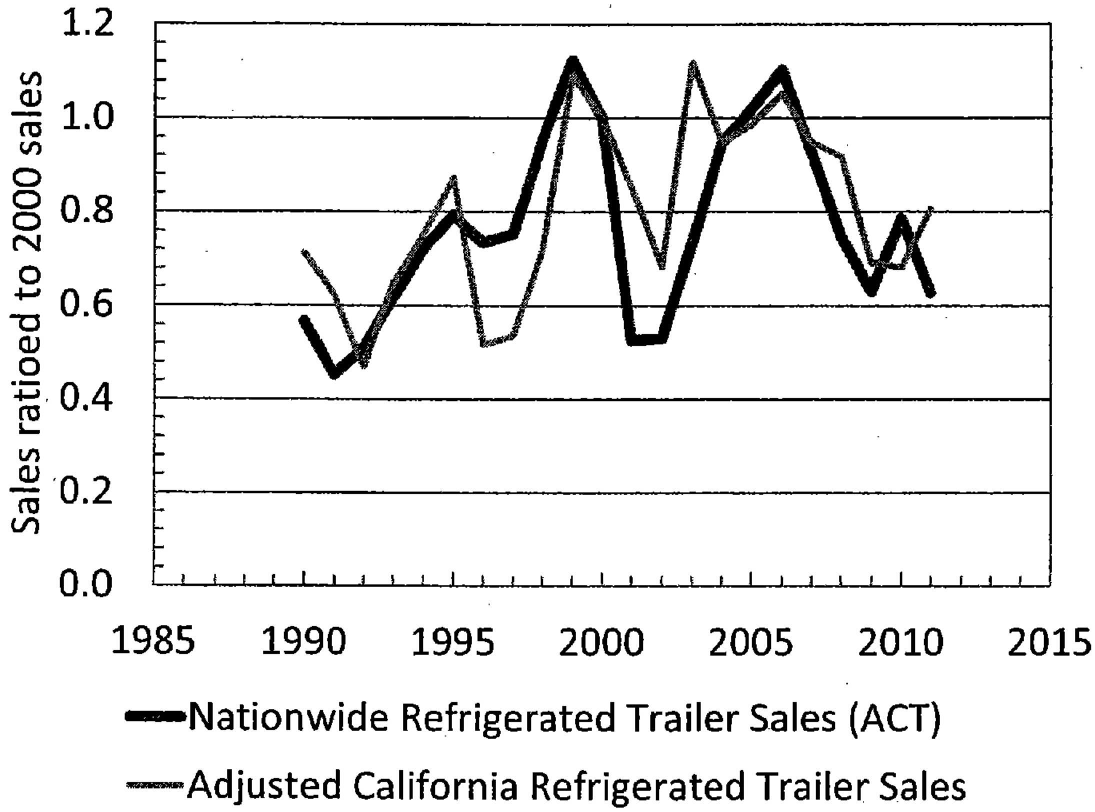
In the final step, staff applied the survival rate estimated with the second iteration to the 2011 population of the truck/trailer TRUs registered in ARBER to estimate sales of CA-based equipment from past years. Table 31 shows the results.

Table 31: Final Estimation of California-based Truck and Trailer TRU Sales

MY	CA Sales
1990	2,180
1991	1,902
1992	1,439
1993	1,983
1994	2,303
1995	2,676
1996	1,583
1997	1,638
1998	2,197
1999	3,344
2000	3,062
2001	2,606
2002	2,090
2003	3,424
2004	2,904
2005	3,019
2006	3,226
2007	2,904
2008	2,810
2009	2,119
2010	2,086
2011	2,470

To validate these data, ARB staff compared the trend estimated for past refrigerated truck/trailer sales in California to nationwide sales reported by ACT. As a reminder, to account for the impact of the regulation on overall sales, staff adjusted sales in calendar years 2008, 2009, and 2010. These adjustments are described in Section I.C.1.b)(6). The comparison is shown in Figure 11.

Figure 11: Adjusted California-based Refrigerated Truck and Trailer Sales and Sales Reported Nationwide



(3) Forecasting Sales

In the last phase of the sales-modeling process, staff used estimated historical California-based truck/trailer TRU sales to forecast future sales. Both linear and exponential best-fit lines were fit to estimated historical sales, shown previously in Table 31.

The linear best fit equation:

$$\text{Sales} = 40.15 * \text{Calendar Year} - 77{,}859$$

The exponential model best fit equation:

$$\text{Sales} = 6.6 * 10^{-13} * e^{0.0179 * \text{Calendar Year}}$$

Staff projected sales for future years by using the average of these two best-fit lines. These future sales represent the long term trend and are shown in the second column of Table 31. In order to account for the recovery from the recession staff assumed that sales would return to the long-term trend in 2017. 2017 was selected because a recent ACT report indicated that 2017 is the year in which the industry would recover from the recession. Thus, staff assumed that sales in 2017 would return to normal levels and sales prior to 2017 would increase steadily between 2011 and 2017 in the direction of recovery. The forecast sales estimated for each of these models is shown in Figure 12 and Table 32. For comparison, the figure also shows the sales as forecast by the previous inventory in 2003.

Figure 12: California-based Truck and Trailer TRU Sales with Slow Recovery

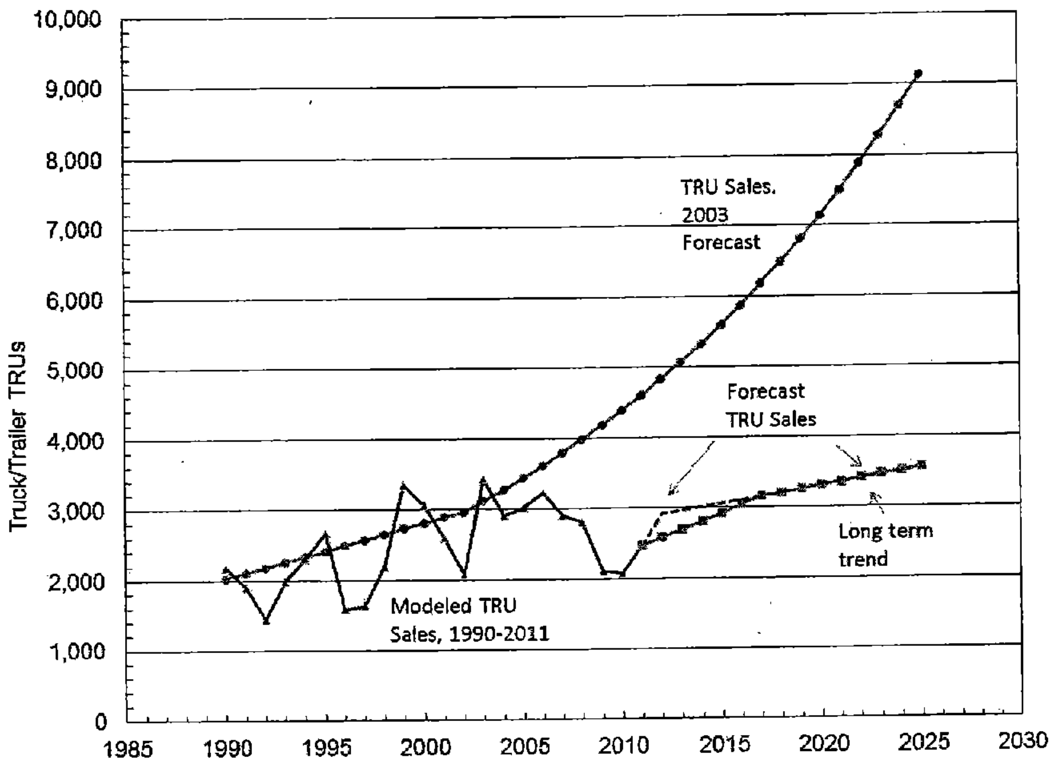


Table 32: Sales Forecast for California-based Truck and Trailer TRUs

CY	Sales Forecast Assuming No Recession	Sales Forecast with Recession and 2017 Recovery
2011	2,470	2,470
2012	2,922	2,585
2013	2,969	2,700
2014	3,016	2,815
2015	3,063	2,930
2016	3,111	3,045
2017	3,160	3,160
2018	3,209	3,209
2019	3,258	3,258
2020	3,309	3,309
2021	3,359	3,359
2022	3,410	3,410
2023	3,462	3,462
2024	3,514	3,514
2025	3,567	3,567

Lastly, because truck/trailer-based TRUs are assumed to follow the same survival curve and sales patterns regardless of the engine size (or truck/trailer size), the sales estimated for previous years and forecast for future years are simply divided between the three engine-size categories. The trailer-based units, those larger than 25 horsepower, represented 78.6 percent of the units, the truck-based units between 11 and 25 horsepower represented 20.7 percent of the units, and those smaller than 11 horsepower represented the remaining 0.7 percent.

b) California-based Generator Sets

ARB staff estimated the past sales, future sales, and survival curve associated with generator sets to represent the same model as that just presented for truck/trailer TRUs, with a few minor modifications. Based upon comments received from industry members at the workgroup meetings and data in ARBER, staff estimate that generator sets do not generally last as long as truck/trailer TRUs. This came in part from the relatively lower cost of generator sets, which makes them more easily replaceable. Thus staff made adjustments to the shape of the survival curve.

In addition, generator sets appeared to experience a significant growth in sales between 2006 and 2008, followed by a sales decline between 2009 and 2011 that far exceeded the decline in activity with truck/trailer TRUs. Discussion with industry members suggested that this decline may have been related to the significant number of generator sets that were ordered with the increase in intermodal traffic through the ports that preceded the recession; these generator sets likely exceeded the number necessary when the activity declined during the recession, and thus orders for new generator sets dropped significantly. Industry members indicated that the sales of generator sets were finally recovering.

(1) Past sales and survival curve

ARB staff were unable to locate data related to the sales of generator sets that were used exclusively for refrigerating goods. The original inventory, as well as meetings with current industry members, suggested that the emissions from generator sets would be small relative to the emissions from trailer/truck TRUs. As a result, staff used the relationship between the population in ARBER and the data in ARBER regarding truck/trailer TRUs.

Specifically, staff estimated the survival curve of generator sets by scaling the survival curve developed for truck/trailer TRUs. Staff estimated this relationship based upon the expectation that the curve would be similarly shaped and the observation that few generator sets older than ten years appeared to still be in use. Industry members had suggested that the lower replacement costs associated with generator sets caused them to be replaced rather than repaired more so than truck/trailer TRUs. The survival curves for refrigeration-based generator sets and, for comparison, truck/trailer TRUs as estimated are shown in Figure 13 and Table 33.

Figure 13: Survival Curves for Generator Sets and Truck and Trailer TRUs

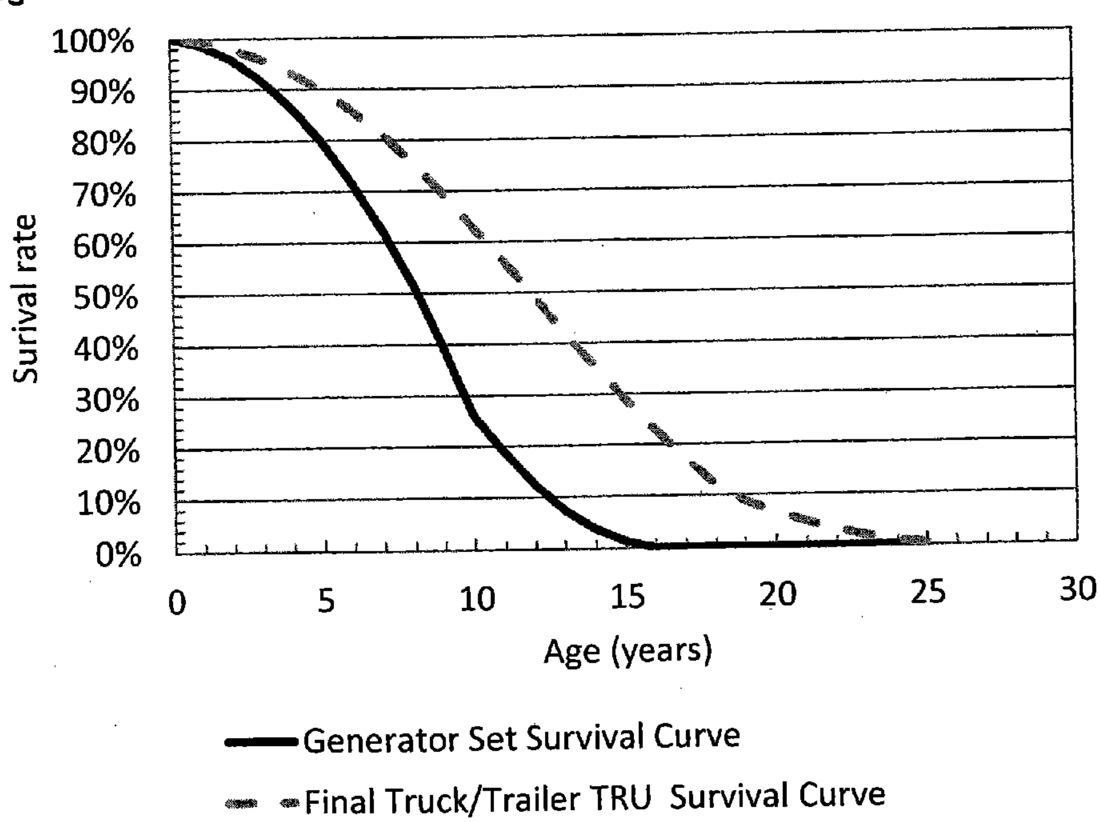


Table 33: Survival Curve for Generator Sets and Truck and Trailer TRUs

Age	Generator Set Survival Curve	Truck/Trailer TRU Survival Curve
0	100%	100%
1	99%	99%
2	96%	98%
3	92%	96%
4	87%	93%
5	80%	90%
6	72%	86%
7	62%	81%
8	52%	76%
9	39%	70%
10	26%	63%
11	19%	56%
12	12%	49%
13	7%	42%
14	4%	36%
15	1%	29%
16	0%	23%
17	0%	17%
18	0%	12%
19	0%	9%
20	0%	7%
21	0%	5%
22	0%	3%
23	0%	2%
24	0%	1%
25	0%	0%

Staff then used the estimated survival curve for generator sets with the CA-based population estimated from ARBER to backcast sales of refrigerated-transport-related generator sets in California. The estimated sales are shown in Table 34. Sales for the remainder of CY 2011 were estimated to be in proportion to sales of truck/trailer TRUs. Specifically, to estimate the remaining number of generator sets to be sold in 2011, staff multiplied the ratio of the CA-based population of generator sets and the CA population of truck/trailer TRUs by the number of CA-based truck/trailer TRUs:

Equation 4:

$$GS_{CA,\,2011} = TT_{CA,\,2011} * (Pop_{GS,\,CA}/Pop_{TT,\,CA})$$

Where:

$GS_{CA,\,2011}$ is the number of generator sets sold for California-based activity in 2011
$TT_{CA,\,2011}$ is the number of truck/trailer transport refrigeration units sold for California-based activity in 2011
$POP_{GS,\,CA}$ is the population modeled for generator sets in CA
$POP_{TT,\,CA}$ is the population modeled for truck/trailer transport refrigeration units in CA

This led to estimated sales for 2011 of 502 California-based units.

Table 34: Estimated Sales for California-based Generator Sets

CY	2011 Generator Set Population	Generator Set Survival Rate	Estimated Generator Set Sales
1995	3	0%	--
1996	1	1%	61
1997	7	4%	198
1998	16	7%	214
1999	24	12%	193
2000	36	19%	193
2001	56	26%	215
2002	243	39%	622
2003	430	52%	834
2004	402	62%	645
2005	640	72%	892
2006	1,254	80%	1,570
2007	1,776	87%	2,052
2008	1,098	92%	1,195
2009	75	96%	78
2010	96	99%	97
2011	502	100%	502

(2) Future sales

Then, in a manner similar to truck/trailer TRUs, staff used the patterns exhibited by past sales to forecast the sale of transport-related generator sets in future years.

The linear best fit equation:

$$\text{Sales} = 32.46 * \text{Calendar Year} - 64{,}386$$

The exponential best fit equation:

$$Sales = 6.09*10^{-12} * e^{0.016*Calendar\ Year}$$

Also in a manner similar to truck/trailer TRUs, staff forecast future sales by averaging between the linear and exponential curves that best described the historic sales. It was again assumed that the sales of the equipment would not return to the long-term trend until 2017. Staff also estimated generator set sales for calendar years prior to 1997 using the same formula. Figure 14 shows the sales data estimated for 1985-2011 as well as the sales projected for future years. Table 35 gives the results for 1995-2025 in a tabular format.

Figure 14: Estimated Sales of California-based Generator Sets

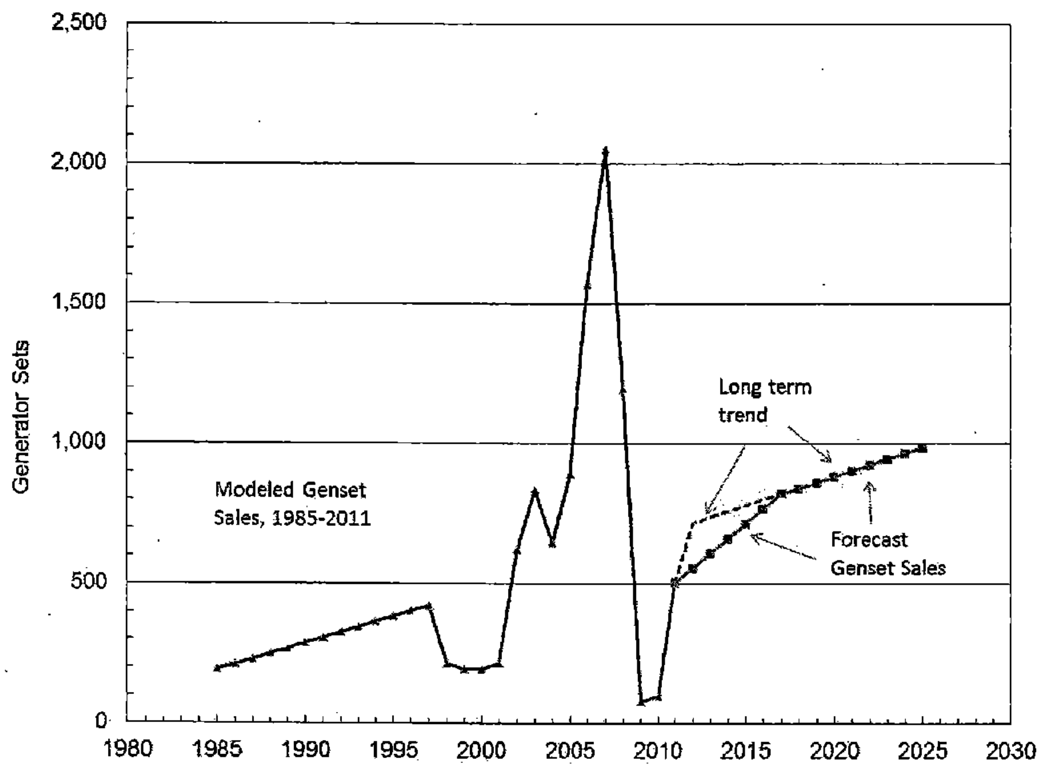


Table 35: Estimated California-based Generator Set Sales

CY	Estimated Generator Set Sales	Future Generator Set Sales	Future generator Set Sales (2017 Recovery)
1995	0		
1996	61		
1997	198		
1998	214		
1999	193		
2000	193		
2001	215		
2002	622		
2003	834		
2004	645		
2005	892		
2006	1,570		
2007	2,052		
2008	1,195		
2009	78		
2010	97		
2011	502	502	502
2012		718	555
2013		738	608
2014		759	661
2015		779	714
2016		799	767
2017		820	820
2018		841	841
2019		861	861
2020		882	882
2021		903	903
2022		924	924
2023		945	945
2024		966	966
2025		987	987

c) Out-of-State Truck/Trailer TRUs

ARB staff also estimated the equipment sales and survival curves for TRUs that are registered outside California but anticipated as visiting California. To do this, staff made use of the data available in the ARBER registry for out-of-state equipment, the nationwide population reported by ACT, and the population that was estimated as visiting California from out of state in calendar year 2011 (described in Section I.C.1.d). Staff estimated that 102,536 TRUs will visit California from out of state in calendar year 2011. Because registration for out-of-state TRUs is not mandatory, the population registered within ARBER is used only as a sample of the overall population in order to estimate a survival curve and sales.

In the first step, staff estimated the model year distribution associated with out-of-state TRUs from ARBER. Staff found that the TRUs visiting California from out-of-state were, on average, younger than those registered in California. To make sure that this was reasonable and not influenced by the likelihood of younger compliant TRUs to register relative to those which are older and not yet compliant with the ATCM, staff compared the relative age of TRUs visiting California from out-of-state to the relative age of trucks visiting California from out-of-state, as estimated in the inventory associated with the Truck and Bus Rule. Because the relationship was similar, the difference actually being less for TRUs than for trucks, staff assumed that the age distribution of the out of state TRUs registered in ARBER was representative of the total population. This distribution is shown in Table 36.

Table 36: Average Age of California-based and Out-of-State TRUs

		Average Age (years)
TRUs	California-based	6.7
	Out of state	4.6
Trucks	California-based	7.9
	Out of state	3.9

(1) Past sales and survival curve

As described earlier in order to estimate the survival curve associated with out-of-state units sales for each model year need to be calculated. To do this staff used the sales data for California-based TRUs and the California share relative to the remainder of the nation. Recall that only those of units used in trailers, those greater than 25 horsepower, are anticipated as visiting California from out of state. Table 37 shows the nationwide sales estimated for TRUs relative to the sales in California alongside the number that are anticipated to still be active as of 2011.

Table 37: Estimated California-based and Nationwide TRU Sales

Calendar Year	Age	Estimated CA Sales	Estimated US Sales	Estimated Population Visiting CA
1988	23	1,886	19,704	22
1989	22	1,928	20,142	17
1990	21	2,180	22,774	23
1991	20	1,902	19,865	22
1992	19	1,439	15,034	36
1993	18	1,983	20,715	70
1994	17	2,303	24,061	96
1995	16	2,676	27,951	136
1996	15	1,583	16,534	144
1997	14	1,638	17,112	174
1998	13	2,197	22,953	247
1999	12	3,344	34,929	639
2000	11	3,062	31,990	620
2001	10	2,606	27,226	1,435
2002	9	2,090	21,833	2,051
2003	8	3,424	35,767	9,398
2004	7	2,904	30,333	9,936
2005	6	3,019	31,532	13,923
2006	5	3,226	33,702	14,535
2007	4	2,904	30,339	12,780
2008	3	2,810	29,350	7,855
2009	2	2,119	22,134	9,154
2010	1	2,086	21,786	8,846
2011	0	2,470	25,800	10,377
Total		**57,778**	**603,566**	**102,536**

The survival curve for out of state TRUs represents those units that are retired and those that leave long haul service from out of state to enter local short haul vocations. To estimate the survival rate associated with TRUs visiting California from out-of-state, staff compared the population visiting California to the national sales. Staff estimated the proportion likely to visit California using the estimated population visiting California in 2011 (102,536) and the nationwide population (275,000) after the CA-based trailer population has been removed (25,771). Note that the 275,000 nationwide units represent only the trailer-based units larger than 25 horsepower, or 79.6% of nationwide truck/trailer TRU population, which was estimated at 350,000 by ACT Research (ACT Research, 2009). Thus, the share of the trailer-based population based outside California that was anticipated as visiting California was 41% (or 102,536/(275,000-25,771)).

To estimate the survival curve, staff compared the number of TRUs anticipated as visiting California to the sales of units likely to visit California from out of state (41% of all units). The only conditions used to adjust this curve were similar to those used with California-based generator sets, namely that:

i) survival at age zero was 100%,
ii) survival at age 14 was 0%, and
iii) that the likelihood of survival would decrease with age

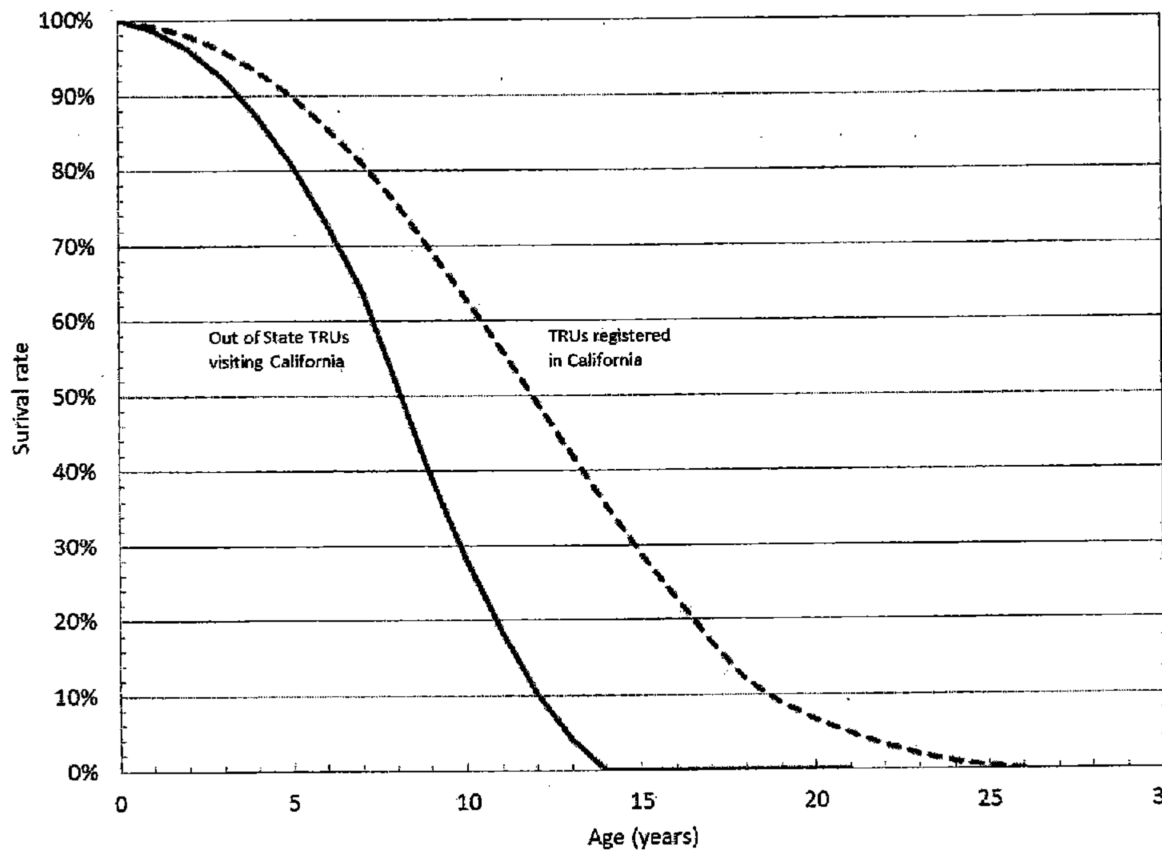
Table 38 shows the results.

Table 38: Estimated Survival Curve for Out-of-State Truck and Trailer TRUs Entering California

Calendar Year	Age	Estimated Population Visiting CA	Estimated US Sales	Adjusted Survival Rate
1988	23	22	19,704	0%
1989	22	17	20,142	0%
1990	21	23	22,774	0%
1991	20	22	19,865	0%
1992	19	36	15,034	0%
1993	18	70	20,715	0%
1994	17	96	24,061	0%
1995	16	136	27,951	0%
1996	15	144	16,534	0%
1997	14	174	17,112	0%
1998	13	247	22,953	4%
1999	12	639	34,929	10%
2000	11	620	31,990	18%
2001	10	1,435	27,226	28%
2002	9	2,051	21,833	39%
2003	8	9,398	35,767	51%
2004	7	9,936	30,333	64%
2005	6	13,923	31,532	73%
2006	5	14,535	33,702	81%
2007	4	12,780	30,339	87%
2008	3	7,855	29,350	92%
2009	2	9,154	22,134	96%
2010	1	8,846	21,786	99%
2011	0	10,377	25,800	100%
	Total	**102,536**	**603,566**	

The survival curve for TRUs visiting California from out of state is shown in Figure 15; it is compared to the survival curve developed for California-based TRUs. The out-of-state survival curve represents those units that are retired and those that leave long haul service from out of state to enter local short haul vocations.

Figure 15: Estimated Survival Curves for California-based and Out-of-State Truck and Trailer TRUs



(2) Future sales

Staff modeled the sales of trailer TRUs visiting California from out-of-state for past and future years in a manner similar to that used for California-based units. Estimated nationwide sales, shown previously in Table 38, were similarly fit with linear and exponential best fit lines and the average of the two was used for estimating the trend in long term future sales.

The linear best fit equation:

$$\text{Sales} = 419.37 * \text{Calendar Year} - 813{,}330$$

The exponential best fit equation:

$$Sales = 6.90*10^{-12} * e^{(0.0179*\text{ Calendar Year})}$$

Forecast sales are shown in Table 39.

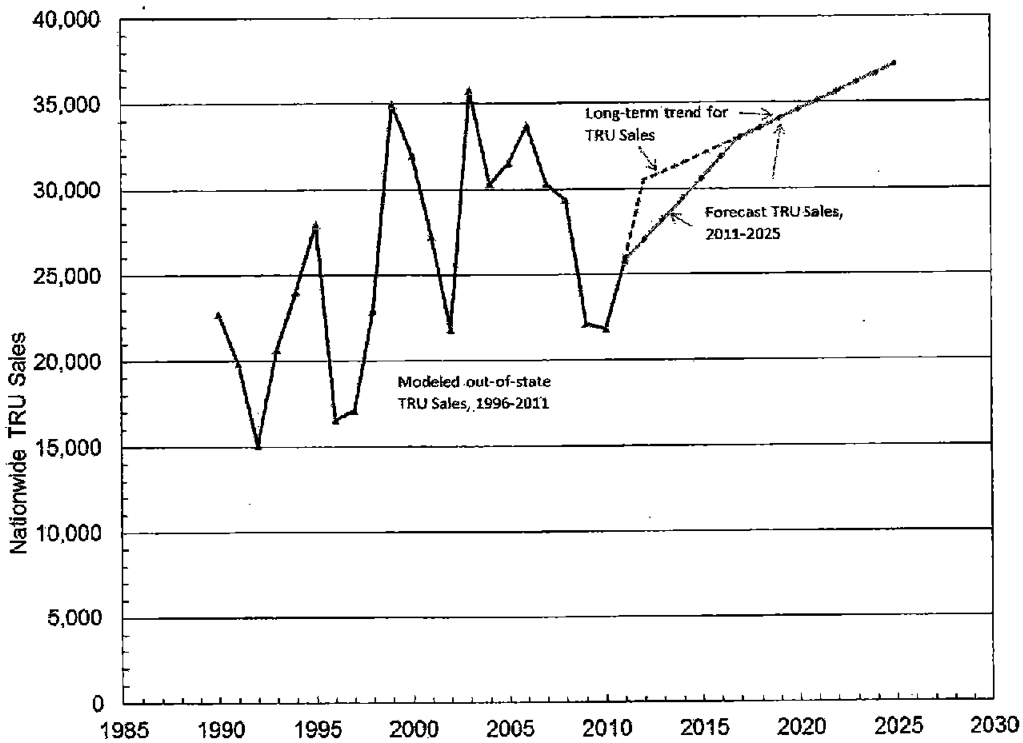
Table 39: Estimated Trailer TRU Sales Nationwide

Calendar Year	Estimated US Sales
2000	31,990
2001	27,226
2002	21,833
2003	35,767
2004	30,333
2005	31,532
2006	33,702
2007	30,339
2008	29,350
2009	22,134
2010	21,786
2011	25,800
2012	27,001
2013	28,202
2014	29,403
2015	30,604
2016	31,805
2017	33,006
2018	33,518
2019	34,036
2020	34,559
2021	35,087
2022	35,622
2023	36,162
2024	36,709
2025	37,261

In a manner similar to the sales estimated for California-based units, staff projected sales of units based out-of-state as not recovering to the long-term trend until 2017. For each calendar year, the population projected as visiting California, once the survival curve has been applied to past sales, is estimated using the ratio from 2011 (102,536 TRUs visiting CA from (275,000 nationwide – 25,079 CA-based trailer units) = ~41%). The estimated past and projected sales data for TRUs nationwide are shown again in Figure 16. The curve again shows much volatility on a year-to-year basis with a steady underlying upward trend.

As modeled, the ratio between California-based units and out-of-state units varies less than 1% between 2011 and 2025.

Figure 16: Projected Trailer TRU Sales Nationwide



d) Out-of-state Generator Sets

Because generator sets commonly move more freely between states, as they are used on rail lines, ocean-going vessels, and other uses, staff assumed the sales, survival, and model year distribution of generator sets visiting California from out of state was similar to CA-based generator sets. The population, as described earlier, was estimated using the ratio of California-based truck/trailer TRUs and truck/trailer TRUs visiting from outside California, applying that same ratio to the generator sets considered to be based in California. This led to an estimated population of over 26,000 generator sets coming from out of state to California, relative to the California-based population of 6,600.

e) Railcars

The UMLER database reports a nationwide railcar population of 7,900 units. The survival curve and future sales were modeled as assumed to follow those of truck/trailer TRUs.

Data from UMLER also indicated that railcar TRUs spent, on average, 19% of their annual operating hours in California. This ratio was assumed to apply to all calendar years.

f) Measures of the Industry

As shown by the various figures in the preceding sections, the TRU market can be characterized by a number of traits that are similar to the general trucking industry. It has also shown some characteristics that are different.

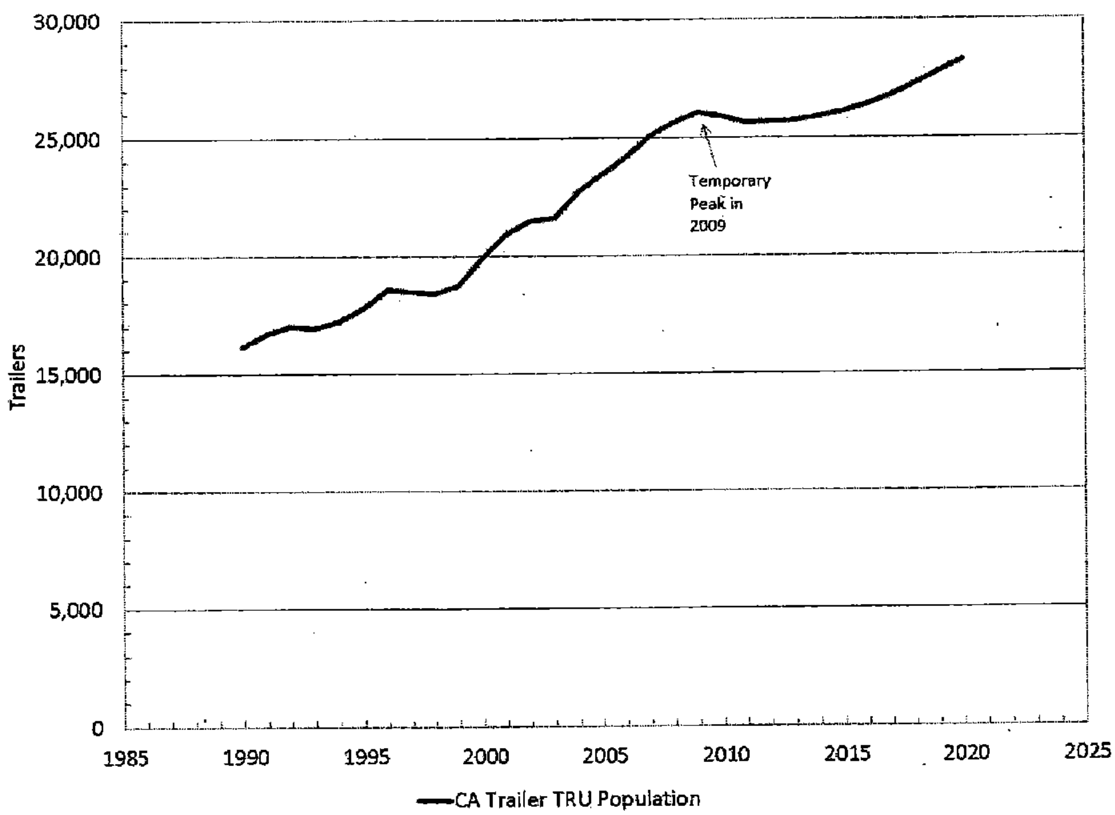
The first similarity is the volatility in new equipment sales, which is represented by Figure 8. ACT data indicated that nationwide refrigerated trailer sales actually declined more than general trailer sales around 2001. Ten years later, it appears that refrigerated trailer sales did not fall quite as far as general trailer sales. During the peak years of 1999 and 2006, refrigerated trailer sales appeared to increase relative to the trough years even more than general trailer sales.

While sales from year-to-year have shown volatility, the long-term trend has been steadier and slow, at least as estimated in terms of both activity and sales. California-based sales projected for calendar year 2025 are actually less than those estimated as having occurred in 2000.

Reported nationwide refrigerated trailer sales experienced an annual increase that averaged 1.6% between the troughs in 1991 and 2001. The annual increase averaged 2.3% between the troughs in 2001 and 2009. Peaks were more aggressive, implying that sales accelerated more quickly during prosperous times than they declined during hard times. Sales increased on average over 9% per year between 1995 and 1999, though only 3.1% between 1995 and 2006. Staff's expectation is that, without the impact of the regulation, sales (and resulting activity) would increase at a rate proportional to the population served by the trucks, at a rate closer to 1.1%, which is just slightly higher than the rate estimated by the California Department of Finance for population growth between 2000 and 2050 (California Department of Finance, 2007).

As a result of discussions with industry members at workshops, staff did not model the activity per unit as being reduced during the recession. However, because sales were modeled as having declined continuously between 2006 and 2010, and not returning to the long-term trend until 2017, the number of units estimated as being active is declining. Thus, the total hours of operation of all units is declining during the recession. Figure 17 shows the population estimated for California-based refrigerated trailers (refrigeration units of engines greater than 25 horsepower) between 1990 and 2020. As the figure shows, the population increases between 1990 and 2009, before decreasing slightly for a few years. Because refrigeration units for trucks, those less than 25 horsepower, follow similar sales patterns and survival curves, the long-term trend in sales would be identical for those units. Because activity per unit is not adjusted, overall activity and engine usage follows the same pattern as the overall population.

Figure 17: Estimated Population of California-based Refrigerated Trailers



In order to corroborate the average age of the transport refrigeration units as modeled in this analysis, staff compared results to average age estimated by ACT research in their forecasts and publications. The average age, as estimated by ARB across time, is shown in Figure 18. These data were found to follow a trend similar to that of ACT research. The data from ACT Research are shown in Figure 19. In both cases, the average age increased as a result of the reduced sales during the recession (and the resulting decrease in representation of the newer units within the overall fleet). Both data sets also indicated an increase in average age during the early 1990s and the early 2000s. Within the model used by staff to represent TRUs in California, the average age increased from just below 6 years in 2005 to 6.8 years at its highest point in 2013. ACT's data, which are based upon annual surveys of industry members rather than an up-to-date registry such as ARBER, estimated the average age of refrigerated trailers peaking in 2010 at just over 6 years. Note first that the ACT study related to trailers and not the refrigeration units based upon the trailers, and second that the ACT study was released in June 2009, and so that report could not have had access to all the data developed afterward. Lastly, that estimate relates to a nationwide population rather than a California-based population. The important point is that both indicate the average age of equipment as rising around the time of the recent recession.

Figure 18: Average Age of California-based Trailer TRUs

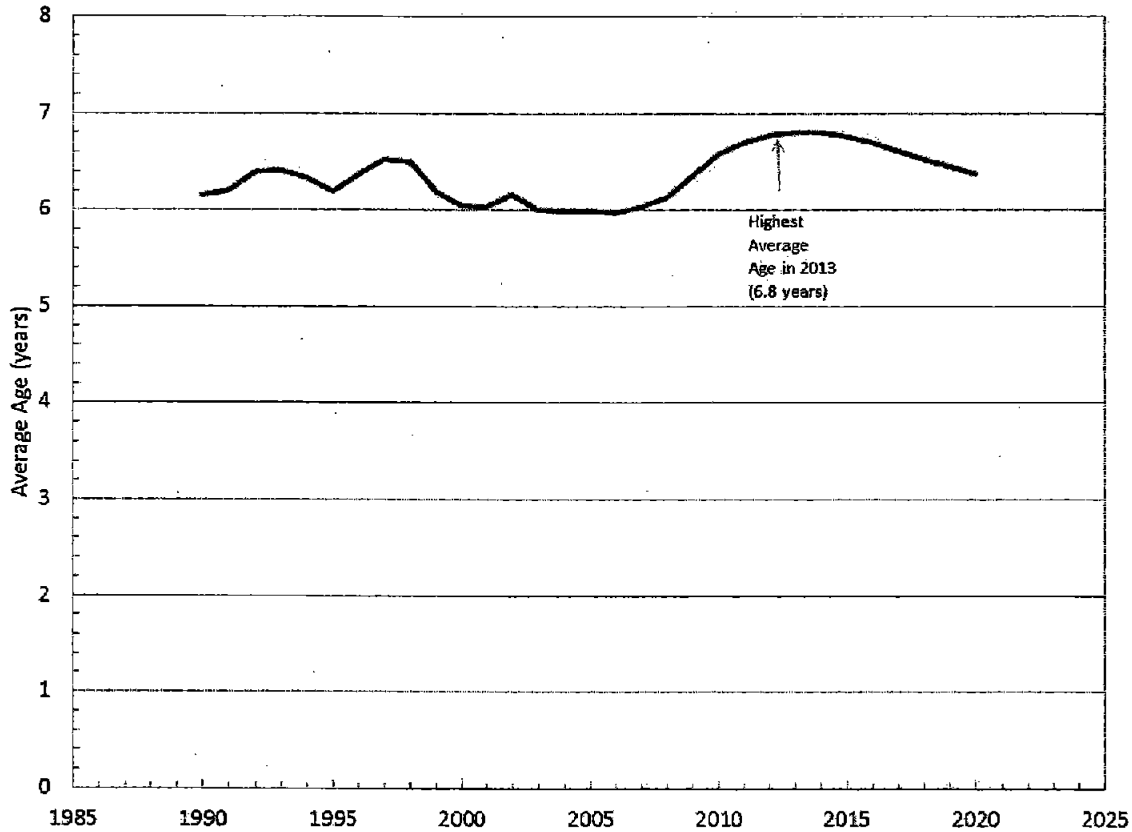
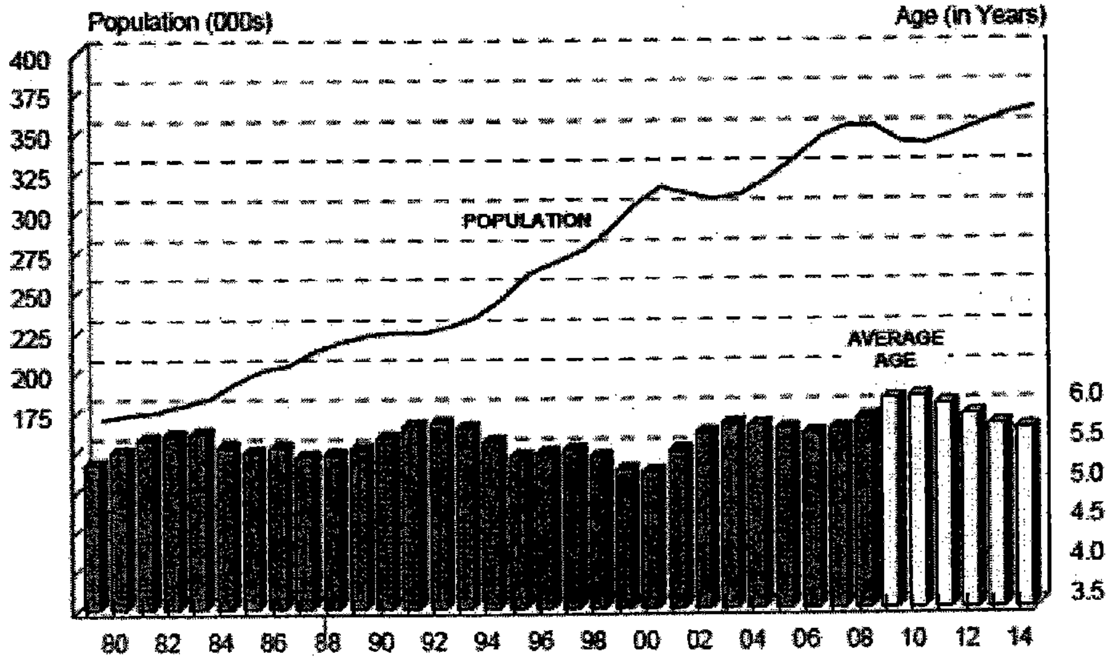


Figure 19: Nationwide Population and Average Age of Refrigerated Trailers, as Estimated by ACT Research (ACT Research, 2009)



6. Emission Factors

Emission factors represent the mass of pollutant produced per unit of engine usage. Generally, emission factors include both a 'zero-hour' emissions rate and a deterioration factor. The zero-hour emissions factor specifies how much emissions an engine would produce in its condition directly out of the factory. The deterioration factor indicates the extent to which an engine's emission factor increases with each unit of time, due to the wear and tear associated with the activity of the engine or the unit being refrigerated.

Deteriorated emission factors are calculated using the zero-hour emission factor and deterioration rate with the following equation:

Equation 5:

$$EF = Zh + Dr * Hrs$$

Where:

EF is the deteriorated emission factor (g/bhp-hr)
Zh is the zero-hour emission rate when the equipment is new (g/bhp-hr)
Dr is the deterioration rate, or the increase in the emission factor as the equipment is used in each hour of activity (g/bhp-hr^2, or g/bhp-hr/hr)
Hrs is the total number of hours of activity accumulated on the equipment

To estimate fuel consumption, the deteriorated emission factor variable is replaced with a brake-specific fuel consumption (BSFC) value (lb/hp-hr) in **Equation 5**. BSFC values were taken from the U.S. EPA NONROAD model (US EPA, 2008).

a) Data Sources

This inventory relies on emission factors and deterioration rates from OFFROAD2007 (ARB, 2010a). Emission factors in the OFFROAD2007 model incorporate the impacts of new engine standards (Tier 3 and 4) for each year and horsepower range. The emission factors also reflect any phase-in of emission standards allowed by the regulations establishing the new engine standards.

California implemented diesel fuel regulations in 1993, which lowered the limits of aromatic compounds and the sulfur content of fuel marketed in California. The fuel correction factors (FCF) used in the emissions inventory model are dimensionless multipliers applied to the basic exhaust emission rates that account for differences in the properties of certification fuels compared to those of commercially dispensed fuels. In instances where engines or vehicles are not required to certify, the FCFs reflect the impact in changes of dispensed fuel over time as refiners respond to changes in fuel specific regulations compared to the fuel used to obtain the test data. The FCFs used in the model were specific to horsepower group and model year and were based on data described in a 2005 OFFROAD Modeling Change Technical Memo (ARB, 2005b). Although the fuel correction factors do impact the emissions inventory, the inclusion of Tier 4 final emission factors, particularly PM emission factors, are of greater significance.

TRU activity is generally split between time on-road transporting refrigerated goods and the time spent at a loading or receiving dock, but because TRUs do not provide motive power to an on-road vehicle, TRU engines are required to meet off-road emissions standards. For the portion of the inventory over 25 horsepower, the emission factor for all Tier 4 final engines (expected to reach the market in 2013), is 94% lower than Tier 4 Interim engines. The emission factors used in the original inventory were based on Tier 0 through Tier 4I engines. Therefore emissions from TRUs representing the Tier 4 final population are substantially lower than emissions estimated in the original inventory.

For the purpose of calculating cumulative hours, staff gathered information from both manufacturers (ThermoKing, 2011; Carrier, 2011b) and from TRU fleets as shown by the results in Appendix B. Additionally a number of TRU and equipment auction sites were reviewed. Both fleets and manufacturers consistently referenced 20,000 hours as the expected life of a TRU engine. To account for this, staff capped the emission factor that could be associated with a TRU as that which would result from Equation 4 at 20,000 cumulative hours.

7. Spatial Allocation

TRUs operate on roads to provide temperature control during the transport of refrigerated goods, at loading docks cooling down trailers prior to loading ('pull down'), and during loading and unloading as well. To characterize TRU activity within the state and allocate by air basin and county, staff considered indicators that incorporated both on-road transit and facility locations across the state.

a) Data Sources

To consider the allocation of TRU use within the state that occurs while the TRU is on the road, or transporting goods, staff used the allocation from the Statewide Truck and Bus inventory (ARB, 2010b) for truck types that are most likely to carry refrigerated trailers. Specifically, staff used vehicle miles traveled by T7 heavy duty diesel tractors, single units, and California IRP trucks. The allocation of activity for these trucks by air basin is shown in Table 40.

Table 40: Statewide Truck and Bus Inventory VMT Air Basin Allocation

Air Basin	Percent of VMT by Heavy Duty Diesel Trucks
Great Basin Valleys	0.4%
Lake County	0.1%
Lake Tahoe	0.1%
Mountain Counties	1.5%
Mojave Desert	11.0%
North Coast	1.3%
North Central Coast	1.6%
Northeast Plateau	1.0%
South Coast	23.2%
South Central Coast	1.6%
San Diego	4.4%
San Francisco Bay Area	10.1%
San Joaquin Valley	30.2%
Salton Sea	5.1%
Sacramento Valley	8.5%

To account for the time TRUs spend at facilities, staff used the results of a FHWA-sponsored study in which Cambridge Systematics disaggregated the commodity flow data from the Freight Analysis Framework (Cambridge Systematics, 2010). Goods movement data within California had previously been allocated to five regions within California; the study reallocated the goods movement data to California's air basins. Staff analyzed results from this study for products that could be refrigerated, including dairy, meat, produce and other agricultural goods. The distribution of goods shipped or received within a given air basin are shown in Table 41.

Table 41: Freight Analysis Framework Goods Movement Air Basin Allocation

Air Basin	Percent of Goods Shipped and Received by Weight
Great Basin Valleys	0.0%
Lake County	0.1%
Lake Tahoe	0.1%
Mountain Counties	0.5%
Mojave Desert	1.6%
North Coast	0.5%
North Central Coast	3.3%
Northeast Plateau	0.1%
South Coast	42.1%
South Central Coast	3.2%
San Diego	4.0%
San Francisco Bay Area	17.3%
San Joaquin Valley	19.3%
Salton Sea	0.9%
Sacramento Valley	6.9%

b) Analysis

The differences between the two sources generally match expectations. For example, truck travel through the Mojave Desert corridor to neighboring states is 11 percent of statewide total while the total shipping and receiving facilities only account for 1.6 percent of the statewide total due to the low population within the area. Staff considered a number of alternatives of weighting the data. While some stakeholders suggested that more time was generally spent in transit than at loading docks, loading docks would generally see most or all of the pull-down time, which produces a significantly higher engine load than keeping a container at a set point once it has already been cooled. Not having further data regarding both time and average engine load at facilities and on-road, staff averaged the data sets to determine statewide allocation. The resulting allocation by air basin is shown in Table 42.

Table 42: Proposed TRU Activity Air Basin Allocation

Air Basin	Proposed Allocation of Statewide TRU Activity
Great Basin Valleys	0.2%
Lake County	0.1%
Lake Tahoe	0.1%
Mountain Counties	1.0%
Mojave Desert	6.3%
North Coast	0.9%
North Central Coast	2.5%
Northeast Plateau	0.6%
South Coast	32.6%
South Central Coast	2.4%
San Diego	4.2%
San Francisco Bay Area	13.7%
San Joaquin Valley	24.8%
Salton Sea	3.0%
Sacramento Valley	7.7%
TOTAL	**100%**

D. Modeling Compliance with the Regulation

Earlier sections of this document outlined the methods behind estimating emissions under a baseline case (i.e. without the regulation). The baseline inventory captures normal business practices of TRU owners. For example, the baseline inventory captures how long each TRU is typically maintained prior to retirement and how often it is operated. Projecting the impact of the regulation requires modeling the regulatory requirements and choices made by the affected industry to comply with those requirements.

1. Overview of Modeling Approach

In general, the TRU ATCM requires that fleet owners take actions to control emissions from their TRU once the TRU is seven years old. Fleet owners have the choice of replacing the TRU unit, replacing the engine with a newer engine, installing an exhaust a retrofit device, or using a TRU equipped with electric standby to allow the unit to run on supplied electric power while at a facility. The requirements apply to all TRUs regardless of owner, meaning that for the purposes of emissions modeling, TRUs do not need to be grouped by fleet. Thus individual fleets are not considered in the emissions model.

To model actions taken to comply with the regulation, the following parameters must be estimated or assumed:

- Compliance method (unit replacement, engine replacement, retrofit or electric standby).
- Percent of TRUs that have or will comply in a given year.

For these two components, staff:

1. Estimated the population of TRUs subject to the ATCM in a given year,
2. Modeled the fraction of the total population that was in compliance,
3. Split the population complying with the regulation between the four alternatives,
4. Estimate emissions for each alternative category.

a) Assumptions and Projections

Modeling the impacts of the regulation on TRUs is based on several assumptions and projections:

- TRU activity in the state would remain the same as the baseline case
- Tier 4 final engines will be available in 2013.
- Based on availability and certification dates, all retrofits installed prior to 2011 were Level 2 (qualifying as a LETRU measure); all retrofits installed after 2010 on units with engine larger than 25 horsepower were ULETRU; and all retrofit technology installed after 2011 on units with engine smaller than 25 horsepower is ULETRU.
- Based on discussions with generator set manufacturers and end-users (Carrier, 2011b; ThermoKing, 2011), generator set units were modeled as replacement only, without engine replacement, retrofit, or electric standby options.

b) Operative model year

In 2010, the Board considered additional flexibility in situations where the owner had already purchased a TRU with an engine model year that did not correspond to the unit model, often times being a year or two older. To prevent the TRU owner from being required to take action within the initial seven years after purchasing the TRU, ARB considered the option to comply based on 'operative model year'. If the TRU owner registered his equipment as necessary, the operative model year became the later of the engine model year and the generator set model year.

The practical impact of this provision is to allow, for example, a 2005 TRU unit with a 2004 engine to comply with the requirements based on the model year of 2005 rather than 2004.

In modeling this provision, staff queried all ARBER records to determine the percent of each engine model year that had an operative model year offset. Table 43 below shows the results of this analysis.

Table 43: Percent of Engine Model Year with Newer Operative Model Year

Engine Model Year	Operative model year	Population	Percent
2001	2001	1,197	
2001	2002	480	28.6%
2002	2002	3,030	
2002	2003	881	22.5%
2003	2003	7,727	
2003	2004	3,596	31.8%
2004	2004	8,907	
2004	2005	2,610	22.7%
2005	2005	11,310	
2005	2006	2,536	18.3%
2006	2006	13,766	
2006	2007	3,104	18.4%
2007	2007	17,094	
2007	2008	1,614	8.6%
2008	2008	11,699	
2008	2009	1,272	9.8%
2009	2009	10,742	
2009	2010	893	7.7%
2010	2010	7,533	
2010	2011	885	10.5%
2011	2011	5,911	
2011	2012	64	1.1%

As an example of how this potential amendment was modeled, when the TRUs with model year 2006 are projected to comply in 2013, 18.4 percent of these engines need not do anything until 2014, because the operative model year of the engine is 2007.

2. Compliance Choices

To determine how the affected owners would choose a compliance method, staff analyzed ARBER data for TRUs that had already met a compliance date. This included all TRUs that were model year 2003 and older. Retrofits and electric standby units are entry fields in ARBER and so can be summed directly without any analysis or assumptions. Unit and engine replacements due to the regulation, however, must be derived from the population using the population adjustment methods described in section I aboveC.1 above. The majority of TRUs have not yet faced a compliance date. Table 44 shows the distribution between TRUs that have not yet faced compliance, and the population in each compliance path, of all active TRUs in ARBER.

Table 44: Total Population Queried for Compliance Path

Category	Population	Percent of Units Facing Compliance	Percent of Compliant Pre-2004 Model Year
No Compliance Requirements to Date (model year 2004 or newer)	75,003		
Unit/Engine Replacement of pre-2003 model year	11,199	42%	65%
Retrofit of Pre-2004 model year	4,536	17%	27%
Electric Standby	1,376	5%	8%
Non-Compliant	9,415	35%	

Performing this query on each category and horsepower bin produced the distribution of compliance options shown in Table 45, where TRUs under 25 horsepower were grouped, as were TRUs over 25 horsepower between California-based and out-of-state.

Table 45: Compliance Options by TRU and Generator set Category

Category and Horsepower Bin	Unit/Engine Replacement	Retrofit	Alt Tech
California-based 25+	79%	20%	1%
California-based <25	47%	21%	32%
OOS	79%	20%	1%
Generator sets	100%	0%	0%

These totals reflect only the portion of 2003 and older model year TRUs and generator sets that have complied with the ATCM.

Staff recognize that the compliance choices of TRU owners may change over time as costs change and the appeal of different compliance options may vary. However, the existing distribution of compliance choices by fleets estimated above remains the best available data in predicting compliance behavior in the future.

Using this approach, staff modeled TRU behavior in all future years on the observations and analysis performed on the existing ARBER data.

3. Non-compliance with the TRU ATCM

Based on the ARBER database, staff project that a significant number of TRU owners have only complied with the ATCM reporting requirement. Many owners have not complied with the equipment requirements. This lack of compliance is likely based on a number of factors. Specifically:

- ARB did not receive the waiver from the US EPA to enforce the ATCM by the initial compliance date.
- The initial compliance date was moved back one year.
- ARB has considered a number of modifications to the ATCM, causing some fleets to delay regulatory actions until they are certain of the requirements.

As discussed in the staff report, staff plan to address these issues by continuing compliance assistance for fleets, stepping up enforcement actions, and providing certainty in regulatory requirements.

The compliance rate was estimated by staff by querying model year 2003 and older engines in ARBER for those that complied and those that were out of compliance. While staff are updating the ARBER information by contacting fleets regarding compliance, Table 44 above shows that over 64 percent of model year 2003 and earlier TRUs had taken action to comply, while the remainder had not complied with the ATCM.

Because the regulation is currently under consideration, staff project this compliance ratio will apply to compliance through December 31, 2011. However, by 2012, staff project full compliance with the regulation based on the steps being taken to increase compliance. As such, a significant portion of the increased benefits estimated in 2012 are due to bringing 100% of the 2004 and previous model year TRUs and generator sets into compliance. Benefits previously attributed to earlier model years are being accounted for in 2012.

4. Example Application

The following example is provided to demonstrate how staff projected compliance from a single model year, single horsepower bin population. In 2010, staff project there are 2,186 California-based TRUs above 25 horsepower with an engine model year 2003. Compliance projected for these TRUs was performed as shown in Table 46. In the example below, the operative model year is used to determine compliance requirements, as described in Section I.D.1.b) above.

Table 46: Compliance Path for Operational Model Year 2003 California-based TRUs with Engines Larger than 25 Hp in 2010 and 2011

	Percent	Population
MY 2003 California-based TRU 25 Hp+		2,186
Operative model year 2004	31.8%	695
Effective MY 2003		1,491
Non-Compliant	36%	537
Complying MY 2003		954
Replace Unit/Engine With MY 2010 Engine	79%	754
Retrofit	20%	191
Electric Standby	1%	10

	Percent	Population
MY 2003 Complying in 2011 due to Effective MY		695
Non-Compliant	36%	250
Complying MY 2003		445
Replace Unit/Engine With MY 2010 Engine	79%	352
Retrofit	20%	89
Electric Standby	1%	4

As shown in the table above, the TRUs with engine model year 2003 are split into those with operative model year 2003, complying in 2010, and those with operative model year 2004, complying in 2011. The percent of non-compliant TRUs is applied to each population and then removed from the total. The remainder is distributed between the compliance options.

Therefore under the regulation the 2,186 TRUs with engine model year 2003 will be distributed among those that are non-compliant, and those that are compliant under any of the three options (unit/engine replacement, retrofit or electric standby). This results in 787 noncompliant TRUs, 744 TRUs in compliance with a model year 2010 engine, 347 TRUs in compliance with model year 2011 engine, 191 model year 2003 TRUs in compliance with a Level 2 retrofit, 89 model year 2003 TRUs in compliance with a Level 3 retrofit, and 27 TRUs with model year 2003 engines in compliance with electric standby.

The survival curve (discussed in section I.C.5) is applied to units complying with a retrofit or electric standby options as if they had not been modified to meet regulatory requirements.

5. Modeling ULETRU Amendment Delay

Staff modeled the emissions impact of the three possible ULETRU delay amendments by modifying the existing regulatory impacts. That is, the populations that would be impacted by these amendments were determined from ARBER, the emissions impact quantified, and the result subtracted from the emissions estimates for the existing regulation.

Under the existing regulation, the model year 2001 and earlier TRUs that were retrofit with a level 2 device or replaced with a Tier 4i engine (either unit replacement or engine replacement) were required to meet ULETRU by December 31, 2015. Model year 2002 TRUs that met LETRU would need to comply by December 31, 2016, and model year 2003 TRUs would comply by December 31, 2017. The following scenarios were evaluated:

1. Model year 2001 and previous TRUs that met their LETRU requirements by December 31, 2008 would not be required to meet ULETRU until December 31, 2016.
2. TRUs of model year 2002 and earlier that met LETRU requirements by December 31, 2009, and TRUs of model year 2003 that met LETRU requirements by December 21, 2010 would have one additional year before meeting ULETRU.
3. In a combination of the previous amendments, model year 2001 and previous TRUs that met their LETRU requirements by December 31, 2008, would have two additional years, their second compliance deadline being shifted from December 31, 2015 to December 31, 2017. Model year 2003 and previous TRUs that met LETRU requirements but were not provided a two-year delay under the previous provision would have one additional year before meeting ULETRU.

To define the populations that would be impacted by amendments, staff queried ARBER. Table 47 shows the results of that query.

Table 47: ARBER LETRU Query and Results

Amendment	Criteria	Model Year	Population
1	Level 2 VDECS by Dec. 31, 2008	2001 and Older	40
	Tier 4i Repower by Dec. 31, 2008	2001 and Older	91
2	Level 2 VDECS	2001 and Older	1746
		2002	137
		2003	316
	Tier 4i Repower	2001 and Older	504
		2002	100
		2003	515

Amendment 3 would affect the same population as Amendment 2.

To estimate the impact of the amendments staff projected the population from the units determined as active in 2011. The population was projected to calendar years 2016 through 2018, the years in which the TRUs would receive a delay of ULETRU requirements.

Based on a query of the population between California-based and out-of-state TRUs in the categories shown above, staff estimate that approximately 85 percent of the TRU populations shown in Table 1 were California-based TRUs. As such, staff projected these populations forward to the date they would be impacted by the delay of ULETRU requirements, from 2016 through 2018, applying the survival curve for California-based TRUs to 85% of the units and applying the survival curve for out-of-state TRUs visiting California to 15 percent of the units. The survival curve for out-of-state TRUs projects a zero percent chance of survival at 14 years (a 2001 TRU would be 14 years old by the end of 2015, the year in which it would receive a delay due to these amendments), and therefore staff projected that in 2016 through 2018, these populations would consist entirely of California-based TRUs. The 15 percent from out-of-state would most likely be retired from out-of-state service or replaced in the intervening years.

Projecting the population forward using the survival curve as described, staff then made one final adjustment to include those TRUs that met LETRU by a full unit replacement instead of a repower or retrofit. Using the compliance assumptions discussed in SectionI.D.2, staff modeled that 10 percent of trailer TRUs would replace the entire unit. To adjust the population of units to reflect this, staff increased the repowered units to include the 10 percent of TRUs that would be brought into compliance by replacement.

Based on these adjustments, staff estimated the number of TRUs that would be in service in 2016 through 2018 and would receive a benefit from the delays. The estimated populations are shown in Table 48.

Table 48: TRU Population Impacted by ULETRU Delay Scenarios

Model Year	TRU Population Impacted by Amendment 1	TRU Population Impacted by Amendment 2
2001 and Older	142 (in 2016)	1,422 (in 2016)
2002	n/a	164 (in 2017)
2003	n/a	638 (in 2018)

To calculate the emissions impact from the delay in ULETRU requirements for these populations, staff modeled each population on the emissions input factors for California-based TRUs associated with trailers, as discussed in Section I.C.

The loss in emission benefits can be correlated to the change in emissions factors for the population. Table 49 shows the emissions factors used for the populations before and after the impact of the amendments.

Table 49: Emission Factors for TRUs Impacted by ULETRU Delays

Model Year and Calendar Year of Impact	PM Emission Factor (g/bhp-hr)	NOx Emission Factor (g/bhp-hr)
2001 in 2016: With Level 2 VDECS	0.61	7.21
2002 in 2017: With Level 2 VDECS	0.61	7.21
2003 in 2018: With Level 2 VDECS	0.61	6.60
2008 in 2016	0.24	5.68
2009 in 2017	0.24	5.68
2010 in 2018	0.24	5.68
2016 and Later	0.01	2.75

Effectively, the loss in emissions benefits in a particular year can be calculated using the previous two tables.

For example, in 2018 the disbenefits for Amendment 2 would be the difference in 638 TRUs operating at 0.01 g/bhp-hr for PM (under the current regulation, they would be required to meet ULETRU requirements) and either 0.61 g/bhp-hr or 0.24 g/bhp-hr (under the amendments, these units would remain either 2003 engines with a Level 2 VDECS or 2010 engines with no controls). This disbenefit would only be seen in 2016, as the units would face ULETRU requirements after the one year delay.

II. EMISSIONS INVENTORY RESULTS

Overall, emissions estimates for PM are lower than the inventory estimated in 2003 and used to support rulemaking, while estimates for NOx have decreased significantly.

A. Assumptions and Example Calculation

1. Assumptions

In calculating emissions staff had to include the impact of applied control strategies to the TRU and generator set engines, specifically the application of retrofits (or VDECS) and electric standby.

As discussed in Section I.D.1.a), staff model all retrofits that were installed prior to 2011 as Level 2 devices, all 2011 and later retrofits on units larger than 25 horsepower as Level 3, and all 2012 and later retrofits on units less than 25 horsepower as Level 3 where available. Staff used the percent reduction in PM that ARB requires to certify a device to Level 2 or Level 3, and applied these factors to the population of TRUs that had a retrofit installed. Level 2 units must reduce PM by at least 50 percent, and Level 3 units must reduce PM by 85 percent or more. For example, a retrofit on a model year 2004 25 to 50 horsepower TRU installed in 2012 was assumed to be a Level 3 unit, and an 85 percent reduction is applied to the TRU PM emissions.

Additionally, staff considered the likely reduction in TRU emissions from the installation of an electric standby unit. Electric standby modifications allow a TRU to be run on electric power provided by a facility while the unit is being loaded, unloaded, or is in pull-down mode at a facility. As discussed in Section I.C.7 with regards to spatial allocation, staff estimate that roughly 50 percent of TRU emissions may occur at a facility (with the remaining 50 percent occurring on the road). Using this reasoning, staff modeled TRU emissions (both NOx and PM) being reduced by 50 percent by the application of electric standby.

2. Example Calculation

While the previous section provides the methodology, to place the number in context, a sample calculation for the final emissions inventory is shown below.

In 2011, staff estimate that 11,725 TRUs visit California from out-of-state with an engine of model year 2008. The PM emissions from this population are calculated as follows, using Equation 1:

Emissions in tons/day = Pop * HPave * LF * Activity * EF

where:

Pop = 11,725 TRUs;
HP_{ave} = 34 Hp / TRU
LF = 0.46
Activity = 1,697 hrs/year * 12.4% (fraction in CA)
EF = 0.16 g/bhp-hr + (0.0000123 g/bhp-hrs^2 * (2 years * 1697 hrs/year)) * 80% (fuel correction factor) * 1lb/453.6g * 1 ton/2000 lb

The calculation produces a result of 6.9 tons/year or 0.021 tons/day.

The emissions from all horsepower bins and all model years are calculated using this equation and summed to provide the final emissions inventory.

B. **Baseline and With-Rule Emissions**

The baseline emissions and with-rule emissions are shown in Figure 20 and Figure 21 for both PM and NOx.

Figure 20: Baseline and with-Rule PM Emissions from TRUs

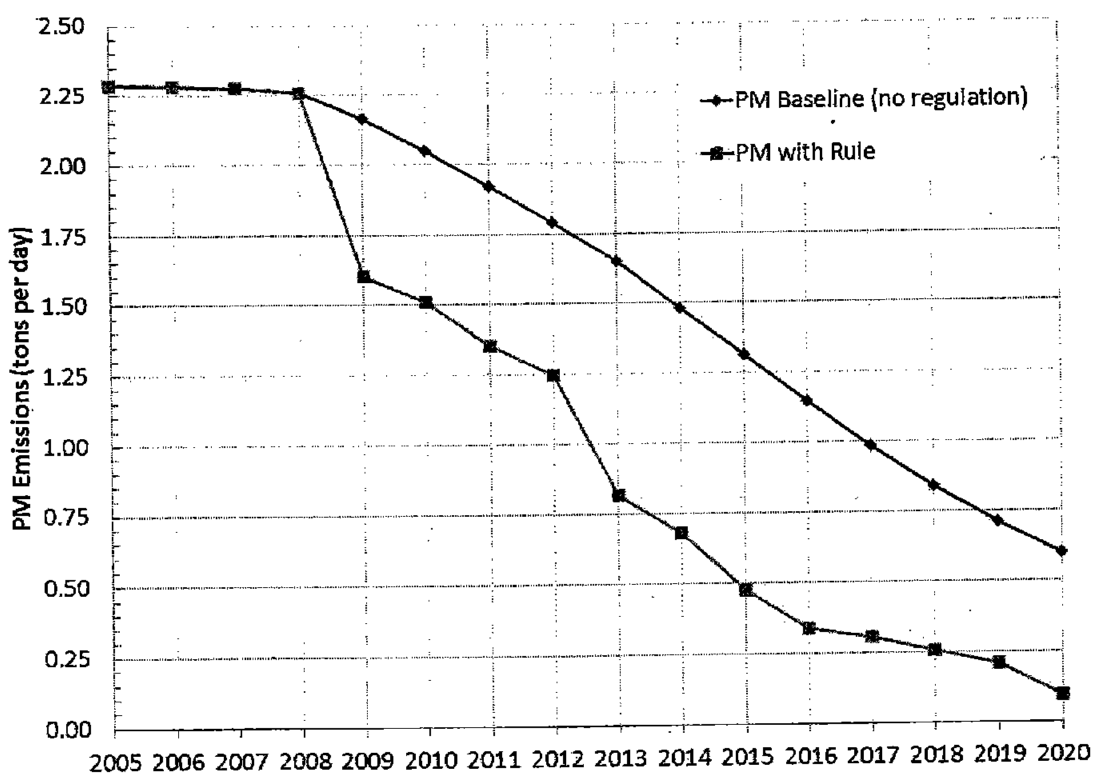
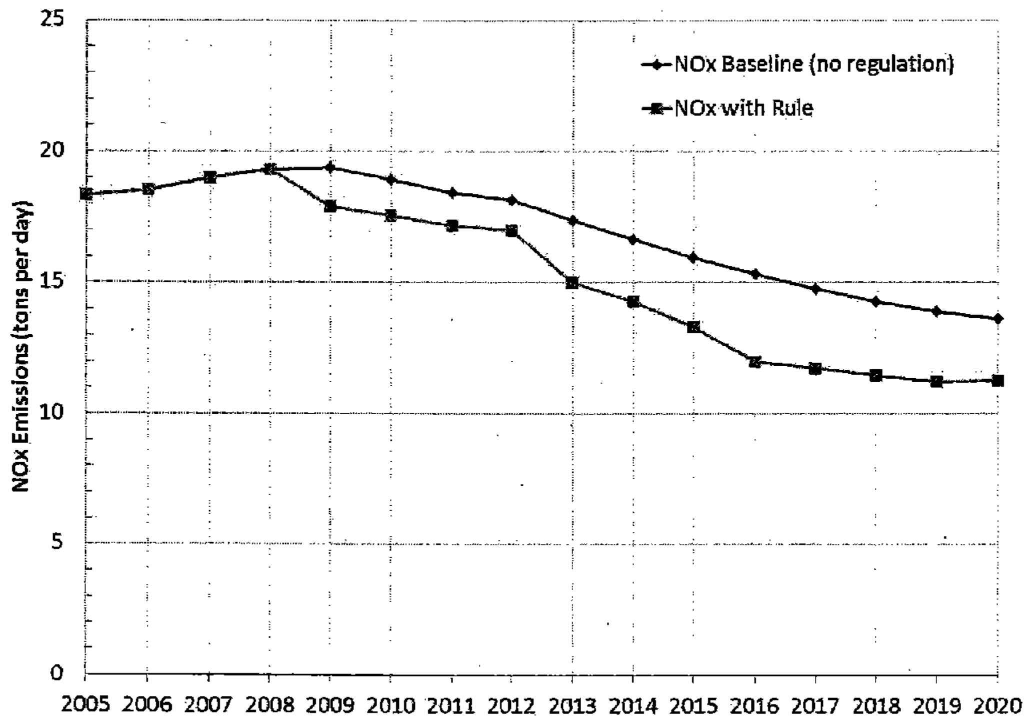


Figure 21: Baseline and with-Rule NOx Emissions from TRUs



The total emissions, benefits, and percent reduction in pollutant are also shown for select years in Table 50.

Table 50: NOx and PM Emissions and Emissions Benefits

	2011	2014	2017	2020
Baseline PM	1.92	1.48	0.99	0.60
With Rule PM	1.35	0.68	0.31	0.09
PM Emissions Benefit	0.57	0.80	0.68	0.51
Percent Reduction	30%	54%	69%	85%
Baseline NOx	18.42	16.64	14.77	13.63
With Rule NOx	17.17	14.28	11.75	11.26
NOx Emissions Benefit	1.25	2.36	3.01	2.37
Percent Reduction	7%	14%	20%	17%

The representation of each TRU category to the inventory and the anticipated benefits for each pollutant is shown in Table 51. The allocation is based on calendar years 2005 to 2020.

Table 51: Contribution to Emissions and Benefits by Inventory Category

	CA-based TRUs	TRUs based outside CA	Generator sets	Railcars
Percent of PM Emissions	65%	27%	5%	3%
Percent of PM Emissions Benefits	75%	19%	4%	2%
Percent of NOx Emissions	60%	30%	7%	3%
Percent of NOx Emissions Benefits	74%	18%	5%	2%

Note that California-based TRUs are responsible for the majority of total emissions due to both population and an older age distribution. The higher population of older units also provides an even larger portion of the emissions benefits than of total emissions. Effectively, a greater portion of the California-based TRU portion is older and subject to the regulation, compared with out-of-state, railcar, and generator set units. Table 52 shows the portion of each category from the 2011 baseline populations that will face a compliance date by the end of 2011. This is the percent of the population under a business as normal case that would be 2004 or older on December 31, 2011.

Table 52: TRU Populations Impacted by the Rule by 2011

Inventory Category	Percent of Category Impacted by the Rule
California-based TRUs	47%
OOS TRUs	24%
Generator sets	18%
Railcars	24%

C. Emissions Benefits for Alternatives

1. Use Operative Model Year in Lieu of Engine Model Year

Using the operative model year when determining compliance requirements, as discussed in Section I.D.1.b), will in most cases reduce the emissions benefits of the regulation. The units that are in compliance according to operative model year instead of engine model year will have an additional year of operation prior to taking any actions under the regulatory requirements, producing a slightly older fleet and higher emissions. Table 53 below shows the emissions benefits not realized if the compliance schedule is determined by the operative model year rather than the engine model year.

Table 53: Emissions Benefits Not Realized Using Operative Model Year in Lieu of Engine Model Year, tons per day

Calendar Year	PM	NOx
2009	0.024	0.056
2010	0.015	0.033
2011	0.037	0.056
2012	0.015	0.021
2013	0.016	0.041
2014	0.017	0.058
2015	0.012	0.033
2016	0.009	0.094
2017	0.000	-0.001
2018	0.005	0.059
2019	-0.001	-0.009
2020	0.000	-0.009

2. Delay ULETRU Requirements for Early Compliers

Staff also analyzed three scenarios in which units that met their initial compliance dates by meeting the LETRU requirements were given an additional year to operate before being required to meet the later ULETRU requirements. The three scenarios are:

1. Model year 2001 and previous TRUs that met their LETRU requirements by December 31, 2008 would not be required to meet ULETRU until December 31, 2016.
2. TRUs of model year 2002 and earlier that met LETRU requirements by December 31, 2009, and TRUs of model year 2003 that met LETRU requirements by December 21, 2010 would have one additional year before meeting ULETRU.
3. In a combination of the previous amendments, model year 2001 and previous TRUs that met their LETRU requirements by December 31, 2008, would have two additional years, their second compliance deadline being shifted from December 31, 2015 to December 31, 2017. Model year 2003 and previous TRUs that met LETRU requirements but were not provided a two-year delay under the previous provision would have one additional year before meeting ULETRU.

Because the units receiving the delay have already faced one level of control, the loss in benefits is relatively small compared to a full delay of the regulation. The emission reductions under these amendments are shown below in Table 54 and Table 55, as well as the emissions benefits of the existing regulation for comparison. Note that disbenefits will only occur in 2016 through 2018, as the delay will still result in the same actions being taken one year later than previously required.

Table 54: PM Benefits Not Realized by ULETRU Delay Amendments (tons/day)

	Existing Regulation Benefits	Delay ULETRU for 2001 and Older Earlier Compliance	Delay ULETRU for 2003 and Older Compliance	Combined ULETRU Amendments
2016	0.804	0.003	0.042	0.042
2017	0.682	0.000	0.004	0.006
2018	0.584	0.000	0.012	0.012

Table 55: NOx Benefits Not Realized by ULETRU Delay Amendments (tons/day)

	Existing Regulation Benefits	Delay ULETRU for 2001 and Older Earlier Compliance	Delay ULETRU for 2003 and Older Compliance	Combined ULETRU Amendments
2016	3.341	0.029	0.348	0.348
2017	3.015	0.000	0.036	0.061
2018	2.831	0.000	0.125	0.125

The emissions benefits not realized under the ULETRU delay amendments are also compared to the emissions anticipated under the existing regulation later in Figure 22 and Figure 23.

3. Delay Future Requirements by One to Three Years

Lastly, staff also modeled the impacts of amending the regulation to allow one-, two-, or three-year delays to all future requirements. Effectively, all future compliance dates would apply to engine model years eight, nine, or ten years prior, instead of seven years. Additionally, requirements to engines retrofit with a Level 2 device would be extended from seven years after the installation to eight, nine, or ten years. Obviously, each case would reduce the overall benefits as TRU owners would have older TRUs with higher emissions, if only incrementally. These amendments were not modeled for past compliance dates, only future compliance dates.

Note that where the regulation is delayed, no unique compliance actions are anticipated in 2012, but a significant emissions benefit is seen in 2013. This is due to the compliance assumptions discussed previously, specifically the assumption that a compliance level of 100% will be achieved during 2012, before 2013. A compliance level less than 100% is modeled for prior years.

The impacts of these changes are shown in Figure 22 for PM and Figure 23 for NOx. Emissions results from this analysis are detailed in the emissions model released in support of this rulemaking package.

4. Baseline and Amendment Emissions

The emissions estimated under the baseline scenario and the emissions resulting from the amendment scenarios are shown Figure 22 Note that emissions for the one, two or three year delay scenarios include the impacts of the operative model amendment, and the emissions for the proposed amendment include both the ULETRU delay and the operative model year amendment.

Figure 22: PM Emissions under Baseline and Amendment Scenarios

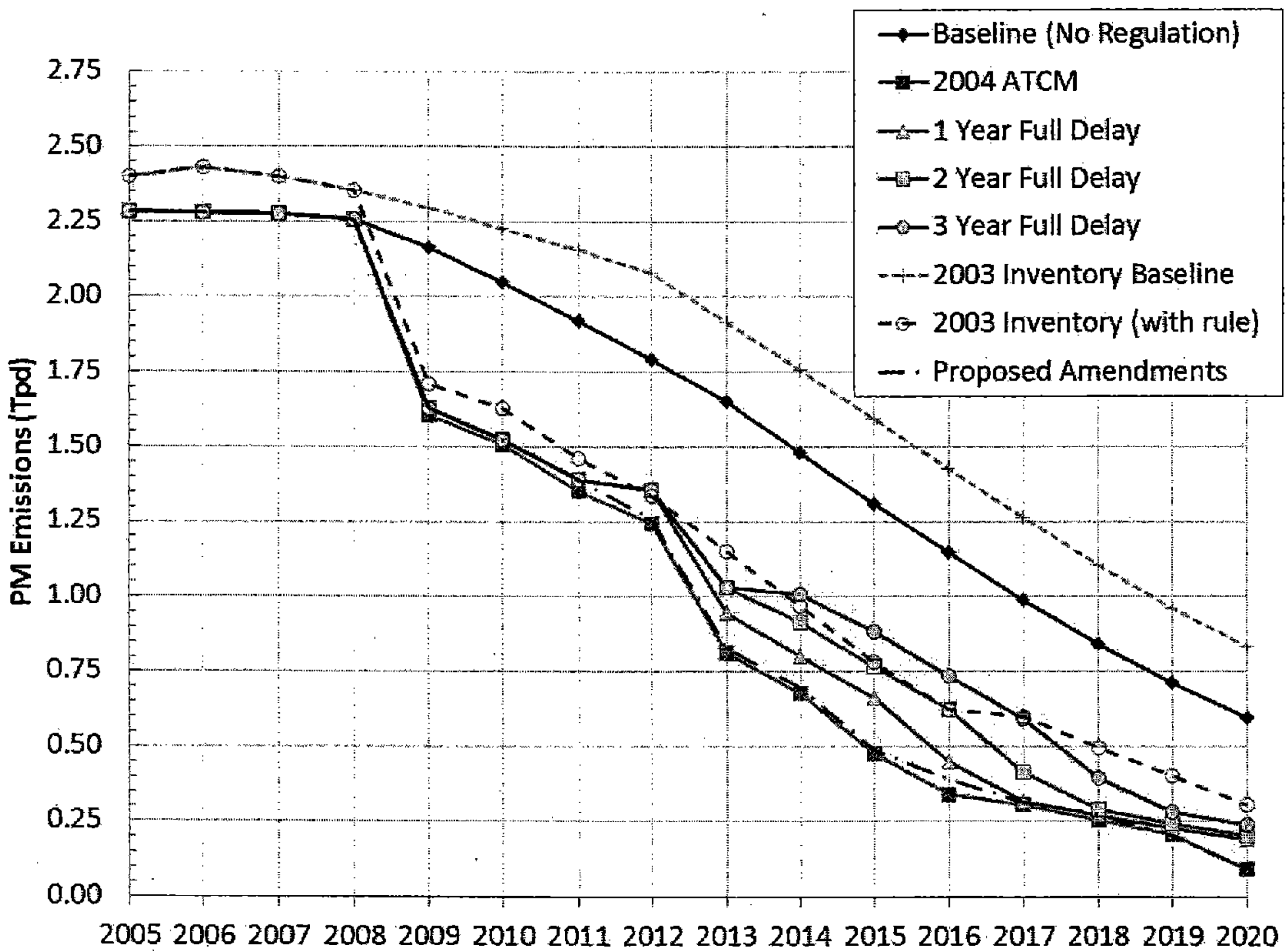
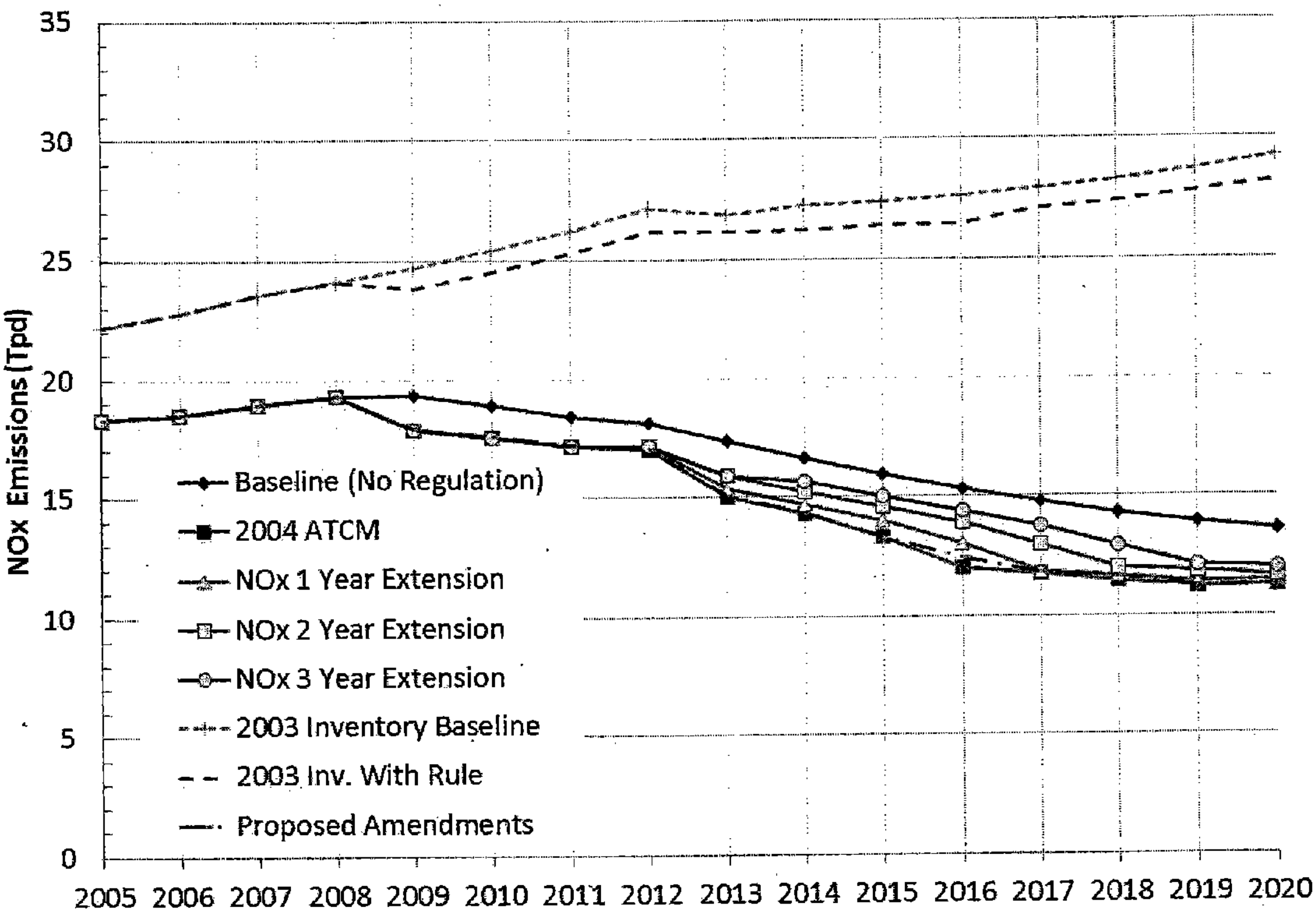


Figure 23: NOx Emissions under Baseline and Amendment Scenarios



D. Emissions Tables

The emissions for all figures are shown in Table 56 and Table 57. Note that the emissions shown for the proposed ULETRU amendments also incorporate the effect of the amendment that would allow unit owners to comply based on the operative model year of the unit rather than the model year of the engine.

The emissions resulting from the proposed amendments are also compared against the existing amendments in Figure 24.

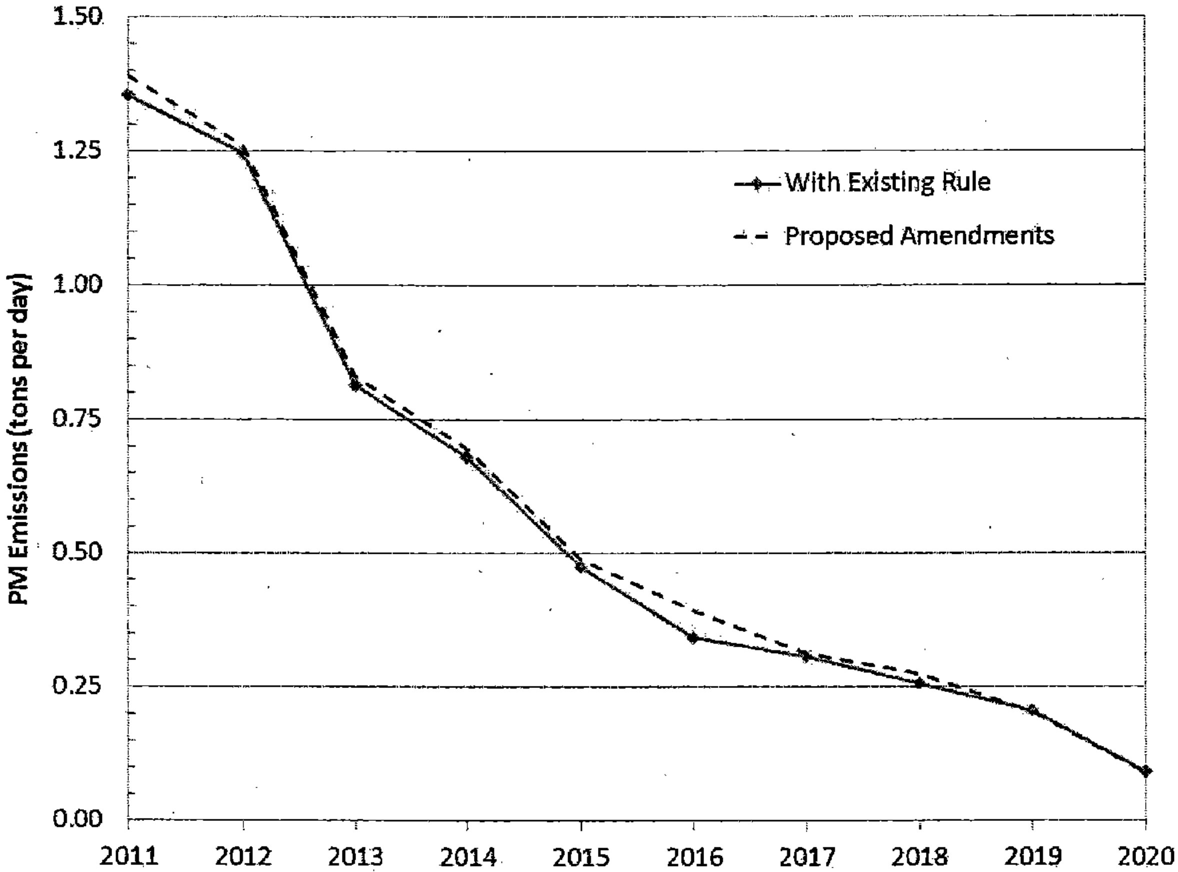
Table 56: PM Emissions (tons/day)

	Baseline	2004 ATCM	Use Operative MY	Delay ULETRU for 2001 and Older Earlier Compliance	Delay ULETRU for 2003 and Older Compliance	Combined ULETRU Amendments (Proposed Amendments)
2005	2.29	2.29	2.29	2.29	2.29	2.29
2006	2.28	2.28	2.28	2.28	2.28	2.28
2007	2.28	2.28	2.28	2.28	2.28	2.28
2008	2.26	2.26	2.26	2.26	2.26	2.26
2009	2.17	1.60	1.63	1.63	1.63	1.63
2010	2.05	1.51	1.52	1.52	1.52	1.52
2011	1.92	1.35	1.39	1.39	1.39	1.39
2012	1.79	1.25	1.26	1.26	1.26	1.26
2013	1.65	0.82	0.83	0.83	0.83	0.83
2014	1.48	0.68	0.70	0.70	0.70	0.70
2015	1.31	0.48	0.49	0.49	0.49	0.49
2016	1.15	0.34	0.35	0.35	0.39	0.39
2017	0.99	0.31	0.31	0.31	0.31	0.31
2018	0.84	0.26	0.26	0.26	0.27	0.27
2019	0.71	0.21	0.21	0.21	0.21	0.21
2020	0.60	0.09	0.09	0.09	0.09	0.09
2021	0.50	0.09	0.09	0.09	0.09	0.09
2022	0.41	0.10	0.10	0.10	0.10	0.10
2023	0.35	0.10	0.10	0.10	0.10	0.10
2024	0.29	0.10	0.10	0.10	0.10	0.10
2025	0.24	0.10	0.10	0.10	0.10	0.10

Table 57: NOx Emissions (tons/day)

	Baseline	2004 ATCM	Use Operative MY	Delay ULETRU for 2001 and Older Earlier Compliance	Delay ULETRU for 2003 and Older Compliance	Combined ULETRU Amendments (Proposed Amendments)
2005	18.33	18.330	18.33	18.33	18.33	18.33
2006	18.55	18.551	18.55	18.55	18.55	18.55
2007	18.98	18.984	18.98	18.98	18.98	18.98
2008	19.29	19.294	19.29	19.29	19.29	19.29
2009	19.38	17.905	17.96	17.96	17.96	17.96
2010	18.92	17.577	17.61	17.61	17.61	17.61
2011	18.42	17.171	17.23	17.23	17.23	17.23
2012	18.14	17.017	17.04	17.04	17.04	17.04
2013	17.37	15.005	15.05	15.05	15.05	15.05
2014	16.64	14.276	14.33	14.33	14.33	14.33
2015	15.96	13.293	13.33	13.33	13.33	13.33
2016	15.34	11.995	12.09	12.12	12.44	12.44
2017	14.77	11.753	11.75	11.75	11.79	11.81
2018	14.29	11.457	11.52	11.52	11.64	11.64
2019	13.91	11.220	11.21	11.21	11.21	11.21
2020	13.63	11.261	11.25	11.25	11.25	11.25
2021	13.43	11.602	11.59	11.59	11.59	11.59
2022	13.31	11.938	11.93	11.93	11.93	11.93
2023	13.28	12.260	12.26	12.26	12.26	12.26
2024	13.31	12.581	12.58	12.58	12.58	12.58
2025	13.39	12.884	12.88	12.88	12.88	12.88

Figure 24. The PM Emissions Impact of the Proposed Amendments



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APPENDIX D

METHODOLOGY FOR ESTIMATING THE POTENTIAL HEALTH IMPACTS FROM DIESEL TRANSPORT REFRIGERATION UNIT ENGINES

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A. Methodology

This appendix presents the methodology used to estimate the potential cancer risk from exposure to diesel particulate matter (diesel PM) from Transport Refrigeration Units (TRU) with diesel engines. This methodology was developed to assist in the development of the proposed *Airborne Toxic Measure for In-Use Diesel-Fueled Transport Refrigeration Units and TRU Generator Sets, and Facilities where TRUs Operate*. The assumptions used to determine these potential cancer risks are not based on TRUs at a specific distribution facility, rather a generic (i.e. example) facility was developed. The source parameters selected include a broad range of possible operating scenarios. These estimated risks are used to provide an approximate range of potential risk levels from diesel TRU engine operations. Actual risk levels will vary due to site-specific parameters, including the number of TRUs operating, emission rates, operating schedules, site configuration, site meteorology, and distance to receptors.

The methodology used in this risk assessment is consistent with the methodology presented in the Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003). These OEHHA guidelines and this assessment utilize health and exposure assessment information that is contained in the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors (OEHHA, 2009); and the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Analysis and Stochastic Analysis (OEHHA 2000), respectively.

The cancer health risk estimates provide a "qualitative" assessment of the potential impacts due to the operation of diesel TRUs. Actual cancer health risks will depend on actual site specific parameters, including number of diesel TRUs operating at the facility, diesel particulate emission rates, facility operation schedules and configuration, and site meteorology. Actual risk will also vary depending on the distance a receptor is from the facility, the duration of exposure, and the inhalation rate.

B. An Overview of Health Risk Assessment

A health risk assessment (HRA) is an evaluation or report that a risk assessor (e.g., ARB, district, consultant, or facility operator) develops to describe the potential a person or population may have of developing adverse health effects from exposure to diesel PM emissions or from other toxic air contaminants (TACs). Some health effects that are evaluated could include cancer, developmental effects, or respiratory illness. The exposure pathways included in an HRA depend on the TACs that a person (receptor) may be exposed to, and can include breathing, the ingestion of soil, water, crops, fish, meat, milk, and eggs, and dermal exposure. For this HRA, we are evaluating the cancer health impacts for diesel particulate via the breathing or inhalation pathway only.

Generally, to develop an HRA, the risk assessor would perform or consider information developed under the following four steps. The four steps are Hazard Identification, Dose-Response Assessment, Exposure Assessment, and Risk Characterization.

Hazard Identification

In the first step, the risk assessor would determine if a hazard exists, and if so, would identify the exact pollutant(s) of concern and the type of effect, such as cancer or non-cancer effects. For this assessment, the pollutant of concern, diesel particulate from internal combustion engines, has been formally identified under the Assembly Bill (AB) 1807 Program as a TAC through an open, regulatory process by the ARB (ARB 1998a).

Dose-Response Assessment

In this step of risk assessment, the assessor would characterize the relationship between exposure to a pollutant and the incidence or occurrence of an adverse health effect. This step of the HRA is performed for the ARB by OEHHA. OEHHA supplies these dose-response relationships in the form of cancer potency factors (CPFs) for carcinogenic effects and reference exposure levels (RELs) for non-carcinogenic effects. The CPFs and RELs that are used in California can be found in one of three references: (1) The OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part III, Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels, January 2001; (2) The OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part I, The Determination of Acute RELs for Airborne Toxicants, March 1999; and (3) The OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors, May 2009. The individual CPF for diesel particulate from internal combustion engines used for this HRA is 1.1 per milligram per kilogram body weight day $(mg/kg\text{-}day)^{-1}$.

Exposure Assessment

In this step of the risk assessment, the risk assessor estimates the extent of public exposure by looking at who is likely to be exposed, how exposure will occur (e.g., inhalation and ingestion), and the magnitude of exposure. For TRU operations, the receptors that are likely to be exposed include residents or offsite workers located near the facility. Onsite workers certainly could also be impacted by the emissions; however, they are not included in this HRA because Cal/OSHA has jurisdiction over onsite workers. Exposure was evaluated for diesel particulate via the breathing or inhalation pathway only. The magnitude of exposure was assessed through the following process. Emission rates were developed using emission parameters determined from site visits, and from facility and manufacturer data gathering, and input from industry representatives. During the site visits, other information such as physical dimensions of the source, operation schedules, and receptor locations were obtained. Computer air dispersion modeling was used to provide downwind ground-level concentrations of the diesel PM at near-source locations.

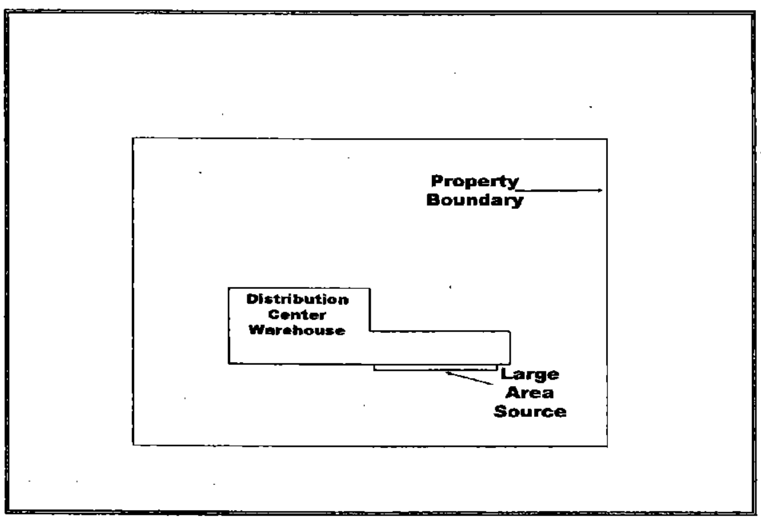
Risk Characterization
This is the final step of risk assessment. In this step, the risk assessor combines information derived from the previous steps. Modeled concentrations, which are determined through exposure assessment, are combined with the CPF for cancer risk determined under the dose-response assessment. This step integrates this information to quantify the potential cancer risk and/or chronic or acute noncancer effects.

C. Source Description

Potential cancer health risks due to diesel TRU operations are from emissions of diesel particulate matter (diesel PM). For these analyses, the emission sources were characterized as area sources where trailers equipped with diesel TRUs were expected to operate. Sensitivity studies were done to show that the point of maximum impact, usually the property boundary, shows little difference between characterizing the emissions as an area source comprised of all TRU emissions or as numerous small point sources. The results of these studies are found in the 2003 Staff Report (ARB, 2003).

The area source is modeled where the trailers sit while pulling down the trailers' interior temperature, filling the trailer with perishables, or delivering perishable goods. The distribution center sources were characterized as small, medium, and large areas of emissions. This section describes the parameters and results from a large distribution center area source (Figure D-1). This figure is only given as an illustration of the modeling layouts and is not to scale.

Figure D-1: Distribution Area Source



The diesel TRUs operating within the large area source were assumed to be 35 horsepower (hp) with a 46 percent load factor. The engine run time hours do not include automated cycle-off time. The hourly emission rate was conservatively assumed to be 0.26 grams per hp-hour (g/hp-hr), which is the estimated fleetwide emission rate for 2014. Analyses were also developed using other diesel PM emission rates, including the 2020 fleetwide emission rate 0.02 g/hp-hr, and emission rates showing the impact due to the amendments. Operation of the diesel TRUs within the area source was assumed to occur between 2:00 PM and 7:00 AM, 7 days per week, based on discussions with distribution centers. This operation schedule was used for the 2003 TRU ATCM report.

Sensitivity studies were done to determine buoyancy and final plume height achieved due to stack gas temperature and upward velocity. These studies led to the determination of a daytime and nighttime plume height used for the initial area source height, as shown in Table D-1. The results of these studies are found in the 2003 TRU ATCM (ARB, 2003).

Table D-1: Dispersion Modeling Parameters

Parameter	Value
Source Type	Area
Dispersion Setting	Urban
Receptor Height	1.5 meters
Initial Vertical Dispersion Parameter (σ_z)	2.5 meters
Area Source Width	16.8 meters
Area Source Length	218.8 meters
PM Emission Factor	0.26 grams/hp-hr
Daytime (7 AM to 7 PM) Plume Height	4.46 meters
Nighttime (7 PM to 7 AM) Plume Height	12.79 meters

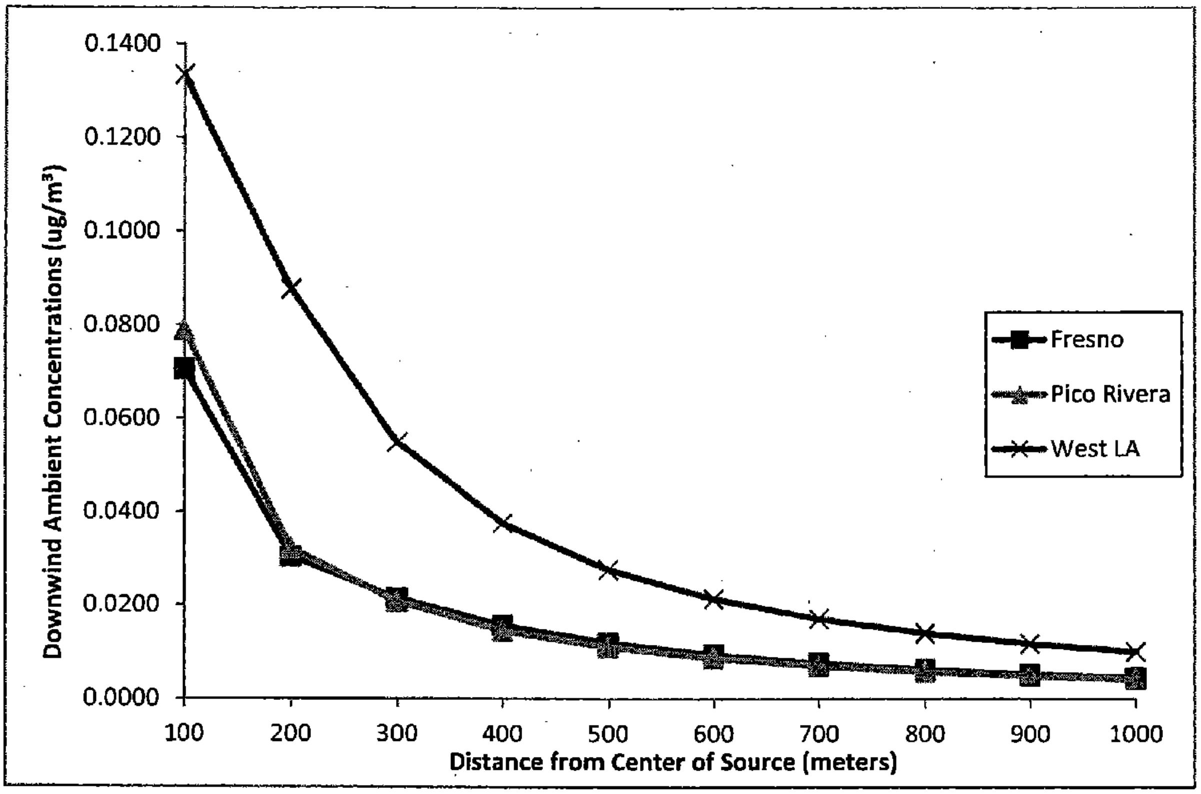
D. Dispersion Modeling Methods

The dispersion of the diesel PM emissions was estimated using the United States Environmental Protection Agency (U.S. EPA) AERMOD dispersion model (version 09292). AERMOD can estimate potential ambient annual average concentrations of diesel PM as a result of diesel PM emissions from area sources (U.S. EPA, 2009).

The analyses used actual meteorological data collected at the West Los Angeles meteorological site during 2005 to 2007[1] processed and provided by the local air district (SCAQMD, 2009). The West Los Angeles meteorological data provides a more conservative estimate of risk than most of the other meteorological data sets available to ARB because this site tends to have lower average wind speeds, predominantly from the same direction, resulting in less dispersion of pollutants. Other representative meteorological data reviewed for these analyses include Fresno and Pico Rivera. Figure D-2 shows a comparison of maximum concentrations for the three meteorological data sets used for this review.

[1] West Los Angeles meteorological data was also used in the 2003 Staff Report.

Figure D-2: Comparison of Downwind Ambient Concentrations Based on Three Meteorological Data Sets Used



Polar coordinate receptors were placed at specific incremental distances from the area sources to determine the maximum offsite impacts. For this area source, receptors were placed at 100-meter increments from 200 meters to 1000 meters. Table D-1 shows the source and modeling parameters used for this assessment.

E. Health Risk Assessment Methods

Maximum offsite concentrations were used to estimate potential cancer risk due to emissions of diesel PM. The maximum offsite ambient annual concentration, in micrograms per cubic meter (µg/m^3), with the cancer potency factor developed for diesel PM by OEHHA, and the average dose (80 percent) were used to estimate potential cancer health risks. The estimated risks assume a residential exposure duration of 70 years.

Table D-2 and Table D-3 present the estimated range of potential cancer health risks at nearby receptor locations due to exposures to diesel TRU PM emissions. The fleetwide emission rate for 2014 is 0.26 g/hp-hr and the 2020 fleetwide emission rate is 0.02 g/hp-hr. The cancer health risks are shown based on hours of diesel TRU operation and downwind distance of the receptor. The horizontal line shaded boxes show where potential cancer risks are greater than or equal to (≥) 100 per million. The grey shaded boxes show where potential cancer risks are less than (<) 10 per million.

The vertical line areas show where the potential cancer risk is ≥ 10 and < 100 per million.

Table D-2: Estimated Range of Potential Cancer Health Risks (per million) Due to TRUs Operating at a Distribution Area Source – 0.26 g/bhp-hr (2014)

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source								
Per Week	Per Year	200	300	400	500	600	700	800	900	1000
100	5200									
200	10400									
500	26000									
1000	52000									
1500	78000									
2000	104000									
2500	130000									
3000	156000									
3500	182000									
4000	208000									
5000	260000									
6000	312000									
7000	364000									
8000	416000									

Meteorological Data: West LA (2005 - 2007)

Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 46 %, Area Source

Grey Shading shows Cancer Risks < 10/million

Vertical Shading shows Cancer Risks ≥ 10/million and < 100/million

Horizontal Line Shading shows Cancer Risks ≥ 100/million

Table D-3: Estimated Range of Potential Cancer Health Risks (per million) Due to TRUs Operating at a Distribution Area Source – 0.02 g/bhp-hr (2020)

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source								
Per Week	Per Year	200	300	400	500	600	700	800	900	1000
100	5200									
200	10400									
500	26000									
1000	52000									
1500	78000									
2000	104000									
2500	130000									
3000	156000									
3500	182000									
4000	208000									
5000	260000									
6000	312000									
7000	364000									
8000	416000									

Meteorological Data: West LA (2005 - 2007)

Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 46 %, Area Source

Grey Shading shows Cancer Risks < 10/million

Vertical Shading shows Cancer Risks ≥ 10/million and < 100/million

Horizontal Line Shading shows Cancer Risks ≥ 100/million

As part of the analyses, staff also reviewed the health risk impacts for the years impacted by the amendments, estimating the cancer health risk using the fleetwide emission rate estimates for 2016 through 2018. The fleetwide emission rates are 0.12 g/hp-hr for 2016, 0.08 g/hp-hr for 2017, and 0.06 g/hp-hr for 2018. The 2016, 2017, and 2018 emission rates illustrate the impacts of extending ULETRU compliance for some 2003 and older model year equipment. Tables D-4 through D-6 show the results of the health risk analyses for these years.

Table D-4: Estimated Range of Potential Cancer Health Risks (per million) Due to TRUs Operating at a Distribution Area Source – 0.12 g/bhp-hr (2016)

Total Hours of TRU Engine Operation		Downwind Distance from the Center of Area Source								
Per Week	Per Year	200	300	400	500	600	700	800	900	1000
100	5200									
200	10400									
500	26000									
1000	52000									
1500	78000									
2000	104000									
2500	130000									
3000	156000									
3500	182000									
4000	208000									
5000	260000									
6000	312000									
7000	364000									
8000	416000									

Meteorological Data: West LA (2005 - 2007)

Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 46 %, Area Source

Grey Shading shows Cancer Risks < 10/million

Vertical Shading shows Cancer Risks ≥ 10/million and < 100/million

Horizontal Line Shading shows Cancer Risks ≥100/million

Table D-5: Estimated Range of Potential Cancer Health Risks (per million) Due to TRUs Operating at a Distribution Area Source – 0.08 g/bhp-hr (2017)

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source								
Per Week	Per Year	200	300	400	500	600	700	800	900	1000
100	5200									
200	10400									
500	26000									
1000	52000									
1500	78000									
2000	104000									
2500	130000									
3000	156000									
3500	182000									
4000	208000									
5000	260000									
6000	312000									
7000	364000									
8000	416000									

Meteorological Data: West LA (2005 - 2007)

Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 46 %, Area Source

Grey Shading shows Cancer Risks < 10/million

Vertical Shading shows Cancer Risks ≥ 10/million and < 100/million

Horizontal Line Shading shows Cancer Risks ≥ 100/million

Table D-6: Estimated Range of Potential Cancer Health Risks (per million) Due to TRUs Operating at a Distribution Area Source – 0.06 g/bhp-hr (2018)

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source								
Per Week	Per Year	200	300	400	500	600	700	800	900	1000
100	5200									
200	10400									
500	26000									
1000	52000									
1500	78000									
2000	104000									
2500	130000									
3000	156000									
3500	182000									
4000	208000									
5000	260000									
6000	312000									
7000	364000									
8000	416000									

Meteorological Data: West LA (2005 - 2007)

Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 46 %, Area Source

Grey Shading shows Cancer Risks < 10/million

Vertical Shading shows Cancer Risks ≥ 10/million and < 100/million

Horizontal Line Shading shows Cancer Risks ≥ 100/million

APPENDIX E

PROPOSED 2011 TRU AMENDMENTS
COMPLIANCE COST ESTIMATES

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Electronic Tracking system Cost Analysis

Annual cost of manual recordkeeping for qualifying electric standby as an Alternative Technology

Inputs:		
Fully burdened driver labor rate:	35	$/hr
Time at home DC to take records:	2	min/day
Time at each delivery point to take records:	2	min/delivery
Number of delivery pointes per day:	10	delivery points/day
Number of days per week deliveries made:	4	days per week
Number of weeks per year that deliveries are made:	52	weeks/year
Calculations:		
Time spent on manual recordkeeping:	1.47	hours/week
	76.3	hour/year
Cost of manual recordkeeping:	$51	per week
	$222	per month
	$2,669	per year

Annual cost of automated electronic tracking, monitoring, recordkeeping and reporting

Inputs:	Low-End Cellular	High-End Cellular
Capital cost, installed:	$250	$1,300
Discount-inflation rate:	5%	5%
Project life:	10 years	10 years
Capital recovery factor:	0.1295	0.1295

	Low-End Cellular	High-End Cellular
Operating cost:	$19.00 per month	$27.00 per month
Calculations:		
Annualized capital cost:	$32	$168
Annual operating cost:	$228	$324
Total Annual Cost:	$260 per year	492.35 per year

Annual savings if automated electronic tracking is used instead of manual recordkeeping

	Low-End Cellular	High-End Cellular
	$2,409 per year	$2,177 per year
	$201 per month	$181 per month
Payback period (annualized):	1.25 months	7.17 months
Payback period (simple):	1.23 months	6.65 months
	0.1 years	0.6 years

Population of TRUs using Electric Standby from ARBER as of 6/23/2011

	23-Jun-2011	31-Dec-2012	31-Dec-2013
1998 and Older	651	403	289
1999 to 2003	739	624	545
2004 to 2011	1193	1138	1089
Total	**2583**	**2165**	**1923**

Average Cellular

$2,293 per year

	As of 31-Dec-2012	As of 31-Dec-2013	Cost Savings
Low-end Cellular Cost Savings for 50 % of 1999 and newer	$2,122,294	$1,968,120	$4,090,414
High-end Cellular Cost Savings for 50 % of 1999 and newer	$1,917,919	$1,778,593	$3,696,512
		Average	$3,893,463

Annual cost of labeling from OEMs on flexibility and prior-tier replacement engines

Inputs:
Cost of labeling 2 $/engine
(From Drayage Truck Program)
Maximum of flexibility or replacement engines annually 15,116 engines
(Per CCR 2423(d)(1)(C) Table 6
Manufacturers can produce, from 2008 to 2014, up to 80 percent of any one model year
(or spread out, so 20 percent per year for 4 years) to a previous Tier.
The maximum flex you would see then is 80% of 18,895 (the one year sales of all units entering the state in 2014), or 15,116 flex engines.)

Calculations:
Cost of labeling: $30,232 per year

Total cost of labeling from OEMs on flexibility and prior-tier replacement engines

Year	Cost	2011 $ (Cost adjusted for 5% discount rate)
2011	30,200	30,200
2012	30,200	28,762
2013	30,200	27,392
2014	30,200	26,088
2015	30,200	24,846
2016	30,200	23,662
2017	30,200	22,536
2018	30,200	21,463
2019	30,200	20,441
2020	30,200	19,467
Total		244,856

Annual cost of documentation from OEMs, dealers and repair shops

Inputs:		
Cost of documentation	1	$/TRU
Average number of TRUs which require update annually	17,200.00	TRU
(Average of populations complying from 2011 through 2019)		
Calculations:		
Cost of documentation:	$17,200	per year

Total cost of documentation from OEMs, dealers and repair shops

Year	Cost	2011 $ (Cost adjusted for 5% discount rate)
2011	17,200	17,200
2012	17,200	16,381
2013	17,200	15,601
2014	17,200	14,858
2015	17,200	14,150
2016	17,200	13,477
2017	17,200	12,835
2018	17,200	12,224
2019	17,200	11,642
2020	17,200	11,087
Total		139,455

Annual cost of documentation, demonstration and labeling from engine rebuilders

Inputs:

Cost of documentation	1	$/engine
Cost of supplemental label	2	$/engine
(From Drayage Truck Program)		
Maximum number of TRUs which are rebuilt annually	521	TRU
(From ARBER database-Rebuild Year 2009)		
Approximate number of rebuilders	10	rebuilders
Cost of engineer certification	5,000	$/configuration
Chance of requiring demonstration	(Undeterminable will use 100 % in this calculation)	
Cost of demonstration	10,000	$/engine

Calculations:

Annual cost of documentation	$521	per year
Annual cost of supplemental label	$1,042	per year
Cost of certification	$50,000	
Cost of demonstration	$100,000	
Total cost	$151,563	

Total cost of documentation, demonstration and labeling from engine rebuilders

Year	Cost	2011 $ (Cost adjusted for 5% discount rate)
2011	152,000	152,000
2012	152,000	144,762
2013	152,000	137,868
2014	152,000	131,303
2015	152,000	125,051
2016	152,000	119,096
2017	152,000	113,425
2018	152,000	108,024
2019	152,000	102,880
2020	152,000	97,981
		1,232,389

Appendix E Matrix 3 8/18/2011

Comparison of Annualized Costs for Amendment for Use of TRU Manufacture Year to Use of Engine Model Year for Compliance Date Determination 2011-2029

Year	Cost Without Amendment (2011$)	Cost With Amendment (2011$)	Cost Savings of Amendment (2011$)
2011	$9,853,540	$7,646,031	$2,207,508
2012	$19,730,320	$17,592,948	$2,137,372
2013	$30,635,772	$27,887,770	$2,748,003
2014	$42,836,963	$40,634,578	$2,202,385
2015	$62,645,584	$58,592,616	$4,052,968
2016	$64,836,962	$62,375,903	$2,461,059
2017	$68,564,698	$65,075,585	$3,489,113
2018	$67,734,603	$66,344,255	$1,390,348
2019	$67,004,851	$65,848,321	$1,156,529
2020	$58,279,724	$57,562,226	$717,498
2021	$46,588,083	$46,207,955	$380,128
2022	$32,432,874	$32,863,177	-$430,303
2023	$26,351,189	$26,275,368	$75,821
2024	$19,585,455	$19,939,260	-$353,805
2025	$10,504,829	$10,924,365	-$419,536
2026	$5,470,159	$5,481,288	-$11,129
2027	$3,511,673	$3,785,412	-$273,739
2028	$1,769,561	$1,815,661	-$46,100
2029	$86,657	$85,532	$1,125
Total	**$638,423,497**	**$616,938,253**	**$21,485,244**

Please See Supplemental Documentation for Economic Impacts for Additional Information

APPENDIX F

TRU ATCM IN-USE COMPLIANCE COST ESTIMATES

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Updated TRU ATCM In-Use Compliance Cost Range Estimates

This Matrix calculates the in-use cost of compliance for TRUs and TRU gen sets ("TRUs".) It takes the annual TRU population numbers (same as used for emissions inventory purposes) and multiplies them by the capital and annual costs for the compliance technology shown. The capital costs are amortized over an assumed life, and all annual costs are converted to constant year (2011) dollars using standard present worth analysis techniques. The scenarios shown are weighted averages for compliance options as determined by experience with the ARBER program data for TRU Model Year 2001 through 2003. In each scenario, on a year-by-year basis, population figures for each engine category are multiplied by a compliance cost component (annualized capital or annual maintenance); these products are then summed to determine the compliance cost for a given year.

Interest Rates Used for Present Worth Analysis

Capital Costs:	0.05	Real interest rate, which is a 7% nominal rate minus an assumed 2% inflation rate
Annual Costs:	0.05	Real interest rate, which is a 7% nominal rate minus an assumed 2% inflation rate

Scenario: VDECS Usage

7-year operational life for Level 2 VDECS compliance technology; capital cost is amortized over a 7-year period.
Capital Recovery Factor for i=5% and n=7 years 0.1728
10-year operational life for Level 3 VDECS compliance technology; capital cost is amortized over a 10-year period.
Capital Recovery Factor for i=5% and n=10 years 0.1295

	< 25 hp	25 - 50 hp	Gensets
In-Use Compliance Technology Used	0.21	0.2	0

	Cap. $ < 25 hp	Cap. $ 25 - 50 hp	Cap. $ - Gensets
Level 2 VDECS	$3,600	$0	$0
Level 3 VDECS	$5,600	$5,448	$0

	Annual Maintenance Cost[2]
Level 2	$109
Level 3 25-50 hp	$868
Level 3 <25 hp	$917

Engine Population Category adjusted for % VDECS

Capital Cost Subtotal

Engine Model Year	Calendar Year	< 11hp	11-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based[3]	25-50 hp Gen Sets Out-of-State[3]	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	Level 2 VDECS Annualized Capital Cost[1]	< 25 hp Level 3 VDECS Annualized Capital Cost[1]	25-50 hp Level 3 VDECS Annualized Capital Cost[1]	< 11hp				
2004	2011	4	115	416	1808	0	0	188	2413	2532	$822	$726	$706	$2,584				
2005	2012	4	109	398	1751	0	0	182	2329	2442		$725	$706	$2,584	$2,868			
2006	2013	4	110	401	1780	0	0	165	2365	2479		$725	$706	$2,584	$2,868	$2,898		
2007	2014	4	112	1020	1810	0	0	188	3018	3135		$725	$706	$2,584	$2,868	$2,898	$2,953	
2008	2015	12	328	1125	3773	0	0	392	5291	5630		$725	$706	$2,584	$2,868	$2,898	$2,953	$8,614
2009	2016	4	108	391	1432	0	0	149	1972	2084		$725	$706	$2,584	$2,868	$2,898	$2,953	$8,614
2010	2017	3	92	360	1298	0	0	135	1793	1888		$725	$706	$2,584	$2,868	$2,898	$2,953	$8,614
2011	2018	4	116	456	1798	0	0	187	2441	2561		$725	$706		$2,868	$2,898	$2,953	$8,614
2012	2019	4	110	438	1737	0	0	181	2356	2470		$725	$706		$2,868	$2,898	$2,953	$8,614
2013	2020	4	112	[4]	[4]	[4]	[4]	[4]	[4]	116		$725	$706		$2,868	$2,898	$2,953	$8,614
	2021			[4]	[4]	[4]	[4]	[4]	[4]	[4]					$2,868	$2,898	$2,953	$8,614
	2022			[4]	[4]	[4]	[4]	[4]	[4]	[4]						$2,898	$2,953	$8,614
	2023			[4]	[4]	[4]	[4]	[4]	[4]	[4]							$2,953	$8,614
	2024			[4]	[4]	[4]	[4]	[4]	[4]	[4]								$8,614
	2025			[4]	[4]	[4]	[4]	[4]	[4]	[4]								
	2026			[4]	[4]	[4]	[4]	[4]	[4]	[4]								
	2027			[4]	[4]	[4]	[4]	[4]	[4]	[4]								
	2028			[4]	[4]	[4]	[4]	[4]	[4]	[4]								
	2029			[4]	[4]	[4]	[4]	[4]	[4]	[4]								
									23978	25337 Total								

[4] In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet > 25 hp
[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meetTRU ATCM requirements as appropriate. The interest rate used is given at the top of this matrix.
[2] This is the annual cost of maintaining the in-use compliance technology over and above that for diesel technology. It may include items such as more-frequent engine servicing, and/or servicing of emission-control device(s).
[3] Use of VDECS retrofit technology not appropriate for gen sets-- cost figures do not include gen sets.

Capital Cost Subtotal | Capital C

					11-25 hp										25-50 hp CA-based	
					$71,250										$293,786	
					$71,250	$79,069									$293,786	$279,666
					$71,250	$79,069	$79,898								$293,786	$279,666
					$71,250	$79,069	$79,898	$81,431							$293,786	$279,666
					$71,250	$79,069	$79,898	$81,431	$237,505						$293,786	$279,666
$2,828					$71,250	$79,069	$79,898	$81,431	$237,505	$77,985					$293,786	$279,666
$2,828	$2,413				$71,250	$79,069	$79,898	$81,431	$237,505	$77,985	$66,525				$293,786	$279,666
$2,828	$2,413	$3,058			$71,250	$79,069	$79,898	$81,431	$237,505	$77,985	$66,525	$84,305			$293,786	$279,666
$2,828	$2,413	$3,058	$2,901		$71,250	$79,069	$79,898	$81,431	$237,505	$77,985	$66,525	$84,305	$79,975		$293,786	$279,666
$2,828	$2,413	$3,058	$2,901	$2,943	$71,250	$79,069	$79,898	$81,431	$237,505	$77,985	$66,525	$84,305	$79,975	$81,138	$293,786	$279,666
$2,828	$2,413	$3,058	$2,901	$2,943		$79,069	$79,898	$81,431	$237,505	$77,985	$66,525	$84,305	$79,975	$81,138		$279,666
$2,828	$2,413	$3,058	$2,901	$2,943			$79,898	$81,431	$237,505	$77,985	$66,525	$84,305	$79,975	$81,138		
$2,828	$2,413	$3,058	$2,901	$2,943				$81,431	$237,505	$77,985	$66,525	$84,305	$79,975	$81,138		
$2,828	$2,413	$3,058	$2,901	$2,943					$237,505	$77,985	$66,525	$84,305	$79,975	$81,138		
$2,828	$2,413	$3,058	$2,901	$2,943						$77,985	$66,525	$84,305	$79,975	$81,138		
	$2,413	$3,058	$2,901	$2,943							$66,525	$84,305	$79,975	$81,138		
		$3,058	$2,901	$2,943								$84,305	$79,975	$81,138		
			$2,901	$2,943									$79,975	$81,138		
				$2,943										$81,138		

ost Subtotal

Capital Cost Subtotal

								25-50 hp Out-of-State								
								$1,276,187								
								$1,276,187	$1,235,164							
$282,600								$1,276,187	$1,235,164	$1,255,475						
$282,600	$719,467							$1,276,187	$1,235,164	$1,255,475	$1,277,193					
$282,600	$719,467	$793,530						$1,276,187	$1,235,164	$1,255,475	$1,277,193	$2,662,244				
$282,600	$719,467	$793,530	$283,478					$1,276,187	$1,235,164	$1,255,475	$1,277,193	$2,662,244	$1,010,503			
$282,600	$719,467	$793,530	$283,478	$254,194				$1,276,187	$1,235,164	$1,255,475	$1,277,193	$2,662,244	$1,010,503	$915,443		
$282,600	$719,467	$793,530	$283,478	$254,194	$321,392			$1,276,187	$1,235,164	$1,255,475	$1,277,193	$2,662,244	$1,010,503	$915,443	$1,268,537	
$282,600	$719,467	$793,530	$283,478	$254,194	$321,392	$309,101		$1,276,187	$1,235,164	$1,255,475	$1,277,193	$2,662,244	$1,010,503	$915,443	$1,268,537	$1,225,559
$282,600	$719,467	$793,530	$283,478	$254,194	$321,392	$309,101	$0	$1,276,187	$1,235,164	$1,255,475	$1,277,193	$2,662,244	$1,010,503	$915,443	$1,268,537	$1,225,559
$282,600	$719,467	$793,530	$283,478	$254,194	$321,392	$309,101	$0		$1,235,164	$1,255,475	$1,277,193	$2,662,244	$1,010,503	$915,443	$1,268,537	$1,225,559
$282,600	$719,467	$793,530	$283,478	$254,194	$321,392	$309,101	$0			$1,255,475	$1,277,193	$2,662,244	$1,010,503	$915,443	$1,268,537	$1,225,559
	$719,467	$793,530	$283,478	$254,194	$321,392	$309,101	$0				$1,277,193	$2,662,244	$1,010,503	$915,443	$1,268,537	$1,225,559
		$793,530	$283,478	$254,194	$321,392	$309,101	$0					$2,662,244	$1,010,503	$915,443	$1,268,537	$1,225,559
			$283,478	$254,194	$321,392	$309,101	$0						$1,010,503	$915,443	$1,268,537	$1,225,559
				$254,194	$321,392	$309,101	$0							$915,443	$1,268,537	$1,225,559
					$321,392	$309,101	$0								$1,268,537	$1,225,559
						$309,101	$0									$1,225,559
							$0									

	Capital Cost Subtotal										Capital Cost Subtotal						
	25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State						
	$0										$0						
	$0	$0									$0	$0					
	$0	$0	$0								$0	$0	$0				
	$0	$0	$0	$0							$0	$0	$0	$0			
	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0		
	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	
	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0
$0			$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0
$0				$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0
$0					$0	$0	$0	$0	$0	$0					$0	$0	$0
$0						$0	$0	$0	$0	$0						$0	$0
$0							$0	$0	$0	$0							$0
$0								$0	$0	$0							
$0									$0	$0							
$0										$0							

													Capital Cost Subtotal			
			25-50 hp Reefer Railcars										Capital Cost Sub-Total	Capital Cost Sub-Total (2011 $)	Level 2 Annual Mtce Cost^2	25-50 hp Level 3 Annual Mtce Cost^2 (
			$132,723										$1,776,531	$1,776,531	$109	$868
			$132,723	$128,457									$3,501,755	$3,336,008		$868
			$132,723	$128,457	$130,569								$5,253,196	$4,764,804		$868
			$132,723	$128,457	$130,569	$132,828							$7,467,068	$6,460,334		$868
			$132,723	$128,457	$130,569	$132,828	$276,873						$11,445,836	$9,416,618		$868
			$132,723	$128,457	$130,569	$132,828	$276,873	$105,092					$12,925,723	$10,127,642		$868
			$132,723	$128,457	$130,569	$132,828	$276,873	$105,092	$95,206				$14,259,503	$10,640,661		$868
$0			$132,723	$128,457	$130,569	$132,828	$276,873	$105,092	$95,206	$131,928			$16,066,138	$11,417,904		$868
$0	$0		$132,723	$128,457	$130,569	$132,828	$276,873	$105,092	$95,206	$131,928	$127,458		$17,811,132	$12,055,276		$868
$0	$0	$0	$132,723	$128,457	$130,569	$132,828	$276,873	$105,092	$95,206	$131,928	$127,458	$0	$17,695,213	$11,598,414		$868
$0	$0	$0		$128,457	$130,569	$132,828	$276,873	$105,092	$95,206	$131,928	$127,458	$0	$16,121,266	$9,897,059		$868
$0	$0	$0			$130,569	$132,828	$276,873	$105,092	$95,206	$131,928	$127,458	$0	$14,396,042	$8,417,088		$868
$0	$0	$0				$132,828	$276,873	$105,092	$95,206	$131,928	$127,458	$0	$12,644,601	$7,040,987		$868
$0	$0	$0					$276,873	$105,092	$95,206	$131,928	$127,458	$0	$10,430,729	$5,631,838		$868
$0	$0	$0						$105,092	$95,206	$131,928	$127,458	$0	$6,451,961	$3,268,579		$868
$0	$0	$0							$95,206	$131,928	$127,458	$0	$4,972,074	$2,391,693		$868
$0	$0	$0								$131,928	$127,458	$0	$3,638,294	$1,666,744		$868
	$0	$0									$127,458	$0	$1,829,075	$798,019		$868
		$0										$0	$64,081	$34,938		$868
										2011 - 2029 Capital Cost Subtotal (in 2011 $):				$120,666,872		

Maintenance Cost Subtotal

< 11hp (..25 hp use $917)									
$453									
$453	$3,626								
$453	$3,626	$3,664							
$453	$3,626	$3,664	$3,735						
$453	$3,626	$3,664	$3,735	$10,893					
$453	$3,626	$3,664	$3,735	$10,893	$3,576				
$453	$3,626	$3,664	$3,735	$10,893	$3,576	$3,051			
	$3,626	$3,664	$3,735	$10,893	$3,576	$3,051	$3,866		
	$3,626	$3,664	$3,735	$10,893	$3,576	$3,051	$3,866	$3,668	
	$3,626	$3,664	$3,735	$10,893	$3,576	$3,051	$3,866	$3,668	$3,721
	$3,626	$3,664	$3,735	$10,893	$3,576	$3,051	$3,866	$3,668	$3,721
		$3,664	$3,735	$10,893	$3,576	$3,051	$3,866	$3,668	$3,721
			$3,735	$10,893	$3,576	$3,051	$3,866	$3,668	$3,721
				$10,893	$3,576	$3,051	$3,866	$3,668	$3,721
					$3,576	$3,051	$3,866	$3,668	$3,721
						$3,051	$3,866	$3,668	$3,721
							$3,866	$3,668	$3,721
								$3,668	$3,721
									$3,721

Maintenance Cost Subtotal

11-25 hp							
$12,484							
$12,484	$99,981						
$12,484	$99,981	$101,030					
$12,484	$99,981	$101,030	$102,968				
$12,484	$99,981	$101,030	$102,968	$300,320			
$12,484	$99,981	$101,030	$102,968	$300,320	$98,610		
$12,484	$99,981	$101,030	$102,968	$300,320	$98,610	$84,119	
	$99,981	$101,030	$102,968	$300,320	$98,610	$84,119	$106,602
	$99,981	$101,030	$102,968	$300,320	$98,610	$84,119	$106,602
	$99,981	$101,030	$102,968	$300,320	$98,610	$84,119	$106,602
	$99,981	$101,030	$102,968	$300,320	$98,610	$84,119	$106,602
		$101,030	$102,968	$300,320	$98,610	$84,119	$106,602
			$102,968	$300,320	$98,610	$84,119	$106,602
				$300,320	$98,610	$84,119	$106,602
					$98,610	$84,119	$106,602
						$84,119	$106,602
							$106,602

		Maintenance Cost Subtotal 25-50 hp CA-based										Maintenance Cost Subtotal 25-50 hp Out-of-State				
		$361,447										$1,570,100				
		$361,447	$344,074									$1,570,100	$1,519,629			
		$361,447	$344,074	$347,685								$1,570,100	$1,519,629	$1,544,617		
		$361,447	$344,074	$347,685	$885,164							$1,570,100	$1,519,629	$1,544,617	$1,571,337	
		$361,447	$344,074	$347,685	$885,164	$976,285						$1,570,100	$1,519,629	$1,544,617	$1,571,337	$3,275,373
		$361,447	$344,074	$347,685	$885,164	$976,285	$339,298					$1,570,100	$1,519,629	$1,544,617	$1,571,337	$3,275,373
		$361,447	$344,074	$347,685	$885,164	$976,285	$339,298	$312,736				$1,570,100	$1,519,629	$1,544,617	$1,571,337	$3,275,373
		$361,447	$344,074	$347,685	$885,164	$976,285	$339,298	$312,736	$395,410			$1,570,100	$1,519,629	$1,544,617	$1,571,337	$3,275,373
$95,723		$361,447	$344,074	$347,685	$885,164	$976,285	$339,298	$312,736	$395,410	$380,288		$1,570,100	$1,519,629	$1,544,617	$1,571,337	$3,275,373
$95,723	$97,116	$361,447	$344,074	$347,685	$885,164	$976,285	$339,298	$312,736	$395,410	$380,288	$0	$1,570,100	$1,519,629	$1,544,617	$1,571,337	$3,275,373
$95,723	$97,116		$344,074	$347,685	$885,164	$976,285	$339,298	$312,736	$395,410	$380,288	$0		$1,519,629	$1,544,617	$1,571,337	$3,275,373
$95,723	$97,116			$347,685	$885,164	$976,285	$339,298	$312,736	$395,410	$380,288	$0			$1,544,617	$1,571,337	$3,275,373
$95,723	$97,116				$885,164	$976,285	$339,298	$312,736	$395,410	$380,288	$0				$1,571,337	$3,275,373
$95,723	$97,116					$976,285	$339,298	$312,736	$395,410	$380,288	$0					$3,275,373
$95,723	$97,116						$339,298	$312,736	$395,410	$380,288	$0					
$95,723	$97,116							$312,736	$395,410	$380,288	$0					
$95,723	$97,116								$395,410	$380,288	$0					
$95,723	$97,116									$380,288	$0					
	$97,116										$0					

Maintenance Cost Subtotal | Maintenance C

					25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State		
					$0										$0		
					$0	$0									$0	$0	
					$0	$0	$0								$0	$0	$0
					$0	$0	$0	$0							$0	$0	$0
					$0	$0	$0	$0	$0						$0	$0	$0
$1,243,227					$0	$0	$0	$0	$0	$0					$0	$0	$0
$1,243,227	$1,126,274				$0	$0	$0	$0	$0	$0	$0				$0	$0	$0
$1,243,227	$1,126,274	$1,560,687			$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0
$1,243,227	$1,126,274	$1,560,687	$1,507,812		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0
$1,243,227	$1,126,274	$1,560,687	$1,507,812	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$1,243,227	$1,126,274	$1,560,687	$1,507,812	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0
$1,243,227	$1,126,274	$1,560,687	$1,507,812	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0
$1,243,227	$1,126,274	$1,560,687	$1,507,812	$0				$0	$0	$0	$0	$0	$0	$0			
$1,243,227	$1,126,274	$1,560,687	$1,507,812	$0					$0	$0	$0	$0	$0	$0			
$1,243,227	$1,126,274	$1,560,687	$1,507,812	$0						$0	$0	$0	$0	$0			
	$1,126,274	$1,560,687	$1,507,812	$0							$0	$0	$0	$0			
		$1,560,687	$1,507,812	$0								$0	$0	$0			
			$1,507,812	$0									$0	$0			
				$0										$0			

:ost Subtotal | Maintenance Cost Subtotal | Maintenance Cc

							25-50 hp Reefer Railcars										Maint Cost Sub-Total
							$163,290										$2,107,774
							$163,290	$158,041									$4,233,126
							$163,290	$158,041	$160,640								$6,390,762
$0							$163,290	$158,041	$160,640	$163,419							$9,117,385
$0	$0						$163,290	$158,041	$160,640	$163,419	$340,639						$14,020,894
$0	$0	$0					$163,290	$158,041	$160,640	$163,419	$340,639	$129,296					$15,834,901
$0	$0	$0	$0				$163,290	$158,041	$160,640	$163,419	$340,639	$129,296	$117,133				$17,478,214
$0	$0	$0	$0	$0			$163,290	$158,041	$160,640	$163,419	$340,639	$129,296	$117,133	$162,311			$19,694,154
$0	$0	$0	$0	$0	$0		$163,290	$158,041	$160,640	$163,419	$340,639	$129,296	$117,133	$162,311	$156,812		$21,638,457
$0	$0	$0	$0	$0	$0	$0	$163,290	$158,041	$160,640	$163,419	$340,639	$129,296	$117,133	$162,311	$156,812	$0	$21,939,294
$0	$0	$0	$0	$0	$0	$0		$158,041	$160,640	$163,419	$340,639	$129,296	$117,133	$162,311	$156,812	$0	$19,844,467
$0	$0	$0	$0	$0	$0	$0			$160,640	$163,419	$340,639	$129,296	$117,133	$162,311	$156,812	$0	$17,719,105
$0	$0	$0	$0	$0	$0	$0				$163,419	$340,639	$129,296	$117,133	$162,311	$156,812	$0	$15,561,469
	$0	$0	$0	$0	$0	$0					$340,639	$129,296	$117,133	$162,311	$156,812	$0	$12,834,847
		$0	$0	$0	$0	$0						$129,296	$117,133	$162,311	$156,812	$0	$7,931,337
			$0	$0	$0	$0							$117,133	$162,311	$156,812	$0	$6,117,330
				$0	$0	$0								$162,311	$156,812	$0	$4,474,017
					$0	$0									$156,812	$0	$2,245,140
						$0										$0	$100,837

2011 - 2029 Maintenance Cost Subtotal (in 2011 $):
2011 - 2029 Total Annual VDEC:

	ost Subtotal		Total
	Maintenance Cost Sub-Total (2011 $)	Total Annual In-Use Cost	Total Annual VDECS In-Use Cost (2011 $)
	$2,107,774	$3,884,305	$3,884,306
	$4,031,548	$7,734,881	$7,366,653
	$5,796,610	$11,643,958	$10,561,413
	$7,876,940	$16,584,453	$14,326,274
	$11,835,024	$25,466,730	$20,951,542
	$12,407,068	$28,760,624	$22,834,701
	$13,042,512	$31,737,717	$23,883,173
	$13,986,268	$35,760,292	$26,414,172
	$14,781,127	$39,649,589	$28,836,402
	$14,142,264	$39,834,507	$25,877,678
	$12,182,776	$35,965,723	$22,879,834
	$10,359,994	$32,115,147	$18,777,061
	$8,665,208	$28,206,070	$15,706,195
	$6,806,693	$23,265,575	$12,338,281
	$4,005,864	$14,383,299	$7,284,643
	$2,942,540	$11,089,404	$5,334,193
	$2,049,599	$8,112,311	$3,716,343
	$979,547	$4,074,215	$1,777,566
	$41,900	$184,918	$76,837
	$147,750,148		
S In-Use Cost (in 2011 $):			$268,307,020

Scenario: Engine Repower Usage

7-year operational life for engine repower compliance technology; capital cost is amortized over a 7-year period.
Capital Recovery Factor for I=6% and n=7 years 0.1726

	≤ 25 hp	25 - 50 hp	Gensets
In-Use Compliance Technology Used	0.37	0.69	0

	Cap. $ < 25 hp	Cap. $ 25 - 50 hp	Cap. $ - Gensets	Annual Maintenance Cost[2]
New Tier 4i Engine (30% of total cost):		$2,520	$0	$0
New Tier 4f Engine (30% of total cost):	$1,725			$0

Engine Population Category | **Capital Cost Subtotal**

Engine Model Year	Calendar Year	< 11hp	11-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based[3]	25-50 hp Gen Sets Out-of-State[3]	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	< 25 hp TRUs Annualized Capital Cost[1]	25 - 50 hp TRUs Annualized Capital Cost[1]	25 - 50 hp Genset Annualized Capital Cost[1]	< 11hp				
2004	2011	7	202	1437	6241	0	0	649	8326	8535	$298	$435	$0	$2,182				
2005	2012	7	192	1368	6040	0	0	628	8036	8235	$298	$435	$0	$2,182	$2,077			
2006	2013	7	194	1382	6139	0	0	638	8160	8361	$298	$435	$0	$2,182	$2,077	$2,099		
2007	2014	7	198	3518	6246	0	0	650	10413	10618	$298	$435	$0	$2,182	$2,077	$2,099	$2,139	
2008	2015	21	577	3880	13018	0	0	1354	18253	18851	$298	$435	$0	$2,182	$2,077	$2,099	$2,139	$6,239
2009	2016	7	189	1349	4941	0	0	514	6804	7000	$298	$435	$0	$2,182	$2,077	$2,099	$2,139	$6,239
2010	2017	6	162	1243	4477	0	0	466	6185	6353	$298	$435	$0	$2,182	$2,077	$2,099	$2,139	$6,239
2011	2018	7	205	1572	6203	0	0	645	8420	8632	$298	$435	$0		$2,077	$2,099	$2,139	$6,239
2012	2019	7	194	1512	5993	0	0	623	8128	8329	$298	$435	$0			$2,099	$2,139	$6,239
2013	2020	7	197	[a]	[a]	[a]	[a]	[a]	[a]	204	$298	$435	$0				$2,139	$6,239
	2021			[a]	[a]	[a]	[a]	[a]	[a]	[a]								$6,239
	2022			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2023			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2024			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2025			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2026			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2027			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2028			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
	2029			[a]	[a]	[a]	[a]	[a]	[a]	[a]								
									82725	85119 Total								

[a] In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet

[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet TRU ATCM requirements as appropriate. The interest rate used is given at the top of this matrix.

[2] This is the annual cost of maintaining the in-use compliance technology over and above that for diesel technology. It is set to $0 as engine repowers are diesel technology.

[3] Use of engine repower technology not appropriate for gen sets-- cost figures do not include gen sets.

					11-25 hp										25-50 hp CA-based	
					$60,153										$625,587	
					$60,153	$57,262									$625,587	$595,519
					$60,153	$57,262	$57,862								$625,587	$595,519
					$60,153	$57,262	$57,862	$58,972							$625,587	$595,519
					$60,153	$57,262	$57,862	$58,972	$172,001						$625,587	$595,519
$2,048					$60,153	$57,262	$57,862	$58,972	$172,001	$56,477					$625,587	$595,519
$2,048	$1,747				$60,153	$57,262	$57,862	$58,972	$172,001	$56,477	$48,177				$625,587	$595,519
$2,048	$1,747	$2,214				$57,262	$57,862	$58,972	$172,001	$56,477	$48,177	$61,054				$595,519
$2,048	$1,747	$2,214	$2,101				$57,862	$58,972	$172,001	$56,477	$48,177	$61,054	$57,918			
$2,048	$1,747	$2,214	$2,101	$2,131				$58,972	$172,001	$56,477	$48,177	$61,054	$57,918	$58,760		
$2,048	$1,747	$2,214	$2,101	$2,131					$172,001	$56,477	$48,177	$61,054	$57,918	$58,760		
$2,048	$1,747	$2,214	$2,101	$2,131						$56,477	$48,177	$61,054	$57,918	$58,760		
	$1,747	$2,214	$2,101	$2,131							$48,177	$61,054	$57,918	$58,760		
		$2,214	$2,101	$2,131								$61,054	$57,918	$58,760		
			$2,101	$2,131									$57,918	$58,760		
				$2,131										$58,760		

Capital Cost Subtotal

								25-50 hp Out-of-State								
								$2,717,509								
								$2,717,509	$2,630,154							
$601,768								$2,717,509	$2,630,154	$2,673,404						
$601,768	$1,532,030							$2,717,509	$2,630,154	$2,673,404	$2,719,649					
$601,768	$1,532,030	$1,689,741						$2,717,509	$2,630,154	$2,673,404	$2,719,649	$5,668,973				
$601,768	$1,532,030	$1,689,741	$587,253					$2,717,509	$2,630,154	$2,673,404	$2,719,649	$5,668,973	$2,151,761			
$601,768	$1,532,030	$1,689,741	$587,253	$541,279				$2,717,509	$2,630,154	$2,673,404	$2,719,649	$5,668,973	$2,151,761	$1,949,341		
$601,768	$1,532,030	$1,689,741	$587,253	$541,279	$684,371				$2,630,154	$2,673,404	$2,719,649	$5,668,973	$2,151,761	$1,949,341	$2,701,218	
$601,768	$1,532,030	$1,689,741	$587,253	$541,279	$684,371	$658,198				$2,673,404	$2,719,649	$5,668,973	$2,151,761	$1,949,341	$2,701,218	$2,609,702
	$1,532,030	$1,689,741	$587,253	$541,279	$684,371	$658,198	$0				$2,719,649	$5,668,973	$2,151,761	$1,949,341	$2,701,218	$2,609,702
		$1,689,741	$587,253	$541,279	$684,371	$658,198	$0					$5,668,973	$2,151,761	$1,949,341	$2,701,218	$2,609,702
			$587,253	$541,279	$684,371	$658,198	$0						$2,151,761	$1,949,341	$2,701,218	$2,609,702
				$541,279	$684,371	$658,198	$0							$1,949,341	$2,701,218	$2,609,702
					$684,371	$658,198	$0								$2,701,218	$2,609,702
						$658,198	$0									$2,609,702
							$0									

	25-50 hp Gen Sets CA-based									25-50 hp Gen Sets Out-of-State						
	$0									$0						
	$0	$0								$0	$0					
	$0	$0	$0							$0	$0	$0				
	$0	$0	$0	$0						$0	$0	$0	$0			
	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0		
	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	
	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0
$0				$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0
$0					$0	$0	$0	$0	$0	$0				$0	$0	$0
$0						$0	$0	$0	$0	$0					$0	$0
$0							$0	$0	$0	$0						$0
$0								$0	$0	$0						
$0									$0	$0						
$0										$0						

Capital Cost Subtotal

			25-50 hp Reefer Railcars										Capital Cost Sub-Total	Capital Cost Sub-Total (2011 $)		Annual Mtce Co
			$282,621										$3,688,051	$3,688,051		$0
			$282,621	$273,536									$7,246,599	$6,901,523		$0
			$282,621	$273,536	$278,034								$10,859,766	$9,850,127		$0
			$282,621	$273,536	$278,034	$282,844							$15,455,400	$13,350,956		$0
			$282,621	$273,536	$278,034	$282,844	$589,573						$23,581,926	$19,400,909		$0
			$282,621	$273,536	$278,034	$282,844	$589,573	$223,783					$26,603,248	$20,844,341		$0
			$282,621	$273,536	$278,034	$282,844	$589,573	$223,783	$202,731				$29,346,524	$21,898,828		$0
$0				$273,536	$278,034	$282,844	$589,573	$223,783	$202,731	$280,927			$29,388,256	$20,885,685		$0
$0	$0				$278,034	$282,844	$589,573	$223,783	$202,731	$280,927	$271,409		$29,429,035	$19,918,729		$0
$0	$0	$0				$282,844	$589,573	$223,783	$202,731	$280,927	$271,409	$0	$25,876,760	$16,880,390		$0
$0	$0	$0					$589,573	$223,783	$202,731	$280,927	$271,409	$0	$21,281,126	$13,064,765		
$0	$0	$0						$223,783	$202,731	$280,927	$271,409	$0	$13,154,599	$7,681,222		
$0	$0	$0							$202,731	$280,927	$271,409	$0	$10,133,277	$5,642,588		
$0	$0	$0								$280,927	$271,409	$0	$7,390,001	$3,919,079		
	$0	$0									$271,409	$0	$3,660,218	$1,848,659		
		$0										$0	$60,692	$29,280		
													$0	$0		
													$0	$0		
													$0	$0		

2011 - 2029 Capital Cost Subtotal (in 2011 $): $185,616,139

Maintenance Cost Subtotal

< 11hp									
$0									
$0	$0								
$0	$0	$0							
$0	$0	$0	$0						
$0	$0	$0	$0	$0					
$0	$0	$0	$0	$0	$0				
$0	$0	$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0	$0	$0
				$0	$0	$0	$0	$0	$0
					$0	$0	$0	$0	$0
						$0	$0	$0	$0
							$0	$0	$0
								$0	$0
									$0

Maintenance Cost Subtotal

11-25 hp							
$0							
$0	$0						
$0	$0	$0					
$0	$0	$0	$0				
$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0
				$0	$0	$0	$0
					$0	$0	$0
						$0	$0
							$0

		Maintenance Cost Subtotal										Maintenance Cost Subtotal				
		25-50 hp CA-based										25-50 hp Out-of-State				
		$0										$0				
		$0	$0									$0	$0			
		$0	$0	$0								$0	$0	$0		
		$0	$0	$0	$0							$0	$0	$0	$0	
		$0	$0	$0	$0	$0						$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0
$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0
$0	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0
$0	$0				$0	$0	$0	$0	$0	$0	$0				$0	$0
$0	$0					$0	$0	$0	$0	$0	$0					$0
$0	$0						$0	$0	$0	$0	$0					
$0	$0							$0	$0	$0	$0					
$0	$0								$0	$0	$0					
$0	$0									$0	$0					
	$0										$0					

					Maintenance Cost Subtotal										Maintenance C		
					25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State		
					$0										$0		
					$0	$0									$0	$0	
					$0	$0	$0								$0	$0	$0
					$0	$0	$0	$0							$0	$0	$0
					$0	$0	$0	$0	$0						$0	$0	$0
$0					$0	$0	$0	$0	$0	$0					$0	$0	$0
$0	$0				$0	$0	$0	$0	$0	$0	$0				$0	$0	$0
$0	$0	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0
$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0
$0	$0	$0	$0	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0
$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0						$0	$0	$0	$0	$0			
	$0	$0	$0	$0							$0	$0	$0	$0			
		$0	$0	$0								$0	$0	$0			
			$0	$0									$0	$0			
				$0										$0			

ost Subtotal							Maintenance Cost Subtotal										Maintenance C
							25-50 hp Reefer Railcars										Maint Cost Sub-Total
							$0										$0
							$0	$0									$0
							$0	$0	$0								$0
$0							$0	$0	$0	$0							$0
$0	$0						$0	$0	$0	$0	$0						$0
$0	$0	$0					$0	$0	$0	$0	$0	$0					$0
$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0				$0
$0	$0	$0	$0	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0
$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0							$0	$0	$0	$0	$0
				$0	$0	$0								$0	$0	$0	$0
					$0	$0									$0	$0	$0
						$0										$0	$0

2011 - 2029 Maintenance Cost Subtotal (in 2011 $):

2011 - 2029 Total Annual Engin

›st Subtotal

Maintenance Cost Sub-Total (2011 $)	Total Annual In-Use Cost	Total Annual Engine Repower In-Use Cost (2011 $)
$0	$3,688,051	$3,688,051
$0	$7,246,599	$6,901,623
$0	$10,859,766	$9,850,127
$0	$15,455,400	$13,350,866
$0	$23,581,926	$19,400,909
$0	$26,603,248	$20,844,341
$0	$29,346,524	$21,898,828
$0	$29,388,256	$20,886,685
$0	$29,429,035	$19,918,729
$0	$25,876,780	$16,680,390
$0	$21,281,126	$13,064,768
$0	$13,154,599	$7,691,222
$0	$10,133,277	$5,642,588
$0	$7,390,001	$3,919,075
$0	$3,680,218	$1,846,859
$0	$60,892	$29,280
$0	$0	$0
$0	$0	$0
$0	$0	$0

$0

›e Repower In-Use Cost (in 2011 $):	$185,615,139

Scenario: Electric Standby Usage

10-year operational life for Level 3 VDECS compliance technology; capital cost is amortized over a 10-year period.
Capital Recovery Factor for i=5% and n=10 years 0.1295

	< 25 hp	25 - 50 hp	Gensets	
In-Use Compliance Technology Used	0.32	0.01	0	
	Cap: $ < 25 hp	Cap. $ 25 - 50 hp	Cap. $ - Gensets	Annual Maintenance Cost[2]
Electric Standby Option	$675	$5,000	$0	$0

Engine Population Category | **Capital Cost Subtotal**

Engine Model Year	Calendar Year	< 11hp	11-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based[3]	25-50 hp Gen Sets Out-of-State[3]	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	< 25 hp TRU Alt. Tech Annualized Capital Cost[1]	25 - 50 hp TRU Alt. Tech Annualized Capital Cost[1]	25-50 hp Genset Alt. Tech Annualized Capital Cost[1]	< 11hp				
2004	2011	6	175	21	90	0	0	9	121	302	$87	$389	NA	$553				
2005	2012	6	166	20	88	0	0	9	116	289	$87	$389	NA	$553	$527			
2006	2013	6	166	20	89	0	0	9	118	292	$87	$389	NA	$553	$527	$532		
2007	2014	6	171	51	91	0	0	9	151	328	$87	$389	NA	$553	$527	$532	$542	
2008	2015	18	499	56	189	0	0	20	265	782	$87	$389	NA	$553	$527	$532	$542	$1,582
2009	2016	6	164	20	72	0	0	7	99	268	$87	$389	NA	$553	$527	$532	$542	$1,582
2010	2017	5	140	18	65	0	0	7	90	234	$87	$389	NA	$553	$527	$532	$542	$1,582
2011	2018	6	177	23	90	0	0	9	122	306	$87	$389	NA	$553	$527	$532	$542	$1,582
2012	2019	6	168	22	87	0	0	9	118	292	$87	$389	NA	$553	$527	$532	$542	$1,582
2013	2020	6	170	*	*	*	*	*	*	116	$87	$389	NA	$553	$527	$532	$542	$1,582
	2021			*	*	*	*	*	*	*					$527	$532	$542	$1,582
	2022			*	*	*	*	*	*	*						$532	$542	$1,582
	2023			*	*	*	*	*	*	*							$542	$1,582
	2024			*	*	*	*	*	*	*								$1,582
	2025			*	*	*	*	*	*	*								
	2026			*	*	*	*	*	*	*								
	2027			*	*	*	*	*	*	*								
	2028			*	*	*	*	*	*	*								
	2029			*	*	*	*	*	*	*								
									1199	3209 Total								

* In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet

[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet TRU ATCM requirements as appropriate. The interest rate used is given at the top of this matrix.

[2] This is the annual cost of maintaining the in-use compliance technology over and above that for diesel technology. It is set to $0 as any costs are reduced by cost savings in using electric power rather than diesel.

[3] Use of electric standby retrofit technology not appropriate for gen sets-- cost figures do not include gen sets.

					11-25 hp										25-50 hp CA-based	
					$15,256										$8,069	
					$15,256	$14,523									$8,069	$7,700
					$15,256	$14,523	$14,675								$8,069	$7,700
					$15,256	$14,523	$14,675	$14,957							$8,069	$7,700
					$15,256	$14,523	$14,675	$14,957	$43,623						$8,069	$7,700
$519					$15,256	$14,523	$14,675	$14,957	$43,623	$14,324					$8,069	$7,700
$519	$443				$15,256	$14,523	$14,675	$14,957	$43,623	$14,324	$12,219				$8,069	$7,700
$519	$443	$562			$15,256	$14,523	$14,675	$14,957	$43,623	$14,324	$12,219	$15,485			$8,069	$7,700
$519	$443	$562	$533		$15,256	$14,523	$14,675	$14,957	$43,623	$14,324	$12,219	$15,485	$14,689		$8,069	$7,700
$519	$443	$562	$533	$541	$15,256	$14,523	$14,675	$14,957	$43,623	$14,324	$12,219	$15,485	$14,689	$14,903	$8,069	$7,700
$519	$443	$562	$533	$541		$14,523	$14,675	$14,957	$43,623	$14,324	$12,219	$15,485	$14,689	$14,903		$7,700
$519	$443	$562	$533	$541			$14,675	$14,957	$43,623	$14,324	$12,219	$15,485	$14,689	$14,903		
$519	$443	$562	$533	$541				$14,957	$43,623	$14,324	$12,219	$15,485	$14,689	$14,903		
$519	$443	$562	$533	$541					$43,623	$14,324	$12,219	$15,485	$14,689	$14,903		
$519	$443	$562	$533	$541						$14,324	$12,219	$15,485	$14,689	$14,903		
	$443	$562	$533	$541							$12,219	$15,485	$14,689	$14,903		
		$562	$533	$541								$15,485	$14,689	$14,903		
			$533	$541									$14,689	$14,903		
				$541										$14,903		

Capital Cost Subtotal

									25-50 hp Out-of-State								
									$35,137								
									$35,137	$34,008							
$7,781									$35,137	$34,008	$34,567						
$7,781	$19,809								$35,137	$34,008	$34,567	$35,165					
$7,781	$19,809	$21,848							$35,137	$34,008	$34,567	$35,165	$73,300				
$7,781	$19,809	$21,848	$7,593						$35,137	$34,008	$34,567	$35,165	$73,300	$27,822			
$7,781	$19,809	$21,848	$7,593	$6,999					$35,137	$34,008	$34,567	$35,165	$73,300	$27,822	$25,205		
$7,781	$19,809	$21,848	$7,593	$6,999	$8,849				$35,137	$34,008	$34,567	$35,165	$73,300	$27,822	$25,205	$34,927	
$7,781	$19,809	$21,848	$7,593	$6,999	$8,849	$8,510			$35,137	$34,008	$34,567	$35,165	$73,300	$27,822	$25,205	$34,927	$33,743
$7,781	$19,809	$21,848	$7,593	$6,999	$8,849	$8,510	$0		$35,137	$34,008	$34,567	$35,165	$73,300	$27,822	$25,205	$34,927	$33,743
$7,781	$19,809	$21,848	$7,593	$6,999	$8,849	$8,510	$0			$34,008	$34,567	$35,165	$73,300	$27,822	$25,205	$34,927	$33,743
$7,781	$19,809	$21,848	$7,593	$6,999	$8,849	$8,510	$0				$34,567	$35,165	$73,300	$27,822	$25,205	$34,927	$33,743
	$19,809	$21,848	$7,593	$6,999	$8,849	$8,510	$0					$35,165	$73,300	$27,822	$25,205	$34,927	$33,743
		$21,848	$7,593	$6,999	$8,849	$8,510	$0						$73,300	$27,822	$25,205	$34,927	$33,743
			$7,593	$6,999	$8,849	$8,510	$0							$27,822	$25,205	$34,927	$33,743
				$6,999	$8,849	$8,510	$0								$25,205	$34,927	$33,743
					$8,849	$8,510	$0									$34,927	$33,743
						$8,510	$0										$33,743
							$0										

	25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State						
$0																	
$0																	
$0																	
$0																	
$0																	
$0																	
$0																	
$0																	
$0																	
$0																	

Capital Cost Subtotal

			25-50 hp Reefer Railcars										Capital Cost Sub-Total	Capital Cost Sub-Total (2011 $)		Annual Mtce Co...
			$3,654										$62,590	$62,690		$0
			$3,654	$3,537									$122,964	$117,128		$0
			$3,654	$3,537	$3,595								$184,135	$167,015		$0
			$3,654	$3,537	$3,595	$3,657							$258,265	$223,099		$0
			$3,654	$3,537	$3,595	$3,657	$7,623						$406,242	$334,216		$0
			$3,654	$3,537	$3,595	$3,657	$7,623	$2,894					$459,384	$369,947		$0
			$3,654	$3,537	$3,595	$3,657	$7,623	$2,894	$2,621				$506,881	$378,242		$0
			$3,654	$3,537	$3,595	$3,657	$7,623	$2,894	$2,621	$3,632			$570,335	$405,327		$0
			$3,654	$3,537	$3,595	$3,657	$7,623	$2,894	$2,621	$3,632	$3,509		$631,320	$427,302		$0
			$3,654	$3,537	$3,595	$3,657	$7,623	$2,894	$2,621	$3,632	$3,509	$0	$646,764	$416,810		$0
				$3,537	$3,595	$3,657	$7,623	$2,894	$2,621	$3,632	$3,509	$0	$584,074	$368,671		
					$3,595	$3,657	$7,623	$2,894	$2,621	$3,632	$3,509	$0	$523,780	$306,243		
						$3,657	$7,623	$2,894	$2,621	$3,632	$3,509	$0	$462,629	$257,609		
							$7,623	$2,894	$2,621	$3,632	$3,509	$0	$388,499	$206,029		
								$2,894	$2,621	$3,632	$3,509	$0	$240,522	$121,480		
									$2,621	$3,632	$3,509	$0	$187,370	$90,128		
										$3,632	$3,509	$0	$139,863	$64,082		
											$3,509	$0	$76,429	$33,346		
												$0	$15,444	$6,417		
										2011 - 2029 Capital Cost Subtotal (in 2011 $):				$4,335,782		

Maintenance Cost Subtotal

< 11hp									
$0									
$0	$0								
$0	$0	$0							
$0	$0	$0	$0						
$0	$0	$0	$0	$0					
$0	$0	$0	$0	$0	$0				
$0	$0	$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0	$0	$0
				$0	$0	$0	$0	$0	$0
					$0	$0	$0	$0	$0
						$0	$0	$0	$0
							$0	$0	$0
								$0	$0
									$0

Maintenance Cost Subtotal

11-25 hp							
$0							
$0	$0						
$0	$0	$0					
$0	$0	$0	$0				
$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0
				$0	$0	$0	$0
					$0	$0	$0
						$0	$0
							$0

Maintenance Cost Subtotal | Maintenance Cost Subtotal

		25-50 hp CA-based										25-50 hp Out-of-State				
		$0										$0				
		$0	$0									$0	$0			
		$0	$0	$0								$0	$0	$0		
		$0	$0	$0	$0							$0	$0	$0	$0	
		$0	$0	$0	$0	$0						$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0
$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0
$0	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0
$0	$0				$0	$0	$0	$0	$0	$0	$0				$0	$0
$0	$0					$0	$0	$0	$0	$0	$0					$0
$0	$0						$0	$0	$0	$0	$0					
$0	$0							$0	$0	$0	$0					
$0	$0								$0	$0	$0					
$0	$0									$0	$0					
	$0										$0					

Maintenance Cost Subtotal

Maintenance C

					25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State		
$0																	
$0	$0																
$0	$0	$0															
$0	$0	$0	$0														
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
	$0	$0	$0	$0													
		$0	$0	$0													
			$0	$0													
				$0													

:ost Subtotal | Maintenance Cost Subtotal | Maintenance Cc

							25-50 hp Reefer Railcars										Maint Cost Sub-Total
							$0										$0
							$0	$0									$0
							$0	$0	$0								$0
							$0	$0	$0	$0							$0
							$0	$0	$0	$0	$0						$0
							$0	$0	$0	$0	$0	$0					$0
							$0	$0	$0	$0	$0	$0	$0				$0
							$0	$0	$0	$0	$0	$0	$0	$0			$0
							$0	$0	$0	$0	$0	$0	$0	$0	$0		$0
							$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
								$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
									$0	$0	$0	$0	$0	$0	$0	$0	$0
										$0	$0	$0	$0	$0	$0	$0	$0
											$0	$0	$0	$0	$0	$0	$0
												$0	$0	$0	$0	$0	$0
													$0	$0	$0	$0	$0
														$0	$0	$0	$0
															$0	$0	$0
																$0	$0

2011 - 2029 Maintenance Cost Subtotal (in 2011 $):

2011 - 2029 Total Annual Electri

›st Subtotal

Maintenance Cost Sub-Total (2011 $)	Total Annual In-Use Cost	Total Annual Electric Standby Option In-Use Cost (2011 $)
$0	$82,690	$82,690
$0	$122,964	$117,128
$0	$184,135	$167,816
$0	$258,265	$223,099
$0	$406,242	$334,216
$0	$459,394	$359,947
$0	$508,881	$376,242
$0	$570,335	$406,327
$0	$631,320	$427,302
$0	$646,764	$416,910
$0	$584,074	$358,571
$0	$523,780	$306,243
$0	$462,629	$257,608
$0	$358,499	$206,029
$0	$240,522	$121,480
$0	$187,370	$90,128
$0	$139,883	$64,082
$0	$76,429	$33,346
$0	$15,444	$6,417

$0	
›c Standby Option In-Use Cost (in 2011 $):	$4,335,782

Scenario: Replacement TRU Usage

Matrix 1

8/5/2011

7-year operational life for TRU Replacement; capital cost is amortized over a 7-year period.
Capital Recovery Factor for i=5% and n=7 years 0.1728

	< 25 hp	25 - 50 hp	Gensets	
In-Use Compliance Technology Used	0.1	0.1	1.00	
	Cap. $ < 25 hp	Cap. $ 25 - 50 hp	Cap. $ - Gensets	Annual Maintenance Cost[2]
Replacement TRU (30% of total cost)	$4890	$6,480	$4350	$0

Engine Population Category / Capital Cost Subtotal

Engine Model Year	Calendar Year	< 11hp	11-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based	25-50 hp Gen Sets Out-of-State	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	< 25 hp Annualized Capital Cost[1]	25 - 50 hp Annualized TRU Capital Cost[1]	25 - 50 hp Genset Annualized Capital Cost[1]	< 11hp				
2004	2011	2	55	208	904	453	1781	94	3441	3497	$845	$1,120	$752	$1,672				
2005	2012	2	52	198	875	545	2126	91	3635	3889	$845	$1,120	$752	$1,672	$1,591			
2006	2013	2	52	200	890	804	3513	93	5600	5654	$845	$1,120	$752	$1,672	$1,591	$1,608		
2007	2014	2	53	510	905	1348	5233	94	8090	8145	$845	$1,120	$752	$1,672	$1,591	$1,608	$1,639	
2008	2015	6	156	562	1887	1071	4150	196	7867	8028	$845	$1,120	$752	$1,672	$1,591	$1,608	$1,639	$4,780
2009	2016	2	51	195	716	231	940	74	2157	2210	$845	$1,120	$752	$1,672	$1,591	$1,608	$1,639	$4,780
2010	2017	2	44	180	649	208	841	67	1945	1991	$845	$1,120	$752	$1,672	$1,591	$1,608	$1,639	$4,780
2011	2018	2	55	228	699	483	1904	93	3607	3664	$845	$1,120	$752		$1,591	$1,608	$1,639	$4,780
2012	2019	2	53	219	869	522	2046	90	3746	3801	$845	$1,120	$752			$1,608	$1,639	$4,780
2013	2020	2	53	*	*	*	*	*	*	116	$845	$1,120	$752				$1,639	$4,780
	2021			*	*	*	*	*	*	*								$4,780
	2022			*	*	*	*	*	*	*								
	2023			*	*	*	*	*	*	*								
	2024			*	*	*	*	*	*	*								
	2025			*	*	*	*	*	*	*								
	2026			*	*	*	*	*	*	*								
	2027			*	*	*	*	*	*	*								
	2028			*	*	*	*	*	*	*								
	2029			*	*	*	*	*	*	*								
									40287	40995 Total								

* In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet

[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet TRU ATCM requirements as appropriate. The interest rate used is given at the top of this matrix.

[2] This is the annual cost of maintaining the in-use compliance technology over and above that for diesel technology. It is set to $0 as TRU replacement is diesel technology.

					11-25 hp										25-50 hp CA-based	
					$46,086										$233,138	
					$46,086	$43,871									$233,138	$221,933
					$46,086	$43,871	$44,332								$233,138	$221,933
					$46,086	$43,871	$44,332	$45,182							$233,138	$221,933
					$46,086	$43,871	$44,332	$45,182	$131,780						$233,138	$221,933
$1,569					$46,086	$43,871	$44,332	$45,182	$131,780	$43,270					$233,138	$221,933
$1,569	$1,339				$46,086	$43,871	$44,332	$45,182	$131,780	$43,270	$38,911				$233,138	$221,933
$1,569	$1,339	$1,697				$43,871	$44,332	$45,182	$131,780	$43,270	$38,911	$46,777				$221,933
$1,569	$1,339	$1,697	$1,609				$44,332	$45,182	$131,780	$43,270	$38,911	$46,777	$44,374			
$1,569	$1,339	$1,697	$1,609	$1,633				$45,182	$131,780	$43,270	$38,911	$46,777	$44,374	$45,020		
$1,569	$1,339	$1,697	$1,609	$1,633					$131,780	$43,270	$38,911	$46,777	$44,374	$45,020		
$1,569	$1,339	$1,697	$1,609	$1,633						$43,270	$38,911	$46,777	$44,374	$45,020		
	$1,339	$1,697	$1,609	$1,633							$38,911	$46,777	$44,374	$45,020		
		$1,697	$1,609	$1,633								$46,777	$44,374	$45,020		
			$1,609	$1,633									$44,374	$45,020		
				$1,633										$45,020		

Capital Cost Subtotal

								25-50 hp Out-of-State								
								$1,012,736								
								$1,012,736	$980,182							
$224,261								$1,012,736	$980,182	$996,299						
$224,261	$570,943							$1,012,736	$980,182	$996,299	$1,013,534					
$224,261	$570,943	$629,717						$1,012,736	$980,182	$996,299	$1,013,534	$2,112,661				
$224,261	$570,943	$629,717	$218,852					$1,012,736	$980,182	$996,299	$1,013,534	$2,112,661	$801,899			
$224,261	$570,943	$629,717	$218,852	$201,719				$1,012,736	$980,182	$996,299	$1,013,534	$2,112,661	$801,899	$726,483		
$224,261	$570,943	$629,717	$218,852	$201,719	$255,045				$980,182	$996,299	$1,013,534	$2,112,661	$801,899	$726,483	$1,006,665	
$224,261	$570,943	$629,717	$218,852	$201,719	$255,045	$245,291				$996,299	$1,013,534	$2,112,661	$801,899	$726,483	$1,006,665	$972,560
	$570,943	$629,717	$218,852	$201,719	$255,045	$245,291	$0				$1,013,534	$2,112,661	$801,899	$726,483	$1,006,665	$972,560
		$629,717	$218,852	$201,719	$255,045	$245,291	$0					$2,112,661	$801,899	$726,483	$1,006,665	$972,560
			$218,852	$201,719	$255,045	$245,291	$0						$801,899	$726,483	$1,006,665	$972,560
				$201,719	$255,045	$245,291	$0							$726,483	$1,006,665	$972,560
					$255,045	$245,291	$0								$1,006,665	$972,560
						$245,291	$0									$972,560
							$0									

	25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State						
	$340,147										$1,339,116						
	$340,147	$409,662									$1,339,116	$1,597,968					
	$340,147	$409,662	$679,638								$1,339,116	$1,597,968	$2,640,523				
	$340,147	$409,662	$679,638	$1,013,176							$1,339,116	$1,597,968	$2,640,523	$3,933,196			
	$340,147	$409,662	$679,638	$1,013,176	$804,838						$1,339,116	$1,597,968	$2,640,523	$3,933,196	$3,119,816		
	$340,147	$409,662	$679,638	$1,013,176	$804,838	$173,414					$1,339,116	$1,597,968	$2,640,523	$3,933,196	$3,119,816	$706,448	
	$340,147	$409,662	$679,638	$1,013,176	$804,838	$173,414	$156,387				$1,339,116	$1,597,968	$2,640,523	$3,933,196	$3,119,816	$706,448	$632,066
		$409,662	$679,638	$1,013,176	$804,838	$173,414	$156,387	$362,977				$1,597,968	$2,640,523	$3,933,196	$3,119,816	$706,448	$632,066
			$679,638	$1,013,176	$804,838	$173,414	$156,387	$362,977	$392,399				$2,640,523	$3,933,196	$3,119,816	$706,448	$632,066
$0				$1,013,176	$804,838	$173,414	$156,387	$362,977	$392,399	$0				$3,933,196	$3,119,816	$706,448	$632,066
$0					$804,838	$173,414	$156,387	$362,977	$392,399	$0					$3,119,816	$706,448	$632,066
$0						$173,414	$156,387	$362,977	$392,399	$0						$706,448	$632,066
$0							$156,387	$362,977	$392,399	$0							$632,066
$0								$362,977	$392,399	$0							
$0									$392,399	$0							
$0										$0							

Capital Cost Subtotal

			25-50 hp Reefer Railcars										Capital Cost Sub-Total	Capital Cost Sub-Total (2011 $)		Annual Mtce Co...
			$105,325										$3,078,220	$3,078,220		$0
			$105,325	$101,939									$6,435,365	$6,128,929		$0
			$105,325	$101,939	$103,615								$11,125,642	$10,091,266		$0
			$105,325	$101,939	$103,615	$105,408							$17,808,720	$16,383,842		$0
			$105,325	$101,939	$103,615	$105,408	$219,717						$24,832,028	$20,429,371		$0
			$105,325	$101,939	$103,615	$105,408	$219,717	$83,397					$26,860,878	$21,046,201		$0
			$105,325	$101,939	$103,615	$105,408	$219,717	$83,397	$75,552				$28,691,315	$21,409,501		$0
$1,431,062				$101,939	$103,615	$105,408	$219,717	$83,397	$75,552	$104,693			$28,822,011	$20,483,265		$0
$1,431,062	$1,538,234				$103,615	$105,408	$219,717	$83,397	$75,552	$104,693	$101,146		$28,760,478	$19,466,223		$0
$1,431,062	$1,538,234	$0				$105,408	$219,717	$83,397	$75,552	$104,693	$101,146	$0	$24,118,853	$15,545,939		$0
$1,431,062	$1,538,234	$0					$219,717	$83,397	$75,552	$104,693	$101,146	$0	$17,433,775	$10,702,826		
$1,431,062	$1,538,234	$0						$83,397	$75,552	$104,693	$101,146	$0	$10,410,467	$6,086,795		
$1,431,062	$1,538,234	$0							$75,552	$104,693	$101,146	$0	$6,381,618	$4,667,198		
$1,431,062	$1,538,234	$0								$104,693	$101,146	$0	$6,581,181	$3,474,231		
	$1,538,234	$0									$101,146	$0	$3,342,265	$1,688,071		
		$0										$0	$46,683	$22,441		
														$0		
														$0		
														$0		
										2011 - 2029 Maintenance Cost Subtotal (in 2011 $)				$179,704,718		

Maintenance Cost Subtotal

< 11hp

$0									
$0	$0								
$0	$0	$0							
$0	$0	$0	$0						
$0	$0	$0	$0	$0					
$0	$0	$0	$0	$0	$0				
$0	$0	$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0	$0	$0
				$0	$0	$0	$0	$0	$0
					$0	$0	$0	$0	$0
						$0	$0	$0	$0
							$0	$0	$0
								$0	$0
									$0

Maintenance Cost Subtotal

11-25 hp

$0							
$0	$0						
$0	$0	$0					
$0	$0	$0	$0				
$0	$0	$0	$0	$0			
$0	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0
			$0	$0	$0	$0	$0
				$0	$0	$0	$0
					$0	$0	$0
						$0	$0
							$0

		Maintenance Cost Subtotal										Maintenance Cost Subtotal				
		25-50 hp, CA-based										25-50 hp Out-of-State				
		$0										$0				
		$0	$0									$0	$0			
		$0	$0	$0								$0	$0	$0		
		$0	$0	$0	$0							$0	$0	$0	$0	
		$0	$0	$0	$0	$0						$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0	$0	$0
$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0
$0	$0			$0	$0	$0	$0	$0	$0	$0	$0			$0	$0	$0
$0	$0				$0	$0	$0	$0	$0	$0	$0				$0	$0
$0	$0					$0	$0	$0	$0	$0	$0					$0
$0	$0						$0	$0	$0	$0	$0					
$0	$0							$0	$0	$0	$0					
$0	$0								$0	$0	$0					
$0	$0									$0	$0					
	$0										$0					

Maintenance Cost Subtotal

Maintenance C

					25-50 hp Gen Sets CA-based										25-50 hp Gen Sets Out-of-State		
$0																	
$0	$0																
$0	$0	$0															
$0	$0	$0	$0														
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
$0	$0	$0	$0	$0													
	$0	$0	$0	$0													
		$0	$0	$0													
			$0	$0													
				$0													

ost Subtotal | Maintenance Cost Subtotal | Maintenance Co

							25-50 hp Reefer Railcars										Maint Cost Sub-Total 25-50 hp
							$0										$0
							$0	$0									$0
							$0	$0	$0								$0
							$0	$0	$0	$0							$0
							$0	$0	$0	$0	$0						$0
							$0	$0	$0	$0	$0	$0					$0
							$0	$0	$0	$0	$0	$0	$0				$0
							$0	$0	$0	$0	$0	$0	$0	$0			$0
							$0	$0	$0	$0	$0	$0	$0	$0	$0		$0
							$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
								$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
									$0	$0	$0	$0	$0	$0	$0	$0	$0
										$0	$0	$0	$0	$0	$0	$0	$0
											$0	$0	$0	$0	$0	$0	$0
												$0	$0	$0	$0	$0	$0
													$0	$0	$0	$0	$0
														$0	$0	$0	$0
															$0	$0	$0
																$0	$0

2011 - 2029 Maintenance Cost Subtotal (in 2011 $):

2011 - 2029 Total In-Use TRU Replacement

Total Annual In-Use Cost (2011 $) All Comp ost Subtotal

	Maintenance Cost Sub-Total (2011 $)	Total Annual In-Use Cost	Total Annual TRU Replacement In-Use Cost (2011 $)
	$0	$3,078,220	$3,078,220
	$0	$6,435,365	$6,120,920
	$0	$11,125,642	$10,091,286
	$0	$17,808,720	$15,383,842
	$0	$24,832,028	$20,429,371
	$0	$26,660,878	$21,048,201
	$0	$28,691,315	$21,409,901
	$0	$28,822,011	$20,483,265
	$0	$28,760,478	$19,466,223
	$0	$24,116,853	$15,546,939
	$0	$17,433,775	$10,702,826
	$0	$10,410,487	$8,088,785
	$0	$8,381,618	$4,667,198
	$0	$6,551,181	$3,474,231
	$0	$3,342,265	$1,688,071
	$0	$46,653	$22,441
	$0	$0	$0
	$0	$0	$0
	$0	$0	$0
	$0		
In-Use Cost (in 2011 $):			$179,704,719
oliance Methods			$637,962,659

Total Annual In-Use Cost (2011 $) All compliance methods
$10,713,266
$20,514,124
$30,669,842
$43,284,171
$51,118,038
$54,785,191
$57,370,145
$57,188,449
$56,648,667
$58,320,917
$46,205,996
$32,861,311
$26,273,591
$19,637,567
$10,822,763
$6,476,062
$3,780,425
$1,810,912
$83,254
$637,962,659

TRU ATCM Updated Annual Cost-Effectiveness (PM only)

Adjusted to 2003 Dollars to Compare with Original TRU ATCM Cost-Effectiveness

Year	Emission Benefits (tpy)	Updated Cost (2003$)	2008 In-Use Cost Payment Adjustment[1]	Total Updated Cost	PM Cost Effectiveness $/lb.
2000		$0	$0	$0	
2001		$0	$0	$0	
2002		$0	$0	$0	
2003		$0	$0	$0	
2004		$0	$0	$0	
2005		$0	$0	$0	
2006		$0	$0	$0	
2007		$0	$0	$0	
2008	0	$21,587,712	$0	$0	See Footnote 1
2009	306	$25,959,345	$3,083,959	$29,043,304	47
2010	300	$31,045,109	$3,083,959	$34,129,068	57
2011	303	$36,817,931	$3,083,959	$39,901,890	66
2012	302	$42,043,595	$3,083,959	$45,127,554	75
2013	286	$47,576,489	$3,083,959	$50,660,448	88
2014	273	$54,837,319	$3,083,959	$57,921,278	106
2015	302	$50,471,624	$3,083,959	$53,555,583	89
2016	304	$48,707,657		$48,707,657	80
2017	264	$45,760,351		$45,760,351	87
2018	228	$45,523,242		$45,523,242	100
2019	204	$45,135,220		$45,135,220	111
2020	184	$39,473,892		$39,473,892	107
2021	146	$31,274,036		$31,274,036	107
2022	115	$22,241,829		$22,241,829	97
2023	90	$17,783,000		$17,783,000	99
2024	69	$13,494,530		$13,494,530	98
2025	52	$7,392,949		$7,392,949	72
2026	41	$3,706,407		$3,706,407	45
2027	32	$2,558,741		$2,558,741	40
2028	25	$1,225,696		$1,225,696	25
2029	19	$56,350		$56,350	1
	3842 Tons PM Reduced				83

[1]These columns take the 2008 in-use cost and converts it into uniform payments for the years 2009 - 2015
This calculation is performed to account for the 2008 in-use costs, since a cost-effectiveness figure cannot be calculated for this year reduction due to zero PM emission.

Please See Supplemental Documentation for Economic Impacts for Additional Information

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APPENDIX G

ACRONYMS

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Appendix G

LIST OF ACRONYMS AND ABBREVIATIONS

$/lb	Dollars per pound
AB	Assembly bill
ARB, or the Board	Air Resources Board
ATCM	Airborne Toxic Control Measure
CCR	California Code of Regulations
DECS	Diesel Emission Control System or Strategy
DPF	Diesel particulate filter
DRRP, or Plan	Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles Risk Reduction Plan
ED	Enforcement Division of ARB
EO	Executive Officer of the Air Resource Board
E/S	Electric standby
g/hp-hr	Grams per horsepower-hour
>	Greater than
≥	Greater than or equal to
H&SC	Health and Safety Code
<	Less than
≤	Less than or equal to
LETRU	Low Emissions Transport Refrigeration Unit
MY	Model year
NMHC	Non-methane hydrocarbons
NO_x	Oxides of nitrogen
O & M	Operation and maintenance
PM	Particulate matter
PTSD	Planning and Technical Support Division of ARB
SSD	Stationary Source Division of ARB
TAC	Toxic air contaminant
tpd	Tons per day
TRU	Transport Refrigeration Unit
TRU OEM	Transport Refrigeration Unit Original Equipment Manufacturer
ULETRU	Ultra-Low Emission Transport Refrigeration Unit
U. S. EPA	United States Environmental Protection Agency
VDECS	Verified Diesel Emission Control Strategy

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TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER 2011 AMENDMENTS TO THE CALIFORNIA REFORMULATED GASOLINE REGULATIONS

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the California Reformulated Gasoline (CaRFG) Regulations. The proposed amendments would: (1) help preserve the benefits of the Phase 2 CaRFG standards and to correct errors of coefficients in the Predictive Model and (2) include other miscellaneous changes to improve consistency, flexibility, and enforceability.

DATE: October 20, 2011

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., October 20, 2011. This item is scheduled to be heard on the Board's Consent Calendar. All items on the consent calendar can be voted on by the Board immediately after the start of the public meeting. An item will be removed from the consent calendar at the request of a Board member or if someone in the audience would like to speak on that item.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed repeal of section 2258, and proposed amendments to sections 2260, 2261, 2264, 2265 (and the incorporated "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model" as last amended August 7, 2008), 2265.1, 2266, 2266.5, and 2271, of title 13, California Code of Regulations (CCR).

Background

The ARB administers the CaRFG regulations, which have applied to all California gasoline since March 1996; the Phase 3 CaRFG standards have applied since December 31, 2003. The CaRFG regulations establish specifications for the following eight gasoline properties: sulfur, benzene, olefins, aromatic hydrocarbons, and oxygen content, 50 percent distillation temperature (T50), 90 percent distillation temperature (T90), and summertime Reid vapor pressure (RVP). The Phase 3 CaRFG regulations also prohibit the use of oxygenated compounds (oxygenates) other than ethanol in CaRFG, and regulate the composition of denatured ethanol that can be blended with California reformulated gasoline blendstock for oxygenate blending (CARBOB) to produce CaRFG.

The CaRFG regulations allow refiners to use a "Predictive Model" to certify alternative formulations[1]. The Predictive Model is a set of mathematical equations that relate emission rates of exhaust and evaporative hydrocarbons and carbon monoxide (CO), oxides of nitrogen (NOx), and potency-weighted toxics for four toxic air contaminants (benzene, 1,3-butadiene, formaldehyde, and acetaldehyde) to the values of the eight regulated gasoline properties. An alternative gasoline formulation based on the Predictive Model is acceptable if emissions of reactivity-weighted hydrocarbons and CO (total ozone forming potential), NOx, and potency-weighted toxics resulting from this formulation are no greater than emissions from gasoline having the specifications set forth in the CaRFG standards. Currently, most of the gasoline sold in California complies with the CaRFG regulations through the use of the Predictive Model.

Since 1995, most of the State's gasoline has contained about two percent oxygen by weight. From 1995 to 2002, methyl tertiary-butyl ether (MTBE) was the oxygenated compound used in most California gasoline. Since December 31, 2003—the Phase 3 CaRFG compliance deadline—ethanol has been the only oxygenate allowed in California gasoline[2]. Since the phase-out of MTBE, most California gasoline contained 5.7 percent by ethanol. Since January 2010, refiners have begun producing most California gasoline with 10 percent ethanol. This recent increase in ethanol can be traced to the Federal Renewable Fuels Standard (RFS2), the 2007 amendments to the CaRFG regulations, and California's Low Carbon Fuel Standard. RFS2 requires increasing amounts of biofuels, such as ethanol, to be used in transportation fuels. The 2007 amendments to the CaRFG regulations required emissions associated with permeation to be mitigated. Permeation refers to the diffusive process whereby fuel molecules migrate through the materials of a vehicle's fuel system. Eventually, the fuel molecules are emitted into the air where they contribute to evaporative emissions from the vehicle. Increasing oxygen content in gasoline helps to mitigate evaporative hydrocarbon emissions such as permeation. The Low Carbon Fuel Standard requires the reduction of carbon intensity in transportation fuels, mostly through the increased use of low carbon biofuels, such as cellulosic ethanol.

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[1] California Code of Regulations Title 13, Section 2265

[2] California Code of Regulations Title 13, Section 2262.6

The Proposed Amendments

Health and Safety Code section 43013.1 requires that the Phase 3 CaRFG regulations preserve the emissions and air quality benefits of the Phase 2 CaRFG program. The purpose of the proposed amendments is to correct drafting errors in the *California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model* (Procedures Guide). There are nine coefficients that are proposed to be amended in the Procedures Guide. Eight of the coefficients have a very slight effect on the potency-weighted toxics (PWT) emission portion of the Predictive Model. The last coefficient does not affect the emissions output of the Predictive Model but is being amended for consistency with the correct values. The proposed coefficients would slightly ease the PWT emission standard as compared to the current incorrect coefficients in the Predictive Model, but still preserve the air quality benefits of CaRFG2 as required by Health and Safety Code section 43013.1. Staff is also proposing several additional amendments below.

In addition to correcting the coefficients, staff is proposing to require that gasoline with an RVP of 7.2 psi or less (5.99 psi or less for CARBOB) be certified as an RVP-controlled gasoline. This change would ensure that summertime gasoline produced early would meet all the requirements for summertime gasoline.

Staff is also proposing to delete an outdated provision for gasoline produced in 1992 through 1996. For gasoline sold or supplied between November 1, 1992, and February 29, 1996, California Code of Regulations, title 13, section 2258 specifies the oxygen content of gasoline during the wintertime. Section 2262.5 specifies the oxygen content of gasoline sold or supplied during the wintertime beginning on March 1, 1996. As section 2258 is no longer applicable, staff proposes to repeal this outdated section.

Staff is proposing to amend section 2266 to comport with the intent that any producer or importer intending to sell, offer, or supply a final blend of test-certified alternative gasoline formulation shall notify the Executive Officer sufficiently in advance to allow ARB inspectors an opportunity to sample and test the gasoline. Notification by the producers or importers after the gasoline has been transferred or commingled defeats these purposes.

Staff is proposing to amend section 2266.5(f)(1) to comport with the intent that no person may combine any CARBOB that has been supplied from the facility at which it was produced or imported with anything other than what is listed in the regulation.

Staff is proposing to amend the definition of racing vehicle to add clarity and more closely align with U.S. Environmental Protection Agency's (EPA) definition.

The staff is also proposing other amendments to the CaRFG regulations to improve consistency, flexibility, and enforceability.

COMPARABLE FEDERAL REGULATIONS

The federal reformulated gasoline (RFG) regulations apply to about 80 percent of California's gasoline and are set forth in Code of Federal Regulations (CFR), title 40, part 80, section 40 et seq. The CaRFG regulations apply to all gasoline sold, supplied, or offered in California. All CaRFG meets or exceeds the requirements of the federal RFG regulations, resulting in significant additional emission reductions. Under 40 CFR § 80.81, gasoline meeting the Phase 3 CaRFG standards is exempt from several of the enforcement requirements of the federal RFG regulations.

Congress adopted a renewable fuels standard in 2005 (RFS) and strengthened it in December 2007 (RFS2) as part of the Energy Independence and Security Act (EISA). The RFS2 requires that 36 billion gallons of biofuels be sold annually by 2022, of which 21 billion gallons must be "advanced" biofuels and the other 15 billion gallons can be corn ethanol (See 40 CFR § 80.81100 et seq.).

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the environmental and economic impacts of the proposal and supporting technical documentation. The report is entitled "Proposed Amendments to the California Reformulated Gasoline Regulations."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on the ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California 95814, (916) 322-2990, on August 31, 2011.

Upon its completion, the Final Statement of Reasons (FSOR) will also be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's website listed below.

Inquiries concerning the substance of the proposed amendments may be directed to the designated agency contact persons: Mr. Mike Waugh, Chief, Transportation Fuels Branch, (916) 322-6020 or Mr. Adrian Cayabyab, Air Resources Engineer, Fuels Section, (916) 327-1515.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The

ARB staff has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at http://www.arb.ca.gov/regact/2011/carfg11/carfg11.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies, private persons, and businesses in reasonable compliance with the proposed regulations are presented below.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB staff is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action would not affect small businesses because the affected refineries are not small businesses.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the CaRFG regulations that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to

Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary costs or savings to State or local agencies.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action. Alternatives that staff considered are discussed in the ISOR.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the meeting, or comments may be submitted by postal mail or by electronic submittal before the meeting. The public comment period for this regulatory action will begin on **September 3, 2011**. To be considered by the Board, written comments not physically submitted at the meeting must be submitted on or after **September 3, 2011,** and received **no later than 12:00 noon on October 19, 2011**, and must be addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

New Feature

You can now sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm.

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

ARB requests that written and email statements on this item be filed at least 10 days prior to the hearing so that ARB staff and Board members have additional time to consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Additionally, the Board requests but does not require that persons who submit written comments to the Board reference the title of the proposal in their comments to facilitate review.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in sections 39600, 39601, 43013, 43013.1, 43018, and 43101, Health and Safety Code, and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). This regulatory action is proposed to implement, interpret, and make specific sections 39000, 39001, 39002, 39003, 39010, 39048, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018, 43101, and 43830.8, Health and Safety Code, and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975).

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15-days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

SPECIAL ACCOMMODATION REQUEST

Special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format (i.e., Braille, large print, etc.) or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594, or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia.
- Documentos disponibles en un formato alterno (por decir, sistema Braille, o en impresión grande) u otro idioma.
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD

James N. Goldstene
Executive Officer

Date: August 23, 2011

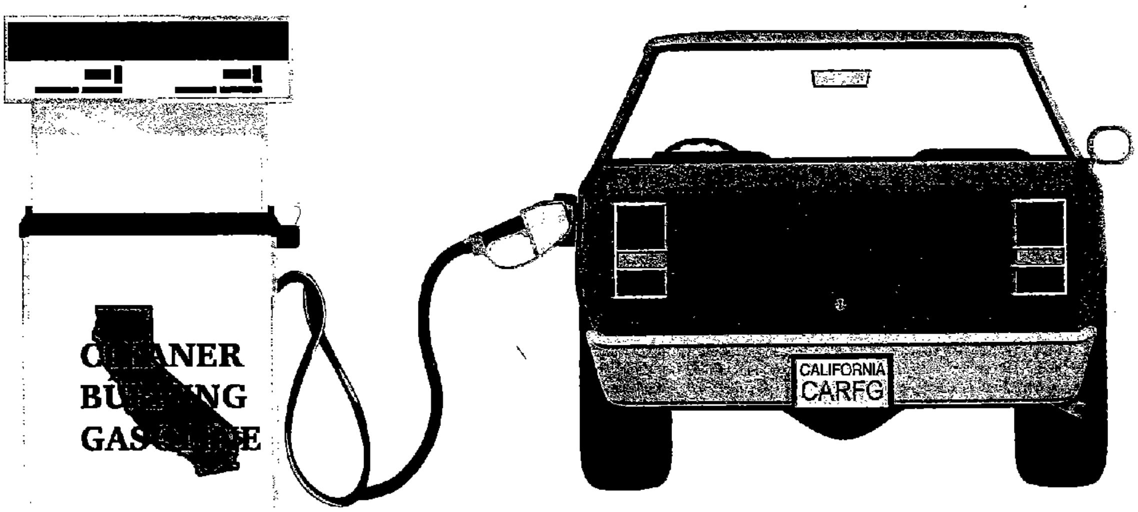
The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

California Environmental Protection Agency

Air Resources Board

Proposed 2011 Amendments to Phase 3 California Reformulated Gasoline Regulations

Staff Report: Initial Statement of Reasons



Release Date: August 31, 2011

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State of California

California Environmental Protection Agency
AIR RESOURCES BOARD
Stationary Source Division

STAFF REPORT: INITIAL STATEMENT OF REASONS PROPOSED 2011 AMENDMENTS TO CALIFORNIA PHASE 3 GASOLINE REGULATIONS

Public Hearing to Consider Amendments to the California Reformulated Gasoline Regulations

Date of Release: August 31, 2011
Scheduled for Consideration: October 20-21, 2011

Location:

California Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

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Executive Summary

A. Introduction

The Air Resources Board (ARB or Board) approved the Phase 3 Reformulated Gasoline (CaRFG3) regulations at a hearing on December 9, 1999. CaRFG3 banned the use of MTBE in California gasoline. The regulations recently amended in 2007 (2007 CaRFG3 amendments) did several things, the most significant being that they mitigated emissions associated with permeation from on-road vehicles, lowered the sulfur cap of California reformulated gasoline (CaRFG), and updated the Predictive Model.

The Predictive Model is a set of mathematical equations that relate emission rates of exhaust hydrocarbons, oxides of nitrogen (NOx), and combined exhaust toxic species to the values of the eight gasoline properties regulated under CaRFG3. Emissions of each pollutant type are predicted by equations formulated separately for vehicles of different technology classes. Producers of California gasoline use the Predictive Model to identify alternative limits that achieve equal or better emission reductions compared to the use of the flat or averaging limits. The Predictive Model provides flexibility for the producers, while ensuring ARB's emissions reduction goals are met.

The Predictive Model amended by the 2007 CaRFG amendments went into effect on December 31, 2009. These amendments were necessary to preserve the air quality benefits of the Phase 2 CaRFG standards as they existed in 1999, pursuant to Health and Safety Code Section 43013.1. The Predictive Model was also updated to reflect the current motor vehicle fleet and new data on how fuel properties affect motor vehicle emissions.

Staff is now proposing some additional, mainly technical, clean-up amendments to the CaRFG3 regulations. These proposed amendments would: 1) correct some transcription errors in the Predictive Model coefficients; 2) require that gasoline with a Reid vapor pressure (RVP) of 7.2 psi or less be certified as an RVP-controlled gasoline; 3) clarify that no person may add anything to CARBOB other than what is specifically listed in the regulation; 4) remove an outdated provision that only applies to 1992-1996 gasoline; and 5) change the notification requirements relating to test-certified alternative gasoline, 6) modify the definition of racing vehicle, and 7) make additional minor amendments to increase the flexibility, enforceability, and consistency of the regulations.

One purpose of the proposed amendments is to correct transcription errors in the *California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model* (Procedures Guide or Predictive Model). The Procedures Guide contains the equations and the coefficients of the Predictive Model and is technically considered the Predictive Model. The terms "Procedures Guide" and "Predictive Model" will be used interchangeably throughout this document. There are nine coefficients that are proposed to be amended in the Procedures Guide. The coefficients have a very slight effect on the potency-weighted toxics emission portion of the Predictive Model, which affects the certification of alternative formulation of fuels.

As part of the 2007 CaRFG3 amendments, staff updated the Predictive Model with new emissions studies, emissions associated with permeation, and reactivity factors. Permeation refers to the diffusive process whereby fuel molecules migrate through the materials of a vehicle's fuel system. Eventually, the fuel molecules are emitted into the air where they contribute to evaporative emissions from the vehicle. Reactivity factors are factors that attribute the relative contributions of various hydrocarbons and CO to ozone formation. When updating the Predictive Model, staff typically builds the model into a spreadsheet so that emission outputs of the model can be seen visually while changes are being made to the equations and coefficients. The Predictive Model in its spreadsheet form is finalized first. Then the equations and coefficients are transcribed from the spreadsheet to the Procedures Guide. Prior to the implementation on December 31, 2009, of the most recently amended Predictive Model, staff discovered nine coefficient discrepancies between the Predictive Model spreadsheet and the Procedures Guide.

Upon discovery of the discrepancy of the coefficients between the Predictive Model spreadsheet and the Procedures Guide, ARB's Stationary Source Division and Enforcement Division issued advisories regarding the issue. Stationary Source Division's advisory, which was sent out through ARB's "Fuels" e-mail list serve, identified the incorrect coefficients and provided corrected values for the incorrect coefficients and indicated that ARB would enter into a rulemaking to correct the coefficients. Enforcement Division's advisory indicated that ARB would accept Predictive Model formulations that score a "pass" using either the coefficients in the Procedures Guide or the coefficients in the Predictive Model or California Reformulated Gasoline Blendstocks for Oxygenate Blending (CARBOB) Model spreadsheets found on ARB's website. The advisory was issued in November 2009, prior to the December 31, 2009, start date for use of the new Predictive Model. The full advisory can be found at http://www.arb.ca.gov/enf/advs/advs409.pdf

Staff is proposing to amend the following coefficients in the Procedures Guide:

- Oxides of nitrogen (NOx) Emissions for Tech 3 coefficient for RVP contribution from 0.424915 to 0.0424915;
- Potency Weighted Toxics (PWT) Benzene Emissions for Tech 3 coefficient for benzene contribution from -0.12025037 to 0.12025037;
- PWT Benzene Emissions for Tech 4 coefficient for RVP contribution from 0.07392876 to -0.04782469;
- PWT Benzene Emissions for Tech 5 coefficient for RVP contribution from 0.06514198 to -0.04214049;

- PWT Formaldehyde Emissions for Tech 5 coefficient for T90 contribution from 0.000000 to 0.06037698;
- Tech 5 benzene mean from 1.014259 to 0.969248;
- Tech 5 benzene standard deviation from 0.537392 to 0.504325;
- PWT Acetaldehyde Emissions for Tech 5 coefficient for "oxygen as ethanol" from 0.046699012 to 0.46699012; and
- Tech 4 Reid Vapor Pressure (RVP) standard deviation from 0.8891114 to 0.889114.

The aforementioned coefficients were transcribed incorrectly during the update of the Predictive Model in the 2007 CaRFG3 amendments. Correcting these coefficients is necessary to ensure consistency between the spreadsheet and the Procedures Guide, which is incorporated by reference. These corrections are also necessary to preserve the emissions benefits of the Phase 2 CaRFG standards, pursuant to Health and Safety Code Section 43013.1.

Another purpose of the proposed amendments is to repeal an outdated provision relating to the oxygen content of gasoline during the wintertime for gasoline sold or supplied between November 1, 1992, and February 29, 1996. The currently effective provision relating to the oxygen content of gasoline during the wintertime for gasoline sold or supplied beginning March 1, 1996, remains unchanged. Therefore, this repeal is proposed to eliminate an outdated provision, which no longer applies to gasoline currently produced; to provide clarity; and to eliminate unnecessary provisions.

Staff is also proposing that gasoline with an RVP value equal to or less than 7.20 pounds per square inch (psi) (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB), be required to be certified as an RVP-controlled gasoline. In other words, if a refiner is making summer gasoline early, it would need to meet all the summer gasoline specifications, not just the vapor pressure limit. This amendment is proposed to provide the refiners with flexibility in making RVP-controlled gasoline more than 15 days before the start of the RVP control period. It would also require refiners who make a gasoline with an RVP of 7.2 psi or less to use the THC Model of the Predictive Model during the non-RVP regulatory period. In addition, staff determined allowing refiners to make an RVP-controlled gasoline all year round may provide an emission benefit above what the current regulations are achieving and give refiners the flexibility to meet common carrier pipeline specifications outside of the 15-day transition period for the RVP regulatory control period.

Staff also proposes amendments to ensure that any producer or importer intending to sell, offer, or supply a final blend of test-certified alternative gasoline formulation shall notify the Executive Officer sufficiently in advance to allow ARB inspectors an opportunity to sample and test the gasoline.

In addition, staff is proposing amendments to clarify that no person may combine any CARBOB that has been supplied from the facility at which it was produced or imported with anything other than what is specifically listed in the regulation. The current regulation allows for things such as jet fuel to be added to CARBOB and staff is trying to close the loophole on what is allowed to be combined with CARBOB.

Staff is proposing to amend the definition of racing vehicle to clear up ambiguity in the definition and more closely align with the U.S. Environmental Protection Agency's (EPA) definition. The current definition of racing vehicle is not specific and leaves room for interpretation, which makes parts of ARB's regulations difficult to enforce. In order to clear up any ambiguity, ARB staff is aligning the definition of racing vehicle with U.S. EPA's definition.

Staff is also proposing additional amendments to the CaRFG3 regulations to increase the flexibility, enforceability, and consistency of the regulations. The proposed regulatory amendments are in Appendix A.

Staff is proposing that the 2011 proposed amendments would take effect upon the Office of Administrative Law's filing with the Secretary of State. The amendments are considered "clean-up" and would not affect the cost or production of CaRFG3, nor change the estimated benefit of the 2007 CaRFG3 amendments.

B. Economic Impacts of the Proposed Amendments

As mentioned, the current coefficients predicting slightly higher PWT emissions make the Predictive Model slightly stricter than intended. The proposed coefficients would ease the PWT emission standard as compared to the current coefficients in the Predictive Model, but still preserve the emission benefits of CaRFG2. The lone incorrect NOx coefficient has no impact on the Predictive Model, but is still being corrected. All of the fuel formulations submitted by producers who chose to use the 2007 amended Predictive Model before December 31, 2009, passed the Predictive Model under the current coefficients, as well as the proposed coefficients. The difference in the Predictive Model between the current coefficients and the corrected coefficients are slight, and are limited to the toxics portion of the Predictive Model. Because all formulations submitted to date would have passed with either set of coefficients, ARB staff does not expect the proposed coefficients to have any impact on fuel formulations and therefore does not expect there would be any economic impact associated with the proposed changes.

The current regulation allows for a 15-day transition period, where refiners can start to make summer (RVP-controlled) gasoline early. The common carrier pipeline operator is looking for a longer transition period, to ensure their distribution system switches over in time. Allowing RVP-controlled gasoline to be made all year round with the trigger being an RVP of 7.2 psi or less (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB) removes the 15-day transition period from the non-RVP-controlled gasoline season to the RVP-controlled gasoline season. ARB's gasoline requirements cap the Reid vapor pressure (RVP) of gasoline at 7.2 psi during the summer RVP-control season to reduce smog formation. Wintertime gasoline does not have an RVP cap. In California, the gasoline sold at the pumps from November through February is almost entirely all winter gasoline. March/April and October/early November are transition (switchover) periods, exact transition deadlines vary by air district. Refiners, and the pipelines that carry CARBOB, start the transition to summer (RVP-controlled) gasoline early to ensure that wintertime gasoline is cleared out of the distribution system in time.

Rather than designating a specific date, staff is proposing that summer gasoline could be made at any time of the year, but that it would need to meet all the summer gasoline requirements. This would give refiners and pipelines flexibility on setting transition dates that work with their schedule, but ensure that any summer (RVP at 7.2 psi or less) gasoline would meet the RVP-controlled specifications. As part of this change, a refiner making a summer gasoline (RVP <=7.2 psi) early would have to use the Total Hydrocarbon (THC) Model of the Predictive Model—and meet the evaporative requirements of summer gasoline. A current, unnecessary requirement in the regulation prevents refiners from using the evaporative part of the Predictive Model in the winter – forcing them to make winter gasoline, a transition gasoline, and a summer gasoline. The proposed changes would eliminate the need to make a special transition gasoline, something which most refiners support. Virtually all gasoline made during the non-RVP-regulatory season has an RVP greater than 7.2 psi and would be unaffected by this change. Therefore, ARB staff believes that there will be no impact to the production or cost of CaRFG3 as a result of the amendments.

The remaining proposed changes do not impose new requirements on producers and importers, but are intended only to clarify certain procedures to ensure the emissions benefits originally intended.

C. Environmental impacts of the Proposed Amendments

Health and Safety Code section 43013.1(b)(1) requires that CaRFG3 preserve the emission benefits of CaRFG2. Although the current coefficients in the Procedures Guide technically provide a slightly stricter standard to certify fuel formulations, the current coefficients exist as a result of transcription errors in transcribing the coefficients from the Predictive Model spreadsheet to the Procedures Guide and are not technically correct. The proposed coefficients are technically correct and would ease the PWT emission standard as compared to the current incorrect coefficients in the Predictive Model, but still preserve the emission benefits of CaRFG2. The lone incorrect NOx coefficient has no impact on the Predictive Model, but is still being corrected. In addition, all fuel formulations submitted to date would have passed with either set of coefficients. Therefore, ARB staff expects there will be no environmental impacts associated with the proposed changes to the coefficients.

Allowing RVP-controlled gasoline to be made all year round will require refiners to use the THC model of the Predictive Model for gasolines with an RVP of 7.2 psi or less that are produced during the non-RVP-regulatory period. In general, RVP-controlled gasoline is likely cleaner than non-RVP-controlled gasoline because refiners have to mitigate the evaporative emissions of gasoline in RVP-controlled gasoline. Therefore, allowing refiners to make RVP-controlled gasoline all year round may provide some emissions benefits.

Repealing the outdated section relating to oxygen content will have no environmental impact because gasoline subject to this section is no longer made. The applicable provision relating to oxygen content is not proposed to be amended by this rulemaking.

D. Recommendations

The staff recommends that the Board adopt the following proposed 2011 amendments to the California reformulated gasoline regulations:

1. Amendments to the *California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model* to amend transcription errors with coefficients.

2. Amendment that requires that gasoline with a RVP of 7.2 psi or less (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB) be certified as an RVP-controlled gasoline.

3. Repeal of the outdated section relating to oxygen content, section 2258.

4. Amendment to section 2266, the notification requirements relating to test-certified alternative gasoline. This will improve enforceability of the regulations by allowing ARB inspectors an opportunity to sample and test the gasoline before it is transferred or commingled.

5. Amendment to section 2266.5(f)(1) to clarify that only those items listed may be blended with CARBOB after it has been supplied from the production or import facility.

6. Amendment to modify the definition of racing vehicle to more closely align with U.S. EPA's definition.

7. Other miscellaneous changes to increase enforceability, flexibility, and consistency of the regulations.

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Chapter I. Introduction

This report presents the Initial Statement of Reasons in support of proposed amendments to the Phase 3 California Reformulated Gasoline (CaRFG3) regulations. Over the years, the Air Resources Board (ARB or Board) developed and amended these regulations in three major phases. The most recent amendments, which became effective on August 29, 2008, mitigated emissions associated with permeation from on-road vehicles, lowered the sulfur cap of CaRFG, and updated the Predictive Model. Senate Bill 989 (1999), establishing Health and Safety Code section 43013.1, requires the Board to preserve the air quality benefits of the existing reformulated gasoline program as it existed in 1999.

The Predictive Model.

One purpose of the proposed amendments is to correct transcription errors in the *California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model* (Procedures Guide or Predictive Model). The Procedures Guide contains the equations and the coefficients of the Predictive Model and is technically considered the Predictive Model. The terms "Procedures Guide" and "Predictive Model" will be used interchangeably throughout this document. The Predictive Model is a set of equations that relate changes in fuel properties to changes in emissions. The Predictive Model allows producers to certify alternative formulations of CaRFG3 by comparing the emission predictions for a candidate set of property limits to the predictions for the flat or averaging limits. There are nine coefficients that are proposed to be amended in the Procedures Guide. The coefficients have a very slight effect on the potency-weighted toxics emission portion of the Predictive Model, which affects the certification of alternative formulation of fuels.

As part of the 2007 CaRFG3 amendments, staff updated the Predictive Model with new emissions studies, emissions associated with permeation, and reactivity factors. Permeation refers to the diffusive process whereby fuel molecules migrate through the materials of a vehicle's fuel system. Eventually, the fuel molecules are emitted into the air where they contribute to evaporative emissions from the vehicle. Reactivity factors are factors that attribute the relative contributions of various hydrocarbons and CO to ozone formation. When updating the Predictive Model, staff typically builds the model into a spreadsheet so that emission outputs of the model can be seen visually while changes are being made to the equations and coefficients. The Predictive Model in its spreadsheet form is finalized first. Then the equations and coefficients are transcribed from the spreadsheet to the Procedures Guide. Prior to the implementation on December 31, 2009, of the Predictive Model amended by the 2007 CaRFG3 amendments, staff discovered nine coefficient discrepancies between the Predictive Model spreadsheet and the Procedures Guide.

Upon discovery of the discrepancy of the coefficients between the Predictive Model spreadsheet and the Procedures Guide, ARB's Stationary Source Division and Enforcement Division issued advisories regarding the issue. Stationary Source Division's advisory, which was sent out through ARB's "Fuels" e-mail list serve, identified the incorrect coefficients and provided corrected values for the incorrect coefficients and indicated that ARB would enter into a rulemaking to correct the coefficients. Enforcement Division's advisory indicated that ARB would accept Predictive Model formulations that score a "pass" using either the coefficients in the Procedures Guide or the coefficients in the Predictive Model or CARBOB Model spreadsheets found on ARB's website. The advisory was issued in November 2009, prior to the December 31, 2009, start date for use of the new Predictive Model. The full advisory can be found at http://www.arb.ca.gov/enf/advs/advs409.pdf

Below is a brief description of each change that staff is proposing:

Amend the incorrect Predictive Model coefficients in the Procedures Guide. Staff proposes to amend the nine incorrect coefficient sin the Procedures Guide.

Require that gasoline with a Reid vapor pressure (RVP) of 7.2 psi or less be certified as an RVP-controlled gasoline. Staff is proposing to allow refiners to make RVP-controlled gasoline all year round for gasolines that have an RVP of 7.2 psi or less (5.99 or less for CARBOB), and to require that that gasoline be certified as RVP-controlled gasoline.

Repeal of outdated provisions. For gasoline sold or supplied between November 1, 1992, and February 29, 1996, California Code of Regulations, title 13, section 2258 specifies the oxygen content of gasoline during the wintertime. Section 2262.5[1] specifies the oxygen content of gasoline sold or supplied during the wintertime beginning on March 1, 1996. As section 2258 is no longer applicable, staff proposes to repeal this outdated section.

Notification regarding sales and supplies of a test-certified alternative gasoline formulation. Staff proposes to amend section 2266 to comport with the intent that any producer or importer intending to sell, offer, or supply a final blend of test-certified alternative gasoline formulation shall notify the Executive Officer sufficiently in advance to allow ARB inspectors an opportunity to sample and test the gasoline. Notification by the producers or importers after the gasoline has been transferred or commingled defeats these purposes.

Restrictions on blending CARBOB with other materials. Staff proposes to amend section 2266.5(f)(1) to comport with the intent that no person may combine any CARBOB that has been supplied from the facility at which it was produced or imported with anything other than what is listed.

[1] Unless otherwise indicated, all sections refer to the California Code of Regulations, title 13.

<u>Amend definition of Racing Vehicle.</u> Staff is proposing to amend the definition of racing vehicle to clear up ambiguity in the definition and more closely align with the U.S. Environmental Protection Agency's (U.S. EPA) definition.

<u>Other miscellaneous changes.</u> The staff is also proposing additional amendments to the CaRFG3 regulations to increase the flexibility, enforceability, and consistency of the regulations.

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Chapter II. Background

A. California Reformulated Gasoline Program

California Health and Safety Code section 43018 requires ARB to achieve the maximum feasible reductions from motor vehicles and motor vehicle fuels. In carrying out this requirement, ARB is to adopt standards and regulations that produce the most cost-effective combination of control measures on all classes of motor vehicles and motor vehicles fuels, including the specification of vehicular fuel composition. In response, the Board has adopted numerous regulations, including the California reformulated gasoline program.

The CaRFG program is a vital part of ARB's strategy to address motor vehicles and fuels as a system by combining cleaner fuels and motor vehicle controls to achieve the maximum emission reductions at the lowest cost. CaRFG also substantially reduced emissions from existing vehicles. The Board initially adopted the CaRFG program in two phases. Phase 1 of the program required changes to gasoline that could be made in a short time frame and only required small investments by producers and importers. (Note: "Producers" from this point forward in the Staff Report will refer to both producers and importers, unless otherwise specified.) Phase 2 was significantly more complex and achieved more emissions reductions. Phase 3 implemented the Governor's and Legislature's direction to remove methyl tertiary butyl ether (MTBE) from California gasoline.

In June 2007, the Board approved amendments to the CaRFG3 regulations. The 2007 CaRFG3 amendments required mitigation of emissions associated with permeation from on-road vehicles through the Predictive Model, lowered the sulfur cap of CaRFG from 30 parts per million by weight (ppmw) to 20 ppmw beginning December 31, 2011, and updated the Predictive Model with new data. The 2007 CaRFG3 amendments went into effect on August 29, 2008; use of the amended Predictive Model was required beginning December 31, 2009.

The CaRFG3 limits now in effect are shown in Table 1.

Table 1: CaRFG Limits and Caps

Property	Flat Limits	Averaging Limits	Cap Limits(1)
Reid vapor pressure, psi, max	7.00 or 6.90 (2)	---	6.40 - 7.20(3)
Benzene, vol%, max	0.8	0.70	1.10
Sulfur, ppmw, max	20	15	30
Aromatic HC, vol%, max	25	22	35.0
Olefins, vol%, max	6.0	4.0	10.0
Oxygen, wt%	1.8 to 2.2	---	1.8 – 3.5(4) 0 – 3.5
T50 (temp. at 50% distilled) °F, max	213	203	220
T90 (temp. at 90% distilled) °F, max	305	295	330

(1) The "cap limits" apply to all gasoline at any place in the marketing system and are not adjustable.
(2) 6.90 psi applies when a producer is using the evaporative emissions element of CaRFG3 Predictive Model and gasoline may not exceed a cap of 7.20 psi; otherwise, the 7.00 psi limit applies.
(3) The 7.20 psi RVP cap limit only applies during the RVP regulatory control period. The minimum 6.40 psi RVP limit applies all year round.
(4) The 1.8 weight percent minimum applies only during the winter and only in certain areas.

B. The California Predictive Model

Numerous studies have shown that the properties of gasoline affect motor vehicle emissions. Based on thousands of individual tests, equations have been developed that relate changes in fuel properties to changes in emissions. The Predictive Model takes advantage of these relationships to provide producers flexibility. The producers use the Predictive Model to identify alternative limits that achieve equal or better emission reductions compared to the use of the flat or averaging limits. The Predictive Model provides flexibility for the producers, while ensuring California's emissions reduction goals are met. This flexibility is highly valued by the producers and the vast majority of CaRFG is produced using the Predictive Model.

The Predictive Model allows producers to certify alternative formulations of CaRFG3 by comparing the emission predictions for a candidate set of property limits to the predictions for the flat or averaging limits. If each prediction for the candidate limit is no greater than 1.004 times the corresponding basic-limit prediction, the alternative set of limits is allowed. In effect, the model allows a producer to use one or more limits greater than flat or averaging limits in exchange for compensating reductions in other limits. Thus, the model provides valuable flexibility to individual refiners by allowing refiners to most efficiently meet the CaRFG3 requirements, taking into consideration the configuration of the refinery.

To facilitate the use of the Predictive Model, ARB staff provides a procedures guide, *California Procedures for Evaluation Alternative Specifications of Phase 3 Reformulated Gasoline Using the California Predictive Model*, a document that is incorporated by reference in the regulations. The Procedures Guide provides step-by-step instructions, including ARB staff notification requirements. For clarification, the Procedures Guide is the Predictive Model. Also, a computer spreadsheet is provided so that users can insert the specifications for the candidate fuel, and the spreadsheet will calculate if the candidate fuel passes or fails.

As part of the 2007 CaRFG3 amendments, staff updated the Predictive Model with new emissions studies, emissions associated with permeation, and reactivity factors. When updating the Predictive Model, staff typically builds the model into a spreadsheet so that emission outputs of the model can be seen visually while changes are being made to the equations and coefficients. The Predictive Model in its spreadsheet form is finalized first. The equations and coefficients are transcribed from the spreadsheet to the Procedures Guide.

C. Ethanol Use in California Gasoline

In general, oxygenates such as MTBE and ethanol are used in gasoline to reduce the exhaust emissions of hydrocarbons and carbon monoxide and improve the octane rating. However, as the result of the presence of MTBE in groundwater, on March 25, 1999, the Governor issued Executive Order D-5-99. The Executive Order directed the phase-out of MTBE in California's gasoline. The phase-out of MTBE left ethanol as the only oxygenate allowed to be used in California gasoline. In addition, the Legislature passed Senate Bill 989. Among other provisions, the bill directed the ARB to ensure that regulations adopted pursuant to the Executive Order maintain or improve upon emissions and air quality benefits achieved by CaRFG2 as of January 1, 1999 (Health and Safety Code section 43013.1).

Currently, CaRFG3 contains 10 percent ethanol by volume. Prior to 2010, most of California's gasoline contained 5.7 percent ethanol by volume. The recent increase of ethanol in gasoline can be traced to the 2007 CaRFG3 amendments, the Low Carbon Fuel Standard, and the Federal Renewable Fuels Standard. The Low Carbon Fuel Standard requires the reduction of carbon intensity in transportation fuels, mostly through the increased use of low-carbon biofuels. The Federal Renewable Fuels standard requires increasing amounts of biofuels, such as ethanol, to be used in transportation fuels.

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Chapter III. Proposed Amendments to the CaRFG3 Regulations

This chapter presents the staff's proposal to amend the CaRFG3 regulations. In summary, the staff is proposing the following amendments:

- Amend the *California Procedures for Evaluation Alternative Specifications of Phase 3 Reformulated Gasoline Using the California Predictive Model* to correct transcription errors;
- Require that gasoline with a Reid vapor pressure (RVP) of 7.2 psi or less be certified as an RVP-controlled gasoline;
- Repeal section 2258, an outdated provision relating to the oxygen content of gasoline sold or supplied during the wintertime between November 1, 1992 and February 29, 1996;
- Amend the notification requirements for test-certified alternative gasoline formulations;
- Amend the restrictions on blending CARBOB with other materials;
- Amend the definition of racing vehicle; and
- Other miscellaneous changes.

These proposed amendments are presented in strikeout-and-underline form in Appendix A.

A. Revise the Procedures Guide

When updating the Predictive Model, staff typically builds the model into a spreadsheet so that emission outputs of the model can be seen visually while changes are being made to the equations and coefficients. The Predictive Model in its spreadsheet form is finalized first. The equations and coefficients are then transcribed from the spreadsheet to the Procedures document. In working with producers to incorporate the Predictive Model into their computer systems, staff discovered that the emission outputs from the Predictive Model spreadsheet were not matching the emission outputs from the refiner's Predictive Models that were built from the Procedures Guide. The discrepancies between the Predictive Model spreadsheet and the Procedures Guide were traced to nine coefficients. A list of the nine Predictive Model coefficient changes that are being proposed are shown below:

1. The NOX Emissions for Tech 3 coefficient for RVP contribution is stated in the Procedures Guide as 0.424915. A typographical error occurred that left a zero out of the tenths place. Staff is proposing to change the coefficient to 0.0424915.

2. The PWT Benzene Emissions for Tech 3 coefficient for benzene contribution stated in the Procedures Guide as -0.12025037. This is a

typographical error that omitted the negative sign in front of the value. Staff is proposing to change the coefficient to 0.12025037.

3. PWT Benzene Emissions for Tech 4 coefficient for RVP contribution stated in the Procedures Guide is 0.07392876. From the Predictive Model spreadsheet, one must multiply the Tech 4 benzene model coefficient (0.03114189) by the Tech 4 standardized RVP value (-1.535703) to get the correct PWT Benzene Emission for Tech 4 coefficient (-0.04782469). The drafting error occurred during the transcription process when the original PWT Benzene Emission for Tech 4 coefficient (0.048140014) in the Procedures Guide was multiplied by the updated Tech 4 standardized RVP value (-1.535703) from the Predictive Model spreadsheet. The product of these two numbers is the incorrect PWT Benzene Emissions for Tech 4 coefficient for RVP contribution that currently exists in the Procedures Guide without the minus sign (0.07392876). Staff is proposing to change the PWT Benzene Emissions for Tech 4 coefficient for RVP contribution to -0.04782469.

4. PWT Benzene Emissions for Tech 5 coefficient for RVP contribution stated in the Procedures Guide is 0.06514198. From the Predictive Model spreadsheet, one must multiply the Tech 5 benzene model coefficient (0.03114189) by the Tech 4 standardized RVP value (-1.353177) to get the correct PWT Benzene Emission for Tech 5 coefficient (-0.04214049). The drafting error occurred during the transcription process when the original PWT Benzene Emission for Tech 5 coefficient (0.048140014) in the Procedures Guide was multiplied by the updated Tech 5 standardized RVP value (-1.353177) from the Predictive Model spreadsheet. The product of these two numbers is the incorrect PWT Benzene Emissions for Tech 5 coefficient for RVP contribution that currently exists in the Procedures Guide without the minus sign (0.06514198). Staff is proposing to change the PWT Benzene Emissions for Tech 5 coefficient for RVP contribution to -0.04214049.

5. The PWT Formaldehyde Emissions for Tech 5 coefficient for T90 contribution stated in the Procedures Guide as 0.000000. The value was inadvertently changed in the revisions to the Procedures Guide in the ensuing 15-day and second set of 15-day items change versions of the Procedures Guide. The correct value was in the original Initial Statement of Reasons (ISOR) version of the Procedures Guide in Appendix A. Staff is proposing to change the coefficient to 0.06037698.

6. The Tech 5 benzene mean coefficient in the Procedures Guide is stated as 1.014259. The correct value occurs in the Procedures Guide in the Mass Effect Emission for Tech 5 equation but is incorrect in Table 12. Staff is proposing to change the coefficient in Table 12 to 0.969248 to

match the correct coefficient as listed in the Mass Effect Emission for Tech 5 equation.

7. The Tech 5 benzene standard deviation in the Procedures Guide is stated as 0.537392. The correct value occurs in the Procedures Guide in the Mass Effect Emission for Tech 5 equation but is incorrect in Table 12. Staff is proposing to change the coefficient in Table 12 to 0.504325 to match the correct coefficient as listed in the Mass Effect Emission for Tech 5 equation.

8. PWT Acetaldehyde Emissions for Tech 5 coefficient for "oxygen as ethanol" contribution stated in the Procedures Guide is 0.046699012 but in the spreadsheet it is 0.46699012. This is a typographical error that inadvertently added an additional zero in the tens place of the coefficient.

9. Tech 4 RVP standard deviation in the Procedures Guide is stated as (0.8891114) but in the spreadsheet it is 0.889114. An extra one was inadvertently added in the ten-thousandths place of the coefficient.

1. Require that gasoline with a Reid vapor pressure (RVP) of 7.2 psi or less be certified as an RVP-controlled gasoline

ARB's gasoline requirements cap the Reid vapor pressure (RVP) of gasoline at 7.2 psi during the summer RVP control season, to reduce smog formation. Wintertime gasoline does not have an RVP cap. In California, the gasoline sold at the pumps from November through February is almost entirely all winter gasoline. March/April and October/early November are transition (switchover) periods, exact transition deadlines vary by air district. Refiners, and the pipelines that carry CARBOB, start the transition to summer (RVP-controlled) gasoline early, to ensure that wintertime (non-RVP-controlled) gasoline is cleared out of the distribution system in time.

The current regulation allows for a 15-day transition period, where refiners can start to make summer (RVP-controlled) gasoline early. The common carrier pipeline operator is looking for a longer transition period, to ensure their distribution system switches over in time. Rather than designating a specific date, staff is proposing that summer gasoline could be made at any time of the year, but that it would need to meet all the summer gasoline requirements. This would give refiners and pipeline operators flexibility on setting transition dates that work with their schedule, and ensure that any summer (RVP at 7.2 psi or less) gasoline would meet the RVP-controlled specifications. As part of this change, a refiner making a summer gasoline (RVP <=7.2 psi) early would have to use the THC model of the Predictive Model. A current, unnecessary requirement in the regulation prevents refiners from using the evaporative part of the Predictive Model in the winter – forcing them to make winter gasoline, a special transition gasoline, and a summer gasoline. The proposed changes would eliminate the need to make a special transition gasoline, something which most refiners support.

2. Outdated section relating to oxygen content.

The proposed amendment also repeals section 2258 in its entirety. Section 2258 is an outdated provision since it relates to the oxygen content of gasoline during the wintertime for gasoline sold or supplied between November 1, 1992, and February 29, 1996. Staff does not expect that gasoline sold or supplied during this time period is still available. Therefore, repeal of this outdated provision will help to clean up the regulations. The currently effective provision relating to the oxygen content of gasoline during the wintertime for gasoline sold or supplied beginning March 1, 1996, is section 2262.5. This section remains unchanged by the proposed amendments. Therefore, repeal of the outdated section 2258 is not expected to have any effect on the cost or production of CaRFG3, change the estimated benefit of the 2007 CaRFG3 amendments, or alter emissions from CaRFG3.

3. Notification relating to test-certified alternative gasoline.

In order to afford ARB inspectors an opportunity to sample and test California gasoline to ensure compliance with the regulations, staff also proposes amendments to the CaRFG3 regulations to ensure that any producer or importer intending to sell, offer, or supply a final blend of test-certified alternative gasoline formulation notifies the Executive Officer sufficiently in advance. The current regulations require notification at least 12 hours before start of physical transfer of the final blend from the production or import facility. Previously, it was thought that the final blend would be available for sampling at some point during this 12-hour period. However, staff has learned that producers and importers have been starting and completing the physical transfer during this period. As a result, the final blend was not available for sampling and confirmation of compliance. The proposed amendments correct this situation by specifying that the producer or importer must provide notification to the Executive Officer before the start of physical transfer of the gasoline from the production or import facility, and in no case less than 12 hours before the producer or importer either completes physical transfer or commingles the final blend. This amendment will ensure that the final blend will be available for sampling by ARB during the 12 hour period.

4. Combining CARBOB with other materials.

In addition, staff is proposing amendments to clarify that no person may combine any CARBOB that has been supplied from the facility at which it was produced or imported with anything other than what is specifically listed in the regulation. This will help stakeholders in understanding that combining CARBOB, after it has been supplied from the production or import facility, with anything not specifically listed is prohibited. An exhaustive list of materials that may not be combined with

CARBOB is not practical, but includes materials such as hydrocarbons, diesel fuel, jet fuel, aviation gasoline, biodiesel, renewable diesel, marine fuels, and transmix.

5. Amend definition of Racing Vehicle

Staff is proposing to amend the definition of racing vehicle to clear up the ambiguity in the definition and more closely align with U.S. EPA's definition. The current definition defines racing vehicle as a competition vehicle not used on public highways. The proposed definition of racing is shown in the language below.

"Racing vehicle" means a vehicle that:

(A) Is exclusively operated in conjunction with sanctioned racing events;

(B) Exhibits racing features and modifications such that it is incapable of safe and practical street or highway use;

(C) Is not licensed by the State of California Department of Motor Vehicles for operation on public streets or highways; and

(D) Is never operated on public streets or highways.

6. Miscellaneous amendments.

Staff is also proposing additional amendments to the CaRFG3 regulations to increase the flexibility, enforceability, and consistency of the regulations. The proposed regulatory amendments are in Appendix A.

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Chapter IV. Economic and Fiscal Impacts of the Proposed Amendments

This chapter presents a summary of potential effects of the proposed amendments on the production of CaRFG3 and an analysis of the costs to produce CaRFG3 gasoline in compliance with the proposed amendments. In addition, the chapter outlines potential economic impacts on businesses and consumers.

Health and Safety Code section 43013.1(b)(1) requires that CaRFG3 preserve the emission benefits of CaRFG2. The proposed amendments will correct coefficients in the Predictive Model to increase the accuracy of emissions estimations from the Predictive Model in fuel formula certifications. The proposed amendments associated with the use of CaRFG3 in on-road motor vehicles will preserve the emission benefits of CaRFG2.

Staff compared the emissions output using the current coefficients in the Procedures Guide versus the proposed coefficients. For both non-ethanol fuels and for ethanol fuels, the directional change in potency-weighted toxics (PWT) emissions was higher for the Predictive Model using the current coefficients and lower for the Predictive Model using the proposed coefficients. Staff used Statistical Analysis Software to run over 51 million combinations of fuel properties and found that the directional difference was consistent amongst all combinations; the current coefficients always had a slightly higher PWT emission output versus the proposed coefficients. The differences between current coefficients and the proposed coefficients for PWT emissions were 0.12 percent for non-ethanol fuels and 0.11 percent for ethanol fuels. The coefficients only affected the PWT portions of the Predictive Model. The hydrocarbon and oxides of nitrogen portions of the model were unaffected.

A. Effects of the Proposed Amendments on the Production of CaRFG3

1. Change in PWT Coefficients

The current coefficients predicting slightly higher PWT emissions means that the Predictive Model is slightly stricter under the current coefficients because refiners would need to make a slightly cleaner formulation to pass. The proposed coefficients would ease the PWT emission standard as compared to the current coefficients in the Predictive Model, but still preserve the emission benefits of CaRFG2. The lone incorrect NOx coefficient has no impact on the Predictive Model, but is still being corrected. All of the fuel formulations submitted by producers who chose to use the 2007 amended Predictive Model before December 31, 2009, passed the Predictive Model using the current coefficients, as well as the proposed coefficients. Because the difference in the Predictive Model between the current coefficients and the corrected coefficients is slight, and because all formulations submitted to date would pass under either formulation, ARB staff does not expect the proposed coefficients to have any impact on fuel formulations or the production of CaRFG3.

2. RVP-Controlled Gasoline All Year Round

Allowing RVP-controlled gasoline to be made all year round with the trigger being an RVP of 7.2 psi or less (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB) removes the 15-day transition period from the non-RVP-controlled gasoline season to the RVP-controlled gasoline season. This amendment gives refiners the flexibility to choose when they would like to begin making RVP-controlled gasoline in preparation for the RVP control season. It is preferable by the common carrier pipeline operator that refiners start providing RVP-controlled gasoline more than 15 days in advance of the transition period to ensure that the downstream tanks are purged of non-RVP-controlled gasoline in time for the RVP control season. This amendment will require refiners to use the evaporative portion of the Predictive Model for gasolines with an RVP of 7.2 psi or less that are produced during the non-RVP regulatory period. This will take away the ability for refiners to make a gasoline with an RVP of 7.2 psi or less during the non-RVP-regulatory period without having to use the evaporative portion of the Predictive Model. Virtually all gasoline made during the non-RVP-regulatory season has an RVP greater than 7.2 psi and would be unaffected by this change. Therefore, ARB staff believes that there will be no impact to the production or cost of CaRFG3 as a result of the amendments.

3. Repeal of section 2258

Repealing the outdated section relating to oxygen content will have no impact on the production of CaRFG3, because gasoline subject to this section is no longer made. The applicable provision relating to oxygen content is not proposed to be amended by this rulemaking.

4. Notification requirements relating to test-certified alternative gasoline

Amending the notification requirements for test-certified alternative gasoline formulations will have no impact on the production of CaRFG3. This amendment changes the notification requirements such that ARB enforcement will have sufficient time to inspect the final blend of gasoline before the producer or importer completes physical transfer of the final blend

5. Blending CARBOB with other materials

Amending the restrictions on blending CARBOB with other liquids will have no impact on the production of CaRFG3. This amendment is meant to clarify the restrictions on liquids that may be blended with CARBOB.

6. Amending the definition of racing vehicle

Amending the definition of racing vehicle will have no impact on the production of CaRFG3. This amendment is meant to clarify ambiguity in the definition and more closely align with U.S. EPA's definition.

7. Other miscellaneous changes

Additional miscellaneous changes are proposed to increase enforceability, flexibility, and consistency, but have no impact on the production of CaRFG3.

B. Costs to Produce CaRFG3 Gasoline Fuel

No additional costs to produce CaRFG3 gasoline are expected as a result of the amendments because fuel formulations and production will remain unchanged. These proposed coefficients will allow slightly higher PWT emissions and therefore will not be more restrictive in the fuel formulations that qualify for CaRFG3. In addition, the Predictive Model Spreadsheet reflects the correct coefficient so that many producers are already using the proposed coefficient values to assess new fuel formulations. RVP-controlled gasoline production is also unlikely to change but, may provide producers with a smoother transition between RVP seasons. Repealing section 2258, applicable to the oxygen content in gasoline produced between 1992 and 1996, will not affect current costs to produce CaRFG3, since this section no longer applies to CaRFG3 produced today. Clarifying the blending restrictions of CARBOB with other materials will not affect cost to produce CaRFG3, because this clarification is a restatement of current industry practice and expectations. The other changes, i.e., changing the notification requirements relating to test-certified alternative gasoline, amending the definition of racing vehicle, and the other miscellaneous changes, will not affect the cost to produce CaRFG3, since these changes do not affect the fuel formulation or production.

C. Impact on Government Revenue

No impact on government revenue is expected as a result of the amendments because gasoline fuel sales and costs will remain unchanged.

D. Small Refiners

No additional costs to produce CaRFG3 gasoline fuel are expected as a result of the amendments for small refiners because no changes in fuel formulations or production are expected.

E. Small Business Economic Effect

Government Code sections 11342 et. seq. require the ARB to consider any adverse effects on small businesses that would have to comply with a proposed regulation. In defining small business, Government Code section 11342 explicitly excludes refiners from the definition of "small business." Also, the definition includes only businesses that are independently owned and, if in retail trade, gross less than $2,000,000 per year. Thus, our analysis of the economic effects on small business is limited to the costs to gasoline retailers and jobbers, retailers, and gasoline fuel end-users. A jobber is an individual or business that purchases wholesale gasoline and delivers and sells it to another party, usually a retailer or other end-user.

1. Jobbers and Retailers

No economic impact expected to affected jobbers and retailers as a result of the amendments because they do not certify fuel formulations for sale. Furthermore, these amendments would not change production costs or volumes, so fuel prices and supplies should remain unchanged.

2. Gasoline Fuel End-Users

No economic impact expected to affected jobbers and retailers as a result of the amendments because fuel prices and supplies should remain unchanged.

F. Fiscal Impacts

1. Impact on Government Revenue

No impact on government revenue is expected as a result of the amendments because gasoline fuel sales and costs will remain unchanged.

2. Impact on Government Expenditures

No impact on government entities as fuel end-users is expected as a result of the amendments because gasoline fuel sales and costs will remain unchanged.

There will be no additional person-years needed to enforce the amendments because the amendments do not add additional enforcement requirements above what is already currently being enforced.

Chapter V. Environmental Impacts of the Proposed Amendments

This chapter summarizes the expected environmental impacts of the proposed amendments. Health and Safety Code section 43013.1 requires that CaRFG3 preserve the emission benefits of CaRFG2. These benefits include emission reductions for all pollutants, including ozone precursors, identified in the State Implementation Plan, and emission reductions in potency-weighted air toxics compounds. The staff does not anticipate any significant adverse environmental impacts associated with the proposed amendments.

A. California Environmental Quality Act (CEQA)

CEQA and ARB policy require an analysis to determine the potential adverse environmental impacts of the proposed amendments. ARB's program involving the adoption of regulations has been approved by the Secretary of Resources (see Public Resources Code, section 21080.5). Therefore, the CEQA environmental analysis requirements are included in the ARB's Initial Statement of Reasons in lieu of preparing an environmental impact report or negative declaration. In addition, ARB will respond in writing to all significant environmental issues raised by the public during the public review period or the public Board hearing. These responses are to be contained in the Final Statement of Reasons for the proposed amendments.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by the ARB include the following:

- An analysis of the reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable mitigation measures; and
- An analysis of reasonably foreseeable alternative means of compliance with the standard.

Our analysis of the reasonably foreseeable environmental impacts of the methods of compliance and the analysis of reasonably foreseeable mitigation measures, if appropriate, are presented in the following sections. In general, ARB staff has not identified any significant environmental impacts associated with the proposed amendments; therefore, there has been no need to identify mitigation measures.

An assessment of potential alternatives to the proposed amendments is presented in Chapter VI. ARB staff has concluded there is no alternative considered by the agency that would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective as and less burdensome to affected private persons than the proposed regulation.

B. Multimedia Evaluation

Health and Safety Code section 43830.8, enacted in 1999 (Stats. 1999, ch. 813; S.B. 529, Bowen) generally prohibits ARB from adopting a regulation establishing a specification for motor vehicle fuel unless the regulation is subject to a multimedia evaluation by the California Environmental Policy Council (CEPC). A multimedia evaluation is the identification and evaluation of any significant adverse impact on public health or the environment, including air, water, or soil, that may result from the production, use, or disposal of the motor vehicle fuel that may be used to meet the Board's motor vehicle fuel specifications. The statute provides that the Board may adopt a regulation that establishes a specification for motor vehicle fuel without the proposed regulation being subject to a multimedia evaluation if the CEPC, following an initial evaluation of the proposed regulation, conclusively determines that the regulation will not have any significant adverse impact on public health or the environment.

The proposed amendments do not change specifications of CaRFG3 gasoline and will not require a gasoline ingredient to be added or removed beyond what is already used to produce gasoline for sale in California. While these amendments do correct certain coefficients in the Predictive Model, they do not ultimately change specifications of CaRFG3 gasoline. Again, the Predictive Model is a set of mathematical equations used to predict whether a gasoline formulation will meet the CaRFG3 specifications. The CaRFG3 specifications are not proposed to be changed by this rulemaking. Therefore, staff believes that the proposed amendments to the CaRFG3 regulations are not subject to the requirement for a multimedia evaluation.

C. Air Quality

This section presents the air quality impacts of the proposed amendments.

1. Impact on On-road Sources

The proposed amendments are specifically designed to correct coefficients in the Predictive Model that estimate emissions for fuel certification purposes. Staff compared the emissions output using the current coefficients in the Procedures Guide versus the proposed coefficients. For both non-ethanol fuels and for ethanol fuels, the directional change in PWT emissions was higher for the Predictive Model using the current coefficients and lower for the Predictive Model using the proposed coefficients. Staff used Statistical Analysis Software to run over 51 million combinations of fuel properties and found that the directional difference was consistent amongst all combinations; the current coefficients always had a slightly higher PWT emission output versus the proposed coefficients. The minimum differences between current coefficients and the proposed coefficients for PWT emissions were 0.12 for non-ethanol fuels and 0.11 for ethanol fuels. The coefficients only affected the PWT portions of the

Predictive Model. The hydrocarbon and oxides of nitrogen portions of the model were unaffected.

The current coefficients predicting slightly higher PWT emissions means that the Predictive Model is slightly stricter under the current coefficients. Although stricter, the current coefficients exist as a result of drafting errors in transcribing the coefficients from the Predictive Model spreadsheet to the Procedures Guide and are not technically correct. The proposed coefficients are technically correct and would ease the PWT emission standard as compared to the current coefficients in the Predictive Model, but still preserve the emission benefits of CaRFG2. All of the fuel formulations submitted by producers who chose to use the 2007 amended Predictive Model before December 31, 2009, passed the Predictive Model under the current coefficients, as well as the proposed coefficients. The difference in the Predictive Model between the current coefficients and the corrected coefficients are slight, are limited to the toxics portion of the predictive model, and because all formulations submitted to date would have passed with either set of coefficients, ARB staff does not expect the proposed coefficients to have any impact on fuel formulations and therefore does not expect there would be any impact on air quality associated with the proposed changes.

Requiring that fuels with an RVP value equal to or less than 7.20 psi (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB), be required to be certified as an RVP-controlled gasoline may result in emissions benefits should a producer or importer choose to make a lower RVP fuel during the non-RVP-controlled season. This amendment will preserve the emissions of CaRFG2.

Repealing the outdated section relating to oxygen content will not impact air quality, because this section is no longer applicable to gasoline currently produced or imported. The current section relating to oxygen content is not proposed for changes by this rulemaking.

Changing the notification requirements relating to test-certified alternative gasoline will not impact air quality, because these requirements are administrative in nature and do not affect the quality or specifications of the gasoline.

Restricting the materials that may be blended with CARBOB after it has been supplied from the production or import facility will not impact air quality, because this amendment merely restates the current industry practice and expectation.

Changing the definition of racing vehicle to more closely align with U.S. EPA's definition will not impact air quality, because the proposed definition merely restates the current racing industry practice and expectation.

The other miscellaneous changes will not impact air quality, because these changes are merely administrative in nature and do not affect the quality or specifications of the gasoline.

a. *Impact on the State Implementation Plan*

The ARB's 2007 State Implementation Plan (SIP) proposal is a comprehensive strategy designed to attain federal air quality standards as quickly as possible through a combination of technologically feasible, cost-effective, and far reaching measures. The total magnitude of the reductions to be achieved through new actions is primarily driven by the scope of the air quality problems in the San Joaquin Valley and South Coast Air Basin. This proposed measure would not likely have a significant impact on the SIP, because the only changes that affect the quality of the gasoline are minor in nature.

D. Greenhouse Gas Emissions

The proposed changes to the CaRFG3 regulations are not expected to have a significant effect on greenhouse gas emissions, because the only changes that affect the quality of the gasoline are minor in nature.

E. Water Quality

The proposed amendments do not change flat or average limits of CaRFG3 gasoline. While they do change the coefficients in the Predictive Model, these changes are minor and are not expected to result in the addition of any new material to CaRFG3. The proposed requirement that gasoline with a RVP of 7.2 psi or less (or, correspondingly, an RVP value equal or less than 5.99 psi for a final blend of CARBOB) be certified as an RVP-controlled gasoline allows that an already approved, and more stricter, fuel formulation be used throughout the year, rather than just during the summer. Therefore, no major changes in fuel formulation are expected. The resulting fuel formulations from the proposed amendments are not expected to have a significant negative effect on the quality of both ground and surface water. The findings of the environmental fate and transport analysis and a health risk evaluation of ethanol performed in 1999 supports this analysis. In 1999, the Board approved the environmental assessment of CaRFG3 with ethanol. This assessment included ethanol levels up to 10 percent by volume. In 2000, the California Environmental Policy Council approved the multimedia environmental assessment of ethanol in gasoline for ethanol levels up to 10 percent by volume.

F. Community Health and Environmental Justice

Environmental justice is a core consideration in ARB's efforts to provide clean air for all California communities (CARB 2001, i.e. Policies and Actions for Environmental Justice, PTSD, 2001). The proposed changes to the CARFG3 regulations are not expected to have a significant effect on community health.

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Chapter VI. Alternatives to the Proposed Amendments

This chapter presents an analysis of alternatives to the proposed amendments. The only alternative to the proposed amendments would be to leave the incorrect coefficients unchanged. Staff determined that leaving the incorrect coefficients in the Predictive Model would undermine the technical credibility of the Predictive Model, add confusion, and fail to preserve the emission benefits of CaRFG2, as required by Health and Safety Code section 43013.1.

An alternative to requiring that fuels with an RVP value equal to or less than 7.20 psi (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB), be required to be certified as an RVP-controlled gasoline would be to leave the regulation as it currently exists. Leaving the regulation as it currently exists would take away the refiners flexibility to make RVP-controlled gasoline more than 15 days before the start of the RVP control period. It would also allow refiners to continue to make a gasoline with an RVP of 7.2 psi or less that does not use the evaporative portion of the Predictive Model during the non-RVP-regulatory period. Staff determined allowing refiners to make an RVP-controlled gasoline all year round may provide an emission benefit above what the current regulations are achieving and give refiners the flexibility to meet common carrier pipeline specifications outside of the 15-day transition period for the RVP regulatory control period.

Leaving the outdated section relating to oxygen content, section 2258, intact would result in unnecessary confusion and complexity in the regulations.

The current regulations require notification at least 12 hours before start of physical transfer of the final blend of test-certified alternative gasoline from the production or import facility. Staff has learned that producers and importers have been starting and completing the physical transfer during this period. As a result, the final blend was not available for sampling and confirmation of compliance. The proposed amendments correct this situation by specifying that the producer or importer must provide notification to the Executive Officer before the start of physical transfer of the gasoline from the production or import facility, and in no case less than 12 hours before the producer or importer either completes physical transfer or commingles the final blend. This amendment will ensure that the final blend will be available for sampling by ARB during the 12 hour period. Leaving the notification provision unchanged will impede ARB's ability to sample and verify compliance of the fuel.

An alternative to changing section 2266.5(f)(1), relating to what may be blended with CARBOB after it has been supplied from the production or import facility, is to leave it unchanged. However, leaving it unchanged adds to confusion as to what may be added.

An alternative to changing the definition of "racing vehicle" is to leave it unchanged. However, leaving it unchanged results in a discrepancy between ARB's definition and U.S. EPA's definition, and therefore, confusion.

An alternative to the other miscellaneous changes is to leave them unchanged. However, this would result in a decrease in enforceability, flexibility, and consistency of the regulations.

No alternative considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective as and less burdensome to affected stakeholders than the proposed regulation.

Chapter VII. References

1. State of California, Air Resources Board, Staff Report: Initial Statement of Reasons: *Proposed 2007 Amendments to the California Reformulated Gasoline Regulations*, Release Date: October 22, 1999.

2. State of California, Air Resources Board, *California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model,* Last Amended: August 7, 2008

3. http://www.arb.ca.gov/fuels/gasoline/premodel/premodel.htm

4. http://www.arb.ca.gov/enf/advs/advs409.pdf

5. 40 Code of Federal Regulations 80.78(12)(ii)

6. Statistical Analysis System analysis of fuel property changes

APPENDIX A

PROPOSED CARFG3 REGULATIONS, INCLUDING PREDICTIVE MODEL PROCEDURES GUIDE

Contents:

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A-1) PROPOSED CARFG3 REGULATIONS

PROPOSED REGULATION ORDER

PROPOSED 2011 AMENDMENTS TO THE CALIFORNIA PHASE 3 REFORMULATED GASOLINE REGULATIONS

Note: The proposed amendments are shown in underline to indicate additions and ~~strikeout~~ to Indicate deletions, compared to the preexisting regulatory language. The symbol "* * * * *" means that intervening text not being amended is not shown. Subsection headings are shown in ***bold italics*** and are to be italicized in Barclays California Code of Regulations.

Repeal title 13, California Code of Regulations (CCR) section 2258, and amend sections 2260, 2261, 2264, 2265 (and the incorporated "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model" as last amended August 7, 2008), 2265.1, 2266, 2266.5, and 2271 to read as follows:

California Code of Regulations, Title 13, Division 3
Chapter 5. Standards for Motor Vehicle Fuels
Article 1. Standards for Gasoline

Subarticle 1. Gasoline Standards That Became Applicable Before March 1, 1996

~~§ 2258. Oxygen Content of Gasoline in the Wintertime.~~

~~(a) *Regulatory Standard.*~~

~~(1) Starting November 1, 1992, within each of the air basins during the regulatory control period set forth in section (a)(2), no person shall sell, offer for sale, supply, offer for supply, or transport California gasoline unless the gasoline has an oxygen content of not less than 1.8 percent by weight and not more than 2.2 percent by weight.~~

~~(2) Regulatory Control Periods.~~

~~(A) October 1 through February 29~~
~~South Coast Air Basin and Ventura County~~

~~(B) October 1 through January 31~~
~~Sacramento Valley Air Basin~~
~~San Joaquin Valley Air Basin~~
~~San Francisco Bay Area Air Basin~~
~~Lake Tahoe Air Basin~~
~~Great Basin Valley Air Basin~~
~~Mountain Counties Air Basin~~
~~North Coast Air Basin~~
~~Lake County Air Basin~~
~~Northeast Plateau Air Basin~~
~~North Central Coast Air Basin~~
~~San Luis Obispo County~~

~~(C) November 1 through February 29~~
~~San Diego Air Basin~~
~~Southeast Desert Air Basin~~
~~Santa Barbara County~~

~~(3) Section (a)(1) shall not apply to transactions involving gasoline not meeting the minimum oxygen content standard where the person selling, supplying, or offering the gasoline demonstrates by affirmative defense that: [i] the gasoline has not yet been supplied from the final distribution facility, and [ii] the documents accompanying such gasoline clearly state that it does not comply with the minimum oxygen content standard in section (a)(1), and either [iii] the person has taken reasonably prudent precautions to assure that he or she will bring the gasoline within the standards in section (a)(1) before it is supplied from the final distribution facility, or [iv] at or before the time of the transaction the person has obtained a written statement from the purchaser, recipient, or offeree of the gasoline stating that he or she will take reasonably prudent precautions to assure that the gasoline is brought within the standards of section (a)(1) before it is supplied from the final distribution facility.~~

~~(4) Section (a)(1) shall not apply to a transaction occurring in an air basin during the regulatory control period where the person selling, supplying, or offering the gasoline demonstrates as an affirmative defense that, prior to the transaction, he or she has taken reasonably prudent precautions to assure that the gasoline will be delivered to a retail service station or bulk purchaser-consumer's fueling facility when the station or facility is not subject to a basic regulatory control period.~~

~~(5) Section (a)(1) shall not apply to a transaction occurring in an air basin during the regulatory control period where the transaction involves the transfer of gasoline from a stationary storage tank to a motor vehicle fuel tank and the person selling, supplying, or offering the gasoline demonstrates as an affirmative defense that the last delivery of gasoline to the stationary storage tank occurred more than fourteen days before the start of the regulatory control period.~~

~~(6)(A) The regulatory standards in section (a)(1) shall not apply to a transaction occurring in the air basin during a transition period, where the transaction involves the transfer of gasoline from a stationary storage tank to a motor vehicle fuel tank and the person selling, supplying, or offering the gasoline demonstrates as an affirmative defense that he or she has made, prior to the transaction, specific arrangements with a gasoline distributor for the delivery of an oxygenated or nonoxygenated gasoline blend containing oxygenates in quantities that will result in gasoline in the stationary storage tanks at the facility having an oxygen content of from 1.8 percent to 2.2 percent by weight by the end of the transition period.~~

~~(B) The regulatory standards in section (a)(1) shall not apply to a transaction occurring in an air basin during a transition period, where the transaction involves the sale, offer for sale, supply, offer for supply, or transport of gasoline to a retail gasoline outlet or bulk purchaser-consumer's facility and the person selling, supplying, or offering the gasoline demonstrates as an affirmative defense that the gasoline is being distributed pursuant to a prior arrangement to deliver oxygenated or nonoxygenated gasoline to bring the retail gasoline outlet or bulk purchaser-consumer's facility into compliance with the regulatory standards in section (a)(1) by the end of the transition period.~~

~~(7) Section (a)(1) shall not apply to a transaction involving the sale, offer for sale, supply, or offer for supply of gasoline to a stationary storage tank at a retail gasoline outlet, or the transfer of gasoline from a stationary storage tank at a retail gasoline outlet to a motor vehicle fuel tank, if the person selling, offering, or supplying the gasoline demonstrates by affirmative defense all of the following:~~

~~(A) The retail gasoline outlet is within Modoc, Lassen, Sierra, Nevada, Placer, El Dorado, Alpine, Mono, Inyo, or San Bernardino counties, and is not within the Lake Tahoe or Sacramento Valley Air Basins.~~

~~(B) The final distribution facility from which the gasoline is being or has been delivered is outside California.~~

~~(C) The gasoline is being or has been delivered to the stationary storage tank by a tank truck having a total capacity not exceeding 4500 gallons.~~

~~(D) The stationary storage tank at the retail gasoline outlet has a total capacity not exceeding 2500 gallons, and~~

~~(E) The retail gasoline outlet has a monthly throughput not exceeding 10,000 gallons.~~

~~(8) For the purposes of section (a)(1), each sale of California gasoline at retail, and each dispensing of California gasoline into a motor vehicle fuel tank, shall also~~

~~be deemed a sale or supply by any person who previously sold or supplied such gasoline in violation of section (a)(1).~~

~~(b) Definitions.~~

~~For the purposes of this section:~~

~~(1) "Bulk purchaser-consumer" means a person who purchases or otherwise obtains gasoline in bulk and then dispenses it into the fuel tanks of motor vehicles owned or operated by the person.~~

~~(2) "California gasoline" means gasoline sold or intended for sale as a motor vehicle fuel in California.~~

~~(3) "Distributor" means any person engaged in the business of transporting and delivering gasoline to a retail gasoline outlet or bulk purchaser-consumer's facility.~~

~~(4) "Final distribution facility" means the stationary gasoline transfer point from which gasoline is transferred into the cargo tank truck, pipeline, or other delivery vessel from which the gasoline will be delivered to the facility at which the gasoline will be dispensed into motor vehicles; except that a cargo tank truck is the final distribution facility where the cargo tank truck is used to transport gasoline and carries written documentation demonstrating that oxygenates, in quantities that will bring the gasoline into compliance with section 2258(a)(1), will be or have been blended directly into the cargo tank truck prior to delivery of the gasoline from the cargo tank truck to the facility at which the gasoline will be dispensed into motor vehicles.~~

~~(5) "Gasoline means any fuel which is commonly or commercially known or sold as gasoline.~~

~~(6) "Motor vehicle" has the same meaning as defined in section 415 of the Vehicle Code.~~

~~(7) "Northern California" means the area of California not contained within the South Central Coast, South Coast, Southeast Desert and San Diego Air Basins.~~

~~(8) "Southern California" means the area of California contained within the South Central Coast, South Coast, Southeast Desert and San Diego Air Basins.~~

~~(9) "Supply" means to provide or transfer a product to a physically separate facility, vehicle, or transportation system.~~

~~(10) "Transition period" means:~~

~~a. the first 15 days of any October regulatory control period.~~

~~b. November 1 to November 15, 1992, and~~

~~c. November 1 through November 15 of 1993, 1994, or 1995 in the San Diego Air Basin, the Southeast Desert Air Basin, and Santa Barbara County.~~

~~(c) Sampling Procedures and Test Methods.~~

~~Compliance with the oxygen content standards in this regulation shall be determined by use of an applicable sampling methodology set forth in Title 13, California Code of Regulations, section 2296, and use of American Society for Testing and Materials Test Method ASTM D 4815-94, which is incorporated herein by reference. Another test method may be used following a determination by the executive officer that the other method produces results equivalent to the results obtained with ASTM D 4815-94.~~

~~(d) Inability to Produce Conforming Gasoline in Extraordinary Circumstances.~~

~~In appropriate extreme and unusual circumstances (e.g., natural disaster or Act of God) which are clearly outside the control of the refiner, importer, or oxygenate blender and which could not have been avoided by the exercise of prudence, diligence, and due care, the executive officer may permit a refiner, importer, or oxygenate blender, for a brief period, to distribute gasoline which does not meet the requirements in section (a)(1) if:~~

~~(1) It is in the public interest to do so (e.g., distribution of the nonconforming gasoline is necessary to meet projected shortfalls which cannot otherwise be compensated for);~~

~~(2) The refiner, importer, or oxygenate blender exercised prudent planning and was not able to avoid the violation and has taken all reasonable steps to minimize the extent of the nonconformity;~~

~~(3) The refiner, importer, or oxygenate blender can show how the requirements for oxygenated gasoline will be expeditiously achieved;~~

~~(4) The refiner, importer, or oxygenate blender agrees to make up air quality detriment associated with the nonconforming gasoline, where practical; and~~

~~(5) The refiner, importer, or oxygenate blender pays to the Air Pollution Control Fund an amount equal to the economic benefit of the nonconformity minus the amount expended, pursuant to section (d)(4), in making up the air quality detriment.~~

~~(e) Effect of Supply Waiver Under Federal Clean Air Act.~~

~~(1) If the Administrator of the U.S. Environmental Protection Agency issues, pursuant to 42 U.S.C. section 7545(m)(3)(C), a waiver of the requirements of 42 U.S.C. section 7545(m)(2) applicable to a geographic area or areas of California, the requirements of section (a)(1) shall not apply in any air basin containing an area covered by the waiver, during the effective period of the waiver.~~

~~(2) If the Administrator of the U.S. Environmental Protection Agency issues, pursuant to 42 U.S.C. section 7545(m)(3)(C), a waiver of the requirements of 42 U.S.C. section 7545(m)(2) applicable to a geographic area or areas within Southern California, section (a)(1) shall not apply, during the effective period of the waiver, in any air basin in Southern California not containing any area required under 42 U.S.C. section 7545(m) to have a wintertime oxygenates program.~~

~~(3) If the Administrator of the U.S. Environmental Protection Agency issues, pursuant to 42 U.S.C. section 7545(m)(3)(C), a waiver of the requirements of 42 U.S.C. section 7545(m)(2) applicable to a geographic area or areas within Northern California, section (a)(1) shall not apply, during the effective period of the waiver, in any air basin in Northern California not containing any area required under 42 U.S.C. section 7545(m) to have a wintertime oxygenates program.~~

~~(f) Sunset. This section shall not apply to gasoline sold or supplied after February 29, 1996.~~

~~NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975)~~

Subarticle 2. Standards for Gasoline Sold Beginning March 1, 1996

§ 2260. Definitions.

(a) For the purposes of this subarticle, the following definitions apply:

* * * * *

(6.5) "California reformulated gasoline blendstock for oxygenate blending, or 'CARBOB,'" means a petroleum-derived liquid which is intended to be, or is represented as, a product that will constitute ~~Califoria~~ California gasoline upon the addition of a specified type and percentage (or range of percentages) of oxygenate to the product after the product has been supplied from the production or import facility at which it was produced or imported.

* * * * *

(7.7) "Drag reducing agent" means a long chain polymer chemical that is used in crude oil, refined products or non-potable water pipelines injected by the pipeline operator in small amounts (parts per million) and is used to reduce the frictional pressure drop along the pipeline's length.

* * * * *

(8.5) "Emissions associated with permeation" means the incremental increase in emissions because of permeation which is calculated as the difference between the emissions from the producer's or importer's final blend formulation and the flat limits without ethanol. The Phase 3 reformulated gasoline Predictive Model, as described in the applicable version of the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model~~,~~" as ~~corrected November 18, 2004 and last amended August 7, 2008, which is~~ incorporated ~~herein~~ by reference in section 2265(a)(2)(A), shall be used to calculate emissions associated with permeation.

Emissions are calculated as follows:

Ozone Forming Potential (tons per day) = 18.4 (tons per day) * (PCE(OFP)/ 2.39) * 2.80 * percent share of California gasoline sales covered by the AERP, and

NOx (tons per day) = 427.8 (tons per day) * PCE(NOx) * percent share of California gasoline sales covered by the AERP, where

PCE(OFP) and PCE(NOx) = Percent change in emissions, as predicted by the CaRFG3 Predictive Model for Ozone Forming Potential (OFP) and Oxides of Nitrogen (NOx), respectively, as described in the applicable version of the

"California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model~~,~~" as ~~corrected November 18, 2004 and last amended August 7, 2008 which is~~ incorporated ~~herein~~ by reference in section 2265(a)(2)(A).

* * * * *

(19.7) "Percent change in emissions values, as they pertain to the PM emissions offsetting compliance option" means values calculated, each for oxides of nitrogen, total ozone forming potential, and potency-weighted toxics, from the Phase 3 Predictive Model using the designated emissions offsetting limits for the candidate fuel and the flat limits in section 2262 for the reference fuel, as described in the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," ~~as corrected November 18, 2004 and last amended August 7, 2008~~ the applicable version as described in section 2265(a)(2), which is incorporated ~~herein~~ by reference in section 2265(a)(2)(A).

* * * * *

(29.5) "Racing vehicle" means a ~~competition vehicle not used on public highways.~~ vehicle that:

(A) Is exclusively operated in conjunction with sanctioned racing events;

(B) Exhibits racing features and modifications such that it is incapable of safe and practical street or highway use;

(C) Is not licensed by the State of California Department of Motor Vehicles for operation on public streets or highways; and

(D) Is never operated on public streets or highways.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39048, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975).

§ 2261. Applicability of Standards; Additional Standards.

* * * * *

(b) *Applicability of the CaRFG Phase 3 Standards.*

* * * * *

(4) *Early compliance with the CaRFG Phase 3 Amendments (Emissions Associated with Permeation) Before December 31, 2009.*

(A) Any producer or importer that produces gasoline electing to supply from its production or import facility, before December 31, 2009, any final blends of gasoline subject to any of the applicable versions of the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," ~~as corrected November 18, 2004 and last amended August 7, 2008~~ which are incorporated by reference in section 2265(a)(2), shall notify the Executive Officer of its wish to do so. The notification shall include all of the information listed in section 2261(b)(4)(E).

* * * * *

(C) Any producer or importer electing to supply from its production or import facility, before December 31, 2009, any final blends of gasoline subject to any of the applicable versions of the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," ~~as corrected November 18, 2004 and last amended August 7, 2008~~ which are incorporated by reference in section 2265(a)(2), or to the "Procedures for Using the California Model for California Reformulated Gasoline Blendstocks for Oxygenate Blending (CARBOB)," as adopted April 25, 2001, last amended August 7, 2008, may elect to use either one of the two compliance options ~~(exhaust + evaporative emissions model elements or the exhaust emissions model element only)~~ (total hydrocarbon model or the exhaust hydrocarbon model) as defined in the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model" to certify alternative blends of gasoline. With certain limited exceptions, which are described in the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," beginning December 31, 2009, a candidate fuel that is designated as "non-RVP-controlled gasoline" must use the exhaust hydrocarbon model in determining the emissions equivalency of the candidate fuel specifications. A candidate fuel that is designated as "RVP-controlled gasoline" must use the total hydrocarbon model in determining the emissions equivalency of the candidate fuel specifications. ~~Beginning December 31, 2009, only the first compliance option (exhaust + evaporative emissions model elements) shall be used during the RVP regulatory control periods in section 2262.4(b)(2) and only the second compliance option (exhaust emissions model element only) shall be used outside of the RVP regulatory control period.~~

* * * * *

(E) Notification.

1. The approximate date by which it intends to begin supplying from its production or import facility gasoline complying with any of the applicable versions of the "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," ~~as corrected November 18, 2004 and last amended August 7, 2008~~ which are incorporated by reference in section 2265(a)(2), or the "Procedures for Using the California Model for California Reformulated Gasoline Blendstocks for Oxygenate Blending (CARBOB)," as adopted April 25, 2001, last amended August 7, 2008, referred to as the amended Procedures Guides, if permitted to do so;

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018, 43101 and 43830.8, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal. Rptr. 249 (1975).

§ 2264. Designated Alternative Limits.

* * * * *

(d) ***Designated alternative limits for PM alternative gasoline formulations.***

The producer or importer of a final blend of California gasoline that is subject to the PM averaging compliance option for one or more properties may assign a designated alternative limit to the final blend by satisfying the notification requirements of section 2264(a). The producer or importer of such a final blend shall be subject to all of the provisions of this section 2264, except that, with respect to that final blend, the PM averaging limit (if any) for ~~for~~ each property subject to the PM averaging compliance option shall replace any reference in this section 2264 to the averaging limit specified in section 2262.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975).

§ 2265. Gasoline Subject to PM Alternative Specifications Based on the California Predictive Model.

(a) ***Election to sell or supply a final blend as a PM alternative gasoline formulation.***

* * * * *

~~(2) The producer or importer shall evaluate the candidate PM alternative specifications for gasoline subject to the CaRFG Phase 2 standards in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 2 Reformulated Gasoline Using the California Predictive Model," as adopted April 20, 1995 and last amended December 11, 1998, which is incorporated herein by reference. The producer or importer shall evaluate the candidate PM alternative specifications for gasoline subject to the CaRFG Phase 3 standards in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," as corrected November 18, 2004, which is incorporated herein by reference. Starting December 31, 2009, the producer or importer shall evaluate the candidate PM alternative specifications for gasoline subject to the CaRFG Phase 3 standards in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," as corrected November 18, 2004 and last amended August 7, 2008, which is incorporated herein by reference. The three documents incorporated by reference in this section 2265(a)(2) are collectively referred to as the "Predictive Model Procedures." If the PM alternative specifications meet the criteria for approval in the applicable Predictive Model Procedures, the producer shall notify the executive officer of: (A) The identity and location of the final blend; (B) the PM alternative specifications that will apply to the final blend, including for each specification whether it applies as a PM flat limit or a PM averaging limit; and (C) the numerical values for percent change in emissions for oxides of nitrogen, total ozone forming potential, and potency-weighted toxic air contaminants as determined in accordance with the applicable Predictive Model Procedures. The notification shall be received by the executive officer before the start of physical transfer of the gasoline from the production or import facility, and in no case less than 12 hours before the producer or importer either completes physical transfer or commingles the final blend.~~

<u>(2)(A) ***Evaluation of the Candidate PM Alternative Specifications.***</u>

<u>1. The producer or importer shall evaluate the candidate PM alternative specifications in accordance with the applicable "Predictive Model Procedures" documents incorporated by reference below.</u>

<u>2. ***Gasoline Subject to the CaRFG Phase 2 Standards***.</u> <u>The producer or importer shall evaluate the candidate PM alternative specifications for gasoline subject to the CaRFG Phase 2 standards in accordance with the Air Resources</u>

Board's "California Procedures for Evaluating Alternative Specifications for Phase 2 Reformulated Gasoline Using the California Predictive Model," as adopted April 20, 1995, and last amended December 11, 1998, which is incorporated herein by reference.

3. ***Gasoline Subject to the CaRFG Phase 3 Standards and Supplied Before April 9, 2005.*** For a final blend subject to the CaRFG Phase 3 standards and starting to be sold or supplied from the production or import facility before April 9, 2005, the producer or importer shall evaluate the candidate PM alternative specifications in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," as adopted April 25, 2001, which is incorporated herein by reference.

4. ***Gasoline Supplied From April 9, 2005 through December 30, 2009.*** For a final blend starting to be sold or supplied from the production or import facility from April 9, 2005, through December 30, 2009, the producer or importer shall evaluate the candidate PM alternative specifications in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," as amended November 18, 2004, which is incorporated herein by reference.

5. ***Gasoline Supplied From December 31, 2009 through [Insert day before operative date of amendments].*** For a final blend starting to be sold or supplied from the production or import facility from December 31, 2009 through [Insert day before operative date of amendments], the producer or importer shall evaluate the candidate PM alternative specifications for gasoline subject to the CaRFG Phase 3 standards in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," as last amended August 7, 2008, which is incorporated herein by reference.

6. ***Gasoline Supplied Starting [insert operative date of amendments].*** For a final blend starting to be sold or supplied from the production or import facility on or after [insert operative date of amendments], the producer or importer shall evaluate the candidate PM alternative specifications for gasoline subject to the CaRFG Phase 3 standards in accordance with the Air Resources Board's "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model," last amended [insert date of amendment], which is incorporated herein by reference.

(B) ***Notification to the Executive Officer.*** If the PM alternative specifications being evaluated meet the criteria for approval in the applicable Predictive Model Procedures, the producer or importer shall notify the Executive Officer of:

1. The identity and location of the final blend;
2. the PM alternative specifications that will apply to the final blend, including for each specification whether it applies as a PM flat limit or a PM averaging limit;
3. the numerical values for percent change in emissions for oxides of nitrogen, total ozone forming potential, and potency-weighted toxic air contaminants as determined in accordance with the applicable Predictive Model Procedures;
4. the grade of gasoline of the final blend;
5. the location of the final blend with sufficient specificity to locate and sample the gasoline. This shall include, but is not limited to, the name of the facility, address, and identification of the storage tank.

The notification shall be received by the Executive Officer before the start of physical transfer of the gasoline from the production or import facility, and in no case less than 12 hours before the producer or importer either completes physical transfer or commingles the final blend.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal. Rptr. 249 (1975).

§ 2265.1. Offsetting Emissions Associated with Higher Sulfur Levels.

(a) Assignment of designated emissions offsetting limits and percent change in emissions values for batches of gasoline for which the emissions associated with higher sulfur levels are being offset.

* * * * *

(3) Notification of final blends associated with a final blend credit.

(A) For each final blend associated with a final blend credit, the producer or the importer that produces gasoline shall notify the executive officer in writing for receipt by the executive officer before the start of physical transfer of the gasoline from the production facility or the import facility, and in no case less than 12 hours before the producer or the importer that produces gasoline either completes physical transfer or commingles the final blend, with the following information:

~~(1)~~ 1. The company name, address, phone number, and contact information,

~~(2)~~ 2. The production facility or the import facility name, batch name, number, or other identification, the blend identity, grade of California gasoline, the location (with sufficient specificity to allow ARB inspectors to locate and sample the gasoline; this shall include, but is not limited to, the name of the facility, address, and identification of the tank), and other information that uniquely identifies the California gasoline associated with a final blend credit,

~~(3)~~ 3. The estimated volume (in barrels),

~~(4)~~ 4. The designated emissions offsetting limits for RVP, sulfur content, benzene content, aromatics content, olefins content, T50, T90, and oxygen content for the final blend,

~~(5)~~ 5. The percent change in emissions values, as they pertain to the PM emissions offsetting compliance option, for oxides of nitrogen, total ozone forming potential, and potency-weighted toxics for the final blend,

~~(6)~~ 6. A statement, signed by a legal representative for the producer or the importer that produces gasoline that all information submitted with the notification is true and correct, and

~~(7)~~ 7. Within 24 hours after the completion of the physical transfer, the date and time of the completion of physical transfer from the production facility or the import facility.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975).

§ 2266. Certified Gasoline Formulations Resulting in Equivalent Emission Reductions Based on Motor Vehicle Emissions Testing.

* * * * *

(c) ***Notification regarding sales and supplies of a test-certified alternative gasoline formulation.*** A producer or importer intending to sell or supply a final blend of California gasoline from its production facility or import facility as a test-certified alternative gasoline formulation shall notify the ~~e~~Executive ~~o~~Officer in accordance with this section (c). The notification shall identify the final blend and the identification name of the test-certified alternative gasoline formulation. The notification shall be received by the ~~e~~Executive ~~o~~Officer ~~at least 12 hours before start of physical transfer of the final blend from the production or import facility.~~ before the start of physical transfer of the gasoline from the production or import facility, and in no case less than 12 hours before the producer or importer either completes physical transfer or commingles the final blend. A producer or importer intending to have a series of its final blends be a specific test-certified alternative gasoline formulation may enter into a protocol with the executive officer for reporting such blends as long as the executive officer reasonably determines the reporting under the protocol would provide at least as much notice to the executive officer as notification pursuant to the express terms of this section (c).

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975).

§ 2266.5. Requirements Pertaining to California Reformulated Gasoline Blendstock for Oxygen Blending (CARBOB) and Downstream Blending.

* * * * *

(e) *Restrictions on transferring CARBOB.*

(1) *Required agreement by transferee.* No person may transfer ownership or custody of CARBOB to any other person unless the transferee has agreed in writing with the transferor that either:

* * * * *

(B) The transferee will take all reasonably prudent steps necessary to assure that the CARBOB is transferred to a registered oxygen blender who adds the type and amount (or within the range of amounts) of oxygenate designated in accordance with section (b) to the CARBOB before the CARBOB is ~~transfered~~ transferred from a final distribution facility.

(2) *Prohibited sales of CARBOB from a final distribution facility~~.~~.* No person may sell, offer, or supply CARBOB from a final ~~distribition~~ distribution facility where the

type and amount or range of amounts of oxygenate designated in accordance with section (b) has not been added to the CARBOB.

(f) ***Restrictions on blending CARBOB with other ~~products~~ materials.***

(1) *Basic prohibition*. No person may combine any CARBOB that has been supplied from the facility at which it was produced or imported with any ~~other CARBOB, gasoline, blendstock or oxygenate,~~ material except:

* * * * *

(F) Deposit Control Additives that meet the limits specified in sections 2253.4 and 2254, and that are certified pursuant to 2257

(G) Additives that a pipeline operator that would add for operational purposes, such as, drag reducing agent.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 41511, 43000, 43013, 43013.1, 43016, 43018, 43021 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal. Rptr. 249 (1975).

§ 2271. Variances.

* * * * *

(g) *Duration of variances.*

* * * * *

(2) *Variances related to a physical catastrophe*. Notwithstanding the provisions of section (g)(1), a refiner may be granted a variance with a duration of more than 120 days, or a variance extension of more than 90 days, if the applicant demonstrates that the additional time is necessary due to a physical catastrophe, and the requirements of sections (d) and (e) are met. In order to receive a variance or variance extension, the applicant must submit an application as specified in section (a) and a hearing must be held as specified in sections (b) and (c). As used in this section, "physical catastrophe" means a sudden ~~unforseen~~ unforeseen emergency beyond the reasonable control of the refiner,

causing the severe reduction or total loss of one or more critical refinery units that materially impact the refiner's ability to produce complying gasoline. "Physical catastrophe" does not include events which are not physical in nature such as design errors or omissions, financial or economic burdens, or any reduction in production that is not the direct result of qualifying physical damage.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43013.1, 43013.2, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 39515, 39516, 40000, 41511, 43000, 43013, 43013.1, 43013.2, 43016, 43018 and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n.* v. *Orange County Air Pollution Control District*, 14 Cal.3d 411, 121 Cal.Rptr. 249 (1975).

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A-2) PROCEDURES FOR USING THE PREDICTIVE MODEL

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model

Adopted: June 16, 2000
Amended: April 25, 2001
Amended: November 18, 2004
~~Last~~ Amended: August 7, 2008
Last Amended: [Insert date of amendment]

Note: The preexisting text is set forth below in normal type. The amendments are shown in *underline italic* to indicate additions and ~~strikeout~~ to indicate deletions.

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List of Tables

I. INTRODUCTION

A. Purpose and Applicability

1. The predictive model prescribed in this document may be used to evaluate gasoline specifications as alternatives to the Phase 3 California Reformulated Gasoline (RFG) flat and averaging limits in the gasoline specifications set forth in Title 13, California Code of Regulations (13 CCR), section 2262.

   This procedure:

   - prescribes the range of specifications that may be utilized to select a set of candidate Phase 3 RFG alternative gasoline specifications for evaluation,
   - defines the Phase 3 RFG reference specifications,
   - prescribes the calculations to be used to predict the emissions from the candidate fuel specifications and the reference Phase 3 RFG specifications,
   - prescribes the calculations to be used to compare the emissions resulting from the candidate fuel specifications to the reference Phase 3 RFG specifications,
   - establishes the requirements for the demonstration and approval of the candidate fuel specifications as an alternative Phase 3 RFG formulation, ~~and~~
   - establishes the notification requirements*, and*
   - *identifies when the exhaust hydrocarbon equations models and the evaporative hydrocarbon emissions equations must be used.*

2. Gasoline properties for which alternative gasoline specifications may be set by this procedure include all eight Phase 3 RFG properties.

3. The Phase 3 RFG specifications, established in 13 CCR, section 2262, are shown in Table 1.

4. The pollutant emissions addressed by these procedures and the units of model predictions are shown in Table 2.

Table 1
Properties and Specifications for Phase 3 Reformulated Gasoline

Fuel Property	Units	Flat Limit	Averaging Limit	Cap Limit
Reid vapor pressure (RVP)	psi, max.	6.90[1]/7.00	none	7.20
Sulfur (SUL)	ppmw, max.	20	15	60/30[3]/20[3]
Benzene (BENZ)	vol.%, max.	0.80/1.00[2]	0.70	1.10
Aromatic HC (AROM)	vol.%, max.	25.0/35.0[2]	22.0	35.0
Olefin (OLEF)	vol.%, max.	6.0	4.0	10.0
Oxygen (OXY)	wt. %	1.8 (min) 2.2 (max)	none	1.8(min)[4] 3.5(max)[5]
Temperature at 50 % distilled (T50)	deg. F, max.	213/220[2]	203	220
Temperature at 90% distilled (T90)	deg. F, max.	305/312[2]	295	330

1 The flat limit for RVP is 7.00 psi. The flat limit for RVP is 6.90 when the fuel being certified is blended without ethanol. The Reid vapor pressure (RVP) standards apply only during the warmer weather months identified in section 2262.4.

2 The higher value is the small refiner CaRFG flat limit for qualifying small refiners only, as specified in section 2272.

3 The CaRFG Phase 3 sulfur content cap limits of 60, 30, and 20 parts per million are phased in starting December 31, 2003, December 31, 2005, and December 31, 2011, respectively, in accordance with section 2261(b)(1)(A).

4 Applicable only during specified winter months in the areas identified in 13 CCR, section 2262.5(a).

5 If the gasoline contains more than 3.5 percent by weight oxygen but not more than 10 volume percent ethanol, the maximum oxygen content cap is 3.7 percent by weight.

Table 2
Predictive Model Pollutants and Their Units of Measurement

Pollutant Predictions	**Units**
Oxides of Nitrogen (NOx)	gm/mile
Exhaust Hydrocarbons (*ExHC*)	gm/mile
Evaporative Hydrocarbons ~~(HC)~~	Percent Change (Candidate Fuel Relative to Reference Fuel)
Exhaust Potency-Weighted Toxics (PWT)	mg/mile
Evaporative Benzene	mg/mile
~~Exhaust~~ *Carbon Monoxide* (CO) ~~(Adjustment Factor for Oxygen)~~	gm/mile

B. Synopsis of Procedure

The predictive model is used to predict the emissions for gasoline meeting the Phase 3 RFG specifications (reference fuel specifications) and the emissions for a candidate gasoline meeting alternative specifications (candidate fuel specifications). The predicted emissions are functions of the regulated fuel properties shown in Table 1. The candidate gasoline is ~~accepted as equivalent to~~ *deemed acceptable as* Phase 3 RFG if its predicted emissions for each pollutant is less than or equal (within round-off) to the predicted emissions for a fuel meeting the Phase 3 RFG specifications.

1. What is the Predictive Model?

The predictive model consists of a number of sub-models. The sub-models are equations which relate gasoline properties to the exhaust emissions and evaporative emissions changes which result when the gasoline is used to fuel a motor vehicle. The emissions predictions are expressed in the units shown in Table 2.

Twenty-one separate exhaust sub-models have been developed for seven pollutants (NOx, *hydrocarbon* (HC), CO, benzene, 1,3-butadiene, formaldehyde, and acetaldehyde). Three exhaust sub-models have been developed for each of the seven pollutants: one sub-model for each of three vehicle emissions control technology "Tech" classes (Tech 3, Tech 4, and Tech 5).

In addition, six sub-models have been developed for evaporative emissions. Three sub-models have been developed for evaporative hydrocarbon emissions and three sub-models have been developed for evaporative benzene emissions. For both evaporative hydrocarbon emissions and evaporative benzene emissions, one sub-model has been developed for each of the following evaporative emission processes: 1) Diurnal/Resting

Losses, 2) Hot Soak Emissions, and 3) Running Losses. ~~Finally, an adjustment factor has been developed to predict the effect of changing fuel properties on exhaust CO emissions.~~

2. Combination of Sub-Model Predictions for Exhaust Emissions Across Tech Classes *(referred to as the Exhaust Hydrocarbon Model (ExHC Model) in this procedures document)*

In the ExHC Model, ~~T~~*t*he exhaust emissions of the reference fuel specifications and the candidate fuel specifications for each Tech class of vehicles are predicted by the sub-models of the predictive model. The differences between the predicted exhaust emissions for the reference fuel specifications and the candidate fuel specifications are combined to yield Tech class-weighted predicted emissions differences. These predicted differences represent the predicted differences in exhaust emissions between the reference fuel specifications and the candidate fuel specifications for the entire California vehicle fleet. For NOx and ~~exhaust~~ *Ex*HC emissions, the differences in predictions for each Tech class are combined using Tech class weighting factors which represent the fraction of the total emissions originating from each Tech class.

For the exhaust toxics emissions, the predicted emissions for Tech classes are weighted both by fractions and by potencies. The potency weights represent the relative carcinogenicity of the toxic pollutants. For each toxic pollutant, the predicted exhaust emissions for each Tech class is weighted by the HC exhaust Tech group weighting factor which represents the fraction of the total vehicle miles traveled by each Tech class. Then, the Tech class-weighted emissions prediction for each toxic pollutant is multiplied by the relative potency for that pollutant. The Tech class-weighted, potency-weighted predictions for each toxic pollutant are then summed to yield the predicted total potency-weighted exhaust toxics emissions. Finally, an emissions prediction for evaporative benzene emissions is added to the prediction for total potency-weighted exhaust toxics emissions to yield a prediction for total potency-weighted toxics emissions. This calculation is performed for both the reference fuel specifications and the candidate fuel specifications.

3. Combination of Evaporative HC Emissions Predictions*,* ~~with~~ Exhaust H*ydrocarbon*~~C~~ Emissions Predictions*, and CO Emissions Predictions* *(referred to as the Total Hydrocarbon Model (THC Model) in this procedures document)*

~~Two compliance options are available to applicants. The first compliance option~~ *The THC Model* includes predictions for differences in *exhaust and* evaporative HC emissions and CO emissions between the candidate fuel specifications and the Phase 3 RFG reference fuel in the evaluation of the ~~HC emissions~~ equivalency of the candidate fuel. ~~The second option does not, and the HC emissions equivalency of the candidate fuel specifications is based only on the predictions of the exhaust HC emissions models, as is the case in the Phase 2 RFG regulations.~~ In the *THC Model* ~~first compliance option~~, the Tech class-weighted difference in the predicted ~~exhaust~~ *Ex*HC emissions between the reference fuel specifications and the candidate fuel specifications is combined with the predicted difference in evaporative HC emissions *and CO emissions* between the two fuels when evaluating the ~~HC emissions~~ equivalency of the candidate fuel specifications. This combination estimates the difference in total HC emissions (exhaust plus evaporative) *and*

CO emissions between the reference fuel specifications and the candidate fuel specifications. ~~In the second compliance option, the predicted evaporative HC emissions changes are not included and the HC emissions equivalency of the candidate fuel specifications is based only on the Tech class-weighted difference in the predicted exhaust HC emissions. This was the only compliance option available in the Phase 2 RFG regulations. The second option is being offered for applicants who are not interested in using the evaporative HC emissions model in the evaluation of the HC emissions equivalency of the alternative fuel specifications.~~

~~Under first compliance option~~ _In the THC Model_, when combining the Tech class-weighted difference in the predicted ~~exhaust~~ _ExHC_ emissions with the predicted difference in evaporative HC emissions, the greater ozone-forming potential of the exhaust emissions is recognized by the inclusion of a "reactivity adjustment" factor for the evaporative HC emissions. Also, the ozone-forming potential of CO emissions is recognized in ~~this compliance option~~ _the THC Model_ by the inclusion of emissions in the sum of exhaust and evaporative HC emissions. Thus, ~~under this compliance option~~ _in the THC Model_, the combination of the model predictions for ~~exhaust~~ _ExHC_ emissions, evaporative HC emissions changes, and CO emissions yields a number which represents a prediction for the change in ozone-forming potential (OFP) between the reference fuel specifications and the candidate fuel specifications. The flat and cap RVP limits for ~~this compliance option~~ _the THC Model_ are 7.00 psi, and 7.20 psi, respectively for fuels containing ethanol, and flat and cap RVP limits of 6.90 and 7.20 psi, respectively for fuels not containing ethanol.

~~Under the second compliance option, only the Tech class-weighted difference in the predicted exhaust HC emissions is used in comparing the HC emissions of the reference fuel specifications to the HC emissions of the candidate fuel specifications. Under this option, evaporative HC emissions of the candidate fuel are limited by the imposition of a flat (and cap) RVP limit of 7.0. The CO adjustment factor also is not used under the second compliance option.~~

~~Either the first or second compliance options can be used during the RVP control season until December 31, 2009. Beginning December 31, 2009, only the first compliance option can be used during the RVP control season. Only the second compliance option can be used outside of the RVP control season.~~

4. Determination of Emissions Equivalency

The candidate fuel specifications are deemed equivalent to the reference fuel specifications if, for each pollutant (NOx, total OFP or ~~exhaust~~ _Ex_HC, and potency-weighted toxics (PWT)), the predicted percent change in emissions between the candidate fuel specifications and the reference Phase 3 RFG specifications is equal to or less than 0.04%. If the applicant ~~has elected to use the evaporative HC emissions model~~ _is using or is required to use the THC Model_ in the evaluation of the emissions equivalency, the 0.04% criteria must be met for NOx, OFP, and PWT. If the applicant ~~has elected not to use the evaporative HC emissions model~~ _is using or is required to use the ExHC Model_, the 0.04% criteria must be met for NOx, ~~exhaust~~ _Ex_HC, and PWT. If, for any of the three pollutants in the criteria, the predicted percent change in emissions between the candidate fuel specifications and the reference Phase 3 RFG specifications is equal to or greater than 0.05%, the candidate specifications are deemed unacceptable and may not be a substitute for Phase 3 RFG. [Note: All final values of the percent change in emissions shall be reported to the nearest hundredth using conventional rounding.]

C. Definitions

1. **Alternative gasoline formulation** means a final blend of gasoline that is subject to a set of alternative specifications deemed acceptable pursuant to the *California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model.*

2. **Alternative fuel specifications** means the specifications for the following gasoline properties, as determined in accordance with ~~13 CCR~~California Code of Regulations, title 13, section 2263:
   - maximum Reid vapor pressure, expressed in the nearest hundredth of a pound per square inch;
   - maximum sulfur content, expressed in the nearest parts per million by weight;
   - maximum benzene content, expressed in the nearest hundredth of a percent by volume;
   - maximum olefin content, expressed in the nearest tenth of a percent by volume;
   - minimum and maximum oxygen content, expressed in the nearest tenth of a percent by weight;
   - maximum T50, expressed in the nearest degree Fahrenheit;
   - maximum T90, expressed in the nearest degree Fahrenheit; and
   - maximum aromatic hydrocarbon content, expressed in the nearest tenth of a percent by volume.

3. **Applicant** means the party seeking approval of alternative gasoline specifications and responsible for the demonstration described herein.

4. **Aromatic hydrocarbon content (Aromatic HC, AROM)** means the amount of aromatic hydrocarbons in the fuel expressed to the nearest tenth of a percent by volume in accordance with 13 CCR, section 2263.

5. **ASTM** means the American Society of Testing and Materials.

6. **Averaging Limit** means a limit for a fuel property that must be achieved in accordance with 13 CCR, section 2264.

7. **Benzene content (BENZ or Benz)** means the amount of benzene contained in the fuel expressed to the nearest hundredth of a percent by volume in accordance with 13 CCR, section 2263.

8. **Candidate fuel or candidate fuel specifications** means the fuel or set of specifications which are being evaluated for its emission performance using these procedures.

9. **Cap limit** means a limit that applies to all California gasoline throughout the gasoline distribution system, in accordance with 13 CCR, sections 2262.3 (a), 2262.4 (a), and 2262.5 (a) and (b).

9.5. ***Carbon Monoxide (CO) Emissions Equations** means the equations that relate gasoline properties to carbon monoxide emissions which result when the gasoline is used to fuel a motor vehicle.*

10. **EMFAC2007** means the EMFAC2007 motor vehicle emission inventory and emissions calculation system maintained by the ARB.

11. **Ethanol content** means the amount of ethanol in the fuel expressed to the nearest tenth of a percent by volume.

*11.5. **Evaporative hydrocarbon emissions equations (Evaporative HC emissions equations)** means the equations that relate gasoline properties to evaporative hydrocarbon emissions which result when the gasoline is used to fuel a motor vehicle.*

12. **Executive Officer** means the executive officer of the Air Resources Board, or his or her designee.

*12.5 **Exhaust hydrocarbon emissions Equations (ExHC emissions equations)** means the equations that relate gasoline properties to exhaust hydrocarbon emissions which result when the gasoline is used to fuel a motor vehicle.*

13. **Exhaust~~-only option~~** ***Hydrocarbon Model (ExHC Model)*** means the ~~compliance option available to applicants~~ *model* which uses only the exhaust ~~HC~~*hydrocarbon* emissions models in the evaluation of the HC emissions equivalency of the candidate fuel specifications.

14. *[Reserved]* ~~**Evap option** means the compliance option available to applicants which uses evaporative HC emissions models and the CO adjustment factor in the evaluation of the HC emissions equivalency of the candidate fuel specifications.~~

15. **Flat limit** means a single limit for a fuel property that applies to all California

gasoline sold or supplied from a California production facility or import facility.

16. **Intercept** means the average vehicle effect for a particular Tech class and a particular pollutant. The intercept represents the average emissions across vehicles in the Tech class, for a fuel with properties equal to the average values of all fuels in the data base for that Tech class.

17. **MTBE content (MTBE)** means the amount of methyl tertiary-butyl ether in the fuel expressed in the nearest tenth of a percent by volume.

17.5 ***Non-RVP-controlled gasoline*** *means gasoline sold or supplied from a production or import facility outside the applicable RVP control periods set forth in California Code of Regulations, title 13, section 2262.4 or gasoline subject to 2262.4(c)(1) or (2).*

18. **Olefin content (OLEF)** means the amount of olefins in the fuel expressed in the nearest tenth of a percent by volume in accordance with 13 CCR, section 2263.

19. **Oxygen content (OXY)** means the amount of oxygen contained in the fuel expressed in the nearest tenth of a percent by weight in accordance with 13 CCR, section 2263.

20. **Phase 3 reformulated gasoline (Phase 3 RFG)** means gasoline meeting the flat or averaging limits of the Phase 3 RFG regulations.

21. **Potency-weighted exhaust toxics (PWT)** means the mass exhaust emissions of benzene, 1,3-butadiene, formaldehyde, and acetaldehyde multiplied by the relative potency with respect to 1,3-butadiene.

22. **Predictive model** means a set of equations that relate the properties of a particular gasoline formulation to the predicted exhaust and evaporative emissions that result when that gasoline is combusted in a motor vehicle engine.

23. **Reference fuel or reference fuel specifications** means a gasoline meeting the flat or average specifications for Phase 3 RFG.

24. **Reid vapor pressure (RVP)** means the vapor pressure of the fuel expressed in the nearest hundredth of a pound per square inch in accordance with 13 CCR, section 2263.

24.5 ***RVP-controlled gasoline*** *means gasoline sold or supplied from a production or import facility during the applicable RVP control period set forth in California Code of Regulations, title 13, section 2262.4 or gasoline subject to paragraph III.B.4 below.*

25. **Sulfur content (SUL)** means the amount of sulfur contained in the fuel expressed in the nearest part per million in accordance with 13 CCR, section 2263.

26. **Technology class (Tech 3, Tech 4, and Tech 5)** means a classification of vehicles by model year based on the type of technology used to control gasoline exhaust emissions.

<u>*26.5 **Total Hydrocarbon Model (THC Model)** means the model which uses the exhaust hydrocarbon emissions equations, evaporative hydrocarbon emissions equations, and the carbon monoxide emissions equations in the evaluation of the emissions equivalency of the candidate fuel specifications.*</u>

27. **50% distillation temperature (T50)** means the temperature at which 50% of the fuel evaporates expressed in the nearest degree Fahrenheit in accordance with <u>*California Code of Regulations, title 13*</u>, section 2263.

28. **90% distillation temperature (T90)** means the temperature at which 90% of the fuel evaporates expressed in the nearest degree Fahrenheit in accordance with <u>*California Code of Regulations, title 13*</u>, section 2263.

29. **Total potency-weighted toxics (PWT)** means the sum of the mass exhaust emissions of benzene, 1,3-butadiene, formaldehyde, and acetaldehyde, and the evaporative benzene emissions, multiplied by the relative potency with respect to 1,3-butadiene.

30. **Toxic air contaminants** means exhaust emissions of benzene, 1,3-butadiene, formaldehyde, and acetaldehyde, and evaporative benzene emissions.

II. VEHICLE TECHNOLOGY CLASS AND WEIGHTING FACTORS

A. Vehicle Technology Groups

For the purpose of these procedures, exhaust sub-models have been developed for three categories of light-duty vehicles (passenger cars and light-duty trucks) using the vehicle model year as an indicator of the type of emission controls used. Table 3 shows the three vehicle categories.

Table 3
Vehicle Categories

Technology Class	Model Year	Emission Controls
Tech 3	1981-1985	older closed-loop three-way catalyst
Tech 4	1986-1995	closed-loop three-way catalyst
Tech 5	1996-2015	three-way catalyst, adaptive learning, LEVs

B. Emission-Weighting Factors

Emission-weighting factors are used~~,~~ for NOx, ~~exhaust~~ *Ex*HC, and CO emissions~~,~~ to weight the model predictions for each technology class. These weightings represent, for each of the three pollutants, the fractional contribution of exhaust emissions from on-road gasoline-fueled vehicles in a particular Tech class to the total emissions from these vehicles from all three Tech classes in the year 2015. The year 2015 was selected because it approximately represents the midpoint year over which the Phase 3 reformulated gasoline regulations will be most effective. The factors were calculated using the information in EMFAC2007. The emission-weighting factors (EWF) are shown in Table 4 and are used in the combination of the sub-models for NOx, ~~exhaust~~ *Ex*HC, and CO emissions.

Table 4
Emission-Weighting Factors

Pollutant	Tech 3	Tech 4	Tech 5
NOx	0.052	0.325	0.622
HC	0.075	0.380	0.546
CO	0.063	0.288	0.649

C. Toxics Weighting Factors

Since toxics emissions are also ~~exhaust~~ *ExHC*, the hydrocarbon weighting factors are used to weight the model predictions for each technology class. The values were calculated for the year 2015 using the ARB's EMFAC2007 motor vehicle emissions inventory. The toxics weighting factors (TWFs) are shown in Table 5 and are used in the combination of the exhaust toxics emissions sub-models.

Table 5
Toxics Weighting Factors (TWFs)

Pollutant	Tech 3	Tech 4	Tech 5
Benzene	0.075	0.380	0.546
1,3-Butadiene	0.075	0.380	0.546
Formaldehyde	0.075	0.380	0.546
Acetaldehyde	0.075	0.380	0.546

III. GENERAL EQUATIONS FOR CALCULATING PERCENT CHANGES IN EMISSIONS

A. Summary and Explanation

- ~~The applicant will first select one of two compliance options. The first compliance option, referred to as the exhaust and evap model option, uses the exhaust HC emissions models, the evaporative HC emissions changes models, and the CO adjustment in determining the HC emissions equivalency of the candidate fuel specifications based on ozone forming potential. The second option, referred to as the exhaust-only option, is set to sunset December 31, 2009 and uses only the exhaust HC emissions model in the determination of the HC emissions equivalency of the candidate fuel specifications. (See III.B)~~

  ~~The exhaust and evap model option may only be used for final blends of California gasoline or CARBOB where some part of the final blend is physically transferred from its production or import facility during the Reid vapor pressure control period for the production or import facility set forth in section 2262.4, title 13, California Code of Regulations, or within 15 days before the start of such period.~~

  With certain limited exceptions, which are described in paragraph B below, beginning December 31, 2009, a candidate fuel that is designated as "non-RVP-controlled gasoline" must use the ExHC model in determining the emissions equivalency of the candidate fuel specifications. A candidate fuel that is designated as "RVP-controlled gasoline" must use the THC model in determining the emissions equivalency of the candidate fuel specifications.

- The applicant will select a candidate specification for each property, and will identify whether the specification represents a flat limit or an averaging limit. The Phase 3 RFG reference specification is identified for each property using the flat/average limit compliance option selected for the corresponding candidate specification. (See III.B.)

- The selected candidate specifications and the comparable Phase 3 RFG reference specifications are inserted into the predictive model equations to determine the predicted candidate and reference emissions by Tech class. (See III.C.)

- Because oxygen is specified in the form of a range, emissions predictions are, in a majority of the cases, made for two oxygen levels, the upper level of the specified range for the candidate fuel specifications and the lower level. The emissions of the candidate fuel are compared to the emissions of the reference fuel at both of these oxygen levels. When the range between the upper and lower oxygen levels is less than or equal to 0.4 percent then the prediction is only made for two oxygen levels. If the range is greater than 0.4 percent, then the prediction is based on the individual upper and lower levels.

- For NOx and ~~exhaust~~ *Ex*HC, the ratio of the predicted emissions for the candidate fuel specifications to the predicted emissions for the reference fuel specifications is emissions weighted according to the relative contribution of each technology class. These emissions-weighted ratios are summed, reduced by 1, and multiplied by 100 to represent the Tech class-weighted percent change in emissions. The resulting values represent the predicted percent change in NOx or ~~exhaust~~ *Ex*HC emissions between the candidate fuel specifications and reference fuel specifications. (See III.D.)

- If ~~the exhaust and evap model option has been selected~~ *the THC Model is used or is required to be used*, the predicted percent change in evaporative HC emissions between the candidate fuel specifications and the reference fuel specifications is computed using the equations given in Section VII*I*.A. The predicted change is computed for each evaporative emissions process. (See VII*I*.A)

- If ~~the exhaust and evap model option has been selected~~ *the THC Model is used or is required to be used*, the CO emissions a*re* calculated in accordance with the equations given in Section VI.A. (See VI.A)

- If ~~the exhaust and evap model option has been selected~~ *the THC Model is used or is required to be used*, the predicted percent changes in ~~exhaust~~ *Ex*HC emissions, evaporative HC emissions, and the CO emissions are combined in accordance with the equation given in Section X to yield the predicted percent change in ozone-forming potential (OFP) between the reference fuel specifications and the candidate fuel specifications. (See X)

- For exhaust toxics emissions, the predicted emissions for the candidate fuel specifications and the reference fuel specifications (for each pollutant and each Tech class) are weighted using the toxics weighting factors and potency-weighted, in accordance with the equations given in VII.B. (See VII.B)

- The evaporative benzene emissions predictions for the reference fuel specifications and the candidate fuel specifications are calculated in accordance with the equations given in Section IX.A. Note that emissions predictions for evaporative benzene emissions are made even if the applicant is not using ~~the compliance option which provides for the use of the evaporative HC emissions models~~ *the THC Model*. (See IX.A)

- For both the reference fuel specifications and the candidate fuel specifications, the potency-weighted exhaust toxics emissions predictions are combined with the potency-weighted evaporative benzene emissions predictions, in accordance with the equations given in Sections XI.A and XI.B. This yields the total potency-weighted toxics emissions prediction for the reference fuel specifications and for the candidate fuel specifications. (See XI.A and XI.B)

- The percent change in the predicted total potency-weighted toxics emissions between the reference fuel specifications and the candidate fuel specifications is calculated in accordance with the equation given in Section XI.C. (See XI.C)

B. Selection by Applicant of Candidate and Reference Specifications

~~Before December 31, 2009, the applicant shall first select one of two compliance options. The first compliance option uses the exhaust HC emissions models, the evaporative HC emissions models, and the CO emissions model in determining the HC emissions equivalency of the candidate fuel specifications. The second option uses only the exhaust HC emissions model in the determination of the HC emissions equivalency of the candidate fuel specifications. After December 31, 2009, the second compliance option sunsets and the first compliance option that uses the exhaust HC emissions models, the evaporative HC emissions models, and the CO emissions model in determining the HC emissions equivalency of the candidate fuel specifications becomes the only compliance option during the RVP control season.~~

1. RVP-Controlled Period

Beginning December 31, 2009, for gasoline that is sold or supplied from a production or import facility during the applicable RVP control period set forth in California Code of Regulations, title 13, section 2262.4 for that facility, the applicant must designate the gasoline as "RVP-controlled gasoline" and use the THC Model in determining the HC emissions equivalency of the candidate fuel specifications.

2. RVP-Controlled Period with assurances that the gasoline will be delivered during the Non-RVP-Controlled Period

Notwithstanding paragraph 1, above, the applicant must designate gasoline, which is subject to California Code of Regulations, title 13, section 2262.4(c)(1) or (2) as "non-RVP-controlled gasoline." The applicant must use the ExHC model in determining the HC emissions equivalency of these candidate fuel specifications for this "non-RVP-controlled gasoline." Gasoline produced in California and sold or supplied to the South Coast Air Basin, Ventura County, or the San Diego Air Basin must also meet the requirements in Section 2262.4(c)(4).

3. Non-RVP-Controlled Period

For gasoline that is sold or supplied from a production or import facility during the time period other than the applicable RVP control period for that facility, the applicant must designate the gasoline as "non-RVP-controlled gasoline" and use the ExHC Model in determining the HC emissions equivalency of the candidate fuel specifications.

4. Low RVP gasoline during the Non-RVP-Controlled Period

Notwithstanding paragraph 3, above,, if an applicant submits candidate fuel specifications for a final blend of gasoline that includes an RVP value equal to or less than 7.20 psi (or, correspondingly, an RVP value equal to or less than 5.99 psi for a final blend of CARBOB) and that is sold or supplied from a production or import facility during the time period other than the applicable RVP control period for that facility, the applicant must designate this gasoline as "RVP-controlled gasoline" and use the THC model in determining the HC emissions equivalency of these candidate fuel specifications . Gasoline produced in California and sold or supplied to the South Coast Air Basin, Ventura County, or the San Diego Air Basin must also meet the requirements in Section 2262.4(c)(4)

~~If~~ *When* the applicant ~~selects the first compliance option~~ *uses, or is required to use, the THC Model*, the applicable Phase 3 RVP limits are a flat limit of 7.00 psi and a cap limit of 7.20 psi. ~~That is if the applicant elects to use the evaporative HC emissions predictive model, all evaporative HC emissions changes predicted by the model for the candidate fuel will be based on the use of 7.00 psi as the RVP of the Phase 3 reference fuel.~~ ~~If~~ *When* the applicant ~~selects the second compliance option~~ *uses the ExHC Model*, the applicable Phase 3 RVP limit is a flat (and cap) limit of 7.00 psi. If the applicant selects to certify an alternative formulation produced without ethanol, then the applicable flat limit for either compliance option is 6.90 psi RVP.

Next, the applicant shall, for each fuel property, select a candidate specification and indicate whether this specification represents a flat limit or an averaging limit. The appropriate corresponding Phase 3 RFG reference specifications (flat or average) are then identified. Table 7 provides an optional worksheet to assist the applicant in selecting the candidate and reference specifications. These steps are summarized below.

1. Identify the value of the candidate specification for each fuel property and insert the values into Table 7. The candidate specifications may have any value for RVP, sulfur, benzene, aromatic hydrocarbons, olefins, T50, and T90 as long as each specification is less than or equal to the cap limits shown in Table 1. Note that, if the applicant is not using ~~the compliance option which provides for the use of the evaporative HC emissions models~~ *the THC Model*, no value is entered for RVP into the "Candidate Fuel Specifications" column of Table 7 (In this case the RVP is 7.00). The candidate specification may have any value for oxygen as long as the specification is within the range of the cap limits shown in Table 1.

2. When the range between the upper and lower oxygen levels is less than or equal to 0.4 percent, then the prediction is only made for the average of the

two oxygen levels. If the range is greater than 0.4 percent, then the prediction is based on the individual upper and lower levels. If the range between the upper and lower oxygen levels is greater than 0.4 percent, then the oxygen contents of the reference fuel specifications can be found from Table 6. Since oxygen is specified in the form of a range, there are usually two candidate fuel specifications for oxygen, the upper end of the range (maximum) and the lower end of the range (minimum).

3. The hot soak benzene emissions model contains a MTBE content term. The relevant oxygen content value is the oxygen content as MTBE, not the total oxygen content as in the case of the exhaust emissions predictions. The result is that, if the candidate fuel does not contain MTBE, the oxygen content as MTBE for the reference fuel is 2.0 percent, and the oxygen content as MTBE for the candidate fuel is zero percent. The reason it is assumed that the reference fuel contains MTBE is that MTBE was the oxygenate used while the Phase 2 regulations were in effect, and this assumption helps ensure that potency-weighted toxics emissions from Phase 3 gasoline will not be greater than those from Phase 2 gasoline.

4. For each property other than oxygen and RVP, indicate whether the candidate specification will represent a flat limit or an averaging limit.

5. For each candidate specification identified in 1., identify the appropriate corresponding Phase 3 RFG reference specifications (flat or average). Circle the appropriate flat or average limit for the reference fuel in Table 7. The circled values are the reference specifications which will be used in the predictive model.

   When the range between the upper and lower oxygen levels is less than or equal to 0.4 percent, then the oxygen level of the reference fuel is 2.0 wt%. If the range is greater than 0.4 percent, then Table 6 gives the oxygen contents of the reference fuel specifications. Because oxygen is specified in the form of a range, there are two reference fuel oxygen specifications. In most cases they are the same, but in two cases they are not. These two cases are: 1) If the minimum oxygen content of the candidate fuel specifications is within 1.8 to 2.2 percent (inclusive) and the maximum oxygen content of the candidate is greater than 2.2 percent, and 2) If the minimum oxygen content of the candidate fuel specifications is less than 1.8 percent and the maximum oxygen content of the candidate is between 1.8 and 2.2 percent (inclusive). In case 1), the oxygen contents of the reference fuel specifications are 1.8 and 2.0 percent. In case 2), the oxygen contents of the reference fuel specifications are 2.0 and 2.2 percent. (See Table 6)

Table 6
Candidate and Reference Specifications for Oxygen

Oxygen Content for Candidate Fuel Specified by Applicant		Number of Reference vs. Candidate Comparisons Required	Values to be Used in Comparison in Equations	
Minimum	**maximum**		**Candidate**	**Reference**
> 1.8, < 2.2	> 2.2	2	minimum	1.8
			maximum	2.0
< 1.8	> 1.8, < 2.2	2	minimum	2.0
			maximum	2.2
< 1.8	> 2.2	2	minimum	2.0
			maximum	2.0
< 1.8	< 1.8	2	minimum	2.0
			maximum	2.0
> 2.2, < 2.5	> 2.2	2	maximum	2.0
			minimum	2.0
> 2.5	> 2.9	2	minimum	2.0
			maximum	2.0

Table 7
Optional Worksheet for Candidate and Reference Fuel Specifications

~~Does the applicant which to use the evaporative HC emissions model and the CO adjustment factor in the evaluation of the equivalency of the candidate fuel specifications?~~ *Is this an RVP-controlled gasoline?* YES ___ NO ___

If the above question is answered yes, *the applicant must use the Total Hydrocarbon Model and* the reference fuel flat RVP limit is 7.00 psi and the RVP cap is 7.20 psi, unless the gasoline does not contain ethanol in which case the reference fuel flat RVP limit is 6.90 psi and the RVP cap is 7.20 psi.

If the above question is answered no, *the applicant must use the Exhaust Hydrocarbon Model and* 7.00 psi is the flat RVP limit and the candidate fuel RVP specification.

Fuel Property	**Candidate Fuel[1]: Specifications**	**Compliance Option: Flat or Average**	**Reference Fuel: Phase 3 RFG Specifications** (Circle Option Chosen)	
			Flat	**Average**
RVP		Flat	7.00[5] / 6.90[5]	None
Sulfur			20	15
Benzene			0.80/1.00[6]	0.70
Aromatic			25.0/35.0[6]	22.0
Olefin			6.0	4.0
Oxygen[2] (Total)	(min) (max)	Flat-Range	(min) (max)	None
Oxygen[3] (as MTBE)	(min) (max)	Not Applicable	Not Applicable	None
Oxygen[4] (as EtOH)	(min) (max)	Not Applicable	Not Applicable	None
T50			213/220[6]	203
T90			305/312[6]	295

Note: Footnotes are on the next page

Footnotes for Table 7

1 The fuel property value must be within or equal to the cap limit.

2 When the range between the upper and lower oxygen levels is less than or equal to 0.4 percent, then the prediction for the candidate fuel is only made for the average of the two oxygen levels, and the reference fuel oxygen value is 2.0. If the range is greater than 0.4 percent, then the prediction for the candidate fuel is based on the individual upper and lower levels, and the reference fuel oxygen value is obtained from Table 6.

3 The oxygen content (as MTBE) is reported because the hot soak evaporative benzene emissions model includes an MTBE content term (See VIII.A.2).

4 The oxygen content (as EtOH) is reported because the exhaust formaldehyde and the exhaust acetaldehyde models include EtOH content terms for the predictions for the candidate fuel specifications (See VI.A.1.c & d., VI.A.2.c & d., VI.A.3.c & d.). The EtOH content term is not included in the exhaust formaldehyde and acetaldehyde predictions for the reference fuel specifications because it is assumed that, for the reference fuel specifications, MTBE is the oxygenate used to meet the oxygen requirement.

5 If the applicant elects to certify an alternative formulation without the use of ethanol, then the appropriate flat limit will be 6.90 psi; otherwise, the flat limit for RVP is 7.00 psi.

6 The higher value is the small refiner CaRFG flat limit for qualifying small refiners only, as specified in section 2272.

C. General Equations for Calculating Exhaust Emissions by Pollutant and by Technology Class

The selected candidate specifications and set reference specifications are inserted into the predictive model equations to determine the predicted pollutant emissions generated from each fuel formulation by Tech Class. The following is the general form of the equations used to calculate exhaust emissions of the candidate and reference fuel specifications for each pollutant and for each technology class.

$$ln\ y_{Tech} = \text{intercept} + \Sigma\ [(\text{fuel effects coefficient}) \times (\text{standardized fuel property})]$$

or

$$y_{Tech} = \text{Exp}\ \{\text{intercept} + \Sigma\ [(\text{fuel effects coefficient}) \times (\text{standardized fuel property})]\}$$

where

ln is the natural logarithm.

Exp is the exponential.

y_{Tech} is the exhaust emission prediction in grams per mile (for NOx, HC, and CO), and milligrams per mile (for benzene, 1,3-butadiene, formaldehyde, and acetaldehyde) for a particular technology class. (Note: **$y_{Tech-REF}$** is the emissions prediction for the reference fuel specifications and **$y_{Tech-CAND}$** is the emissions prediction for the candidate fuel specifications.)

intercept represents the average vehicle effect for a particular Tech class and a particular pollutant. The intercepts are provided in Table 13, Coefficients for NOx, ~~Exhaust~~ *Ex*HC, and CO Equations, and Table 14, Coefficients for Toxics Equations.

fuel effects coefficient represents the average fuel effects across all vehicles in the database for a particular Tech class and a particular pollutant. The fuel effect coefficients are provided in Table 13, Coefficients for NOx, ~~Exhaust~~ *Ex*HC, and CO Equations, and Table 14, Coefficients for Exhaust Toxics Equations.

standardized fuel property is defined as:

$$\text{standardized fuel property} = \frac{[(\text{actual fuel property}) - (\text{mean fuel value})]}{\text{standard deviation of the value for the fuel property}}$$

actual fuel property represents the candidate or reference fuel property selected by the applicant in Table 7, Worksheet for Candidate and Reference Specifications.

Note that the actual fuel property may represent the minimum value of selected candidate fuel properties and is established by the linearization equations defined in sections IV. A. 2 & 3 and V. A. 2 & 3.

mean fuel value represents the average fuel values from all data that are used in developing the California Predictive Model. The mean and standard deviation are provided in Table 12, Standardization of Fuel Properties-Mean and Standard Deviation.

standard deviation of the value for the fuel property is the standard deviation from all data that are used in developing the California Predictive Model.

The equations include a term for the RVP effect, however, this term has been made a constant. This was done by computing the standardized RVP value at an actual RVP value of 7.0, and then multiplying this standardized RVP value by the RVP effect coefficient, thereby yielding an additional constant in the equations. Thus, the RVP term is shown as an additional constant (in addition to the intercept) in the exhaust emissions equations. This effectively removes from the exhaust models RVP as fuel property which effects exhaust emissions.

D. General Equations for Calculating Percent Change of Exhaust Emissions Between Candidate and Reference Specifications

To calculate the percent change of NOx, ~~exhaust~~ *Ex*HC, and CO emissions, the ratio of the predicted emissions for the candidate specifications to the predicted emissions from reference specifications is multiplied by the technology class emission-weighting factors for NOx, HC, and CO. These weighted ratios are summed. The sum is reduced by 1 and multiplied by 100 to give the percent change in NOx, HC, and CO emissions.

The following is the general form of the equations used to calculate percent change in exhaust emissions between the candidate fuel specifications and the reference fuel specifications for each pollutant.

% Change in NOx, ~~Exhaust~~ *Ex*HC, and CO Emissions:

%CE = percent change in emissions =

$$\{[(y_{Tech\ 3\text{-}CAND} / y_{Tech\ 3\text{-}REF}) \times EWF_{3q}] + [(y_{Tech\ 4\text{-}CAND} / y_{Tech\ 4\text{-}REF}) \times EWF_{4q}] + [(y_{Tech\ 5\text{-}CAND} / y_{Tech\ 5\text{-}REF}) \times EWF_{5q}]\} - 1\} \times 100$$

where

$y_{Tech\ 3}$, $y_{Tech\ 4}$, and $y_{Tech\ 5}$ are the pollutant emissions in grams per mile of a particular pollutant and particular Tech class,

$y_{Tech\text{-}CAND}$ is the emissions for the candidate specifications, and
$y_{Tech\text{-}REF}$ is the emissions for the reference specifications.

EWF_{3q}, EWF_{4q}, and EWF_{5q} are the technology class 3, technology class 4, and technology class 5 weighting factors for the particular pollutant q. The Vehicle Technology Class Weighting Factors are provided in Table 4.

E. General Equations for Calculating Percent Change of Exhaust Emissions Between Candidate and Reference Specifications

The total Tech class-weighted, potency-weighted exhaust toxics emissions are calculated as shown below.

$E_{PWT\text{-}CAND}$ = Exhaust PWT emissions for candidate specifications =

$$\sum\{[((y_{Tech\ 3q\text{-}CAND}) \times (TWF_3)) + ((y_{Tech\ 4q\text{-}CAND}) \times (TWF_4)) + ((y_{Tech\ 5q\text{-}CAND}) \times (TWF_5))] \times (PWF_q)\}$$

$E_{PWT\text{-}REF}$ = Exhaust PWT emissions for reference specifications =

$$\sum\{[((y_{Tech\ 3q\text{-}REF}) \times (TWF_3)) + ((y_{Tech\ 4q\text{-}REF}) \times (TWF_4)) + ((y_{Tech\ 5q\text{-}REF}) \times (TWF_5))] \times (PWF_q)\}$$

where

The summations are performed across the q number of toxics pollutants, that is: ($y_{Tech\ 3q}$), ($y_{Tech\ 4q}$), ($y_{Tech\ 5q}$) are the predicted emissions in milligrams per mile for each toxic air contaminant for Tech classes 3, 4, and 5.

$y_{Tech\text{-}CAND}$ is the emissions for the candidate fuel specifications, and
$y_{Tech\text{-}REF}$ is the emissions for the reference fuel specifications

TWF_3, TWF_4, TWF_5 are the toxics weighting factors for Tech classes 3, 4 and 5, respectively. These values are shown in Table 5.

PWF_q is the potency-weighting factor for each toxic air contaminant q provided in Table 8.

These equations are shown again in more detail in Section VII.B.1 for the candidate fuel specifications and Section VII.B.2 for the reference fuel specifications.

Table 8
Toxic Air Contaminant Potency-Weighting Factors

Pollutant	Potency-Weighting Factor
Benzene	0.170
1,3-Butadiene	1.000
Formaldehyde	0.035
Acetaldehyde	0.016

IV. OXIDES OF NITROGEN (NOx) EXHAUST EMISSIONS CALCULATIONS

A. NOx Emissions by Technology Class

The property values from the Table 7 worksheet are used to calculate NOx emissions for the candidate and reference specifications.

1. NOx Emissions for Tech 3

The NOx emissions for the candidate ($y_{\text{Tech 3-CAND}}$) and reference ($y_{\text{Tech 3-REF}}$) specifications for Tech 3 are calculated as follows:

NOx emissions Tech 3 = $y_{\text{Tech 3}}$ =

Description	Equation	
	Exp	
intercept	{-0.159800	+
RVP	(0.0424915)	+
Sulfur	$(0.028040)\,\dfrac{(\text{SULFUR} - 139.691080)}{126.741459}$	+
Aromatic HC	$(0.047060)\,\dfrac{(\text{AROM} - 30.212969)}{8.682044}$	+
Olefin	$(0.021110)\,\dfrac{(\text{OLEF} - 7.359624)}{5.383804}$	+
Oxygen	$(0.014910)\,\dfrac{(\text{OXY} - 0.892363)}{1.235405}$	+
T50	$(-0.007360)\,\dfrac{(\text{T50} - 212.245188)}{15.880385}$	+
T90	$(0.000654)\,\dfrac{(\text{T90} - 312.121596)}{23.264684}$	}

where

SULFUR, AROM, OLEF, OXYGEN, T50, and T90 are the value limits for the candidate and reference specifications identified in the Table 7 worksheet.

2. NOx Emissions for Tech 4

The NOx emissions for the candidate ($y_{\text{Tech 4-CAND}}$) and reference ($y_{\text{Tech 4-REF}}$) specifications for Tech 4 are calculated as follows:

NOx emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{-0.634694	+
RVP	(-0.007046)	+
Sulfur	$(0.051043)\,\dfrac{(\text{SULFUR} - 154.120828)}{136.790450}$	+
Aromatic HC	$(0.011366)\,\dfrac{(\text{AROM} - 27.317137)}{6.880833}$	+
Olefin	$(0.017193)\,\dfrac{(\text{OLEF} - 6.549450)}{4.715345}$	+
Oxygen	$(0.028711)\,\dfrac{(\text{OXY} - 1.536017)}{1.248887}$	+
T50	$(-0.002431)\,\dfrac{(\text{T50} - 205.261051)}{17.324472}$	+
T90	$(0.002087)\,\dfrac{(\text{T90} - 310.931422)}{20.847425}$	+
T50T50	$(0.006268)\,\dfrac{(\text{T50} - 205.261051)}{17.324472}\,\dfrac{(\text{T50} - 205.261051)}{17.324472}$	+
T90ARO	$(-0.002892)\,\dfrac{(\text{T90} - 310.931422)}{20.847425}\,\dfrac{(\text{AROM} - 27.317137)}{6.880833}$	+
OXYOXY	$(0.010737)\,\dfrac{(\text{OXY} - 1.536017)}{1.248887}\,\dfrac{(\text{OXY} - 1.536017)}{1.248887}$	}

where

For calculating the reference fuel NOx emissions, SULFUR, AROM, OLEF, OXY, T50, and T90 are equal to the corresponding values for the reference specifications in the Table 7 worksheet.

For calculating candidate fuel NOx emissions, SULFUR, AROM, OLEF, OXY, and T90 are equal to the corresponding values for the candidate specifications in the Table 7 worksheet. The value for T50 is determined as follows:

> If the value for the candidate T50 specification in the Table 7 worksheet is greater than 213 then 213 is the value for T50.
>
> If the value for the candidate T50 specification in the Table 7 worksheet is less than or equal to 213, the T50 specification in the Table 7 worksheet is the value for T50.

3. NOx Emissions for Tech 5

The NOx emissions for the candidate ($y_{\text{Tech 5-CAND}}$) and reference ($y_{\text{Tech 5-REF}}$) specifications for Tech 5 are calculated as follows:

NOx emissions Tech 5 = $y_{\text{Tech 5}}$ =

Description	Equation	
	Exp	
intercept	{-1.599255	+
RVP	(-0.000533)	+
Sulfur	$(0.947915)\left(\dfrac{\text{SULFUR} - 144.6289001}{140.912234}\right)$	+
Aromatic HC	$(0.013671)\left(\dfrac{\text{AROM} - 26.875944}{6.600312}\right)$	+
Olefin	$(0.017335)\left(\dfrac{\text{OLEF} - 6.251891}{4.431845}\right)$	+
Oxygen	$(0.016036)\left(\dfrac{\text{OXY} - 1.551772}{1.262823}\right)$	+
T50	$(0.012397)\left(\dfrac{\text{T50} - 206.020870}{16.582090}\right)$	+

T90 $(0.000762)\ \frac{(T90 - 310.570200)}{22.967591}$ +

T50T50 $(-0.022211)\ \frac{(T50 - 206.020870)}{16.582090}\ \frac{(T50 - 206.020870)}{16.582090}$ +

T50OXY $(-0.015564)\ \frac{(T50 - 206.020870)}{16.582090}\ \frac{(OXY - 1.551772)}{1.262823}$ +

OXYOXY $(0.015199)\ \frac{(OXY - 1.551772)}{1.262823}\ \frac{(OXY - 1.551772)}{1.262823}$ }

where

For calculating the reference fuel NOx emissions, SULFUR, AROM, OLEF, OXY, T50, and T90 are equal to the corresponding values for the reference specifications in the Table 7 worksheet.

For calculating candidate fuel NOx emissions, SULFUR, AROM, OLEF, and T90 are equal to the corresponding values for the candidate specifications in the Table 7 worksheet. The value for OXY and T50 are determined as follows:

If the value of the candidate fuel Oxygen specification in the Table 7 worksheet is less than the $OXYGEN_{(LIN)}$ value, then the $OXYGEN_{(LIN)}$ value is the value for OXY, where $OXYGEN_{(LIN)}$ is calculated as follows:

$$OXYGEN_{(LIN)} = -7.148 + (0.039 \times T50)$$

If the value for the candidate Oxygen specification in the Table 7 worksheet is greater than or equal to the $OXYGEN_{(LIN)}$ value, then the Oxygen specification in the Table 7 worksheet is the value for OXY.

If the value of the candidate fuel T50 specification in the Table 7 worksheet is less than the $T50_{(LIN)}$ value, then the $T50_{(LIN)}$ value is the value for T50, where $T50_{(LIN)}$ is calculated as follows:

$$T50_{(LIN)} = 217.8 - (4.6 \times OXY)$$

If the value for the candidate T50 specification in the Table 7 worksheet is greater than or equal to the $T50_{(LIN)}$ value, then the T50 specification in the Table 7 worksheet is the value for T50.

B. Percent Change in NOx Emissions

The percent change in NOx emissions between the candidate specifications and the reference specifications is calculated as follows:

$$\%CE_{NOx}=\{\{[(y_{Tech\ 3\text{-}CAND} / y_{Tech\ 3\text{-}REF}) \times EWF_{3\text{-}NOx}] + [(y_{Tech\ 4\text{-}CAND} / y_{Tech\ 4\text{-}REF}) \times EWF_{4\text{-}NOx}] + [(y_{Tech\ 5\text{-}CAND} / y_{Tech\ 5\text{-}REF}) \times EWF_{5\text{-}NOx})]\} - 1\} \times 100$$

where

$\mathbf{y_{Tech\ 3\text{-}CAND}}$, $\mathbf{y_{Tech\ 4\text{-}CAND}}$, and $\mathbf{y_{Tech\ 5\text{-}CAND}}$ are the NOx emissions for the candidate specifications in grams per mile for Tech 3, Tech 4, and Tech 5 respectively.

$\mathbf{y_{Tech\ 3\text{-}REF}}$, $\mathbf{y_{Tech\ 4\text{-}REF}}$, and $\mathbf{y_{Tech\ 5\text{-}REF}}$ are the NOx emissions for the reference specifications in grams per mile for Tech 3, Tech 4, and Tech 5 respectively.

The NOx emissions for Tech 3 are calculated in accordance with the equations in section IV. A. 1.

The NOx emissions for Tech 4 are calculated in accordance with the equations in section IV. A. 2.

The NOx emissions for Tech 5 are calculated in accordance with the equations in section IV. A. 3.

$\mathbf{EWF_{3\text{-}NOx}}$, $\mathbf{EWF_{\text{-}4\text{-}NOx}}$, and $\mathbf{EWF_{\text{-}5\text{-}NOx}}$ are the emission-weighting factors for NOx as shown in Table 4.

V. EXHAUST HYDROCARBONS (HC) EMISSIONS CALCULATIONS

A. ~~Exhaust~~ *Ex*HC Emissions by Technology Class

The property values from the Table 7 worksheet are used to calculate HC emissions for the candidate and reference specifications.

1. ~~Exhaust~~ *Ex*HC Emissions for Tech 3

The HC emissions for the candidate ($y_{\text{Tech 3-CAND}}$) and reference ($y_{\text{Tech 3-REF}}$) specifications for Tech 3 are calculated as follows:

HC emissions Tech 3 = $y_{\text{Tech 3}}$ =

Description	Equation	
	Exp	
intercept	{-0.752270	+
RVP	(0.000013)	+
Sulfur	$(0.038207)\left(\dfrac{\text{SULFUR} - 139.691080}{126.741459}\right)$	+
Aromatic HC	$(0.014103)\left(\dfrac{\text{AROM} - 30.212969}{8.682044}\right)$	+
Olefin	$(-0.016533)\left(\dfrac{\text{OLEF} - 7.359624}{5.383804}\right)$	+
Oxygen	$(-0.026365)\left(\dfrac{\text{OXY} - 0.892363}{1.235405}\right)$	+
T50	$(0.015847)\left(\dfrac{\text{T50} - 212.245188}{15.880385}\right)$	+
T90	$(0.011768)\left(\dfrac{\text{T90} - 312.121596}{23.264684}\right)$	+
T90ARO	$(0.016606)\left(\dfrac{\text{T90} - 312.121596}{23.264684}\right)\left(\dfrac{\text{AROM} - 30.212969}{8.682044}\right)$	+

T90OLE	$(-0.007995)\ \dfrac{(T90 - 312.121596)}{23.264684}\ \dfrac{(OLEF - 7.359624)}{5.383804}$	}

where

SULFUR, AROM, OLEF, OXYGEN, T50, and T90 are the value limits for the candidate and reference specifications identified in the Table 7 worksheet.

2. ~~Exhaust~~ *Ex*HC Emissions for Tech 4

The HC emissions for the candidate ($y_{\text{Tech 4-CAND}}$) and reference ($y_{\text{Tech 4-REF}}$) specifications for Tech 4 are calculated as follows:

HC emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{-1.142182	+
RVP	(-0.019335)	+
Sulfur	$(0.079373)\ \dfrac{(SULFUR - 154.120828)}{136.790450}$	+
Aromatic HC	$(0.002047)\ \dfrac{(AROM - 27.317137)}{6.880833}$	+
Olefin	$(-0.010716)\ \dfrac{(OLEF - 6.549450)}{4.715345}$	+
Oxygen	$(-0.019880)\ \dfrac{(OXY - 1.536017)}{1.248887}$	+
T50	$(0.052939)\ \dfrac{(T50 - 205.261051)}{17.324472}$	+
T90	$(0.037684)\ \dfrac{(T90 - 310.931422)}{20.847425}$	+
T50ARO	$(0.019031)\ \dfrac{(T50 - 205.261051)}{17.324472}\ \dfrac{(AROM - 27.317137)}{6.880833}$	+

T50T50	$(0.017086)\left(\frac{T50 - 205.261051}{17.324472}\right)\left(\frac{T50 - 205.261051}{17.324472}\right)$	+
T50OXY	$(0.013724)\left(\frac{T50 - 205.261051}{17.324472}\right)\left(\frac{OXY - 1.536017}{1.248887}\right)$	+
T90T90	$(0.013914)\left(\frac{T90 - 310.931422}{20.847425}\right)\left(\frac{T90 - 310.931422}{20.847425}\right)$	+
AROARO	$(-0.010999)\left(\frac{AROM - 27.317137}{6.880833}\right)\left(\frac{AROM - 27.317137}{6.880833}\right)$	+
AROOXY	$(0.007221)\left(\frac{AROM - 27.317137}{6.880833}\right)\left(\frac{OXY - 1.536017}{1.248887}\right)$	}

where

For calculating the reference fuel HC emissions, SULFUR, AROM, OLEF, OXY, T50, and T90 are equal to the corresponding values for the reference specifications in the Table 7 worksheet.

For calculating the candidate fuel HC emissions, SULFUR, OLEF, and OXY are equal to the corresponding values for the candidate specifications in the Table 7 worksheet. The values for AROM, T50, and T90 are determined as follows:

If the value for the candidate Aromatics specification in the Table 7 worksheet is greater than $AROM_{(LIN)}$ then $AROM_{(LIN)}$ is the value for AROM where $AROM_{(LIN)}$ is calculated as follows:

$$AROM_{(LIN)} = -45.3466 + (1.8086 \times OXY) + (0.3436 \times T50)$$

If the value for the candidate T50 specification in the Table 7 worksheet is less than or equal to $AROM_{(LIN)}$, the Aromatics specification in the Table 7 worksheet is the value for AROM.

If the value for the candidate T50 specification in the Table 7 worksheet is less than $T50_{(LIN)}$ then $T50_{(LIN)}$ is the value for T50 where $T50_{(LIN)}$ is calculated as follows:

$$T50_{(LIN)} = 225.3 - (1.4 \times AROM) - (5.6 \times OXY)$$

If the value for the candidate T50 specification in the Table 7 worksheet is greater than or equal to $T50_{(LIN)}$, the T50 specification in the Table 7 worksheet is the value for T50.

If the value for the candidate fuel T90 specification in the Table 7 worksheet is less than the 283 value, then the 283 value is the value for T90.

If the value for the candidate T90 specification in the Table 7 worksheet is greater than or equal to the 283 value, then the T90 specification in the Table 7 worksheet is the value for T90.

3. ~~Exhaust~~ *<u>Ex</u>*HC Emissions for Tech 5

The HC emissions for the candidate ($y_{\text{Tech 5-CAND}}$) and reference ($y_{\text{Tech 5-REF}}$) specifications for Tech 5 are calculated as follows:

HC emissions Tech 5 = $y_{\text{Tech 5}}$ =

Description	Equation	
	Exp	
intercept	{-2.671187	+
RVP	(-0.012824)	+
Sulfur	$(0.242238)\left(\dfrac{\text{SULFUR} - 144.628901}{140.912204}\right)$	+
Aromatic HC	$(0.003039)\left(\dfrac{\text{AROM} - 26.875944}{6.600312}\right)$	+
Olefin	$(-0.010908)\left(\dfrac{\text{OLEF} - 6.251891}{4.431845}\right)$	+
Oxygen	$(-0.007528)\left(\dfrac{\text{OXY} - 1.551772}{1.262823}\right)$	+
T50	$(0.056796)\left(\dfrac{\text{T50} - 206.020870}{16.582090}\right)$	+
T90	$(0.010803)\left(\dfrac{\text{T90} - 310.570200}{22.967591}\right)$	+
T50ARO	$(0.016761)\left(\dfrac{\text{T50} - 206.020870}{16.582090}\right)\left(\dfrac{\text{AROM} - 26.875944}{6.600312}\right)$	+

T50T50 $(0.019563)\left(\frac{T50 - 206.020870}{16.582090}\right)\left(\frac{T50 - 206.020870}{16.582090}\right)$ +

T50OXY $(0.014082)\left(\frac{T50 - 206.020870}{16.582090}\right)\left(\frac{OXY - 1.551772}{1.262823}\right)$ +

T90T90 $(0.015216)\left(\frac{T90 - 310.570200}{22.967591}\right)\left(\frac{T90 - 310.570200}{22.9675901}\right)$ +

T90OXY $(0.013372)\left(\frac{T90 - 310.570200}{22.967590}\right)\left(\frac{OXY - 1.551772}{1.262823}\right)$ +

AROARO $(-0.009740)\left(\frac{AROM - 26.875944}{6.600312}\right)\left(\frac{AROM - 26.875944}{6.600312}\right)$ +

AROOXY $(0.006902)\left(\frac{AROM - 26.875944}{6.600312}\right)\left(\frac{OXY - 1.551772}{1.262823}\right)$ }

where

For calculating the reference fuel HC emissions, SULFUR, AROM, OLEF, OXY, T50, and T90 are equal to the corresponding values for the reference specifications in the Table 7 worksheet.

For calculating the candidate fuel HC emissions, SULFUR, OLEF, and OXY are equal to the corresponding values for the candidate specifications in the Table 7 worksheet. The values for AROM, T50, and T90 are determined as follows:

If the value for the candidate Aromatics specification in the Table 7 worksheet is greater than $AROM_{(LIN)}$ then $AROM_{(LIN)}$ is the value for AROM where $AROM_{(LIN)}$ is calculated as follows:

$$AROM_{(LIN)} = -45.5269 + (1.8518 \times OXY) + (0.3425 \times T50)$$

If the value for the candidate Aromatics specification in the Table 7 worksheet is less than or equal to $AROM_{(LIN)}$, the Aromatics specification in the Table 7 worksheet is the value for AROM.

If the value for the candidate T50 specification in the Table 7 worksheet is less than $T50_{(LIN)}$, then $T50_{(LIN)}$ is the value for T50, where $T50_{(LIN)}$ is calculated as follows:

$$T50_{(LIN)} = 218.2 - (1.1 \times AROM) - (4.7 \times OXY)$$

If the value for the candidate T50 specification in the Table 7 worksheet is greater than or equal to $T50_{(LIN)}$, the T50 specification in the Table 7 worksheet is the value for T50.

If the value for the candidate fuel T90 specification in the Table 7 worksheet is less than the $T90_{(LIN)}$ value, then the $T90_{(LIN)}$ value is the value for T90 where $T90_{(LIN)}$ is calculated as follows:

$$T90_{(LIN)} = 314.8 - (8.0 \times OXY)$$

If the value for the candidate T90 specification in the Table 7 worksheet is greater than or equal to the $T90_{(LIN)}$ value, then the T90 specification in the Table 7 worksheet is the value for T90.

B. Percent Change in ~~Exhaust~~ ExHC Emissions

The percent change in ~~exhaust~~ ExHC emissions between the candidate fuel specifications and the reference fuel specifications is calculated as follows:

$$\%CE_{ExHC} = \{\{[(y_{Tech\ 3\text{-}CAND} / y_{Tech\ 3\text{-}REF}) \times EWF_{3\text{-}HC}] + [(y_{Tech\ 4\text{-}CAND} / y_{Tech\ 4\text{-}REF}) \times EWF_{4\text{-}HC}] + [(y_{Tech\ 5\text{-}CAND} / y_{Tech\ 5\text{-}REF}) \times EWF_{5\text{-}HC}]\} - 1\} \times 100$$

where

$\mathbf{y_{Tech\ 3\text{-}CAND}}$, $\mathbf{y_{Tech\ 4\text{-}CAND}}$, and $\mathbf{y_{Tech\ 5\text{-}CAND}}$ are the ~~exhaust~~ ExHC emissions for the candidate specifications in grams per mile for Tech 3, Tech 4, and Tech 5 respectively.

$\mathbf{y_{Tech\ 3\text{-}REF}}$, $\mathbf{y_{Tech\ 4\text{-}REF}}$, and $\mathbf{y_{Tech\ 5\text{-}REF}}$ are the ~~exhaust~~ ExHC emissions for the reference specifications in grams per mile for Tech 3, Tech 4, and Tech 5 respectively.

The ~~exhaust~~ ExHC emissions for Tech 3 are calculated according to the equations in section V. A. 1.

The ~~exhaust~~ ExHC emissions for Tech 4 are calculated according to the equations in section V. A. 2.

The ~~exhaust~~ ExHC emissions for Tech 5 are calculated according to the equations in section V. A. 3.

$\mathbf{EWF_{3\text{-}HC}}$, $\mathbf{EWF_{\text{-}4\text{-}HC}}$, and $\mathbf{EWF_{\text{-}5\text{-}HC}}$ are the emission-weighting factors for HC as shown in Table 4.

VI. CARBON MONOXIDE (CO) EMISSIONS CALCULATIONS

A. CO Emissions by Technology Class

The property values from the Table 6 worksheet are used to calculate CO emissions for the candidate and reference specifications.

1. CO Emissions for Tech 3

The CO emissions for the candidate ($y_{\text{Tech 3-CAND}}$) and reference ($y_{\text{Tech 3-REF}}$) specifications for Tech 3 are calculated as follows:

CO emissions Tech 3 = $y_{\text{Tech 3}}$ =

Description	Equation	
	Exp	
intercept	$\{1.615613$	+
RVP	(0.012087)	+
Sulfur	$(0.031849)\left(\frac{\text{SULFUR} - 139.691080}{126.741459}\right)$	+
Aromatic HC	$(0.085541)\left(\frac{\text{AROM} - 30.212969}{8.682044}\right)$	+
Olefin	$(0.002416)\left(\frac{\text{OLEF} - 7.359624}{5.383804}\right)$	+
Oxygen	$(-0.068986)\left(\frac{\text{OXY} - 0.892363}{1.235405}\right)$	+
T50	$(0.009897)\left(\frac{\text{T50} - 212.245188}{15.880385}\right)$	+
T90	$(-0.025449)\left(\frac{\text{T90} - 312.121596}{23.264684}\right)$	+
T50T90	$(0.017463)\left(\frac{\text{T50} - 212.245188}{15.880385}\right)\left(\frac{\text{T90} - 312.121596}{23.264684}\right)\}$	

where

SULFUR, AROM, OLEF, OXYGEN, T50, and T90 are the value limits for the candidate and reference specifications identified in the Table 7 worksheet.

2. CO Emissions for Tech 4

The CO emissions for the candidate ($y_{\text{Tech 4-CAND}}$) and reference ($y_{\text{Tech 4-REF}}$) specifications for Tech 4 are calculated as follows:

CO emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{1.195246	+
RVP	(-0.025878)	+
Sulfur	$(0.073616)\left(\dfrac{\text{SULFUR} - 154.120828}{136.790450}\right)$	+
Aromatic HC	$(0.025960)\left(\dfrac{\text{AROM} - 27.317137}{6.880833}\right)$	+
Olefin	$(0.001263)\left(\dfrac{\text{OLEF} - 6.549450}{4.715345}\right)$	+
Oxygen	$(-0.052530)\left(\dfrac{\text{OXY} - 1.536017}{1.248887}\right)$	+
T50	$(0.022750)\left(\dfrac{\text{T50} - 205.261051}{17.324472}\right)$	+
T90	$(-0.008820)\left(\dfrac{\text{T90} - 310.931422}{20.847425}\right)$	+
OXYOXY	$(-0.016510)\left(\dfrac{\text{OXY} - 1.536017}{1.248887}\right)\left(\dfrac{\text{OXY} - 1.536017}{1.248887}\right)$	+
T50ARO	$(0.009884)\left(\dfrac{\text{T50} - 205.261051}{17.324472}\right)\left(\dfrac{\text{AROM} - 27.317137}{6.880833}\right)$	+
T90OLE	$(-0.007360)\left(\dfrac{\text{T90} - 310.931422}{20.847425}\right)\left(\dfrac{\text{OLEF} - 6.549450}{4.715345}\right)$	+

T90T90 $(0.007767)\ \frac{(T90 - 310.931422)}{20.847425}\ \frac{(T90 - 310.931422)}{20.847450}$ }

where

For calculating the reference fuel CO emissions, SULFUR, AROM, OLEF, OXY, T50, and T90 are equal to the corresponding values for the reference specifications in the Table 7 worksheet.

For calculating the candidate fuel CO emissions, SULFUR, AROM, OLEF, OXY, and T50 are equal to the corresponding values for the candidate specifications in the Table 7 worksheet. The value for T90 is determined as follows:

If the value for the candidate fuel T90 specification in the Table 7 worksheet is greater than the $T90_{(LIN)}$ value, then the $T90_{(LIN)}$ value is the value for T90 where $T90_{(LIN)}$ is calculated as follows:

$$T90_{(LIN)} = 308.3 + (2.5 \times OLEF)$$

If the value for the candidate T90 specification in the Table 7 worksheet is less than or equal to the $T90_{(LIN)}$ value, then the T90 specification in the Table 7 worksheet is the value for T90.

3. CO Emissions for Tech 5

The CO emissions for the candidate ($y_{Tech\ 5\text{-}CAND}$) and reference ($y_{Tech\ 5\text{-}REF}$) specifications for Tech 5 are calculated as follows:

CO emissions Tech 5 = $y_{Tech\ 5}$ =

Description	Equation	
	Exp	
intercept	{-0.240521	+
RVP	(-0.014137)	+
Sulfur	$(0.123649)\ \frac{(SULFUR - 144.628901)}{140.91224}$	+

Aromatic HC	$(0.025775)\ \dfrac{(\text{AROM} - 26.875944)}{6.600312}$	+
Olefin	$(0.005001)\ \dfrac{(\text{OLEF} - 6.251891)}{4.431845}$	+
Oxygen	$(-0.087967)\ \dfrac{(\text{OXY} - 1.551772)}{1.262823}$	+
T50	$(0.018195)\ \dfrac{(\text{T50} - 206.020870)}{16.582090}$	+
T90	$(-0.128296)\ \dfrac{(\text{T90} - 310.570200)}{22.967591}$	+
OXYOXY	$(0.026309)\ \dfrac{(\text{OXY} - 1.551772)}{1.262823}\ \dfrac{(\text{OXY} - 1.551772)}{1.262823}$	+
T50ARO	$(0.009797)\ \dfrac{(\text{T50} - 206.020870)}{16.582090}\ \dfrac{(\text{AROM} - 26.875944)}{6.600312}$	+
T50OXY	$(0.021763)\ \dfrac{(\text{T50} - 206.020870)}{16.582090}\ \dfrac{(\text{OXY} - 1.551772)}{1.262823}\ \}$	

where

For calculating the reference fuel CO emissions, SULFUR, AROM, OLEF, OXY, T50, and T90 are equal to the corresponding values for the reference specifications in the Table 7 worksheet.

For calculating the candidate fuel CO emissions, SULFUR, AROM, OLEF, T50, and T90 are equal to the corresponding values for the candidate specifications in the Table 7 worksheet. The value for OXY is determined as follows:

If the value for the candidate fuel Oxygen specification in the Table 7 worksheet is greater than the $\text{OXY}_{(\text{LIN})}$ value, then the $\text{OXY}_{(\text{LIN})}$ value is the value for OXY where $\text{OXY}_{(\text{LIN})}$ is calculated as follows:

$$\text{OXY}_{(\text{LIN})} = 10.152 - (0.0315 \times \text{T50})$$

If the value for the candidate Oxygen specification in the Table 7 worksheet is less than or equal to the $\text{OXY}_{(\text{LIN})}$ value, then the Oxygen specification in the Table 7 worksheet is the value for OXY.

B. Percent Change in CO Emissions

The percent change in CO emissions between the candidate fuel specifications and the reference fuel specifications is calculated as follows:

$$\%CE_{CO} = \{\{[(y_{Tech\ 3\text{-}CAND} / y_{Tech\ 3\text{-}REF}) \times EWF_{3\text{-}CO}] + [(y_{Tech\ 4\text{-}CAND} / y_{Tech\ 4\text{-}REF}) \times EWF_{4\text{-}CO}] + [(y_{Tech\ 5\text{-}CAND} / y_{Tech\ 5\text{-}REF}) \times EWF_{5\text{-}CO}]\} - 1\} \times 100$$

where

$\mathbf{y_{Tech\ 3\text{-}CAND}}$, $\mathbf{y_{Tech\ 4\text{-}CAND}}$, and $\mathbf{y_{Tech\ 5\text{-}CAND}}$ are the CO emissions for the candidate specifications in grams per mile for Tech 3, Tech 4, and Tech 5 respectively.

$\mathbf{y_{Tech\ 3\text{-}REF}}$, $\mathbf{y_{Tech\ 4\text{-}REF}}$, and $\mathbf{y_{Tech\ 5\text{-}REF}}$ are the CO emissions for the reference specifications in grams per mile for Tech 3, Tech 4, and Tech 5 respectively.

The CO emissions for Tech 3 are calculated according to the equations in section VI. A. 1.

The CO emissions for Tech 4 are calculated according to the equations in section VI. A. 2.

The CO emissions for Tech 5 are calculated according to the equations in section VI. A. 3.

$\mathbf{EWF_{3\text{-}CO}}$, $\mathbf{EWF_{4\text{-}CO}}$, and $\mathbf{EWF_{5\text{-}CO}}$ are the emission-weighting factors for CO as shown in Table 4.

VII. POTENCY-WEIGHTED TOXICS (PWT) EXHAUST EMISSIONS CALCULATIONS

A. Mass Emissions of Toxics by Technology Class

The property values from the Table 7 worksheet are used to calculate mass toxic emissions for the candidate and reference specifications.

1. Mass Emissions for Tech 3

The mass emissions for each toxic for Tech 3 are calculated as follows:

a. Benzene mass emissions Tech 3 = $y_{\text{Tech 3}}$ =

Description	Equation	
	Exp	
intercept	{2.95676525	+
Sulfur	$(0.0683768)\,\dfrac{(\text{SULFUR} - 139.691080)}{126.741459}$	+
Aromatic HC	$(0.15191575)\,\dfrac{(\text{AROM} - 30.212969)}{8.682044}$	+
Oxygen	$(-0.03295985)\,\dfrac{(\text{OXY} - 0.892363)}{1.235405}$	+
BENZ	$\cancel{(-0.12025037)}$ *(0.12025037)* $\dfrac{(\text{BENZ} - 1.36412)}{0.513051}$	}

b. 1,3-Butadiene mass emissions Tech 3 = $y_{\text{Tech 3}}$ =

Description	Equation	
	Exp	
intercept	{0.67173886	+
Olefin	$(0.18408319)\ \dfrac{(OLEF - 7.359624)}{5.383804}$	+
T50	$(0.11391774)\ \dfrac{(T50 - 212.245188)}{15.880385}$	}

c. Formaldehyde mass emissions Tech 3 = $y_{\text{Tech 3}}$ =

Description	Equation	
	Exp	
intercept	$\{2.16836424$	+
Aromatic HC	$(-0.07537099)\,\dfrac{(AROM - 30.212969)}{8.682044}$	+
Oxygen	$(0.12278577)\,\dfrac{(OXY - 0.892363)}{1.235405}$	+
Oxygen (as EtOH)[1]	$(-0.12295089)\,(Type)\,\dfrac{(OXY - 0.892363)}{1.235405}$	+
BENZ	$(-0.1423482)\,\dfrac{(BENZ - 1.36412)}{0.513051}$	$\}$

1 — The Oxygen (as EtOH) term is an indicator variable term which is included only in the model prediction for the candidate fuel specifications, and only if the oxygen originates from the use of ethanol. This term is not included in the calculation for the reference fuel specifications because it is assumed that the oxygen from the reference fuel originates from the use of MTBE. Mathematically, this means that the value of Type in the above equation is 1.0 for the prediction for the candidate fuel specifications if ethanol is used, 0 for the prediction for the candidate fuel specifications if ethanol is not used, and 0 for all predictions for reference fuel specifications.

d. Acetaldehyde mass emissions Tech 3 = $y_{Tech\ 3}$ =

Description	Equation	
	Exp	
intercept	{1.10122139	+
Aromatic HC	$(-0.09219416)\ \frac{(AROM - 30.212969)}{8.682044}$	+
Oxygen	$(0.00122983)\ \frac{(OXY - 0.892363)}{1.235405}$	+
Oxygen (as EtOH)[1]	$(0.54678495)\ (Type)\ \frac{(OXY - 0.892363)}{1.235405}$	}

where

SULFUR, AROM, OLEF, OXYGEN, T50, and T90 are the value limits for the candidate and reference specifications identified in the Table 7 worksheet.

1 — The Oxygen (as EtOH) term is an indicator variable term which is included only in the model prediction for the candidate fuel specifications, and only if the oxygen originates from the use of ethanol. This term is not included in the calculation for the reference fuel specifications because it is assumed that the oxygen from the reference fuel originates from the use of MTBE. Mathematically, this means that the value of Type in the above equation is 1.0 for the prediction for the candidate fuel specifications if ethanol is used, 0 for the prediction for the candidate fuel specifications if ethanol is not used, and 0 for all predictions for reference fuel specifications.

2. Mass Emissions for Tech 4

The mass emissions for each toxic for Tech 4 are calculated as follows:

a. Benzene mass emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{2.3824773	+
	Exp	
intercept	{2.3824773	+
RVP	~~(0.07392876)~~ *(-0.04782469)*	+
Sulfur	(0.09652526) $\left(\frac{\text{SULFUR} - 154.120828}{136.790450}\right)$	+
Aromatic HC	(0.15517085) $\left(\frac{\text{AROM} - 27.317137}{6.880833}\right)$	+
Olefin	(-0.02548759) $\left(\frac{\text{OLEF} - 6.549450}{4.715345}\right)$	+
T50	(0.04666208) $\left(\frac{\text{T50} - 205.261051}{17.324472}\right)$	+
BENZ	(0.11689441) $\left(\frac{\text{BENZ} - 1.014259}{0.537392}\right)$	}

b. 1,3-Butadiene mass emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{0.43090426	+
Aromatic HC	$(-0.03604344)\,\dfrac{(\text{AROM} - 27.317137)}{6.880833}$	+
Olefin	$(0.10354089)\,\dfrac{(\text{OLEF} - 6.549450)}{4.715345}$	+
Oxygen	$(-0.02511374)\,\dfrac{(\text{OXY} - 1.536017)}{1.248887}$	+
T50	$(0.03707822)\,\dfrac{(\text{T50} - 205.261051)}{17.324472}$	+
T90	$(0.09454201)\,\dfrac{(\text{T90} - 310.931422)}{20.847425}$	+
BENZ	$(0.03644387)\,\dfrac{(\text{BENZ} - 1.01425)}{0.537392}$	}

c. Formaldehyde mass emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{1.05886661	+
Sulfur	$(-0.04135075)\,\dfrac{(SULFUR - 154.120828)}{136.790450}$	+
Aromatic HC	$(-0.05466283)\,\dfrac{(AROM - 27.317137)}{6.880833}$	+
Oxygen	$(0.06370091)\,\dfrac{(OXY - 1.536017)}{1.248887}$	+
Oxygen (as EtOH)[1]	$(-0.09819814)\,(Type)\,\dfrac{(OXY - 1.536017)}{1.248887}$	+
T90	$(0.06037698)\,\dfrac{(T90 - 310.981422)}{20.847425}$	}

1 — The Oxygen (as EtOH) term is an indicator variable term which is included only in the model prediction for the candidate fuel specifications, and only if the oxygen originates from the use of ethanol. This term is not included in the calculation for the reference fuel specifications because it is assumed that the oxygen from the reference fuel originates from the use of MTBE. Mathematically, this means that the value of Type in the above equation is 1.0 for the prediction for the candidate fuel specifications if ethanol is used, 0 for the prediction for the candidate fuel specifications if ethanol is not used, and 0 for all predictions for reference fuel specifications.

d. Acetaldehyde mass emissions Tech 4 = $y_{\text{Tech 4}}$ =

Description	Equation	
	Exp	
intercept	{0.16738341	+
Sulfur	$(0.02788263)\ \dfrac{(\text{SULFUR} - 154.120828)}{136.790450}$	+
Aromatic HC	$(-0.05552641)\ \dfrac{(\text{AROM} - 27.317137)}{6.880833}$	+
Oxygen	$(0.02382123)\ \dfrac{(\text{OXY} - 1.536017)}{1.248887}$	+
Oxygen (as EtOH)[1]	$(0.46699012)\ (\text{Type})\ \dfrac{(\text{OXY} - 1.536017)}{1.248887}$	+
T50	$(0.04314573)\ \dfrac{(\text{T50} - 205.261051)}{17.324472}$	+
T90	$(0.06252964)\ \dfrac{(\text{T90} - 310.931422)}{20.847425}$	+
BENZ	$(0.06148653)\ \dfrac{(\text{BENZ} - 1.014259)}{0.537392}$	}

where

SULFUR, AROM, OLEF, OXYGEN, T50, and T90 are the values for the candidate and reference specifications in the Table 7 worksheet.

1 — The Oxygen (as EtOH) term is an indicator variable term which is included only in the model prediction for the candidate fuel specifications, and only if the oxygen originates from the use of ethanol. This term is not included in the calculation for the reference fuel specifications because it is assumed that the oxygen from the reference fuel originates from the use of MTBE. Mathematically, this means that the value of Type in the above equation is 1.0 for the prediction for the candidate fuel specifications if ethanol is used, 0 for the prediction for the candidate fuel specifications if ethanol is not used, and 0 for all predictions for reference fuel specifications.

3. **Mass Emissions for Tech 5**

The mass emissions for each toxic for Tech 5 are calculated as follows:

a. Benzene mass emissions Tech 5 = $y_{\text{Tech 5}}$ =

Description	Equation	
	Exp	
intercept	{2.3824773	+
RVP	~~(0.06514198)~~ *(-0.04214049)*	+
Sulfur	$(0.09652526)\,\left(\frac{SULFUR - 144.628901}{140.91224}\right)$	+
Aromatic HC	$(0.15517085)\,\left(\frac{AROM - 26.875944}{6.600312}\right)$	+
Olefin	$(-0.02548759)\,\left(\frac{OLEF - 6.251891}{4.431845}\right)$	+
T50	$(0.04666208)\,\left(\frac{T50 - 206.020870}{16.582090}\right)$	+
BENZ	$(0.11689441)\,\left(\frac{BENZ - 0.969248}{0.504325}\right)$	}

b. 1,3-Butadiene mass emissions Tech 5 = $y_{\text{Tech 5}}$ =

Description	Equation	
	Exp	
intercept	{0.43090426	+
Aromatic HC	$(-0.03604344)\left(\frac{\text{AROM} - 26.875944}{6.600312}\right)$	+
Olefin	$(0.10354089)\left(\frac{\text{OLEF} - 6.251891}{4.431845}\right)$	+
Oxygen	$(-0.02511374)\left(\frac{\text{OXY} - 1.551772}{1.262823}\right)$	+
T50	$(0.03707822)\left(\frac{\text{T50} - 206.020870}{16.582090}\right)$	+
T90	$(0.09454201)\left(\frac{\text{T90} - 310.570200}{22.967591}\right)$	+
BENZ	$(0.03644387)\left(\frac{\text{BENZ} - 0.969248}{0.504325}\right)$	}

c. Formaldehyde mass emissions Tech 5 = $y_{\text{Tech 5}}$ =

Description	Equation	
	Exp	
intercept	{1.05886661	+
Sulfur	$(-0.04135075)\ \dfrac{(SULFUR - 144.628901)}{140.91224}$	+
Aromatic HC	$(-0.05466283)\ \dfrac{(AROM - 26.875940)}{6.600312}$	+
Oxygen	$(0.06370091)\ \dfrac{(OXY - 1.551772)}{1.262823}$	+
Oxygen (as EtOH)[1]	$(-0.09819814)\ (Type)\ \dfrac{(OXY - 1.551772)}{1.262823}$	+
T90	$\cancel{(0.000000)}\ \underline{\mathit{(0.06037698)}}\ \dfrac{(T90 - 310.570200)}{22.967591}$	}

1 — The Oxygen (as EtOH) term is an indicator variable term which is included only in the model prediction for the candidate fuel specifications, and only if the oxygen originates from the use of ethanol. This term is not included in the calculation for the reference fuel specifications because it is assumed that the oxygen from the reference fuel originates from the use of MTBE. Mathematically, this means that the value of Type in the above equation is 1.0 for the prediction for the candidate fuel specifications if ethanol is used, 0 for the prediction for the candidate fuel specifications if ethanol is not used, and 0 for all predictions for reference fuel specifications.

d. Acetaldehyde mass emissions Tech 5 = $y_{\text{Tech 5}}$ =

Description	Equation	
	Exp	
intercept	{0.16738341	+
Sulfur	$(0.02788263)\left(\frac{SULFUR - 144.628901}{140.91224}\right)$	+
Aromatic HC	$(-0.05552641)\left(\frac{AROM - 26.875944}{6.600312}\right)$	+
Oxygen	$(0.02382123)\left(\frac{OXY - 1.551772}{1.262823}\right)$	+
Oxygen (as EtOH)[1]	$\cancel{(0.046699012)}$ *(0.46699012)* $(Type)\left(\frac{OXY - 1.551772}{1.262823}\right)$	+
T50	$(0.04314573)\left(\frac{T50 - 206.020870}{16.582090}\right)$	+
T90	$(0.06252964)\left(\frac{T90 - 310.570200}{22.967591}\right)$	+
BENZ	$(0.06148653)\left(\frac{BENZ - 0.969248}{0.504325}\right)$	}

where

SULFUR, AROM, OLEF, OXYGEN, T50, and T90 are the values for the candidate and reference specifications in the Table 7 worksheet.

1 — The Oxygen (as EtOH) term is an indicator variable term which is included only in the model prediction for the candidate fuel specifications, and only if the oxygen originates from the use of ethanol. This term is not included in the calculation for the reference fuel specifications because it is assumed that the oxygen from the reference fuel originates from the use of MTBE. Mathematically, this means that the value of Type in the above equation is 1.0 for the prediction for the candidate fuel specifications if ethanol is used, 0 for the prediction for the candidate fuel specifications if ethanol is not used, and 0 for all predictions for reference fuel specifications.

B. Computation of Total Potency-Weighted Exhaust Toxics Emissions

1. Calculation of Potency-weighted Exhaust Toxics Emissions for Candidate Specifications

$EX_{PWT\text{-}CAND}$ =

$$\{((y_{BZ\text{-}TECH3} \times TWF_3)+(y_{BZ\text{-}TECH4} \times TWF_4)+(y_{BZ\text{-}TECH5} \times TWF_5))x(PWF_{BZ})\} +$$

$$\{((y_{BD\text{-}TECH3} \times TWF_3)+(y_{BD\text{-}TECH4} \times TWF_4)+(y_{BD\text{-}TECH5} \times TWF_5))x(PWF_{BD})\} +$$

$$\{((y_{FOR\text{-}TECH3} \times TWF_3)+(y_{FOR\text{-}TECH4} \times TWF_4)+(y_{FOR\text{-}TECH5} \times TWF_5))x(PWF_{FOR})\} +$$

$$\{((y_{ACE\text{-}TECH3} \times TWF_3)+(y_{ACE\text{-}TECH4} \times TWF_4)+(y_{ACE\text{-}TECH5} \times TWF_5))x(PWF_{ACE})\}$$

where

$EX_{PWT\text{-}CAND}$ is the PWT emissions for the candidate specifications.

$y_{BZ\text{-}TECH}$ is the benzene emissions prediction for Tech 3, Tech 4, or Tech 5,
$y_{BD\text{-}TECH}$ is the 1,3-butadiene emissions prediction for Tech 3, Tech 4, or Tech 5,
$y_{FOR\text{-}TECH}$ is the formaldehyde emissions prediction for Tech 3, Tech 4, or Tech 5,
$y_{ACE\text{-}TECH}$ is the acetaldehyde emissions prediction for Tech 3, Tech 4, or Tech 5.

TWF_3, **TWF_4**, and **TWF_5** are the toxics weighting factors for Tech class 3, Tech class 4, and Tech class 5 vehicles, respectively. These values are shown in Table 5.

PWF_q is the potency weighting factor for toxic pollutant q provided in Table 8.

2. Calculation of Potency-Weighted Emissions for Reference Specifications

$EX_{PWT\text{-}REF}$ =

$$\{((y_{BZ\text{-}TECH3} \times TWF_3)+(y_{BZ\text{-}TECH4} \times TWF_4)+(y_{BZ\text{-}TECH5} \times TWF_5))x(PWF_{BZ})\} +$$

$$\{((y_{BD\text{-}TECH3} \times TWF_3)+(y_{BD\text{-}TECH4} \times TWF_4)+(y_{BD\text{-}TECH5} \times TWF_5))x(PWF_{BD})\} +$$

$$\{((y_{FOR\text{-}TECH3} \times TWF_3)+(y_{FOR\text{-}TECH4} \times TWF_4)+(y_{FOR\text{-}TECH5} \times TWF_5))x(PWF_{FOR})\} +$$

$$\{((y_{ACE\text{-}TECH3} \times TWF_3)+(y_{ACE\text{-}TECH4} \times TWF_4)+(y_{ACE\text{-}TECH5} \times TWF_5))x(PWF_{ACE})\}$$

where

EX $_{PWT\text{-}REF}$ is the PWT emissions for the reference specifications.

y $_{BZ\text{-}TECH}$ is the benzene emissions prediction for Tech 3, Tech 4, or Tech 5,
y $_{BD\text{-}TECH}$ is the 1,3-butadiene emissions prediction for Tech 3, Tech 4, or Tech 5,
y $_{FOR\text{-}TECH}$ is the formaldehyde emissions prediction for Tech 3, Tech 4, or Tech 5,
y $_{ACE\text{-}TECH}$ is the acetaldehyde emissions prediction for Tech 3, Tech 4, or Tech 5.

TWF_3, **TWF_4**, and **TWF_5** are the toxics_weighting factors for Tech class 3, Tech class 4, and Tech class 5 vehicles, respectively. These values are shown in Table 5.

PWF_q is the potency-weighting factor for toxic pollutant q provided in Table 8.

VIII. CALCULATIONS FOR CHANGES IN EVAPORATIVE HYDROCARBON (HC) EMISSIONS

A. Evaporative HC Emissions by Process

The evaporative HC *emissions* models predict the percent change in evaporative HC emissions as a function of RVP in psi, relative to a reference fuel's RVP. As stated in Table 1, the RVP of the reference fuel is 7.0 psi for an ethanol blended candidate fuel or 6.9 psi for a non-oxygenated candidate fuel. Thus, the models predict the percent change in evaporative HC emissions of the candidate fuel relative to a particular reference fuel. There are three evaporative HC *emissions* models for each type of candidate fuel, i.e., oxygenated (ethanol) and non-oxygenated candidate fuels. The three HC models are for each of the following three evaporative emissions processes: 1) Diurnal/Resting Loss Emissions, 2) Hot Soak Emissions, and 3) Running Loss Emissions.

1. Diurnal/Resting Loss Emissions

a. The predicted percent change in Diurnal/Resting Loss Emissions (% CE_{DIRES}) of an oxygenated candidate fuel is:

$$\% \mathbf{CE}_{DIRES} = \frac{100 \times [43.589427 + (3.730921 \times RVP)]}{[34.535116 + (3.730921 \times 7.0)]} - 100$$

where RVP is the RVP of the candidate fuel.

b. The predicted percent change in Diurnal/Resting Loss Emissions (% $\mathbf{CE}_{DIRES}$) of a non-oxygenated candidate fuel is:

$$\% \mathbf{CE}_{DIRES} = \frac{100 \times [34.535116 + (3.730921 \times RVP)]}{[34.535116 + (3.730921 \times 6.9)]} - 100$$

where RVP is the RVP of the candidate fuel.

2. Hot Soak Emissions

a. The predicted percent change in Hot Soak Emissions (% CE_{HS}) of an oxygenated candidate fuel is:

$$\% \mathbf{CE}_{HS} = \frac{100 \times [10.356585 + (4.369978 \times RVP)]}{[9.228675 + (4.369978 \times 7.0)]} - 100$$

where RVP is the RVP of the candidate fuel.

b. The predicted percent change in Hot Soak Emissions (% $\mathbf{CE}_{HS}$) of a non-oxygenated candidate fuel is:

$$\% \mathbf{CE}_{HS} = \frac{100 \times [9.228675 + (4.369978 \times RVP)]}{[9.228675 + (4.369978 \times 6.9)]} - 100$$

where RVP is the RVP of the candidate fuel.

3. Running Loss Emissions

a. The predicted percent change in Running Loss (% $\mathbf{CE}_{RL}$) of an oxygenated candidate fuel is:

$$\% \mathbf{CE}_{RL} = \frac{100 \times [42.517912 + (9.744935 \times RVP)]}{[40.567912 + (9.744935 \times 7.0)]} - 100$$

where RVP is the RVP of the candidate fuel.

b. The predicted percent change in Running Loss (% $\mathbf{CE}_{RL}$) of a non-oxygenated candidate fuel is:

$$\% \mathbf{CE}_{RL} = \frac{100 \times [40.567912 + (9.744935 \times RVP)]}{[40.567912 + (9.744935 \times 6.9)]} - 100$$

where RVP is the RVP of the candidate fuel.

IX. EVAPORATIVE BENZENE EMISSIONS CALCULATIONS

A. Evaporative Benzene Emissions by Process

The evaporative benzene models predict the evaporative benzene emissions (in units of milligrams per mile) as a function of RVP, gasoline benzene content, and gasoline MTBE content (for Hot Soak Benzene Emissions). There are three evaporative benzene models, one for each of the following three processes of evaporative benzene emissions: 1) Diurnal/Resting Loss Emissions, 2) Hot Soak Emissions, and 3) Running Loss Emissions.

1. Diurnal/Resting Loss Emissions

The predicted Diurnal/Resting Loss Benzene Emissions ($EVBenz_{DIRES}$) of an ethanol containing fuel is calculated as follows:

$$EVBenz_{DIRES} = \{592 \times [(3.730921 \times RVP + 43.589427) \times 907.18 / 939430)] \times [(0.0294917804 \times Benz) - (0.0017567009 \times Benz \times RVP)]\}$$

The predicted Diurnal/Resting Loss Benzene Emissions ($EVBenz_{DIRES}$) of a non-ethanol containing fuel is calculated as follows:

$$EVBenz_{DIRES} = \{592 \times [(3.730921 \times RVP + 34.535116) \times 907.18 / 939430)] \times [(0.0294917804 \times Benz) - (0.0017567009 \times Benz \times RVP)]\}$$

where

$EVBenz_{DIRES}$ is the predicted evaporative Diurnal/Resting Loss benzene emissions and is calculated for both the reference and candidate fuel specifications,

Benz is the benzene content of the gasoline, in percent by volume, and

RVP is the RVP of the gasoline, in psi.

2. Hot Soak Loss Emissions

The predicted Hot Soak Benzene emissions ($EVBenz_{HS}$) is calculated as follows:

$$EVBenz_{HS} = \{592 \times [(4.369978 \times RVP + 10.356585) \times 907.18 / 939430] \times [(0.0463141591 \times Benz) - (0.0027179513 \times Benz \times RVP) - (0.0008184128 \times Benz \times MTBE)]\}$$

The predicted Hot Soak Benzene emissions ($EVBenz_{HS}$) of a non-ethanol containing gasoline is calculated as follows:

$$EVBenz_{HS} = \{592 \times [(4.369978 \times RVP + 9.228675) \times 907.18 / 939430] \times [(0.0463141591 \times Benz) - (0.0027179513 \times Benz \times RVP) - (0.0008184128 \times Benz \times MTBE)]\}$$

where

$EVBenz_{HS}$	is the predicted evaporative Hot Soak benzene emissions and is calculated for both the reference and candidate fuel specifications,
Benz	is the benzene content of the gasoline, in percent by volume,
RVP	is the RVP of the gasoline, in psi, and
MTBE	is the MTBE content of the gasoline, in percent by volume.

3. Running Loss Emissions

The predicted Running Loss Benzene emissions ($EVBenz_{RL}$) of an ethanol containing gasoline is calculated as follows:

$$EVBenz_{RL} = \{592 \times [(9.744935 \times RVP + 42.517912) \times 907.18 / 939430] \times [(0.0648391842 \times Benz) - (0.005622979 \times Benz \times RVP)]\}$$

The predicted Running Loss Benzene emissions ($EVBenz_{RL}$) of a non-ethanol containing gasoline is calculated as follows:

$$EVBenz_{RL} = \{592 \times [(9.744935 \times RVP + 40.567912) \times 907.18 / 939430] \times [(0.0648391842 \times Benz) - (0.005622979 \times Benz \times RVP)]\}$$

where
$EVBenz_{RL}$ is the predicted evaporative Running Loss benzene emissions and is calculated for both the reference and candidate fuel specifications,
Benz is the benzene content of the gasoline, in percent by volume, and
RVP is the RVP of the gasoline, in psi.

X. COMBINATION OF EX~~HAUST~~HC EMISSIONS PREDICTION*S*, EVAPORATIVE HC EMISSIONS PREDICTIONS, AND CO EMISSIONS PREDICTIONS

In combining the model predictions for ~~exhaust~~ *Ex*HC, evaporative HC, and CO emissions, the ozone-forming potential of each of the three processes is recognized. The predicted percent change in emissions for each process is multiplied by a factor which represents, for that process, the ozone-forming potential of the emissions. For purposes of this discussion, this ozone-forming potential value will be referred to as relative reactivity. The predicted percent change for each process is also multiplied by a factor which represents the relative contribution of the process to the total inventory of reactive ozone precursors (HC and CO) from gasoline vehicles. The products of the predicted changes in emissions, relative reactivities, and contribution factors are then added. This sum is then divided by the sum of the products of the individual reactivities and emissions contribution fractions for each process. This quotient represents the percent change in the ozone-forming potential of the candidate fuel specifications relative to the reference fuel specifications.

The predicted percent change in ~~exhaust~~ *Ex*HC emissions is the Tech class-weighted predicted change computed in accordance with the equation shown in Section V.B. For evaporative HC emissions, each of the individual evaporative processes (Diurnal/Resting, Hot Soak, and Running) has a different relative reactivity. Thus, for the evaporative emissions processes, the products of the predicted change in emissions and relative reactivity are computed separately. These three products are included individually in the overall sum. The predicted percent change in the three evaporative HC emissions processes are those computed in accordance with the equations given in Sections VIII.A.1, VIII.A.2, and VIII.A.3. The predicted percent change in CO emissions is the prediction computed in accordance with the equation given in section VI.B.

The combination of the ~~exhaust~~ *Ex*HC, the evaporative HC, and the CO emissions models predictions can be illustrated mathematically as follows: (Note that this calculation is performed only if the applicant selects the compliance option which provides for the use of the evaporative HC emissions models and the CO ~~adjustment factor~~*emissions models*.)

$$\%CE_{OFP} = [(\%CE_{E\cancel{X}xHC} \times R_{E\cancel{X}xHC} \times F_{E\cancel{X}xHC}) + (\%CE_{DIRES} \times R_{DIRES} \times F_{DIRES}) + (\%CE_{HS} \times R_{HS} \times F_{HS}) + (\%CE_{RL} \times R_{RL} \times F_{RL}) + (\%CE_{CO} \times R_{CO} \times F_{CO})] \,/\, [(R_{E\cancel{X}xHC} \times F_{E\cancel{X}xHC}) + (R_{DIRES} \times F_{DIRES}) + (R_{HS} \times F_{HS}) + (R_{RL} \times F_{RL}) + (R_{CO} \times F_{CO})]$$

where

$\%CE_{OFP}$ is the net percent change in ozone-forming potential of the reference fuel specifications relative to the candidate fuel specifications,

$\%CE_{E\cancel{X}xHC}$ is the predicted percent change in Tech-class weighted ~~exhaust~~ *Ex*HC as given by the equation in Section V.B,

$\%CE_{DIRES}$ is the predicted percent change in Diurnal/Resting Loss emissions as given by the equation in Section VIII.A.1,

$\%CE_{HS}$ is the predicted percent change in Hot Soak emissions as given by the equation in Section VIII.A.2,

$\%CE_{RL}$ is the predicted percent change in Running Loss emissions as given by the equation in Section VII*I*.A.3,

$\%CE_{CO}$ is the predicted percent change in CO emissions as given by the equation in Section VI.B, and

the R's are the relative reactivities as shown below in Table 9, and the F's are the fractions of emissions from gasoline vehicles for each process in the year 2015, as given by the ARB's EMFAC2007 motor vehicle emissions model and shown below in Table 10.

Table 9
Relative Reactivity Values

Process	R Value
~~exhaust~~ *Ex*HC	1.00
Diurnal/Resting HC	0.68
Hot Soak HC	0.78
Running Loss HC	0.68
CO	0.015

Table 10
Emissions Fractions

Process	F Value
~~exhaust~~ *Ex*HC	0.0454
Diurnal/Resting HC	0.0174
Hot Soak HC	0.0113
Running Loss HC	0.0310
CO	0.8949

XI. COMBINATION OF EXHAUST TOXICS EMISSIONS PREDICTIONS WITH EVAPORATIVE BENZENE EMISSIONS PREDICTIONS

The Diurnal/Resting Loss, Hot Soak, and Running Loss evaporative benzene predictions are each multiplied by the toxic air contaminant potency-weighting factor for benzene given in Table 8, and then summed to give the total potency-weighted evaporative benzene prediction. This prediction is then added to the total Tech class-weighted, potency-weighted exhaust toxics predictions computed in accordance with the equations given in Section V.B to give the total Tech class-weighted, potency-weighted toxics emissions predictions. The addition is performed for both the candidate fuel and the reference fuel. The combination is shown mathematically below:

A. Total Toxics for the Candidate Fuel Specifications:

Total Potency-Weighted Evaporative Benzene Prediction

$$\mathbf{EVBENZ_{TOT\text{-}CAND} = (EVBENZ_{DIRES\text{-}CAND} + EVBENZ_{HS\text{-}CAND} + EVBENZ_{RL\text{-}CAND}) \times PWF_{BENZ}}$$

Total Potency-Weighted Toxics Prediction

$$E_{PWT\text{-}CAND} = EX_{PWT\text{-}CAND} + EVBENZ_{TOT\text{-}CAND}$$

where

$EVBENZ_{TOT\text{-}CAND}$ is the total potency-weighted evaporative benzene emission prediction for the candidate fuel specifications,

$EVBENZ_{DIRES\text{-}CAND}$ is the diurnal/resting loss benzene emission prediction for the candidate fuel specifications, as given by the equation in Section IX.A.1,

$EVBENZ_{HS\text{-}CAND}$ is the hot soak benzene emission prediction for the candidate fuel specifications, as given by the equation in Section IX.A.2,

$EVBENZ_{RL\text{-}CAND}$ is the running loss benzene emission prediction for the candidate fuel specifications, as given by the equation in Section IX.A.3,

PWF_{BENZ} is the potency-weighting factor for benzene shown in Table 8,

$E_{PWT\text{-}CAND}$ is the total potency-weighted toxics prediction for the candidate fuel specifications, and

$EX_{PWT\text{-}CAND}$ is the total Tech class-weighted, potency-weighted exhaust toxics prediction for the candidate fuel specifications computed in accordance with the equation give in Section VII.B.1.

B. Total Toxics for the Reference Fuel Specifications

Total Potency-Weighted Evaporative Benzene Prediction

$$EVBENZ_{TOT\text{-}REF} = (EVBENZ_{DIRES\text{-}REF} + EVBENZ_{HS\text{-}REF} + EVBENZ_{RL\text{-}REF}) \times PWF_{BENZ}$$

Total Potency-Weighted Toxics Prediction

$$E_{PWT\text{-}REF} = EX_{PWT\text{-}REF} + EVBENZ_{TOT\text{-}REF}$$

where

$EVBENZ_{TOT\text{-}REF}$	is the total potency-weighted evaporative benzene emission prediction for the reference fuel specifications,
$EVBENZ_{DIRES\text{-}REF}$	is the diurnal/resting loss benzene emission prediction for the reference fuel specifications, as given by the equation in Section IX.A.1,
$EVBENZ_{HS\text{-}REF}$	is the hot soak benzene emission prediction for the reference fuel specifications, as given by the equation in Section IX.A.2,
$EVBENZ_{RL\text{-}REF}$	is the running loss benzene emission prediction for the reference fuel specifications, as given by the equation in Section IX.A.3,
PWF_{BENZ}	is the potency-weighting factor for benzene shown in Table 8
$E_{PWT\text{-}REF}$	is the total potency-weighted toxics prediction for the reference fuel specifications, and
$EX_{PWT\text{-}REF}$	is the total Tech class-weighted, potency-weighted exhaust toxics prediction for the reference fuel specifications computed in accordance with the equation give in Section VII.B.2.

C. Calculation of the Percent Change in Total Predicted Toxics Emissions

The percent change in the total predicted toxics emissions between the candidate fuel specifications and the reference fuel specification is calculated as follows:

$$\%CE_{PWT} = \left[(E_{PWT\text{-}CAND} - E_{PWT\text{-}REF}) / E_{PWT\text{-}REF}\right] \times 100$$

XII. DETERMINATION OF ACCEPTABILITY

If, for each pollutant (NOx, Ozone-forming Potential (OFP) or exhaust HC (ExHC), and Potency-Weighted Toxics (PWT)), the percent difference in emissions between the candidate fuel specifications and the reference Phase 3 RFG specifications is equal to or less than 0.04%, the candidate specifications are deemed acceptable as an alternative to Phase 3 RFG. If the applicant ~~selects the compliance option which provides for the use of the evaporative HC emissions models~~ *uses, or is required to use, the THC Model*, the candidate fuel specifications must pass for NOx, OFP, and PWT to be acceptable as an alternative Phase 3 RFG formulation. If the applicant ~~does not select the compliance option which provides for the use of the evaporative HC emissions models~~ *uses, or is required to use the ExHC Model*, the candidate fuel specifications must pass for NOx, E~~X~~*x*HC, and PWT to be acceptable as an alternative Phase 3 RFG formulation.

These criteria are mathematically shown below.

Applicant ~~Elects to Use the Evaporative HC Emissions Model Compliance Option During the RVP Control Season~~ *uses, or is required to use, the THC Model for RVP-Controlled Gasoline*

$\%CE_{NOx} \leq 0.04\%$, and
$\%CE_{OFP} \leq 0.04\%$, and
$\%CE_{PWT} \leq 0.04\%$.

Applicant ~~Elects not to Use the Evaporative HC Emissions Model Compliance Option During the RVP Control Season, or Outside of the RVP Control Season~~ *uses, or is required to use, the ExHC Model for non-RVP-Controlled Gasoline*

$\%CE_{NOx} \leq 0.04\%$, and
$\%CE_{E\cancel{X}xHC} \leq 0.04\%$, and
$\%CE_{PWT} \leq 0.04\%$.

where

$\%CE_{NOx}$	is given by the equation in Section IV.B,
$\%CE_{OFP}$	is given by the equation in Section X,
$\%CE_{E\cancel{X}xHC}$	is given by the equation in Section V.B, and
$\%CE_{PWT}$	is given by the equation in Section XI.C.

If the percent change in emission between the candidate specifications and the reference Phase 3 RFG specifications is equal to or greater than 0.05% for any pollutant (NOx, OFP, E~~X~~*x*HC, PWT) in the above equivalency criteria, then the candidate specifications are deemed unacceptable and may not be a substitute for Phase 3 RFG. [Note: All final values of the percent change in emissions shall be reported to the nearest hundredth using conventional rounding.]

If the candidate specifications are deemed acceptable, the property values and the compliance options of the candidate specifications become the property values and compliance options for the alternative gasoline formulation.

XIII. NOTIFICATION OF INTENT TO OFFER AN ALTERNATIVE GASOLINE FORMULATION

A producer or importer intending to sell or supply an alternative gasoline formulation of California gasoline from its production facility or import facility shall notify the executive officer in accordance with 13 CCR, section 2265(a).

Table 11, Alternative Specifications for Phase 3 RFG Using the California Predictive Model Notification, has been provided as an example of the minimum information required.

Table 11
Alternative Specifications for Phase 3 RFG
Using California Predictive Model Notification

Name of Producer/Importer:________________Facility Location:
Name of Person Reporting:____________________Telephone No:
Date/Time of This Report:___________ I.D. of 1st Batch with this Specification:
Notification Date: *Notification Time:*
Start Production Date: *Start Production Time:*
Batch Number: *Tank Number:*

- All California gasoline transferred from this facility will meet the specifications listed below until the next Alternative Specifications report to the ARB.
- Fuel properties that will be averaged will be reported as the "Designated Alternative Limit and Volume of Gasoline Report" separately to the ARB.

~~Compliance Option (check one): Evap. Option~~______~~Exhaust-Only Option~~
Type of gasoline (check one):
____ *RVP-controlled gasoline; using the THC Model*
____ *non-RVP-controlled gasoline; using the ExHC Model*

Fuel Property	**Candidate Fuel Property Value**	**Compliance Option:**	**Reference Fuel: Phase 3 RFG Property Value**	
			Flat	**Average**
RVP		**Flat**	**6.90/7.00**	**None**
Sulfur			**20**	**15**
Benzene			**0.80**	**0.70**
Aromatic HC			**25.0**	**22.0**
Olefin			**6.0**	**4.0**
Oxygen[1]	**(min.)**	**Flat Range**	**(min.)**	**None**
	(max.)		**(max.)**	
T50			**213**	**203**
T90			**305**	**295**

1- See Table 6 in the Predictive Model Procedures for the specification of candidate and reference oxygen levels.

Pollutant[2]	**Percent Change in Emissions[3]**
Oxides of Nitrogen	
OFP or ~~Exhaust~~ *Ex*HC	
Potency-Weighted Toxics	

2- Where Applicable, a %CE must be reported for both the candidate fuel minimum and maximum oxygen specifications. See Table 6 for explanation of when both %CE's must be reported.

3- Percent change calculated using equations presented in sections IV.B, V.B, VI.B, and X of the Phase 3 Predictive Model Procedures Document.

Table 12
Standardization of Fuel Properties - Mean and Standard Deviation

Fuel Property	Tech 3		Tech 4		Tech 5	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
RVP	8.670892	0.635066	8.365415	0.8894114	8.221700	0.902838
Sulfur	139.691080	126.741459	154.120828	136.790450	144.628901	140.912204
Aromatic HC	30.212969	8.682044	27.317137	6.880833	26.875944	6.600312
Olefin	7.359624	5.383804	6.549450	4.715345	6.251891	4.431845
Oxygen	0.892363	1.235405	1.536017	1.248887	1.551772	1.262623
T50	212.245188	15.880385	205.261051	17.324472	206.020870	16.582090
T90	312.121596	23.264684	310.931422	20.847425	310.570200	22.967591
Benzene	1.36412	0.513051	1.014259	0.537392	*(0.969248)* ~~1.014259~~	*(0.504325)* ~~0.537392~~

Table 13
Coefficients for NOx, ~~Exhaust~~ *Ex*HC, and CO Equations

Model Term	Tech 3			Tech 4			Tech 5		
	NOx	HC	CO	NOx	HC	CO	NOx	HC	CO
Intercept	-0.159800	-0.752270	1.615613	-0.634694	-1.142182	1.195246	-1.599255	-2.671187	-0.240521
RVP	0.0424915	0.000013	0.012087	-0.007046	-0.019335	-0.025878	-0.000533	-0.012824	-0.014137
Sulfur	0.028040	0.038207	0.031849	0.051043	0.079373	0.073616	0.947915	0.242238	0.123649
Aromatic HC	0.047060	0.014103	0.085541	0.011366	0.002047	0.025960	0.013671	0.003039	0.025775
Olefin	0.021110	-0.016533	0.002416	0.017193	-0.010716	0.001263	0.017335	-0.010908	0.005001
Oxygen	0.014910	-0.026365	-0.068986	0.028711	-0.019880	-0.052530	0.016036	-0.007528	-0.087967
T50	-0.007360	0.015847	0.009897	-0.002431	0.052939	0.022750	0.012397	0.056796	0.018195
T90	0.000654	0.011768	-0.025449	0.002087	0.037684	-0.008820	0.000762	0.010803	-0.128296
T90ARO		0.016606		-0.002892					
T90OLE		-0.007995				-0.007360			
T50T90			0.017463						
T50T50				0.006268	0.017086		-0.022211	0.019563	
OXYOXY				0.010737		-0.016510	0.015199		0.026309
T50ARO					0.019031	0.009884		0.016761	0.009797
T50OXY					0.013724		-0.015564	0.014082	0.021763
T90T90					0.013914	0.007767		0.015216	
AROARO					-0.010999			-0.009740	
AROOXY					0.007221			0.006902	
T90OXY								0.013372	

Table 14
Coefficients for Exhaust Toxics Equations

Model Term	Tech 3			
	Benzene	Butadiene	Formaldehyde	Acetaldehyde
Intercept	2.95676525	0.67173886	2.16836424	1.10122139
RVP (constant)				
Sulfur	0.0683768			
Aromatic HC	0.15191575		-0.07537099	-0.09219416
Olefin		0.18408319		
Oxygen	-0.03295985		0.12278577	0.00122983
Oxygen (as EtOH)			-0.12295089	0.54678495
T50		0.11391774		
T90				
Benzene	*(0.12025037)* ~~-0.12025037~~		-0.1423482	
Model Term	**Tech 4**			
	Benzene	**Butadiene**	**Formaldehyde**	**Acetaldehyde**
Intercept	2.3824773	0.43090426	1.05886661	0.16738341
RVP (constant)	*(-0.04782469)* ~~0.07392876~~			
Sulfur	0.09652526		-0.04135075	0.02788263
Aromatic HC	0.15517085	-0.03604344	-0.05466283	-0.05552641
Olefin	-0.02548759	0.10354089		
Oxygen		-0.02511374	0.06370091	0.02382123
Oxygen (as EtOH)			-0.09819814	0.46699012
T50	0.04666208	0.03707822		0.04314573
T90		0.09454201	0.06037698	0.06252964

Benzene	0.11689441	0.03644387		0.06148653

Model Term	**Tech 5**			
	Benzene	**Butadiene**	**Formaldehyde**	**Acetaldehyde**
Intercept	2.3824773	0.43090426	1.05886661	0.16738341
RVP (constant)	*(-0.04214049)* ~~0.06514198~~			
Sulfur	0.09652526		-0.04135075	0.02788263
Aromatic HC	0.15517085	-0.03604344	-0.05466283	-0.05552641
Olefin	-0.02548759	0.10354089		
Oxygen		-0.02511374	0.06370091	0.02382123
Oxygen (as EtOH)			-0.09819814	0.~~0~~46699012
T50	0.04666208	0.03707822		0.04314573
T90		0.09454201	*(0.06037698)* ~~0.000000~~	0.06252964
Benzene	0.11689441	0.03644387		0.06148653