California Environmental Protection Agency
AIR RESOURCES BOARD

STAFF REPORT:
INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

PUBLIC HEARING TO CONSIDER ADOPTION OF THE REGULATION TO REDUCE GREENHOUSE GAS EMISSIONS FROM HEAVY-DUTY VEHICLES

Mobile Source Control Division
Emission Research and
Regulatory Development Branch

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State of California
AIR RESOURCES BOARD

Initial Statement of Reasons: Proposed Regulation to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles

Public Hearing to Consider

ADOPTION OF PROPOSED REGULATION TO REDUCE GREENHOUSE GAS EMISSIONS FROM HEAVY-DUTY VEHICLES

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California Environmental Protection Agency
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PROPOSED REGULATION TO REDUCDE GREENHOUSE GAS EMISSIONS FROM HEAVY-DUTY VEHICLES

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EXECUTIVE SUMMARY

The State of California has traditionally been a pioneer in efforts to reduce air pollution, dating back to 1963 when the California New Motor Vehicle Pollution Control Board adopted the nation's first motor vehicle emission standards. In 2004, ARB continued its tradition of leadership with the adoption of the first greenhouse gas (GHG) emission reduction measure in the nation, applicable to light-duty vehicles. The staff proposal presented in this Initial Statement of Reasons reduces GHG emissions from another category of motor vehicles that substantially contributes to human GHG emissions: heavy-duty vehicles (HDVs).

Climate Change Overview

While the Earth's natural climate is dynamic and constantly changing, the climate change observed over the last one-and-one-half centuries seems to differ in both its rate and its magnitude. Many sources of data indicate that the Earth is warming faster than at any time in the last millennium. For example, 11 of the last 12 years from 1995 to 2006 rank among the 12 warmest years in instrumental record of global surface temperatures (IPCC, 2007). As the global mean surface temperature increases, significant adverse effects may be observed: decreased water supply, higher sea levels, changed agricultural patterns, altered ecosystems, and worse air quality.

Global temperatures have been linked to the GHG effect, where certain gases in the lower atmosphere absorb radiation released by the Earth's surface that was heated by solar radiation. While the GHG effect is important in maintaining the temperature of the Earth's lower atmosphere, the addition of more GHG emissions into the atmosphere due to human activities may be causing the increase in the average global ambient temperature. Burning of fossil fuels, agriculture, use of refrigeration systems, and other human activities release GHG emissions.

The transportation sector is the largest contributor of human GHG emissions in California: 38 percent of total carbon dioxide equivalent (CO_2e) emissions in 2004. Of this sector, the largest contributing category was that of passenger vehicles at 74 percent of the total transportation CO_2e emissions. The second largest contributing category was that of HDVs, responsible for 20 percent of the total transportation emissions.

Regulatory Authority

The California Global Warming Solutions Act of 2006 (AB 32) established requirements for a comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, and cost-effective reductions of GHG emissions. AB 32 gave ARB responsibility for monitoring and reducing GHG emissions. It requires ARB and other state agencies to adopt regulations and other requirements that would reduce, by 2020, statewide GHG emission levels to the equivalent of 1990 levels. This represents a

reduction of about 25 percent. Further, by Executive Order the Governor has directed that GHG emission levels be reduced to 80 percent below 1990 levels by 2050. The 2020 goal establishes an aggressive, but achievable, mid-term target, and the 2050 goal represents the level scientists believe is necessary to reach in order to stabilize the climate.

To swiftly address GHG reductions in the near-term, AB 32 also directs ARB to identify a list of early action measures to be adopted by the Board and made enforceable by January 1, 2010. In 2007, the Board identified 44 early action measures, consisting of potential regulations affecting motor vehicles, fuels, refrigerant in cars, and many other sources. Included were nine discrete early action measures for which the Board would adopt regulations by the end of 2009. The proposed Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation is one of the nine discrete early action measures.

Federal SmartWay Partnership Program

The proposed regulation references a federal voluntary program called the United States Environmental Protection Agency (U.S. EPA) SmartWay Partnership Program. The U.S. EPA SmartWay Partnership Program aims to improve energy efficiency, reduce GHG and air pollutant emissions, and improve energy security of the ground freight movement system. Under the SmartWay program, U.S. EPA certifies tractors and trailers that have been demonstrated to be more fuel efficient than their traditional counterparts. At this time, there are SmartWay specifications for tractors with sleeper cabs and for 53-foot or longer dry-van trailers, and therefore, only these products can be certified by original equipment manufacturers under the SmartWay program. The SmartWay program also approves individual aerodynamic equipment for trailers and efficient (low-rolling resistance) tires for tractors and trailers.

Regulatory Proposal

The proposed regulation reduces GHG emissions by improving long-haul HDV fuel efficiency. A more efficient HDV uses less fuel, and as a result, emits less GHG emissions. A HDV consists of a heavy-duty tractor (tractor), and a trailer. The proposed regulation requires new and existing long-haul on-road tractors pulling 53-foot or longer box-type trailers and 53-foot and longer box-type trailers pulled by tractors, which operate on California highways, to be equipped with SmartWay approved aerodynamic technologies and low-rolling resistance tires. For purposes of the proposed regulation, a box-type trailer is a dry-van trailer or a refrigerated-van trailer. The proposed regulation does not apply to tractors pulling other types of trailers, e.g., box-type trailers of lengths shorter than 53 feet, or to tractors pulling flatbeds, or logging trailers, drop-frame trailers, curtain-side trailers, or chassis trailers hauling shipping containers. Also exempt from the requirements of the regulation are authorized emergency vehicles and military tactical support vehicles, as well as short-haul and drayage tractors, as defined in the proposal.

Proposed Requirements for Tractors

Beginning January 1, 2010, a 2011 and subsequent model year tractor with a sleeper berth that pulls a 53-foot or longer box-type trailer on a California highway would be required to be a U.S. EPA certified SmartWay tractor. As noted previously, SmartWay does not currently certify a tractor without a sleeper berth, i.e., day cab, and thus, these tractors would not be required to be SmartWay certified. In addition, low-rolling resistance tires that meet U.S. EPA SmartWay specifications would be required beginning January 1, 2010, for a 2011 and subsequent model year tractor regardless of whether it has a sleeper berth or not.

Beginning January 1, 2012, a 2010 and earlier model year tractor with or without a sleeper berth that pulls a 53-foot or longer box-type trailer on a California highway would be required to be equipped with low-rolling resistance tires. This would be the only retrofit requirement for these tractors, and allows most 2010 or earlier model year tractors to use their existing tires for the remainder of their useful life before replacing them with low-rolling resistance tires.

Proposed Requirements for Trailers

Beginning on January 1, 2010, a 2011 and newer 53-foot or longer box-type trailer pulled by a tractor on a California highway would be required to be either (1) a U.S. EPA certified SmartWay trailer or (2) retrofitted with SmartWay approved technologies. The first option, to use a U.S. EPA certified SmartWay trailer, is currently only available for dry-van trailer applications. U.S. EPA has defined specifications for this type of trailer, and several manufacturers have already certified models. For refrigerated-van trailers, the second option, to retrofit with SmartWay approved technologies, would be the available compliance approach. In the future, the SmartWay program may expand to cover refrigerated trailers, as well as other types of trailers, potentially making the first option (above) available for refrigerated trailers.

2010 and earlier model year 53-foot or longer box-type trailers that will be pulled by tractors on California highways would be required to be retrofitted with SmartWay approved technologies by January 1, 2013. The retrofit requirements would be identical to the second option for 2011 and subsequent model year trailers, described above. In lieu of meeting the January 1, 2013 compliance date, the trailer owner could choose to comply with an optional trailer fleet compliance schedule only if it meets the following conditions: (1) submits a compliance plan by the due date, (2) meets its annual commitments for retrofitting trailers, and (3) allows ARB to audit records periodically.

There are two proposed optional trailer fleet compliance schedules that would be based on trailer fleet size: the large fleet compliance schedule and the small fleet compliance schedule. The large fleet compliance schedule would apply to fleets with 21 and greater trailers. A six year phase-in is proposed for large fleets, with the first compliance year starting in 2010 and the last compliance year ending in 2015. For added flexibility, a trailer owner could participate in an early compliance option, in which credit is given for 2010 and earlier model year box-type trailer that are compliant by December 31, 2009. The early compliance credit could be used to delay the retrofit of some affected trailers until 2016.

The small fleet compliance schedule would apply to trailer fleets with 1 to 20 trailers. Compliance would be delayed, beginning in 2013 and completed in 2016.

Also proposed is a delayed compliance provision for refrigerated-van fleets. This provision would apply to 2003 to 2008 model year refrigerated-van trailers equipped with diesel-fueled transport refrigeration units (TRUs). The flexibility proposed for TRUs is because owners of these vehicles will be subjected to another ARB regulation, called the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units and TRU Generator Sets, and Facilities Where TRUs Operate (TRU Rule), which will require replacement or retrofit of the TRU concurrent with the proposed optional compliance schedules. A three year compliance schedule is proposed for these trailers with the first compliance year starting in 2017 and the last compliance year ending in 2019.

Requirements for the Owners, Drivers, Motor Carriers, California-based Brokers, and California-based Shippers

The proposed regulation would establish the following requirements for each of the parties listed below. A notice of violation would be issued to each of the parties listed below if a tractor or trailer subject to the proposed regulation is found to be noncompliant.

- Owners of tractors pulling 53-foot or longer box-type trailers on California highways: Tractor owners would be responsible to ensure that the tractors subject to the proposed regulation comply with the proposed requirements within the proposed compliance schedule. Owners would also need to ensure that aerodynamic devices, if applicable, and low-rolling resistance tires are used and maintained in good operating condition. This would ensure that the SmartWay components are operating as designed.
- Owners of 53-foot or longer box-type trailers pulled by tractors on California highways: Like owners of tractors subject to the proposed regulation, trailer owners would be responsible for ensuring that the applicable trailers comply with the proposed requirements within the proposed compliance schedule, as well as ensuring that the equipment is maintained in good operating condition. Owners of affected trailers would also be required to submit information to ARB if they choose to participate in an optional compliance schedule.
- Drivers of tractors pulling 53-foot or longer box-type trailers on California highways: Drivers would be responsible for ensuring that tractors and trailers to be driven are in compliance with the proposed regulation and meet the proposed good operating condition criteria.
- Motor carriers and California-based brokers that dispatch tractors pulling 53-foot or longer box-type trailers on California highways: Motor carriers and California-based brokers would be responsible for ensuring that the tractors and trailers they dispatch to pick up freight comply with the proposed regulatory requirements.

- California-based shippers that ship freight in 53-foot or longer box-type trailers pulled by tractors on California highways: Shippers would be responsible for ensuring that any freight being picked up at their facility is done so only by compliant tractors and trailers.

Enforcement

ARB enforcement staff would enforce the requirements of the proposed regulation as follows:

- Drivers, owners of tractors and trailers, and motor carriers could receive penalties upon issuance of a notice of violation (NOV) as determined at roadside inspection locations, facility inspections, and audits.

- California-based brokers and California-based shippers would be notified of motor carriers and tractor trailer owners that they have contracted with, that have failed to settle previously issued NOVs. The purpose of this notification would be to give them the opportunity to take the necessary actions to prevent future violations. If, however, ARB enforcement staff finds that the California-based broker or shipper continues to use delinquent motor carriers, tractor owners, or trailer owners, the California-based broker or shipper could be subject to penalties.

Environmental Impact

The statewide GHG emission benefits of the proposed regulation are projected to be 1.0 million metric tons (MMT) of CO_2-equivalent (CO_2e) emissions in 2020. Reductions of GHG emissions would extend beyond the California state borders as California interstate trucks that travel outside California and out-of-state trucks that travel onto California highways are subjected to the proposed regulation. Nationwide benefits of the proposed regulation are projected to be 6.7 MMT of CO_2e emissions in 2020. From 2010 to 2020, the cumulative GHG emission benefits are estimated to be approximately 7.8 MMT CO_2e statewide and 52.1 MMT CO_2e nationwide.

In addition to GHG benefits, reducing aerodynamic drag and rolling resistance will also reduce NOx emissions. Statewide NOx emission reductions are projected to be 4.3 and 1.4 tons per day in 2014 and 2020, respectively.

Economic Impact

The proposed regulation would impact trucking businesses that own tractors and 53-foot or longer box-type trailers subject to the proposed regulation. While compliance with the proposed regulation would require an initial capital cost, it is expected that a cost savings would ultimately result due to the increase in HDV fuel efficiency and the resultant usage of less fuel. The average estimated cost increase for the purchase of a SmartWay certified tractor equipped with aerodynamic devices and low-rolling resistance tires is $2,100 per tractor. The estimated average cost of trailer compliance

for the initial purchase and installation of aerodynamic technologies and low-rolling resistance tires is approximately $2,900 per trailer. In addition, annual maintenance costs for inspection and repair of installed aerodynamic technologies, and replacement and retread costs for low-rolling resistance tires, is estimated to be about $143 for the tractor and $120 for the trailer. Therefore, the initial capital cost for a tractor-trailer combination would average about $5,000, with an annual increased maintenance cost of $263. However, the industry average trailer-to-tractor ratio is estimated to be 2.5-to-1 per owner. This translates into an average cost of $9,200 per owner.

Operating cost savings resulting from the fuel efficiency improvement of compliant tractors and trailers are anticipated to be substantial. A tractor-trailer combination that complies with the proposed regulation is expected to realize a 7 to 10 percent fuel economy gain, depending on the types of tractor and trailer improvements. Assuming this range, the fuel savings would be approximately $4,000 to $5,700 per year for a tractor-trailer combination.[1] The fuel savings due to the proposed requirements would allow the owner to recover the initial capital and maintenance costs for both the tractor and trailer in less than 1.5 years. If an owner had more trailers than tractors, i.e., a trailer-to-tractor ratio of more than one, it would require additional time for the payback of the initial capital costs. Businesses that are required to equip trailers with aerodynamic technologies and low-rolling resistance tires but do not own or operate tractors (including owners of trailer fleets and certain shippers) may not directly recoup initial costs if they do not directly pay for fuel. However, staff anticipates that at least some of the fuel savings from trailers equipped with SmartWay devices and tires will be indirectly shared by trailer owners through price structures that reflect fuel savings associated with these trailers.

The total estimated lifetime equipment cost of complying with the proposed regulation is about $10.4 billion. However, over the same period of time, the total estimated cost (fuel) savings are about $14.7 billion. Therefore, a net savings of approximately $4.3 billion in 2008 dollar values is expected. The total estimated statewide lifetime cost of complying for California based tractors and trailers is about $0.5 billion and the cost savings over the same period of time are $1.1 billion. This yields a net statewide cost savings of almost $0.6 billion. This net cost savings would be realized by fleet operators and owner-operators of compliant tractors and trailers and are directly attributed to operating cost savings associated with improved fuel economy.

Some financial assistance and grant programs are available to aid tractor and trailer owners in complying with the proposed requirements. These programs are available through the federal, state, and local governments; they provide technical assistance, loans for the purchase of fuel savings and emissions reducing vehicles and technologies, and grants to assist eligible partners to adopt diesel emissions reduction

[1] The assumptions for this calculation are as follows: a baseline fuel economy of 5.8 miles per gallon, an average long-haul mileage accrual rate of 125,000 miles per year, 84 percent of the vehicle miles traveled at highway speed benefit fully from the aerodynamic devices, and a projected diesel fuel cost of $3.14 per gallon. If the cost per gallon in diesel fuel is higher than $3.14, the fuel savings due to the proposed regulation would be proportionately greater.

strategies. In particular, in California, $48 million has been appropriated to fund a heavy-duty vehicle air quality loan guarantee program (anticipated loan values of $300 million) to encourage early compliance by on-road fleets affected by this proposed regulation and the proposed In-Use Truck and Bus Regulation (particulate matter and NOx reduction). In developing this air quality loan program, ARB staff is currently coordinating with the State Treasurer's Office and private sector banks to tailor a program to meet the specific needs of the heavy-duty vehicle sector.

Staff Recommendation

ARB staff recommends that the Board adopt the regulation as proposed in the Initial Statement of Reasons. The proposed regulation is intended to achieve feasible and cost-effective GHG emissions from HDVs.

I. INTRODUCTION AND OVERVIEW

A. Introduction

The mission of the California Air Resources Board (ARB or Board) 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, 2002). ARB's vision is that all individuals in California, especially children and the elderly, can live in a healthful environment – free from harmful exposure and the effects of air pollution. To this end, staff is proposing a regulation to reduce greenhouse gas (GHG) emissions from long-haul heavy-duty vehicles (HDVs). These HDVs are commonly used for freight transport and consist of a heavy-duty tractor (tractor), and a trailer. The proposed regulation affects 53-foot or longer box-type trailers and the tractors that pull them, when operating on California highways.

B. Overview

The proposed regulation would reduce GHG emissions by requiring new and existing on-road tractors and trailers to be equipped with technologies that improve fuel efficiency and reduce GHG and oxides of nitrogen (NOx) emissions, when operating on California highways. The proposed regulation references a federal voluntary program, called the United States Environmental Protection Agency (U.S. EPA) SmartWay Transport Partnership, which is designed to improve the environmental performance associated with the overall ground freight delivery system in the United States. In particular, the program "certifies" or approves technologies, such as aerodynamic equipment and low-rolling resistance tires that reduce GHG emissions and improve fuel efficiency of HDVs. Currently, the federal program is limited to HDVs equipped with sleeping berths pulling 53-foot and longer box-type trailers.

The proposal would require the use of aerodynamic equipment and low-rolling resistance tires beginning January 1, 2010. Certain types of HDVs will be exempted from the proposed regulatory requirements, including short-haul trucks and drayage trucks.

Compliance with these requirements would be mandatory for those parties that use the applicable tractor and trailer to transport freight, including the owner, driver, motor carrier, California-based broker, and California-based shipper. These requirements would pertain to all applicable tractors and trailers that operate on California highways regardless of where the vehicles are domiciled.

The statewide GHG emission benefits of the proposed regulation are projected to be 1.0 million metric tons of carbon dioxide equivalent (MMT CO_2e)[2] emissions in 2020. In

[2] Carbon dioxide equivalent (CO_2e) is a metric measure used to compare the emissions from various GHGs based upon their global warming potential. Global warming potential (GWP) is the index used to translate the level of emissions of various gases into a common measure in order to compare the relative radiative forcing of different gases without directly calculating the changes in atmospheric concentrations. GWPs are calculated as the ratio of the radiative forcing that would result from the emissions of one kilogram of a GHG to that from

addition to GHG benefits, reducing aerodynamic drag and rolling resistance will also reduce NOx emissions. Statewide NOx emission reductions are projected to be 4.3 and 1.4 tons per day in 2014 and 2020, respectively.

The proposed regulation would impact trucking businesses that own tractors and 53-foot or longer box-type trailers subject to the proposed regulation. While compliance with the proposed regulation would require an initial up-front capital cost, fuel savings will more than offset the initial cost. The initial capital cost for a tractor-trailer combination would average about $5,000 with an annual increased maintenance cost of $263.

Operating cost savings resulting from the fuel efficiency improvement of compliant tractors and trailers is anticipated to be substantial. Fuel savings for a compliant tractor-trailer combination are expected to be 7 to 10 percent. Thus, fuel savings would be approximately $4,000 to $5,700 per year.[3] The fuel savings due to the proposed requirements would allow the owner to recover the initial capital and maintenance costs for both the tractor and trailer in less than 1.5 years. If an owner had more trailers than tractors, i.e., a trailer to tractor ratio of more than one, it would require additional time for the payback of the initial capital costs. Owners of only trailers would not benefit directly from fuel savings.

The total estimated statewide lifetime cost of complying with the proposed regulation is about $10.4 billion. However, over the same period of time, the total estimated fuel cost savings is about $14.7 billion. Therefore, a net savings of approximately $4.3 billion in 2008 dollar values is expected.

II. REGULATORY AUTHORITY

A. Summary of Regulatory Authority

California first addressed climate change in 1988 with the passage of AB 4420 directing the California Energy Commission, in consultation with ARB and other agencies, to study global warming impacts to the state and develop an inventory of GHG emission sources. Since then, many other pieces of legislation have been passed to continue to research global warming impacts, to establish and update GHG emission inventories, and to develop mitigation efforts. In particular, AB 1493, signed on July 22, 2002, required ARB to develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of GHGs from light-duty vehicles. This resulted in the first

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emission of one kilogram of CO_2 over a period of time (usually 100 years). For example, the GWP of CO_2, methane, and nitrous oxide is 1, 21, and 310, respectively. CO_2 equivalents are commonly expressed as "million metric tons of carbon dioxide equivalents (MMT CO_2e)".

[3] The assumptions for this calculation are as follows: a baseline fuel economy of 5.8 miles per gallon, an average long-haul mileage accrual rate of 125,000 miles per year, 84 percent of the vehicle miles traveled at highway speed benefit fully from the aerodynamic devices, and a projected diesel fuel cost of $3.14 per gallon. If the cost per gallon of diesel fuel is higher than $3.14, the fuel savings due to the proposed regulation would be proportionately greater.

regulation in the nation, adopted by ARB in September 2004, to control GHG emissions from motor vehicles.

In 2006, the California Global Warming Solutions Act of 2006 (AB 32) was signed into law, creating a comprehensive, multi-year program to reduce GHG emissions in California (Nunez, 2002). It calls for the reduction of GHG emissions to 1990 levels by the year 2020, a reduction of about 25 percent. In addition, the Governor issued an Executive Order directing state agencies to reduce GHG emissions to 80 percent below 1990 levels by 2050. The 2020 goal establishes an aggressive, but achievable, mid-term target, while the 2050 goal represents the level scientists believe must be reached in order to stabilize the climate.

To swiftly address GHG reductions in the near-term, one requirement of AB 32 directed ARB to identify a list of early action measures that could be adopted by the Board by January 1, 2011. In 2007, the Board identified 44 such early action measures including potential regulations affecting motor vehicles, fuels, refrigerant in cars, and many other sources, including nine "discrete" early action measures, which would be adopted and enforceable by January 1, 2010 (ARB, 2007). The proposed Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Measure is one of these discrete early action measures.

III. PUBLIC OUTREACH AND ENVIRONMENTAL JUSTICE

A. Public Outreach Efforts

During the development of the regulatory proposal, ARB staff conducted numerous outreach efforts to inform affected parties of the proposal and to obtain stakeholder comments. Outreach efforts included public workshops, individual meetings, and email and telephone contacts.

1. Public Workshops

Three separate series of workshops were conducted jointly with another regulatory proposal, the In-use On-road Heavy-duty Diesel-fueled Vehicle Regulation (Truck and Bus Rule). The first series, held in January and February 2008, consisted of ten workshops in eight locations throughout California. The second series, held in May and June 2008, included twelve workshops in eight California locations. The third series, held in July and August 2008, included eleven workshops in eight locations throughout California. In addition, staff conducted two series of independent workshops focused exclusively on the proposed regulation, one in June 2008 and the other in July and August 2008. Table III-1 provides a listing of the dates, times and locations of the workshops.

Table III-1: Public Workshop Dates, Locations and Times

Date	Location	Time
January 28, 2008	Sacramento	Day

January 30, 2008	Fresno	Day
January 31, 2008	El Monte	Day
January 31, 2008	Riverside	Evening
February 4, 2008	San Diego	Day
February 4, 2008	El Centro	Evening
February 6, 2008	Redding	Day
February 6, 2008	Redding	Evening
February 11, 2008	Berkeley	Day
February 11, 2008	Berkeley	Evening
May 21, 2008	El Monte	Day
May 27, 2008	San Diego	Day
May 27, 2008	El Centro	Evening
May 29, 2008	Riverside	Evening
May 30, 2008	San Jose	Day
May 30, 2008	San Jose	Evening
June 2, 2008	Redding	Day
June 2, 2008	Redding	Evening
June 4, 2008	Sacramento	Day
June 4, 2008	Sacramento	Evening
June 10, 2008	Fresno	Day
June 10, 2008	Fresno	Evening
July 22, 2008	San Diego	Day
July 22, 2008	El Centro	Evening
July 24, 2008	El Monte	Day
July 28, 2008	Redding	Day
July 28, 2008	Redding	Evening
July 30, 2008	San Jose	Day
July 30, 2008	San Jose	Evening
July 31, 2008	Sacramento	Day
August 4, 2008	Riverside	Evening
August 5, 2008	Fresno	Day
August 5, 2008	Arvin	Evening
June 6, 2008	Sacramento	Day
June 12, 2008	El Monte	Day
June 13, 2008	San Diego	Day
July 28, 2008	Sacramento	Day
July 29, 2008	San Diego/Otay Mesa	Day
August 5, 2008	El Monte	Day

In order to ensure that Spanish-speaking stakeholders, particularly those involved in commerce at the U.S.-Mexican border, were able to understand the proposal and provide their comments, the draft regulation and presentation documents were translated into Spanish. In addition, the public workshop held in San Diego/Otay Mesa on July 29, 2008, was conducted with Spanish interpreters. Efforts to reach the

attendees to inform them about the upcoming workshop included distributing flyers translated into Spanish at a California Highway Patrol border-crossing facility and through the Otay Mesa Chamber of Commerce (See Appendix B).

2. Individual Meetings

ARB staff conducted several presentations and off-site meetings targeted at specific stakeholder groups to inform them about the proposed regulation and obtain their participation and feedback in the process. These presentations were given at the following locations or events:

Table III-2: Presentations

Date	Organization/Event
June 9, 2008	Greening the Supply Chain Conference
July 17, 2008	Distribution Management Association - Inland Empire Chapter
August 6, 2008	International Warehouse Logistics Association
July 30, 2008	Otay Mesa Chamber of Commerce
September 12, 2008	Ralphs Grocery Distribution Center
September 18, 2008	Los Angeles area logistics facilities tour

3. Other Outreach

Staff contacted more than 60 industry associations, representing the trucking, logistics, manufacturing, wholesale, and retail industries, as well as individual industry members, to inform them of the proposal and invite them to provide comments. Staff also met with various stakeholders individually to gather information, to discuss the proposed requirements, and to discuss issues of concern. These stakeholders included motor carriers, the trucking industry, warehouse and logistics companies, and equipment manufacturers. Staff met with manufacturers of trailer aerodynamic technologies and manufacturers of low-rolling resistance tires to understand their product offerings, as well as with managers of fleets in the U.S. and Canada that currently use the types of aerodynamic devices required by this regulation, to gain first-hand knowledge of their experiences with the equipment. Summaries of fleet meetings can be found in Appendix E. Table III-3 provides a list of the various associations, companies, and other organizations contacted.

Table III-3: Associations, Companies and Other Organizations Contacted

ACT Research	AdamWorks Inc.
ADS Logistics LLC	Advance Auto Parts
Advanced Logistics & Distribution Systems	Affiliated Warehouse Companies
American Chain of Warehouses Inc	American Home Furnishings Alliance
American Logistics Association	American Supply Association

American Trucking Association (ATA)	American Wholesale Marketers Association
Appliance Parts Distributors Association (APDA)	Association of Home Appliance Manufacturers
AT Dynamics	B& B Trucking
Bakersfield Quality Distribution Center	Business Environmental Resource Center (BERC)
Best Buy Co. Inc.	Best Logistics Inc
Brent Redmond Transportation	Brockway Smith
Brookvale International Corp	Budway Trucking & Warehouse
Bureau of Home Furnishings	CA Manufacturers Technology Association
CA Retailers Association	CA Wholesale Marketers Assoc
Cal Chamber of Commerce	California Distribution Centers
California Furniture Manufacturers Association	California Grocers Association
California Trucking Association (CTA)	California Warehouse Association
Carry Transit	Cascade Drayage & Warehouse
Cascades	Coalition for Responsible Transportation
Containerization & Intermodal Institute (CII)	Cooperative Grocers' Information Network (CGIN)
Costco Wholesale	Council of Supply Chain Management Professionals
CVS Caremark	Daimler/Freightliner
Dependable Logistics Services	Distribution & LTL Carriers Association
Distribution Management Association	Environment Canada, Environmental Stewardship Branch
Falcon Transport	Food Industry Association Executives (FIAE)
Food Ingredient Distributors Association (FIDA)	Freight Wing
Global Cold Chain Alliance/International Assoc. of Refrigerated Warehouses	Great Dane
Hiner Transport	Home Depot
Hy-Vee foods	IKEA North America
Inland Cold Storage	Inland Empire Economic Partnership
Intermodal Association of North America	International
International Foodservice Distributors Association	International Society of Logistics
International Warehouse Logistics Association (IWLA)	JBHunt
J-Line Transport	Kenworth
Laydon Composites	Longs Drug
Los Angeles Cold Storage Co	Lowes
Mexican American Grocers Association	National Association of Wholesaler-Distributors

National Association of Chain Drug Stores	National Association of Manufacturers
National Electronic Distributors Association	National Grocers Association
National Home Furnishings Association (NHFA)	National Motor Freight Traffic Association
National Private Truck Council	National Retail Federation
National Transportation & Logistics Association	New Century
Normandin Transport	North American Transportation Council
Nose Cone	OOIDA (Owner Operator Independent Drivers Assoc)
Otay Mesa Chamber of Commerce	PAFCO (Pacific American Fish Co, Inc)
Performance Warehouse Association (PWA)	Peterbilt/Paccar
Private Label Manufacturers Association	Quest Global
Ralphs/Food 4 Less (Kroger)	Retail Industry Leaders Association (RILA)
Rite Aid	RL Jones Customhouse Brokers
Safeway Inc	Sandag
Schneider National, Inc	Sears Holdings
Secretaria del Medio Ambiente y Recursos Naturales (SEMARNAT)	Sherwin Williams
Silver Eagle Manufacturing Co.	Stater Bros Holdings Inc
Stockton Chamber of Commerce	Supervalu Inc (Albertsons)
Supply Chain & Logistics Association of Canada	Swift
Target Corp	Textile Rental Services Association
The National Customs Brokers & Forwarders Association of America	The National Industrial Transportation League
Toy Industry Association (TIA)	Toys R Us
Trailmobile	Trailwood Transport
Trans Am	Transload Distribution Association
Transportation Intermediaries Association	Transtex Composite
Truckload Carriers Association	Twin City
Unicold Corporation	US Customs border inspection facility Otay Mesa
US Growers Cold Storage Inc	US WTO, National Institute of Standards & Technology (NIST)
Utility Trailer	Van Eerden Trucking
Ventura Transfer Company	Volvo
Walgreens	Walmart
Warehouse Specialists Inc	Warehousing Education & Research Council
West Coast Warehousing	Western Home Furnishings Association,
Whole Foods Market Inc.	World Food Logistics Organization
Yandell Truckaway, Inc	Hendrickson Trucking

Tire Retread Information Bureau	Marangoni Retreading Systems
Bridgestone Bandag Tire Solutions	

B. Environmental Justice

As a matter of policy, ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved Environmental Justice Policies and Actions (Policies), which formally established a framework for incorporating environmental justice into the ARB's programs, consistent with the directives of state law. Environmental justice 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, 2001). ARB recognizes its obligation to work closely with all stakeholders – communities, environmental and public health organizations, industry, business owners, other agencies and all other interested parties – to successfully implement these Policies. These Policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The proposed regulation would benefit the people of California by reducing fuel consumption of tractors pulling 53-foot or longer box-type trailers throughout the state, and reducing emissions of GHGs and criteria pollutants in all communities throughout California, including those with environmental justice concerns.

IV. Need for Greenhouse Gas Emission Reductions

Human, or anthropogenic, activities have altered the chemical composition of the atmosphere through the buildup of GHG emissions. Over the past century the Earth's northern hemisphere has warmed at a faster rate than at any other time over the last millennium. The potential impacts of a warming of the planet include: a rise in sea level, spread of certain diseases out of their usual geographic ranges, loss of agricultural production, decreased water supply, altering of ecosystems, increased strength and frequency of storms, extreme heat events, air pollution episodes, and the consequences of these effects on the economy. As a result, there is an urgent need to curtail GHG emissions from all anthropogenic sources where technologically feasible and economically practicable. (IPPC, 2007; ARB, 2004)

V. On-road Vehicle Descriptions

A. Overview

This chapter provides general background information on tractors and trailers, and describes the vehicles that will be subjected to the proposed regulation.

B. Heavy-duty Tractors

1. Background

An on-road tractor can pull any one of a myriad of trailers to pick up and deliver freight. A long-haul tractor typically has three axles: a front, or steer, axle that uses two wheels, and two rear, or drive, axles that have double wheels on each side of the axle. Thus, a three-axle tractor may have ten wheels. A tractor may also have only two axles (a steer axle and drive axle), which is easier to maneuver in tight areas, but has less load-carrying capacity. Although dual wheels for the drive axles are the most common configuration, there is also limited use of single wide-base tires (also known as "super singles") on each end of an axle, due to their fuel economy benefits. A tractor is also equipped with a coupling known as a fifth wheel, which is used to join it with the trailer. Some tractors have a moveable fifth wheel, also called a slider, which can move forward or backward on the tractor frame. The slider helps distribute the weight of a loaded trailer more evenly between the tractor and trailer axles, in order to stay within federal axle weight limits and bridge laws.

Typically, a tractor that pulls a trailer for a long haul has a cab that is designed for driver comfort and will contain a roomy sleeping berth, or sleeper. A long-haul tractor that is pulling trailers will typically operate at highway speeds during the majority of its trip. Another type of tractor may be used for in-city deliveries and day trips where it may return daily to the location where it is garaged. These tractors are termed local or short haul. A short-haul tractor typically operates at city speeds, with some highway driving.

While HDV exhaust emissions have been regulated since 1973 in the United States, GHG emissions from HDVs are currently unregulated. However, recent voluntary efforts to increase fuel efficiency have reduced GHG emissions. For example, tractors have recently been designed with more aerodynamic features such as rounded rather than flat edges on the cab in order to reduce wind resistance. Some tractors have aerodynamic designs on the fuel tank, exhaust stack, and other protruding parts. These designs reduce aerodynamic drag, which, in turn, reduces needed engine power to propel the vehicle forward. Since there are, as yet, no regulatory requirements established to mandate aerodynamic features on tractors, the degree of aerodynamic improvement varies from manufacturer to manufacturer and within a manufacturer's own line of trucks.

2. Tractor Manufacturers

There are many manufacturers of tractors subject to the proposed regulation. They include Freightliner, Navistar International, Kenworth, Mack, Peterbilt, and Volvo Trucks. Some tractor manufacturers also manufacture engines for their tractors, but most manufacturers design vehicles to accept engines manufactured by other companies.

3. Commercial Truck Classifications

Commercial truck classifications are based on the vehicle's gross vehicle weight rating. The gross vehicle weight rating is the value specified by the manufacturer as the maximum design loaded weight of a single vehicle, which means the total weight of the

tractor and the trailer with freight. The proposed regulation applies only to Class 7 and 8 tractors. A Class 7 tractor has a gross vehicle weight rating of 26,001 to 33,000 pounds, and a Class 8 tractor is over 33,000 pounds gross vehicle weight rating. Most of the affected vehicles are Class 8 tractors.

C. Box-type Trailers

1. Background

There are many different types of trailers used on the road to carry freight. Most trailers have two axles, with dual wheels on each side of the axle, and thus have eight wheels. A trailer may be equipped with a moveable tandem axle, also called a slider, which mates with the fifth wheel of the tractor. Like the tractor's fifth wheel, the tandem axle can be moved forward or backward to more evenly distribute the weight of the loaded trailer between the tractor and trailer's axles and to meet bridge laws.

The most common type of trailer on the road is the box-type trailer, also called a van trailer. Types of box-type trailers include dry-van trailers and refrigerated-van trailers, also called reefers (see Figure V-1). A dry-van trailer, which hauls dry freight such as appliances, clothing, and furniture, does not require a temperature-controlled environment. A refrigerated-van trailer has a refrigeration or heating unit built into the trailer to maintain precise temperatures and is used to haul frozen food, fresh produce, hot or warm food, and other perishable items.

Figure V-1: Box-Type Trailers

Other common types of trailer designs include the curtain-side trailer, chassis trailer, drop-frame trailer, tanker, and flatbed trailer. The proposed regulation does not apply to these types of trailers. As with tractors, current trailer designs incorporate some aerodynamic features, such as rounded or tapered front corners and smooth, rather than ribbed sides, but the use of these features is inconsistent from manufacturer to manufacturer and from model to model.

2. Trailer Manufacturers

Manufacturers of 53-foot box-type trailers will be affected by the proposed regulation. These manufacturers include Utility Trailer Manufacturing Company, Wabash National Corporation, Great Dane Trailers, Trailmobile Corporation, Hyundai Translead, and other box-type trailer manufacturers.

VI. POPULATION AND GHG CONTRIBUTION FROM HEAVY-DUTY VEHICLES

A. Population

Assessing the number of tractors and trailers impacted by the rule was a challenge because the impacted tractors are a subset of the overall fleet and no complete database exists for trailers. Thus, as an example, for the tractors, staff had to take into account the percentage of total tractors that are long-haul, and of those, the number that pull 53-foot or longer box-type trailers. Staff's methodology and the assumptions used to determine the tractor and trailer population impacted by the proposal are discussed below. A variety of data sources were used to establish the tractor and trailer population impacted by the proposed rule. These include the following: ARB Motor Vehicle Emissions Inventory (ARB Inventory), U.S. Bureau of Census 2002 Vehicle Inventory and Use Survey (VIUS), Americas Commercial Transportation Research Company (ACT Research), U.S. Bureau of Census Current Industrial Reports (CIR), and Commercial Carrier Journal (CCJ). (See Appendix C for a more detailed description of these data sources.)

1. Tractors

Tractors impacted by the proposed regulation include Class 7 and 8 California-based intrastate and interstate tractors, and out-of-state-based tractors that operate in California. Staff used ARB's updated inventory (ARB, 2008a) as the basis for developing the tractor inventory affected by the proposed regulation. For purposes of this analysis, out-of-state-based Class 7 and 8 trucks operating in California and all California-based Class 7 and 8 interstate trucks are assumed to be tractors, since they are involved in interstate long-haul freight operation and as such generally use tractor-trailer combination trucks. Table VI-1 shows the projected total tractor population, both short-haul and long-haul, operating in California in 2010 and 2020 and the corresponding annual vehicle miles traveled (VMT).

Table VI-1: 2010 and 2020 Tractor Population and Annual VMT in California

Fleet	Class 7 & 8 Tractors		Annual VMT (10^6 miles)	
	2010	**2020**	**2010**	***2020***
CA Intrastate	72,310	96,621	3,360	*4,540*
CA Interstate	62,292	83,927	2,673	*3,611*
Neighboring Out-of-State	43,278	58,275	1,274	*1,721*
Non-neighboring Out-of-State	469,323	626,853	3,935	*5,316*
Total	**647,203**	**865,677**	**11,241**	**15,187**

The population numbers shown in Table VI-1 were adjusted to differentiate long-haul from short-haul tractors that pull any size box-type trailer. Staff used the 2002 VIUS data to determine the long-haul fraction for California intrastate, interstate, and neighboring out-of-state fleets (Census, 2002). Specifically, the VIUS data provided staff with information on (1) the primary range of operation (to determine the percentage of vehicles with a primary range of operation greater than 100 miles), and (2) jurisdiction in which the vehicle was most driven (to determine whether fleets operate interstate or exclusively intrastate). As shown in Table VI-2, this information was used by staff to conclude that 23 percent of California's intrastate tractors and 71 percent of California's interstate tractors operate long-haul. For out-of-state registered tractors, 69 percent of tractors registered in neighboring states are affected. For the purpose of this proposal, a range of more than 100 miles from their home base would classify these tractors as long-haul. It is assumed that all tractors from non-neighboring states travel more than 100 miles, resulting in the long-haul population percentage for this category equal to 100 percent.

Table VI-2: Percentage of Tractors with Primary Range of Operation Greater than 100 Miles

Fleet	Percentage of Tractors with Primary Range of Operation > 100 Miles
CA Intrastate	23%
CA Interstate	71%
Neighboring Out-of-State	69%
Non-neighboring Out-of-State	100%

Table VI-2 gives the fraction of the tractor population with a primary range of operation greater than 100 miles. These percentages include all long-haul tractors that pull all types of trailers. However, because the proposed regulation applies only to long-haul tractors that pull 53-foot or longer box-type trailers, the percentages in Table VI-2 were further adjusted, as explained below.

To determine the percentage of box-type trailers that are 53-foot or longer, it was necessary to first assess what percentage of trailers sold each year are box-type. Staff analyzed trailer production data from the CIR report (Census, 2000), which showed that the percentage of box-type trailers sold each year from 1988 to 2000 varied from 70 to 77 percent with an overall average of 73 percent. As shown in Table VI-3, staff assumed that this average was appropriate for California intrastate, interstate, and neighboring out-of-state fleets operating in California. It was also assumed that since essentially all non-neighboring out-of-state tractors pull loads for greater distances, it would be appropriate to assume that more than 73 percent are box-type. Staff assumed that 90 percent of these tractors pull box-type trailers.

The next step, to determine the percentage of box-type trailers that are 53-foot or longer, staff consulted several trailer manufacturers and ACT Research.[4] Two of the major trailer manufacturers indicated that approximately 90 percent or more of box-type trailers produced are 53-foot or longer trailers. Based on correspondence with ACT Research, 85 to 90 percent of refrigerated-van and dry-van trailers are 53-foot or longer (Vieth, 2008). Therefore, as shown in Table VI-3, staff assumes that 85 percent of the box-type trailers pulled by California intrastate, interstate, and neighboring out-of-state tractors, and 90 percent of those pulled by non-neighboring out-of-state tractors are 53-foot or longer.

Table VI-3: Percentage of 53-Foot Box Type Trailers

Fleet	Percent Box-Type Trailers	Percent that are 53-foot or Longer
CA Intrastate	73	85
CA Interstate	73	85
Neighboring Out-of-State	73	85
Non-neighboring Out-of-State	90	90

Based on the total tractor population shown in Table VI-1 and the factors shown in Tables VI-2 and VI-3, staff estimated the tractor population impacted by the proposed regulation and the corresponding annual VMT, which is reflected in Table VI-4 for years 2010 and 2020.

[4] ACT Research is a subscriber-funded research company that collects and analyzes commercial vehicle data from manufacturers.

Table VI-4: 2010 and 2020 Impacted Tractor Population and the Corresponding Annual VMT

Fleet	Impacted Tractor Population		Annual VMT (10^6 miles)	
	2010	2020	2010	2020
CA Intrastate	9,547	12,910	705	952
CA Interstate	27,462	37,005	1,320	1,783
Neighboring Out-of-State	18,525	24,962	663	896
Non-neighboring Out-of-State	380,152	507,751	3,187	4,306
Total	**435,686**	**582,628**	**5,875**	**7,937**

2. Trailers

Available data were used to estimate the number of tractors that would be impacted by the proposed rule, as discussed above. For trailers, no database exists that provides a complete inventory on the total number of box-type trailers that would be impacted by the proposed rule. The ratio of trailers-to-tractors in many fleets is often not one-to-one (in which case the same numbers provided in Table VI-4 for tractors could have been used to estimate trailer inventory). The ratio varies considerably from fleet to fleet. Many fleets typically own more trailers than tractors in order to maximize efficiency and reduce downtime for the tractor while waiting for the trailer to be unloaded and loaded. The ratio varies from zero for some owner-operators that own only tractors and pull trailers owned by other businesses, to “infinity” for some shippers that own only trailers and use the services of carriers to pull their trailers. Since data describing the tractor-trailer composition of all fleets that operate in California were not available, staff determined an approximate trailer-to-tractor ratio using data from annual CCJ publications (Vise, 2007; Vise, 2008). The published data included the number of trailers and tractors owned by the top 250 carriers in the country in calendar years 2006 and 2007. Analysis of the two annual datasets provided an estimated ratio of 2.5-to-1 trailers to tractors for both years.

The number of box-type trailers impacted by the proposed rule was then estimated by multiplying the trailer-to-tractor ratio of 2.5 by the number of tractors impacted by the proposed rule shown in Table VI-4. Table VI-5 shows the resulting 53-foot box-type trailer population impacted by staff’s proposal for calendar years 2010 and 2020.

Table VI-5: 2010 and 2020 Impacted 53-Foot Box-Type Trailers

Fleet	2010	2020
CA Intrastate	23,868	32,275
CA Interstate	68,655	92,513
Neighboring Out-of-State	46,313	62,405
Non-neighboring Out-of-State	950,380	1,269,378
Total	**1,089,215**	**1,456,570**

B. GHG Contribution

1. Overview, HDV Fleet

Figure VI-1 shows 2002 to 2004 average GHG emissions inventory broken down by sector (ARB, 2008b). As shown in the figure, the transportation sector, which includes on-road vehicles, aviation, rail, and ships, is the largest contributor to the total statewide GHG emissions inventory, producing approximately 38 percent of the state's total GHGs, or 179 MMT CO_2e. In 2020, GHG emissions from this sector are projected to increase by 25 percent (46 MMT CO_2e) relative to the 2002 to 2004 average and by 50 percent (75 MMT CO_2e) relative to 1990 levels, as shown in Table VI-6. Thus, emissions from the transportation sector must be significantly reduced in order to achieve the AB 32 requirement that State GHG emission levels be reduced to 1990 levels by the year 2020. Furthermore, as shown in Figure VI-2, on-road vehicle emissions account for more than 90 percent of the transportation emissions, with 74 percent from light-duty vehicles and 20 percent from on-road HDVs. This implies that most of the needed emission reductions from the transportation sector must come from on-road vehicles. The proposed regulation would therefore contribute towards achieving AB 32 goals by reducing emissions from on-road HDVs, and specifically from tractors that pull box-type trailers.

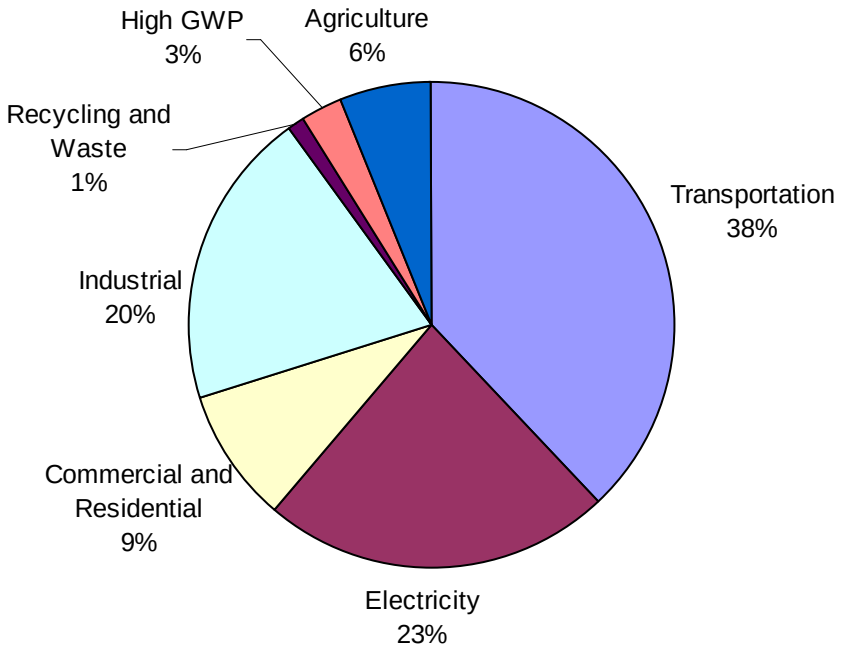

Figure VI-1: California GHG Emissions by Sector – 2002-2004 Average (ARB, 2008b)

Table VI-6: 1990, 2002-2004 Average, and 2020 Projected Transportation Sector GHG Emissions (MMT CO_2e) (ARB, 2008b)

Fleet	**Calendar Year**		
	1990	**2002-2004 Average Emissions**	**Projected 2020 Emissions (BAU)**
Passenger Vehicles	108.9	133.9	160.8
Heavy-duty Trucks	**29.0**	**34.7**	**48.3**
Ships & Commercial Boats	2.2	3.3	6.3
Aviation (Intrastate)	5.1	3.2	4.9
Rail	2.3	3.0	3.8
Unspecified	3.0	1.2	1.4
Emissions Total	**150.7**	**179.3**	**225.4**

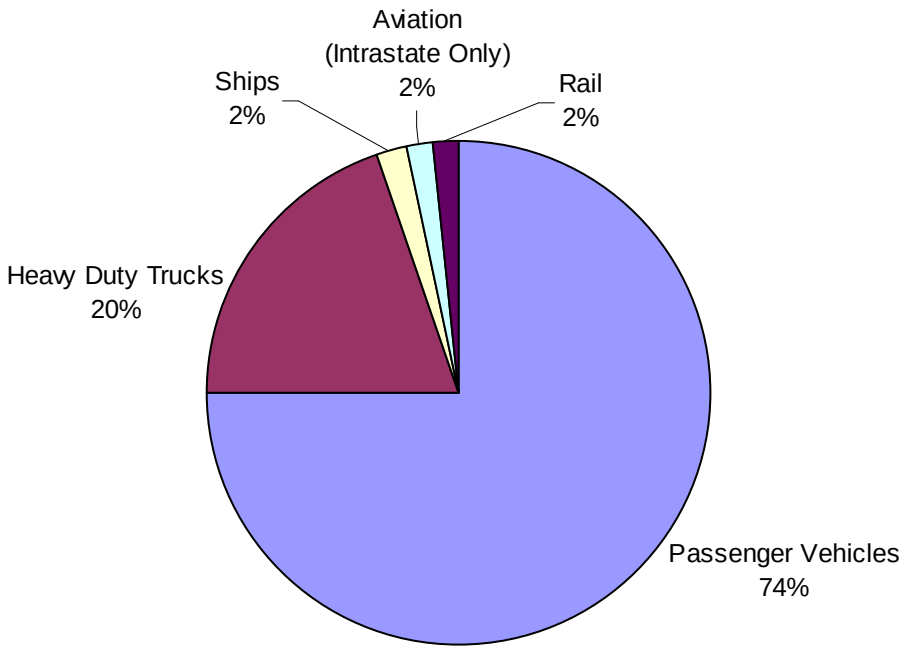

Figure VI-2: Transportation Sector GHG Emissions – 2002-2004 Average (179 MMTCO$_2$e) (ARB, 2008b)

2. Emissions Contribution of Impacted Tractor-trailers

Baseline GHG emissions for fleets impacted by the proposed regulation were estimated using the adjusted VMT shown in Table VI-4, an assumed fleet average fuel economy of 5.8 miles per gallon, and a GHG emission factor of 10.4 kilograms CO_2e per gallon of diesel fuel (ARB, 2008c). The baseline GHG emissions in California from long-haul tractors pulling box-type trailers are 8.5 MMT CO_2e in 2010 and 11 MMT CO_2e in 2020.

VII. U.S. EPA SmartWay Transport Partnership

A. Description of Program

The SmartWay Transport Partnership (SmartWay) is a voluntary program developed by the United States Environmental Protection Agency (U.S. EPA) to reduce fuel consumption and emissions (criteria pollutant and GHG) resulting from the transportation of freight. The information presented in this chapter regarding the SmartWay program was acquired from a collection of references obtained from the U.S. EPA (see Appendix D). Through this program, freight industry companies enter into a partnership with U.S. EPA to implement strategies that improve their transportation efficiency. In return for their collaboration, U.S. EPA rewards these companies with certain market-based incentives, such as the privilege to advertise their SmartWay participation, business preference by other SmartWay partners, and for top-performers, the right to display the official SmartWay logo. U.S. EPA also continually promotes these partnerships in the public forum, which helps partners establish and maintain a

"green" image. Currently, the SmartWay program has more than 850 partners and aims to reduce oil consumption by as much as 150 million barrels per year, carbon dioxide emissions by as much as 66 million metric tons per year, and oxides of nitrogen emissions by as much as 200,000 tons per year by 2012.[5]

U.S. EPA developed SmartWay primarily for carriers (truck and rail), shippers, and logistics companies because of their influence on freight movement in the United States. By implementing strategies that improve transportation efficiency, these companies can earn performance points, the accumulation of which makes up their SmartWay score. This score serves three main purposes: it allows companies to monitor their environmental performance; it can be used as a marketing tool; and it can improve business opportunities, since contracting with other SmartWay partners increases the SmartWay scores of member businesses.

SmartWay carriers and trailer-operating shippers may use the following strategies to earn points:

- Reduce idle time
- Improve vehicle aerodynamics
- Improve freight logistics
- Use automatic tire inflation systems
- Use low-rolling resistance tires
- Implement driver training
- Use low-viscosity lubricants
- Reduce vehicle weight
- Reduce speed
- Use intermodal shipping
- Use hybrid powertrain technology
- Contract with other SmartWay partners

SmartWay shippers may also use the strategies listed below:

- Use intermodal shipping
- Provide preferential docking for SmartWay carriers
- Provide driver comfort stations
- Use electric forklifts
- Implement anti-idling policies
- Implement pickup/delivery scheduling
- Improve freight management to ensure full truckloads
- Improve efficiency of light fleet vehicles
- Improve warehouse efficiency
- Contract with other SmartWay partners

[5] http://www.epa.gov/smartway/swplan.htm (July 10, 2008)

For logistics companies, scores are based solely on the SmartWay participation and scores of the carriers and shippers with whom they contract.

The option to earn points through the use of SmartWay partners encourages the industry as a whole to improve its environmental performance. Not only does a partner earn points for employing the services of another SmartWay partner, but more points are awarded for using partners with higher scores. Therefore, doing more in terms of improving efficiency, even if it requires additional investment, can actually serve as a business advantage.

Although some strategies listed in this section require upfront capital investment, SmartWay is expected to ultimately reduce the monetary cost of transportation as well as transportation's impact on the environment and public health.

B. SmartWay Tractors

Under the SmartWay program, U.S. EPA certifies tractors that have been demonstrated to use less fuel and produce lower emissions than their traditional counterparts. These tractors, which are designed to reduce aerodynamic drag, rolling resistance, and idle times, may be used to improve a partner's efficiency and SmartWay score. U.S. EPA developed the SmartWay tractor specifications in collaboration with the truck manufacturing industry and continues to update these specifications as technology advances. Several truck manufacturers currently offer U.S. EPA certified SmartWay tractors, including Freightliner, International, Kenworth, Mack, Peterbilt, and Volvo.

1. Technical Specifications and Requirements for SmartWay Tractors

To certify a tractor under the SmartWay program, a truck manufacturer must demonstrate to U.S. EPA that the tractor is equipped with the following:

- A 2007 or subsequent model year primary engine
- An integrated cab-high roof fairing
- Tractor-mounted side-fairing gap reducers
- Tractor fuel-tank side fairings
- Aerodynamic bumpers and mirrors
- An option for reducing extended idling
- Low-rolling resistance tires

Since tractors are typically designed from the ground up, retrofitting in-use tractors to meet SmartWay specifications is not practical. Therefore, in-use tractors are not considered for SmartWay certification. This is not the case for trailers, which will be explained in the following section. At this time, U.S. EPA only certifies tractors equipped with an integrated sleeper berth. However, they are currently developing specifications for day cab tractors as well.

C. SmartWay Trailers

Under the SmartWay program, carriers and shippers may use U.S. EPA certified SmartWay trailers to earn points. SmartWay trailers incorporate a number of the strategies listed in Section VII.A above, and are designed to meet specifications that emphasize improved fuel efficiency and reduced emissions. These specifications were developed collaboratively by U.S. EPA and the trailer manufacturing industry. At this time, U.S. EPA has only developed specifications for dry-van trailers, and therefore, only these trailers can be certified under the SmartWay program. Several trailer manufacturers currently offer U.S. EPA certified SmartWay trailers, including Great Dane, Hyundai Translead, Manac, Stoughton, Strick, Utility, and Wabash National.

To designate a trailer as a U.S. EPA certified SmartWay trailer, the trailer must either be equipped with the necessary SmartWay approved devices to meet U.S. EPA's design specifications, or be track tested for fuel consumption against a base trailer. This can be done by the original equipment manufacturers during manufacture, or it can be done on existing used trailers in the fleet.

The design specifications for a U.S. EPA certified SmartWay trailer currently require the following equipment:

- SmartWay approved side skirt fairings
- Either a SmartWay approved front-mounted trailer gap fairing or a SmartWay approved rear-mounted trailer fairing
- SmartWay approved low-rolling resistance tires

In order to demonstrate a trailer as a U.S. EPA certified SmartWay trailer through track testing, the testing must show that the trailer consumes at least 6.5% less fuel than a base trailer under similar drive and duty conditions. For this testing, the "SAE J1321, Type II" protocol[6] must be used to measure fuel consumption.

VIII. PROPOSED REGULATION

A. Proposed Regulation Overview

The proposed regulation would reduce GHG emissions by requiring new and existing 53-foot or longer box-type trailers, and the tractors that pull them, to be equipped with SmartWay technologies when operating on California highways. The proposed regulatory language is contained in the new sections 95300 through 95312 of title 17, California Code of Regulations (see Appendix A of this report). The proposed requirements for both the tractors and trailers begin January 1, 2010. These requirements pertain to all applicable tractors and box-type trailers that operate on California highways regardless of where the vehicles are domiciled.

[6] The SAE J1321, Type II test procedure does not specify any test parameters, such as environmental conditions, test design, load requirements, drive cycles, etc. Therefore, U.S. EPA reviews all test parameters before each test to ensure that testing is performed in a consistent manner.

B. Purpose

The purpose of the proposed regulation is to reduce GHG emissions from tractors that pull 53-foot or longer box-type trailers on California highways. GHG emissions would be reduced from these vehicles through the use of aerodynamic technologies and low-rolling resistance tires, which reduce aerodynamic drag and rolling resistance, respectively. This will result in the tractor requiring less energy to propel the vehicle forward, resulting in reduced fuel usage and GHG and NOx emissions.

C. Applicability

The proposed regulation applies to 53-foot or longer box-type trailers and the tractors that pull them when driven on California highways. The proposed tractor and trailer requirements apply to the owner, driver, motor carrier, California-based broker, and California-based shipper. The proposed regulation does not apply to tractors pulling other types of trailers, e.g., box-type trailers of lengths shorter than 53 feet, or to tractors pulling flatbeds, or logging trailers, drop-frame trailers, curtain-side trailers, or chassis trailers hauling shipping containers. Also exempt from the requirements of the regulation are authorized emergency vehicles and military tactical support vehicles, as well as short-haul and drayage tractors, as defined in the proposal.

D. Definitions

The proposed regulation contains many definitions to define and clarify the requirements. Only the key definitions are highlighted in this section. The full list of definitions can be found in the text of the proposed regulation, provided in Appendix A.

1. Aerodynamic Technologies

Aerodynamic technologies are devices designed to reduce wind resistance on the tractor or trailer that will improve overall vehicle fuel efficiency and reduce exhaust GHG emissions. Examples of such technologies for the tractor are fuel tank fairings, integrated cab roof fairings, and side extender fairings. Examples of trailer technologies are side skirts, front fairings, and rear (or boat tail) fairings.

2. Parties Responsible for Compliance

The parties responsible for compliance with the proposed regulation include the owner, driver, motor carrier, California-based broker, and California-based shipper. Each of these parties is defined here. The owner of a tractor or trailer is the person who legally holds the title of the vehicle or the lessee that has legal responsibility for registration and maintenance of the vehicle. The driver of a tractor is the operator of the tractor on a California highway. The motor carrier and the broker are the business intermediaries that contract with a person for pick-up and delivery of commercial freight, and either contract with tractor owners or, if a motor carrier, employs drivers of its own vehicles to pick-up or deliver freight. The shipper is the person or commercial operation that has possession of freight prior to its transportation, including, but not limited to, the owner of the freight, a distribution center, or a temporary freight storage facility. Only shippers

that are located in California are subject to the proposed requirements. When freight is shipped in a 53-foot or longer box-type trailer, each of the aforementioned parties would be responsible to ensure that both the tractor and the trailer are in compliance with the proposed requirements.

3. U.S. EPA SmartWay Partnership Program

The U.S. EPA SmartWay partnership program is a federal voluntary program aimed at improving energy efficiency, reducing GHG and air pollutant emissions, and improving energy security of the ground freight movement system. The SmartWay program certifies tractors and trailers that have the cleanest, most fuel-efficient equipment available. U.S. EPA certified SmartWay tractors and SmartWay trailers may be identified by the special certification mark on the inside of the tractor cab or trailer. U.S. EPA approved SmartWay aerodynamic devices for retrofitting non-SmartWay trailers are also identified through the SmartWay program. These devices meet the SmartWay technical specifications and requirements for improved fuel efficiency.

E. Requirements and Compliance Deadlines

1. Heavy-Duty Tractors

Different requirements would apply for tractors with sleeper berths and those without sleeper berths that pull 53-foot or longer box-type trailers on California highways (Table VIII-1). Beginning January 1, 2010, a 2011 and subsequent model year tractor with a sleeper berth would be required to be a U.S. EPA certified SmartWay tractor. A U.S. EPA certified SmartWay tractor typically has a high roof sleeper cab equipped with an integrated sleeper cab roof fairing, aerodynamic mirrors, an aerodynamic bumper, cab side extenders, fuel tank fairings, and low-rolling resistance tires. A description of tractor aerodynamic devices can be found in chapter IX, section A.2. SmartWay does not currently certify a tractor without a sleeper berth, i.e., day cab, and thus, these tractors are not included in the proposed regulation.

Low-rolling resistance tires that meet U.S. EPA SmartWay specifications would be required beginning January 1, 2010, for a 2011 and subsequent model year tractor regardless of whether it has a sleeper berth or not. 2010 and earlier model year tractors with or without sleeper berths would have additional time to comply with the low-rolling resistance tire requirements; it is proposed that they comply with these tire requirements by January 1, 2012. This flexibility minimizes waste and tire disposal issues by allowing most existing tires on the vehicle to be used for their normal useful life, and replaced with low-rolling resistance tires only when new tires are needed. Thus, by January 1, 2012, all tractors that pull 53-foot or longer trailers would have low-rolling resistance tires.

Table VIII-1: Proposed Tractor Requirements

Requirement	Model Year 2011 & Later Tractors with Sleeper Berths	Model Year 2011 & Later Tractors without Sleeper Berths	All Model Year 2010 and Earlier Tractors
SmartWay Certified Tractor	1/1/2010	Not Applicable	Not Applicable
SmartWay Approved low-rolling resistance tires	1/1/2010	1/1/2010	1/1/2012

2. Trailers

a) Requirements for 2011 and Subsequent Model Year Trailers

Beginning on January 1, 2010, a 2011 and subsequent model year 53-foot or longer box-type trailer pulled by a tractor on a California highway would be required to be either a U.S. EPA certified SmartWay trailer or retrofitted with SmartWay approved technologies (See Table VIII-2).

The first option, to use a U.S. EPA certified SmartWay trailer, is currently only available for dry-van trailer applications. The U.S. EPA has defined specifications for this type of trailer, and several manufacturers have already certified models. Certified dry-van trailers are equipped with side skirts, front trailer fairings, and low-rolling resistance tires. For refrigerated-van trailers, retrofitting with SmartWay approved technologies would be the only option for compliance. In the future, the SmartWay program may expand to certify refrigerated trailers, as well as other types of trailers, making this alternative available.

The second option, compliance by retrofitting with SmartWay approved aerodynamic and low-rolling resistance tire technologies, is available to both dry-van and refrigerated-van trailers. The proposed regulation would require dry-van trailers to use low-rolling resistance tires and either be retrofitted with (1) aerodynamic equipment that collectively meets or exceeds a 5 percent fuel savings in accordance with test requirements defined by the U.S. EPA SmartWay Partnership Program, or (2) side skirts plus a front fairing or rear trailer fairing that are SmartWay approved. This latter combination of aerodynamic devices has been certified by SmartWay to meet the five percent fuel savings criteria. Refrigerated-van trailers would be required to be retrofitted with low-rolling resistance tires and either (1) any combination of aerodynamic equipment that collectively meets or exceeds 4 percent fuel savings in accordance with test requirements defined by the SmartWay program, or (2) side skirts that are SmartWay approved. The lower percent fuel savings criteria for refrigerated-van trailers reflects the lack of a requirement for a front or rear fairing on these types of trailers. A front trailer fairing is not feasible on a refrigerated-van trailer because the transport refrigeration unit (TRU) is typically installed where the front trailer fairing would be mounted. Requiring a rear-fairing on all refrigerated-van trailers is too restrictive, since current SmartWay approved rear fairing technologies are not compatible with roll-up door trailers.

Table VIII-2: Proposed 2011 and Later Model Year Trailer Compliance Options, Beginning January 1, 2010

Trailer Type	**Option 1:** Purchase Certified SmartWay Trailer	**Option 2:** Retrofit Existing Trailer	
		Retrofitted with SmartWay approved low rolling resistance tires and SmartWay approved aerodynamic devices	Retrofitted with SmartWay approved low rolling resistance tires and aerodynamic devices demonstrated to meet min. fuel savings per SmartWay Program
Dry-Van	Available	Aero=side skirts + rear or front fairing	Aero must meet 5% fuel savings
Refrigerated-Van	Not Available*	Aero= side skirts	Aero must meet 4% fuel savings

***** At time of publishing, U.S. EPA had not yet established SmartWay certification specifications for refrigerated-van trailers

b) Requirements for 2010 and Earlier Model Year Trailers

The 2010 and earlier model year 53-foot or longer box-type trailers that are pulled by tractors on California highways would be required to be retrofitted with SmartWay approved technologies by January 1, 2013. The retrofit requirements would be identical to the second option for 2011 and subsequent model year trailers described above. In lieu of meeting the January 1, 2013, compliance date, the trailer owner could choose to comply with an optional trailer fleet compliance schedule.

There are two proposed optional trailer fleet compliance schedules that would be based on trailer fleet size: the large fleet compliance schedule and the small fleet compliance schedule. A large fleet is defined as a fleet of 21 or more trailers. A small fleet is defined as a fleet of 20 or less trailers. In order to participate, a trailer owner that owns the requisite number of trailers would be required to meet the following criteria: (1) submit a compliance plan by July 1, 2010 for the large fleet optional compliance schedule or by July 1, 2012 for the small fleet compliance schedule, (2) meet the annual commitments for retrofitting trailers, and (3) allow ARB to audit records periodically. The compliance plan would include a statement of intent, information on each trailer, and details as to which affected trailers would be retrofitted to comply with each year of the optional phase-in schedule requirements. If the owner fails to comply with any of the three conditions for optional compliance participation, it may result in termination of the optional compliance schedule(s). If the fleet's participation in the optional compliance schedule is terminated, all trailers in the fleet have to be in compliance within 90 days or by December 31, 2012, whichever is later.

The large fleet compliance schedule is shown in Table VIII-3. A six year phase-in is proposed for large fleets beginning in 2010 and ending in 2015. For added flexibility, a

trailer owner could participate in an early compliance option. For every 2010 and earlier model year box-type trailer that is compliant with the proposed regulation by December 31, 2009, the owner could delay the retrofit of 1.5 noncompliant trailers until 2016. If a trailer owner participates in the early compliance option, the submitted compliance plan would need to contain information on the list of trailers that are brought into compliance by December 31, 2009, and the list of trailers that are delayed for compliance until 2016. The early compliance option is discussed in more detail in Appendix F, Optional Trailer Fleet Compliance Schedules.

Table VIII-3: Proposed Optional Large Fleet (21+) Compliance Schedule for 2010 and Earlier Model Year 53-foot or Longer Box-Type Trailers, Except Refrigerated-Van Trailers with Transport Refrigeration Units using 2003 to 2009 Model Year Engines

	12/31/10	12/31/11	12/31/12	12/31/13	12/31/14	12/31/15
Required Percent Compliance	5%	15%	30%	50%	75%	100%

The small fleet compliance schedule is shown in Table VIII-4. The phase-in for small fleets begins in 2013 and ends in 2016.

Table VIII-4: Proposed Optional Compliance Schedule for Small Trailer Fleets of 2010 and Earlier Model Year 53-foot or Longer Box-Type Trailers

	12/31/13	12/31/14	12/31/15	12/31/16
Required Percent Compliance	25%	50%	75%	100%

3. Refrigerated Fleet Compliance Provision

Since refrigerated trailers would be concurrently impacted by the proposed regulation and the previously adopted Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate (TRU Rule), staff developed a special provision that would allow the delay of retrofits and retirements of certain in-use refrigerated trailers. Specifically, the refrigerated fleet compliance provision would apply to 2003 through 2008 model year refrigerated-van trailers equipped with 2003 and subsequent model year TRUs.

Because allowing the delay of all refrigerated trailers would significantly reduce the cumulative GHG benefits expected from the proposed regulation, the refrigerated fleet compliance provision would not apply to the following trailers:

- 2009 and 2010 model year trailers: The greatest GHG and fuel economy benefits would likely be achieved by bringing these trailers into compliance first. This is

because these trailers would be newer, so they would see more road miles and have more time to realize returns on investment.

- 2002 and previous model year trailers: These trailers would likely reach the natural end of their long-haul service before the phase-in of the refrigerated fleet compliance provision would begin.

In addition, because the provision would only apply to in-use trailers, 2011 and subsequent model year trailers would not be eligible.

A trailer owner participating under this provision would be required to bring trailers of the model years listed in Table VIII-5 into compliance by December 31 of the applicable year.

Table VIII-5: Refrigerated Fleet Compliance Deadlines

Year	2017	2018	2019
Trailer Model Year	2003-2004	2005-2006	2007-2008

4. Requirements for the Owner, Driver, Motor Carrier, Broker and Shipper

As mentioned previously, the responsibility for compliance rests primarily with the owner of the tractor and trailer, but the driver, motor carrier, California-based broker, and California-based shipper also share responsibilities. Noncompliance with the proposed tractor or trailer requirements may result in a notice of violation to each aforementioned party. The responsibility of the owner would be to ensure the applicable tractors and trailers comply with the proposed requirements within the proposed compliance schedule. The owner of affected trailers would also be required to report information to ARB on its trailers and its compliance plan, if applicable.

The driver would be responsible to ensure that the tractor-trailer to be driven is in compliance with this proposed regulation, i.e., SmartWay certified, and meets the good operating condition criteria. If the tractor-trailer is not in compliance, the driver should refuse to operate the tractor-trailer. Failure to do so may result in a notice of violation. The driver should also ensure that the following information is available to be presented to authorized enforcement personnel: driver's license, tractor registration, origin of freight being transported, destination of freight being transported, and motor carrier information, if applicable.

Motor carriers would be responsible to ensure that a tractor-trailer they dispatch to pick up and deliver freight complies with the proposed regulatory requirements. To facilitate compliance, motor carriers would be required to provide the following information to the dispatched driver: the motor carrier business name, street address, contact person, and contact person's business phone number.

The requirements for California-based brokers are similar to those discussed in the previous paragraph for motor carriers. In addition, ARB would also have the authority to

restrict California-based brokers from using the services and vehicles of particular motor carriers, tractor owners and trailer owners that have failed to settle a previously issued notice of violation. This approach to enforcement is discussed in detail in Appendix G, Implementation and Enforcement.

The California-based shipper would be responsible to ensure that the tractors and box-type trailers used to transport freight from its facility are in compliance with the proposed regulation. ARB would have the authority to restrict California-based shippers from using the services and equipment of particular motor carriers, California-based brokers, tractor owners and trailer owners that have failed to settle a previously issued notice of violation. This approach to enforcement is discussed in detail in Appendix G, Implementation and Enforcement.

Motor carriers, California-based brokers, and California-based shippers may choose to discharge the obligation to pay fines through contractual language. For example, once a fine has been assessed to a shipper, the shipper could have a contract with the noncomplying motor carrier that requires the motor carrier to pay all fines associated with the use of noncompliant tractor-trailers. Similarly, a motor carrier could also have a contract with a tractor or trailer owner requiring the tractor or trailer owner to pay all fines associated with the use of a noncompliant tractor or trailer, respectively.

F. Maintenance Requirements

Owners and drivers of the applicable tractors and trailers would be responsible to ensure that the applicable tractor and trailer are equipped with appropriate equipment and that the equipment is in good operating condition. The aerodynamic technology would need to be installed according to manufacturer's specifications, be securely fastened to the tractor or trailer, not be missing any panels or sections, and not be damaged to the extent that its aerodynamic effectiveness is compromised. In addition, a rear trailer fairing must be designed such that, when not in-use, it can be folded back against the trailer or otherwise be readily compacted to allow normal functioning of the doors.

G. Exemptions

The proposed regulation would exempt certain types of tractors and trailers, as discussed previously in Section C of this chapter. For a short-haul tractor exemption, the trailer would need to be registered with ARB and approved as short-haul, requiring annual renewal. A short-haul trailer is defined as only operating within a 100 mile radius from the registered location where the trailer is garaged and maintained. A drayage truck would also be exempted from the proposed requirements. A drayage truck is defined as a truck that only operates within 100 miles of a port or intermodal rail yard property of origin or destination.

H. Reporting Requirements

For tractors, reporting would not be required for the owner of Class 7 or Class 8 tractors used exclusively for long-haul purposes. In order for a tractor or trailer to be classified as short-haul, and thus exempted from the proposed regulation, it would need to be registered with ARB. The owner would need to submit an application with specific information on the vehicle, vehicle owner, and vehicle's local haul base. For tractors, the owner would designate, in the application, whether the exemption will be based on a limit of 50,000 miles annually or a limit of operation within a 100-mile radius from its local base. Once approved, the tractor or trailer would be considered short-haul and not subjected to the requirements of the proposed regulation. The short-haul exemption would be effective for one year and would require renewal on an annual basis.

A trailer owner who does not choose to participate in any of the optional compliance schedules would not be required to provide reporting of trailers. However, if the owner chooses to participate in the optional compliance schedules, a compliance plan would be required to be submitted by July 1, 2010. The compliance plan would include a statement of intent, information on each affected trailer, and details as to which affected trailers would be retrofitted to comply with each year of the optional phase-in schedule requirements.

There are no recordkeeping requirements for shippers specified in the proposed regulation. However, ARB staff reserves the right to audit existing shipping records, if the shipper or broker continues to use noncompliant tractor-trailer owners and motor carriers after being notified of their noncompliance.

I. Enforcement and Fines

Enforcement of the proposed requirements may be carried out by authorized representatives of ARB, peace officers, and authorized representatives of an air pollution control district. A violation of the proposed requirements may result in civil or criminal penalties. A violation may be issued for failure to comply with the proposed tractor and or trailer requirements, failure to submit the appropriate information, or providing false information. The extent of the penalty would depend on the willfulness of the violation, the length of time of the noncompliance, the magnitude of the noncompliance, and other pertinent factors. Authorized enforcement personnel may stop trucks on the highway or at alternative locations, such as on the roadside, at weigh stations, or at loading docks, to ensure that the appropriate aerodynamic equipment and low-rolling resistance tires are properly installed and in good operating condition.

If the tractor or trailer does not have the appropriate aerodynamic equipment or low-rolling resistance tires, or if such equipment is damaged or not properly functioning, the enforcement personnel would write a notice of violation to the parties involved in the movement of freight in the noncompliant vehicle. These may include the owner, driver, motor carrier, California-based broker, and California-based shipper of the transported freight. While the owner of the tractor and trailer is solely responsible for purchasing SmartWay certified tractors and trailers, or retrofitting tractors and trailers with approved SmartWay devices, it would also be the responsibility of brokers and California-based

shippers to ensure that only compliant tractors and trailers are used to transport freight on California highways.

If the tractor and/or trailer has been approved for short-haul exemption, the enforcement personnel would crosscheck its exemption status with the ARB database and confirm that the short-haul tractor and/or trailer is operating within the 100 mile radius from its local base or is within its annual miles limit, whichever is applicable. Similarly, an enforcement officer may check a drayage truck to ensure that it is operating within 100 miles of the port or intermodal rail yard property. See Appendix F for a further discussion of implementation and enforcement issues.

IX. TECHNOLOGICAL FEASIBILITY OF CONTROL MEASURE

The proposed regulation would require heavy-duty tractors and box-type trailers to be SmartWay certified or use SmartWay approved equipment and tires. The vehicles and equipment necessary to comply with the proposed regulation are already commercially available and in use today. In addition, new technologies continue to emerge. Therefore, staff firmly believes that the technological feasibility of the proposed regulation is sound.

The following sections describe the availability of SmartWay certified tractors, SmartWay certified trailers, retrofit equipment for in-use trailers, and low-rolling resistance tires. In addition, because there have been concerns expressed about the reliability and safety of trailer side skirts, fleet experience with these technologies is discussed.

A. SmartWay Certified Tractors

The proposed regulation would require all 2011 and subsequent model year long-haul tractors that pull 53-foot or longer box-type trailers to be SmartWay certified. Most major truck manufacturers currently offer SmartWay tractors and have indicated that they are in a position to manufacture more if demand increases.

Since tractor models are designed as a single unit, retrofitting a tractor with SmartWay aerodynamic equipment after its initial build would not be practical. Therefore, for in-use tractors, the proposed regulation would only require the use of low-rolling resistance tires, and not aerodynamic technologies.

1. Base Tractor

For every SmartWay tractor, a manufacturer must first identify a “base tractor,” upon which SmartWay features can be incorporated. To qualify as a base tractor, a tractor must have an overall aerodynamic profile and a high roof sleeper cab.[7] Most major tractor manufacturers offer at least one base tractor that is eligible for the SmartWay program. Some examples are:

[7] As defined by SmartWay Logo Use Guidelines – Language – Tractor Requirements 27Mar07.doc

- Freightliner Columbia, Century Class S/T, and Cascadia
- International Prostar and Lonestar
- Mack Pinnacle
- Kenworth T2000 and T660
- Peterbilt 387 and 386
- Volvo VN Series

Examples of SmartWay tractors are shown in Figure IX-1..

2. Aerodynamic Features

A base tractor must be equipped with all of the following aerodynamic features to be considered for SmartWay certification.[8] These features have been defined for the purposes of this regulation as follows:

- Integrated sleeper cab roof fairing – a fairing located on the roof of a sleeper-cab-equipped tractor that extends from the front windshield of the tractor cab to the rear edge of the sleeper cab, with enclosed sides that line up with the sides of the sleeper cab.
- Aerodynamic mirrors – side mirrors designed to minimize air resistance
- Aerodynamic bumper – a front bumper designed to minimize air resistance
- Cab side extenders – vertical additions to the rear side of the tractor that fan out slightly and reduce the space between the tractor and trailer.
- Fuel tank fairings or chassis skirt – the fairing located at the base of the cab between the front wheel of the tractor and the forward-most rear wheel, covering the open space and streamlining the fuel tank.

[8] As defined in SmartWay Logo Use Guidelines – Language – Tractor Requirements 27Mar07.doc

Figure IX-1: SmartWay Tractors

3. Experience with SmartWay Certified Tractors

Based on meetings with various fleets, experiences with SmartWay tractors have been favorable. The only concerns raised, that fuel tank fairings can get easily damaged, appear to be highly driver-specific. Therefore, staff anticipates that the damage can be minimized by providing additional guidance to drivers on how to prevent or minimize damage to the fairings.

4. Incremental Cost of SmartWay Certified Tractors

The aerodynamic tractor package cost, which includes low-rolling resistance tires, was determined from current available retail prices, fleet price quotes, and manufacturer price estimates for new SmartWay approved tractors. The average incremental cost of the equipment is about $2,100, based on the purchase price of tractors equipped with the aerodynamic package. Specifically, this incremental cost assumes that the tractor is

equipped with an aerodynamic equipment package featuring fuel tank fairings or chassis skirts, cab side extenders, an integrated sleeper cab roof fairing, aerodynamic bumpers and mirrors, and low-rolling resistance tires.

5. Lifetime Costs of SmartWay Certified Tractors to Owners

The measure is expected to provide cost savings to tractor owners over the useful life of the tractor by reducing operational costs (i.e., fuel consumption). A SmartWay certified tractor is expected to reduce fuel consumption by about 3.5 percent compared to a regular tractor, resulting in an annual fuel savings of approximately $1,800. Looking at the equipment operating costs only, about $22,000 savings is expected over a typical equipment life of 11 years. Equipment life was estimated from discussions with fleets which stated that a tractor will be typically used in the long-haul application for about 11 years. Accounting for capital cost, maintenance cost, and fuel savings to the tractor owner, the proposed requirement is expected to have a net cost savings of about $6,000 (in 2008 dollars). Staff believes this is a conservative estimate of the savings since current California retail prices for diesel fuel are higher than the projected fuel cost used in this analysis. The cost of the SmartWay package for a tractor can, therefore, be recovered from fuel savings in 1 to 1.5 years. For further details on staff's cost analysis, see Chapter XII.

6. Production Availability

The proposed regulation would require that, beginning January 1, 2010, all applicable tractors be SmartWay certified. This section discusses two important issues associated with this requirement: 1) the anticipated demand for these types of tractors; and 2) the procedure that a tractor manufacturer would need to undergo to certify a SmartWay tractor model.

For model years 2011, 2015, and 2020, ARB staff estimates that 107,000, 129,000, and 143,000 new Class 8 SmartWay tractors, respectively, will be sold to comply with the proposed rule. These numbers represent about 70 percent of the total number of new Class 8 tractors sold nationwide in each of those years that will, at some point in their useful life, travel in California. Staff believes that tractor manufacturers will be able to meet the increased demand for SmartWay tractors resulting from this proposal.

Currently, there are six tractor manufacturers that sell a SmartWay base model tractor. Table IX-1 lists the manufacturers and the base tractor models that, when properly outfitted with aerodynamic equipment and low-rolling resistance tires, currently meet the SmartWay specifications. The decision-making process to develop a SmartWay tractor is normally preceded by a series of discussions between the U.S. EPA and the manufacturer to ensure mutual understanding of the technical specifications and requirements of the SmartWay program. Each manufacturer that is approved by the U.S. EPA to sell a SmartWay tractor must abide by a licensing agreement, included in Appendix D.

Table IX-1: U.S. EPA Certified SmartWay Tractors

Manufacturer	Base Tractor Model
Navistar International	Prostar 9200i*
Mack	Pinnacle
Daimler (Freightliner)	Cascadia Century Class Columbia
Kenworth	T660 T2000
Volvo	VN 780 VN 730
Peterbilt	387 386

* will be replaced with the LoneStar model

B. Trailer Aerodynamic Technologies

1. Aerodynamic Technologies

Aerodynamic technologies are defined in the regulation as components that are designed to reduce wind resistance on the tractor or trailer, resulting in improved overall tractor fuel economy and reduced carbon dioxide emissions. These technologies are currently available commercially through several U.S. and Canadian companies; additional companies are in the process of developing new or improved aerodynamic products. The types of equipment they currently offer include: trailer side skirts (sometimes called belly fairings), front fairings, rear fairings, strakes, traps, and others. These aerodynamic products and the companies that manufacture them are briefly described below. Some of the identified technologies are SmartWay approved at the present time, while others are not. It should be noted that this summary does not imply an endorsement of any of the companies or products identified below, nor does it claim to reflect a comprehensive list of all aerodynamic technologies currently available or under development for box-type trailers.

a) Trailer Side Skirts

Trailer side skirts are fairings that extend down from the bottom of the trailer to cover part of the open space between the tractor and the rear trailer wheels. They can be used on dry-vans as well as on refrigerated-vans. The range of fuel savings demonstrated by side skirt manufacturers is between 4 percent and 7 percent. Currently available side skirts are made of aluminum, thermoplastics, or composite materials. Some are constructed of individual panels that can be replaced separately in the event they are damaged, while others are constructed as a single unit extending the length of the skirt. One design consists of dual, parallel side panels. A set of side skirts, on average, may weigh between 150 and 350 pounds, depending on the material, length, and configuration of the skirt. The amount of ground clearance

provided by the various side skirts varies somewhat across the different models; generally they average between 10 and 20 inches from the ground in order to strike a balance between maximizing fuel savings and avoiding potential damage due to road hazards or steeply sloping ramps. According to the manufacturers, installation times per trailer range between three and six hours, although some anticipate shorter times when installed by fully trained installers.

The retail costs to purchase a single set of trailer side skirts range between $1000 and $2600, excluding installation. Fleet volume pricing would be lower. It is anticipated that as demand for these technologies increases, costs will likely drop. The cost to replace a panel varies considerably depending on the design of the skirts, from $80 to $500.

Five different companies manufacture trailer side skirts; four of them offer skirts that are commercially available at the time of this writing, while the fifth company is still in the prototype phase.

Currently Available Trailer Side Skirts:

Figure IX-2 contains photographs of side skirts offered by the four companies discussed below.

- Freight Wing Incorporated offers a selection of side skirts, which they market as Belly Fairings, adapted for different types of trailers. Three of these configurations are currently SmartWay approved, including the Standard Belly Fairing shown in Figure IX-2. Earlier models of the Belly Fairings were constructed of aluminum, while their newest version is made from high density polyethylene.

- Laydon Composites Ltd. offers the TrailerSkirt, a full-length injection molded side skirt. It is made of ABS plastic with a rubber strip along the bottom. This product is constructed of separate panels; the number of panels used will depend upon the length of the trailer (typically between 6 and 8 per side). The Laydon TrailerSkirt is SmartWay approved.

- Silver Eagle Manufacturing offers Mini-Skirts (see two photographs in Figure IX-2). The Mini-Skirts are made of aluminum and designed with dual parallel side panels that are constructed in four-foot modules. As of this writing they are not yet SmartWay approved.

- Transtex Composite manufactures the MFS Skirt out of a fiberglass/thermoplastic composite material. It is constructed of a single panel on each side. The MFS Skirt is SmartWay approved.

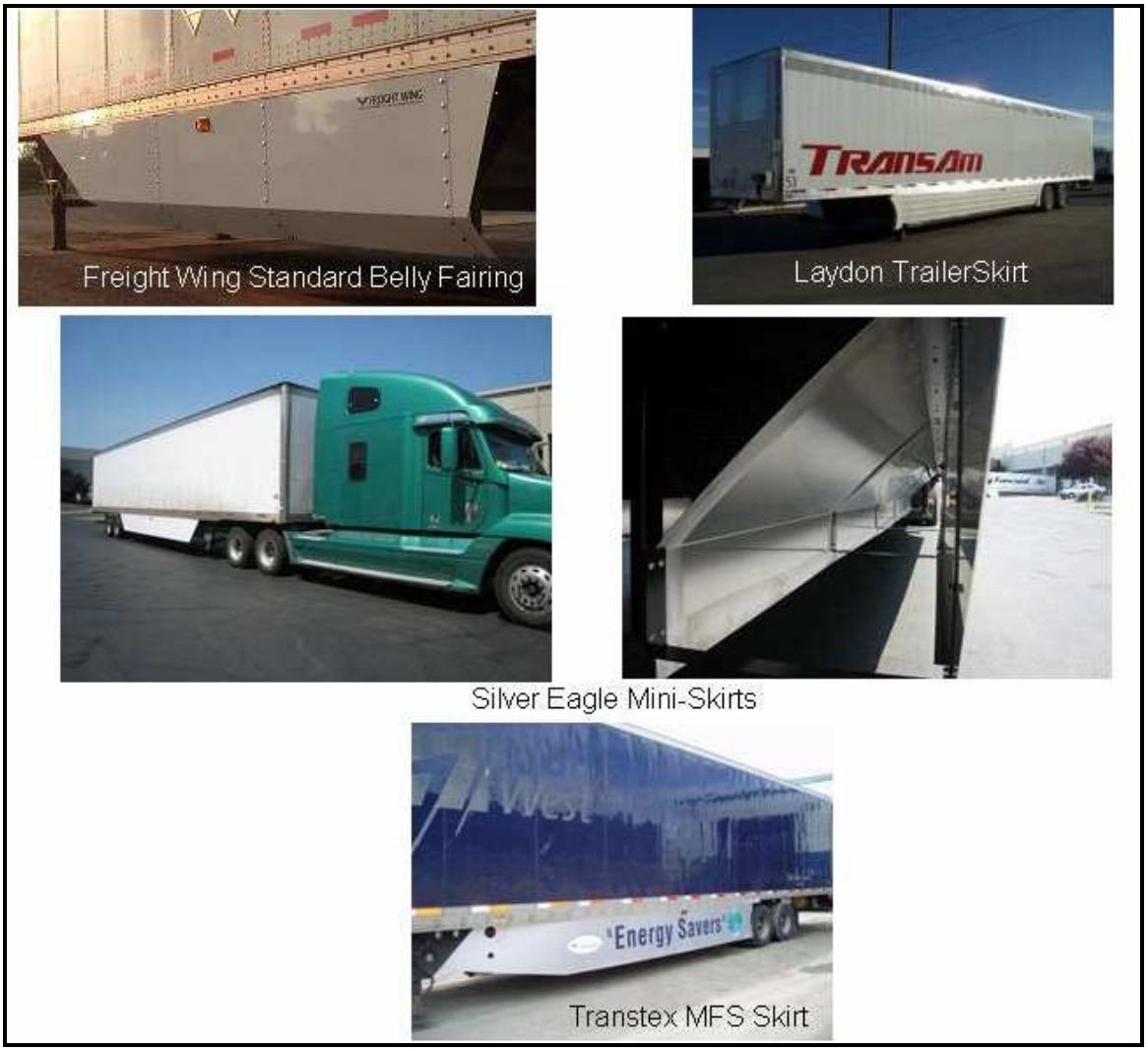

Figure IX-2: Trailer Side Skirts

Still In Development:

- Adamworks has developed the AeroMax Retractable Fairing System, which is currently in the prototype phase. It is designed to be pneumatically controlled and speed sensitive; it deploys at 35 miles per hour (and retracts when speeds fall below 35 miles per hour). When deployed, it reaches within a few inches of the ground, and when retracted, it stays at about 20 inches above ground (see Figure IX-3). The potential advantages of this type of design are that it reduces the chance of damage at low speeds or at loading docks (when retracted), and yet offers potential additional efficiency improvements when deployed closer to the ground, thereby reducing air flow under the trailer. As of this writing, this device is not yet SmartWay approved.

Figure IX-3: Adamworks Aeromax Retractable Fairing

b) Front Trailer Fairings

Front trailer fairings are defined in the regulation as curved structures that attach to the front facing surface of a trailer that covers all or part of the trailer's front facing surface. These devices serve to reduce the wind resistance caused by the gap between the tractor and the trailer and allow for smooth, uninterrupted air flow, regardless of the angle of approaching wind. They are most effective when installed on tractor-trailers with a gap greater than 36 inches. They are designed to be used on dry-vans and not on refrigerated-vans. The average fuel savings associated with front trailer fairings is between 1 percent and 2 percent. Currently available front trailer fairings are constructed of aluminum, fiberglass or plastic. They typically weigh between 75 and 140 pounds.

The approximate retail costs for current front trailer fairings range between $800 and $1000.

The following three companies manufacture some type of front trailer fairing, as shown in Figure IX-4:

- Freight Wing Incorporated produces a few different front trailer fairings. One model, the Gap Fairing, is SmartWay approved. It consists of three curved aluminum panels that extend forward and inward from the top and sides of the trailer front.

- Laydon Composites Ltd. produces the Nose Fairing, which is currently made of fiberglass. It is SmartWay approved. It consists of three elongated hemispheric structures that extend along the top and sides of the trailer front.

- Nose Cone manufactures the Nose Cone/Gap Reducer. It is a rounded air deflector that is installed on the upper front portion of a trailer. The Nose Cone is most effective on trailers pulled by tractors that do not have the extended roof fairings. Previously constructed of aluminum, a newer, plastic version of the Nose Cone has received SmartWay approval, and will soon be commercially available.

Figure IX-4: Front Trailer Gap Fairings

c) Rear Trailer Fairings

Rear trailer fairings are structures that attach to the outer edges of the trailer's rear-facing surface to provide a continuous surface for the air passing over the side and top surfaces of the trailer. Some models also have a base plate on the lower surface. These fairings reduce turbulence and resistance by reducing "suction" on the rear of the trailer. They can be used on both dry-vans and refrigerated-vans. The fuel savings associated with rear trailer fairings ranges between 1 percent and 5.1 percent.

The following three manufacturers offer some type of rear trailer fairing, as shown in Figure IX-5.

- Advanced Transit Dynamics (ATDynamics) manufactures a rear trailer fairing called the TrailerTail. The TrailerTail is a rigid structure that extends four feet out from the perimeter of the rear of the trailer when deployed. It collapses when the rear doors of the trailer are opened, and it expands into its aerodynamic configuration when the doors are closed. This device is SmartWay approved.

- Nose Cone manufactures the Tail Cone. This device is installed on trailers that do not open at the rear. As of this writing, this device is not SmartWay approved.

- Transtex Composite manufactures the BoatTail rear air deflector. It automatically folds away when the rear doors are opened, and folds flat against the sides of the trailer so as not to interfere with loading or unloading. As of this writing, this device is not SmartWay approved.

Figure IX-5: Rear Trailer Fairings

The ranges of fuel savings offered by each of the three types of aerodynamic devices discussed previously are shown in Table IX-2 below. In general, staff expects the benefits of using more than one type of device to be additive, although there may be synergistic effects or interactions that may limit those additive benefits.

Table IX-2: Fuel Savings Ranges for Trailer Aerodynamic Devices (Freight Wing, 2007; Laydon, 2007; Surcel, 2007a; Surcel, 2007b)

Trailer Aerodynamic Devices	Fuel Savings Range
Side skirts	4% - 7%
Front gap fairings	1% - 2%
Rear fairings	1% - 5.1%

d) Other Technologies

Several manufacturers have developed additional technologies to improve trailer aerodynamics, including other types of fairings and a variety of flow control devices (vortex strakes, vortex traps, air talons). As of this writing, these devices are not SmartWay approved but, if approved, may potentially play a role in meeting California's proposed requirements.

2. Experience with Aerodynamic Technologies

ARB staff spoke with representatives of several fleets that have been using some of the aerodynamic technologies identified above in order to ascertain what their "real world" experiences have been with the technologies. Details of these discussions can be found in Appendix E: Fleet Summaries. For the most part, as described below, these companies have used some type of trailer side skirt and, in a few cases, some other type of technology. It should be noted that the majority of fleets with whom staff spoke

were customers of the manufacturers identified in the previous section of this report. Staff also spoke with representatives of two large nationwide fleets that do not currently use trailer aerodynamic technologies; these fleets had some previous negative experiences with them. Their comments, one of which is detailed in Appendix E (the other fleet refused to allow its inclusion in this report), are also summarized below in the Previous Users of Aerodynamic Technologies section.

a) Current Users of Aerodynamic Technologies

Fleet Descriptions

The companies with whom staff spoke are located in different parts of the United States, including the East, Midwest, South, and West, as well as eastern Canada. Fleet sizes ranged from fewer than 50 trailers to over 20,000 trailers. Some operated dry-vans exclusively or refrigerated-vans exclusively, while others operated a variety of different types of trailers. The majority operated mostly 53-foot trailers, although one used smaller trailers (48-foot) exclusively.

Types of Aerodynamic Technologies

All of the fleets indicated that they have been using at least one type of side skirt over a period of between nine months and more than two years. The numbers of skirts they currently use vary considerably, from 2 to 200 skirts, depending primarily on the size of their fleet. Some fleets reported that they are planning to install skirts on all of their trailers, while others have not yet decided or do not have the capital to invest in them at the present time. The majority have continued using the same brand of device; only a minority reported trying more than one brand. Also, only a minority have tried devices other than side skirts. Of those fleets, a few have tried some type of gap reducing fairing, and fewer have tried a rear trailer fairing.

Fuel Economy and Other Benefits

In the real world it is difficult to isolate the benefits achieved using one particular aerodynamic technology from all other fuel-saving strategies and technologies that may be used. Many of the fleets reported that besides side skirts, they also employ the following fuel-conserving practices or technologies: speed governing, extensive driver education and incentives, low-rolling resistance tires, more fuel efficient (SmartWay) tractors, auxiliary power units, etc. For that reason, several fleets were not able to isolate the fuel savings achieved from individual components. For those fleets that could isolate the benefits, they attributed an estimated three to six percent improvement in fuel economy with the skirts – a significant improvement according to these fleet representatives.

In addition to fuel economy, the fleets reported additional benefits when using trailer side skirts, including a smoother and more stable ride, particularly in a crosswind; less side spray in the rain; and an overall improvement in the ability of the trailer to follow straighter. Most fleets were convinced that trailer skirting improves overall safety.

Damage and Repair Issues

The vast majority of the fleets reported having very few incidents of damage to the side skirts. Of those who reported any damage, all were minor. Many were caused by driver error, while some were caused by unavoidable accidents. In all cases, none resulted in any serious damage to their equipment or anyone else's property. None reported any pieces of the skirts becoming disconnected and flying off the trailers. A few reported that when damage did occur, the driver was able to take action to secure the situation before driving on the road.

When damage occurred to aluminum skirts, fleets reported they were often able to repair minor damage themselves, by hammering the skirt back into shape. When that was not possible, fleets reported that either they had extra replacement panels (where applicable) or that the manufacturers quickly sent them replacement panels so that repairs were made within a few days.

Based on anecdotal information, staff became aware that side skirts might accumulate excessive amounts of snow and ice in colder climates. However, several fleets specifically indicated that they do operate in colder climates and severe weather, and have not experienced any problems with snow or ice build-up. Nevertheless, the skirt manufacturers have become aware of these potential concerns and are taking steps to avoid any future problems.

Although the majority of fleets have not used rear fairings, a few expressed skepticism about the safety and ease of using them. They reported concerns that drivers or individuals who load or unload the trailers but are unfamiliar with the equipment could easily damage the rear fairings. Staff anticipates that as drivers and warehouse personnel become more familiar with the technologies, these concerns will disappear. In addition, aerodynamic equipment manufacturers are taking steps to further develop and improve their products to eliminate these potential problems.

Costs and Return on Investment

The majority of fleets reported paying between $1000 and $2600 for their skirts. Several of those who purchased their skirts about two years ago were able to take advantage of a grant that paid for one-half of the cost, up to a certain number of skirts. The return on investment achieved by some of the fleets (excluding those who received grant funding), averaged about 18 months, and ranged from a few months to 3 years (most of the fleets reported a trailer-to-tractor ratio of 2-to-1 or 2.5-to-1).

b) Previous Users of Aerodynamic Technologies

Staff spoke with representatives of two companies with large fleets who had used trailer side skirts in the past, but either stopped using them or were in the process of phasing out their use. The following paragraphs identify the main reasons why these companies are not current proponents of side skirt use, and discuss how these concerns are being addressed.

- Side skirts installed on trailers were damaged by scraping the ground when encountering elevated railroad track crossings and steep loading dock ramps. Side skirt manufacturers are well aware of this concern and have developed workable solutions that are incorporated in many of the side skirt models available today. These solutions include using more pliable and durable materials, adjusting the height of the skirts to provide more clearance where necessary to prevent damage, and designing the skirt to retract when traveling at slow speeds.
- Side skirts were damaged when encountering objects such as snow banks or fire hydrants. As noted in the previous section on Damage and Repair Issues, fleets that are currently using side skirts have not encountered significant damage to their side skirts. When damage did occur, it was usually minor and often caused by driver error.
- Side skirts were pulled away from their mounting brackets by the wind force encountered while traveling on the highway. Most fleets contacted did not experience this issue.
- Side skirts and their support structure collect snow and ice in inclement weather, adding weight to the trailer and posing a safety hazard as the ice breaks away when the trailer is traveling on the highway. As discussed previously, current side skirt users, including those who operate in extreme weather conditions, have not encountered these problems. Moreover, the manufacturers have indicated that the materials from which their skirts are constructed tend to repel snow and ice. Staff therefore anticipates that these issues will continue to be addressed by skirt manufacturers.
- Rain flowing off the side skirts caused a "blinding" spray on vehicles directly behind and near the trailer. Fleets that currently use side skirts did not raise this comment; in fact, some commented that the skirts provide enhanced visibility for the truck driver.
- Side skirts caused additional delays when crossing the U.S.-Mexico border. Staff anticipates that as border inspection personnel become more familiar with such aerodynamic devices as side skirts, they will become more efficient at inspecting trailers equipped with them, and will no longer delay those vehicles.
- High trailer-to-tractor ratio makes outfitting an entire large fleet with skirts cost-prohibitive. Staff recognizes that the return on investment for such fleets will be longer than for the average fleet, but anticipates that these fleets will eventually realize the cost savings during the trailer's life.

3. Incremental Cost of Aerodynamic Technologies

Staff estimated the cost of aerodynamic devices based on currently available retail prices, fleet price quotes, and equipment manufacturer prices for new SmartWay trailers. The amount of time to install the aerodynamic equipment varied, depending on the experience of the person(s) doing the installation. Staff used a typical or average time for installation of four hours and a labor rate of $50 per hour. Thus, the average incremental cost of the aerodynamic equipment for the trailer (which would include side

skirts and front fairings) would be about $2,900. For further details on staff's cost analysis, please see Chapter XII.

4. Lifetime Costs of Aerodynamic Technologies to Owners

The proposed requirements are expected to provide cost savings to owners of trucking businesses over the useful life of the trailer by reducing operational costs (i.e., fuel consumption). The cost of the add-on devices for a trailer can be recovered from fuel savings in 18 months. Looking at the equipment operating costs only, about $35,000 savings is expected over a typical equipment life of 11 years. Staff used 11 years to be consistent with the equipment life of a long-haul trailer. However, it is recognized that a trailer may be used for many years in a long-haul application beyond the assumed equipment life of 11 years. Accounting for capital cost, maintenance cost, and fuel savings, the proposed requirements are expected to result in a net cost savings of about $13,000 per trailer (in 2008 dollars). Staff expects that aerodynamic equipment prices may be lower for future purchases because of increased production and additional manufacturers of approved equipment entering into the market. Again, for further details on the staff's cost analysis, please see Chapter XII.

5. Product Availability

Although recent increases in the cost of fuel have made aerodynamic technologies for trailers more attractive, demand for them has been extremely limited up to this point. Some of the manufacturers identified earlier in this chapter have been producing aerodynamic technologies for only a few years. Nevertheless, some of them have indicated that they will have the capability to meet upcoming demand for their devices in their existing facilities by increasing the number of shifts they operate or by purchasing additional equipment to increase the number of production lines. Others indicated that they have licensed their technology to other larger and more nationally distributed companies, or that they can subcontract production of their products to other manufacturers. It is anticipated that the phase-in period provided by this proposal will give manufacturers time to expand production volumes and help stabilize the cost of the technologies.

C. Tractor and Trailer Low-rolling Resistance Tires

1. SmartWay Approved Low-rolling Resistance Tires

Under the SmartWay program, the assumption is that for every 5 percent reduction in tire rolling resistance, a 1 percent reduction in fuel savings is attained (U.S. EPA, 2008). The goal of requiring low-rolling resistance tires is to achieve a fuel consumption savings of at least 3 percent. In order for tires to be SmartWay approved, U.S. EPA requires manufacturers to provide test data that demonstrate their tires meet the SmartWay performance requirements, using one of the following test methods:

- Using the SAE J1321 Type II fuel consumption test, demonstrate a 3 percent (or greater) fuel savings with low-rolling resistance tires. This test must be performed on a test track, rather than "in service", or

- Using the SAE J1269 tire rolling resistance test, demonstrate that the tire's rolling resistance coefficient complies with the SmartWay "target values." These values (see Table IX-3) are axle-specific.

Table IX-3: Comparison of Tire Rolling Resistance Coefficients

Tire Position	**Standard Tire** (kg/metric ton)	**SmartWay Tire** (kg/metric ton)
Steer Axle	6.8	5.8
Drive Axle	8.6	7.3
Trailer Axle	6.1	5.2

After analyzing tire rolling resistance data, U.S. EPA set the SmartWay target values at 15 percent below the midrange coefficient levels of the most commonly used long-haul tires. A 15 percent reduction in tire rolling resistance results in a 3 percent reduction in fuel consumption. The SmartWay target values for tire rolling resistance are expressed in kilograms (kg) per metric ton. This measurement takes the amount of resistance forces within a tire and divides it by the load mass supported by that tire. For example, a tire with a rolling resistance coefficient of "6" (when tested under SAE J1269) has 6 kilograms of resistive tire forces for each metric ton of downward force on that tire. Thus, about 60 newtons of constant force would be required to overcome the rolling resistance of such a tire.

2. Experience with Low-rolling Resistance Tires

As stated in SAE J1269, rolling resistance is defined as the scalar sum of all contact forces tangent to the test surface and parallel to the wheel plane of the tire. The rolling resistance coefficient is the ratio of the rolling resistance to the load on the tire (SAE J1269). Simply put, the more rolling resistance a tire has, the more energy is required to move a vehicle. The three main physical causes of rolling resistance are: hysteretic losses, aerodynamic drag, and friction losses (tire/ground and tire/rim).

Hysteresis is the phenomenon whereby the tire material's internal molecules slip against one another. The energy that should be converted to do the mechanical work of moving the vehicle forward ends up getting released in the form of heat. Hysteresis occurs as the tires go through their continuous deformation and recovery cycles (Bajer, 2008); i.e., *deforming* when in contact with the road (and bearing the weight) and *recovering* when not in contact with the road). By using more resilient rubber compounds in the manufacturing process, hysteretic losses can be reduced.

Aerodynamic drag stems from the wind drag caused by a tire's tread design. Although it can provide additional traction, an aggressive, zigzag tread pattern with deep lugs has significantly more wind drag (especially at high speeds) than does a rib tread design tire with straight grooves. By designing tread patterns that are more aerodynamic, wind drag is reduced; resulting in lower rolling resistance.

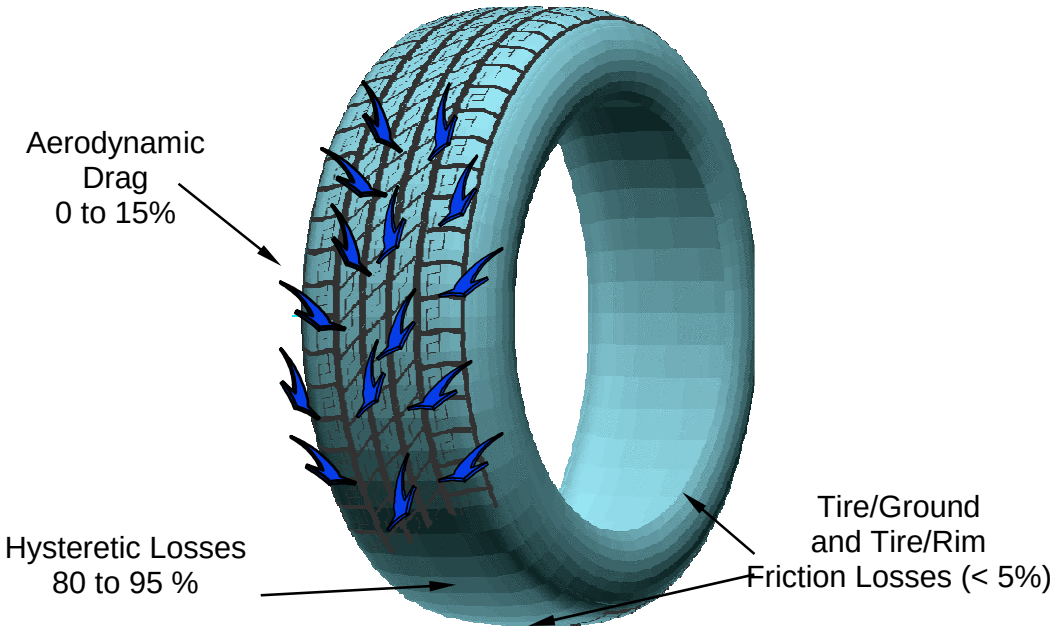

Figure IX-6: Contributors to Rolling Resistance (Michelin, 2002)

Friction losses between the tire and road and between the tire and rim are particularly prevalent when tires are new. Forces on drive tires due to acceleration, and upon all wheels due to turning and heavy loads, can cause flexing and scuffing to the tire tread and sidewalls that result in extra friction. Rough road surfaces further exacerbate this problem. The taller, deeper treads of a new tire are more susceptible to this condition (lack of lateral stiffness) because there is more tire material available to flex. As a tire wears down, lateral stiffness increases and rolling resistance decreases; resulting in fuel economy benefits that increase as the tires' tread depth decreases. Therefore, to provide lower rolling resistance, SmartWay tires are designed with tread depths that are slightly shallower than most standard long-haul tires. Improvements to the tire casings have also been made to reduce sidewall flexing and casing growth (i.e., stretching out of shape), as well as strengthening of tire beads to better stabilize tire-to-rim contact.

The development of low-rolling resistance tires began largely in response to the 1975 Energy Policy Conservation Act, which established Corporate Average Fuel Economy standards for passenger cars and light trucks. Since 1980, the tire and rubber industry has responded by reducing the rolling resistance of tires by more than 50 percent. One of the greatest factors that reduced rolling resistance was the shift from bias-ply tires to radial tires. Although still manufactured (largely due to lower cost), bias-ply tires produce higher friction and heat than radials, which results in higher rolling resistance and fuel consumption.

There are several other factors that affect a tire's rolling resistance, including tire mass, rubber formulations, tread design, inflation pressure, speed, ambient/tire temperature, applied drive torque, surface roughness, and the vehicle's wheel alignment (front/steer tires). Improvements to the factors over which tire manufacturers have control (i.e., tire

mass, rubber formulations, and tread design) are the focus of the SmartWay performance requirements.

3. Incremental Costs of Low-rolling Resistance Tires

According to a tire industry trade publication, in 2005 almost 70 percent of original equipment tires and over 60 percent of replacement tires sold for HDV use were radials (MTD, 2006). With the advent of the SmartWay program, combined with the recent increase in fuel costs, staff believes these percentages are considerably higher today. In the staff's analysis, the cost of SmartWay approved tires over standard HDV radial tires ranged from about $0.00 to $50.00 per tire, with an incremental cost of $0.00 to $900.00 to replace the tires on a tractor and trailer. The average incremental cost for those upgrading to SmartWay tires from bias-ply tires would be slightly higher, but their fuel economy benefit will be significantly greater than those who are already using radial tires. The estimated tire prices were determined from price quotes obtained from fleets, tire manufacturers, and tire retailers. For this analysis, staff assumed that the typical HDV has 18 tires: two steer tires, eight drive tires, and eight trailer tires. Although SmartWay approved tires typically have slightly shallower tread depths, improvements to both the tire casing and tread design have shown that some low-rolling resistance tires may last as long as their conventional counterparts. Moreover, many fleets are already equipping their tractors and trailers with SmartWay approved tires, so their capital expenses for tires have been made already.

4. Lifetime Costs of Low-rolling Resistance Tires

With respect to tires, there are notable differences between tractor-trailers and passenger cars. Most notably, when the tires wear out on passenger cars, they are discarded for new ones. However, when tractor-trailer tires wear out, the tire casings are usually retreaded and put back into service again. Therefore, it is not uncommon for a tire to start off "new" as a steer tire, get retreaded and used as a drive tire, and then retreaded once or twice more and used as a trailer tire before being discarded. Some fleets may retread the trailer tires even more often, if the casing remains serviceable. Taking this practice into account, staff estimates that tractor-trailers equipped with SmartWay approved tires will realize an annual fuel cost savings ranging from $500 to $1,000 (greater fuel savings for those replacing bias-ply tires with SmartWay tires).

Another benefit from the use of low-rolling resistance tires is that, because the tires run cooler, the tire casings are subject to less heat and fatigue, thereby, improving the likelihood that the casings of SmartWay tires will be candidates for multiple retreadings. Besides the cost savings associated with retreads (about one-half the cost of new tires), retreads result in a reduction in the demand for petroleum. Tires are petrochemical products. On average, it takes about 22 gallons of oil to produce a new tire. However, it only takes about 7 gallons to produce a retread (TRIB, 2008). Thus, retreading is not only a cost-effective alternative, but it also reduces the demand on petroleum resources.

5. Product Availability

In discussions with tire manufacturers, the added demand for SmartWay tires does not pose a product availability problem. In years past, tire longevity and traction were the important considerations when selecting tires. Now, following the recent increase in fuel costs, the demand for fuel-efficient tires has come to the fore. Manufacturers are already working towards making their tires more fuel efficient. Although staff anticipates that additional tire manufacturers will produce low-rolling resistance tires that meet the performance requirements of SmartWay, there are currently four manufacturers with SmartWay approved tires: Bridgestone, Continental, Goodyear, and Michelin. According to a recent trade publication (MTD, 2008), these four companies comprise over 79 percent of the truck tire market share. Moreover, each one of these manufacturers produces SmartWay approved tires (listed below) in both the 22.5-inch and 24.5-inch HDV rim sizes, and in tread designs optimized for the steer, drive, and trailer axle positions.

Bridgestone
Steer R287, R280
Drive M720, Greatec
Trailer R195, Greatec

Goodyear
Steer G395 LHS Fuel Max
Drive G305 LHD Fuel Max
Trailer G316 LHT Fuel Max

Continental
Steer HSL
Drive HDL Eco Plus
Trailer HTL

Michelin
Steer XZA3, XZA2
Drive XDA Energy, XDA3, X-One XDA
Trailer XTA Energy, XT1, X-One XTA

Another option for the drive and trailer axle positions is the use of SmartWay approved wide base tires, or “super singles.” Unless originally equipped, this alternative requires replacing the dual-wheel configuration on the drive and/or trailer axles with a single, wide tire and rim. The super single tires provide excellent low-rolling resistance and fuel economy; and because they weigh less, they allow for greater carrying freight capacity.

X. ALTERNATIVES CONSIDERED

Staff developed the proposed regulation in an open public process, initially presenting draft regulatory concepts that evolved into the proposed regulation. During the regulatory development process, the scope, structure, and requirements of the regulation changed based on information staff gained through its own research and through information exchanged at public workshops and separate meetings with interested stakeholders. Ideas that were formulated during the development process and incorporated in the final proposed draft regulation included: adding California-based shippers to the list of regulated entities; removing receivers and non-California-based brokers from the list of regulated entities; exempting short-haul tractors and trailers,

defining an optional compliance schedule that extends over several years, exempting curtain-side trailers, and providing credit for early actions.

When determining whether a suggested change should be incorporated into the proposed regulation, staff considered the impact the proposed change would have on reaching the following goals:

- Achieve maximum reductions in GHG emissions as expeditiously as possible by improving the efficiency of long-haul tractors and trailers;
- Base the regulation's requirements on the U.S. EPA's SmartWay technology specifications and requirements for improved tractor and trailer aerodynamics and reduced rolling resistance;
- Delay the cost to fleet owners that are also retrofitting or replacing equipment to comply with title 13, California Code of Regulations, section 2477, Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate;
- Ensure that the regulation is enforceable on both California-based and out-of-state-based tractors and trailers;
- Achieve a positive cost-benefit ratio resulting from substantial fuel savings;
- Achieve cost-effective emission reductions on a dollar per ton basis; and
- Achieve these goals while keeping in mind the U.S. EPA SmartWay approved technologies available today and likely to become available over the next few years.

The alternative regulatory structures considered and reasons they were rejected in favor of the proposed regulation are summarized in Table X-1 below.

Table X-1: Alternative Regulatory Structures Considered

Approach	Why Rejected
No action – Tractor and trailer owners would install SmartWay technology on a voluntary basis in accordance with the U.S. EPA SmartWay program requirements.	SmartWay technologies have been available for several years and most truck and trailer owners have not installed them despite available fuel savings. Would prevent ARB from meeting GHG emission reduction goals required by AB 32.

Don't limit applicability of regulation to heavy-duty tractors pulling 53-foot or longer box-type trailers • Expand applicability of aerodynamic technology requirements – Require aerodynamic technologies to be installed on box-type trailers of any length and on straight trucks • Expand applicability of low-rolling resistance tire requirements - Require low-rolling resistance tires on all heavy-duty tractors, trailers, and heavy-duty straight trucks.	• Beyond scope of current U.S. EPA SmartWay Program o No SmartWay approved aerodynamic technologies exist for straight trucks. o SmartWay approved technologies only exist for 53-foot or longer box-type trailers o SmartWay certified trailers are all 53-foot or longer. • Extending regulation to straight trucks results in only modest increase in GHG reductions. • Heavy-duty tractors pulling 53-foot or longer box-type trailers comprise the majority of long-range mileage from heavy-duty tractors. Those vehicles will see the greatest fuel economy benefits from the use of aerodynamic technologies and low-rolling resistance tires. • Information to quantify the emission benefits of low-rolling resistance tires on other heavy-duty truck applications is lacking. Thus, it is difficult to assess at this time whether the benefits would outweigh the costs.

The sections below provide further quantification and detail on the two alternative regulatory structures identified in Table X-1.

A. No Action

During the course of the regulatory development process, tractor and trailer owners, as well as representatives of trucking industry associations, suggested that the best approach is to continue with the voluntary U.S. EPA SmartWay Program. They argued that at this time there are insufficient data available to demonstrate how the various aerodynamic technologies and low-rolling resistance tires perform in real world operations to support a regulation that mandates their use.

Staff agrees that the use of aerodynamic technologies and low-rolling resistance tires by current long-haul transport fleets is not widespread. However, staff believes that there are sufficient laboratory test data (generated by U.S. EPA's SmartWay program, Chapter VII) as well as real-world data (information gathered by staff, Chapter IX) to support requiring their use in accordance with the proposed regulation.

The reported negative experiences with aerodynamic devices include increased weight with little or no fuel efficiency gain, extent and frequency of fairing damage, and additional weight added due to snow and ice build-up. The negative experience with low-rolling resistance tires includes little or no fuel economy savings and loss of traction in off-road applications. The negative concerns about adding weight without fuel efficiency gains is being addressed in the proposed regulation by limiting the requirement to add aerodynamic devices to only long-haul applications, where most vehicle miles traveled are done at highway speeds. Further, by limiting the low-rolling resistance tire requirement to tractor-trailer rigs comprised of tractors pulling 53-foot or longer box-type trailers on California highways, concerns about loss of traction are largely mitigated, since typical off-road applications (e.g., logging, construction equipment transport) are not impacted by the proposed regulation. Other negative experiences like fairing damage and snow/ice buildup have largely been addressed by aerodynamic device manufacturers. In summary, staff believes the negative experiences associated with aerodynamic and low-rolling resistance tire technologies required by the proposed regulation are being addressed by the manufacturers of those products and are further lessened by limiting the applicability of the proposed regulation to long-haul tractor-trailer rigs.

Although the SmartWay program has been in place since 2004, a relatively small number of tractors and trailers have been retrofitted with aerodynamic technologies in response to this program. This is especially true for trailers, where staff estimates that less than 0.3 percent of the total 53-foot or longer box-type trailer inventory incorporates aerodynamic technologies. Part of the reason for this lack of use of aerodynamic technologies is that SmartWay partners are choosing other options to reduce the GHG footprint of their businesses. Strategies chosen include reduction in idling time, increasing intermodal transport, reducing trailer weight, and using cleaner diesel engine technologies. But the question still remains, why don't they choose to retrofit trailers instead of some of these other options when meeting their SmartWay goals? Staff believes the decision not to retrofit is rooted in the conservative nature of the long-haul transport business and the magnitude of the up-front capital costs to retrofit an entire fleet of trailers.

Staff estimates that the average capital cost to comply with the proposed regulation is approximately $5,000 per tractor and trailer affected. About $2,900 is needed to retrofit a box-type trailer with aerodynamic technologies and low-rolling resistance tires. However, the operating cost savings resulting from the fuel efficiency improvement associated with compliant tractors and trailers is substantial. Staff estimates a compliant tractor-trailer combination will save between $4,000 and $5,700 in fuel costs every year. To some extent, the transportation industry has recognized the benefits associated with improved aerodynamics. Most long-haul tractors have some aerodynamic features – roof fairings and fuel tank fairings are two examples. However, trailer aerodynamics has lagged woefully behind. Box-trailer design has not evolved much over the last 30 years. The trailers are designed to carry the largest possible load within federal and state size and weight limits. As a result, trailers are rectangular in shape, designed to take advantage of every inch allowed by the size limits, with little consideration given to aerodynamics. Staff believes the incorporation of aerodynamic

technologies on box-type trailers will not happen in a timely manner without regulatory impetus. Real and quantifiable near-term GHG reduction benefits will be lost if the proposed regulation is not implemented. As a result, staff has rejected the "No Action" option.

B. Expand Applicability

The proposed regulation was identified by staff in October 2007 as a discrete early action measure required to be adopted by the Board and made enforceable by January 1, 2010 (ARB, 2007). Key to its inclusion in the list of discrete early actions was the existence of the SmartWay program, which establishes technical specifications and requirements for compliant tractors and trailers. The applicability of the proposed regulation is inline with the applicability of the SmartWay program's technical specifications and requirements.

Throughout the regulatory development process environmental groups have suggested that the applicability of the proposed regulation should be expanded beyond the traditional long-haul configuration of tractor and trailer (i.e., a sleeper cab tractor pulling a 53-foot or longer box-type trailer) to include box-type trailers of various lengths and types, and straight trucks. Their analysis indicates that requiring aerodynamic device retrofits and low-rolling resistance tires on all tractor-trailers pulling box-type trailers and straight trucks could get an additional 46 percent reduction in cumulative GHG emissions by 2020 (Schubert, 2008).

Staff agrees that additional GHG emission reductions can be gained by expanding the applicability of the proposed regulation beyond the proposed long-haul configuration tractors and trailers. But expanding the applicability of the proposed regulation in these areas would mean that it would be broader in scope than the applicability of the current SmartWay program. Expanding the applicability of the rule would require staff to develop an ARB tractor and trailer, tire rolling resistance, and aerodynamic technology approval and certification program. A certification testing protocol and certification procedure would need to be developed. This could not be accomplished in the timeframe allotted to develop the proposed regulation. As a result, staff did not expand the applicability of the proposed regulation. However, staff is committed to work with U.S. EPA SmartWay program staff and evaluate the feasibility of expanding the program in the near future

Below are listed some of the specific data needs associated with expanding the applicability of the proposed regulation that could not be addressed by staff within the regulatory development timeframe of the proposed regulation. These issues will be addressed by staff in the development of future regulations.

- Obtain additional test data to verify fuel economy improvements from aerodynamic technologies and low-rolling resistance tires on straight trucks, and other box-type trailers. For the proposed regulation, staff has relied on the U.S. EPA's published fuel economy benefits based on a Class 8 tractor pulling a 53-foot box-type trailer loaded to 65 percent of its gross vehicle weight rating

(52,000 lbs.) operated over three drive cycles representative of line-haul tractor-trailer operations (Bachman, 2005.) For different trailer sizes and tractor classes and vocations, the fuel economy benefits may be different and would need to be verified through testing.

- Obtain additional data on low-rolling resistance tire availability, off-road capability, and production capacity. Expanding the applicability of the low-rolling resistance tire requirement will increase the demand for these tires and result in them being used on tractors and trailers that travel off-road regularly, i.e. log hauling.

- Obtain additional data on the synergistic effects of combining aerodynamic technologies on tractors and trailers. Staff relied on the fuel economy benefits established by the SmartWay program for combinations of aerodynamic devices. Requiring all available aerodynamic technologies on all trailers goes beyond the requirements of the SmartWay program. Staff needs to verify the fuel economy benefits of such an approach through additional testing.

XI. ENVIRONMENTAL IMPACT

The proposed regulation is driven by the need to reduce GHG emissions from the transportation sector and specifically from on-road HDVs. The reductions are expected to be achieved through the accelerated introduction of new aerodynamically styled fuel efficient tractors and trailers and the retrofit of existing tractors and box-type trailers with fuel efficient aerodynamic and tire technologies.

Staff expects implementation of the regulation to result in significant GHG emission reductions and to a lesser extent oxides of nitrogen emission reductions, and does not anticipate any significant adverse public health or environmental impacts associated with the proposed regulation. The following sections discuss the environmental impacts associated with the proposed regulation.

A. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to identify the potential environmental impacts of proposed regulations and to mitigate significant effects whenever it is feasible to do so. Since ARB's program involving adoption of regulations has been certified by the Secretary of Resources as meeting certain environmental standards set forth in CEQA, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR or Staff Report) for this rulemaking in lieu of following the CEQA format of an Initial Study and Negative Declaration, and Environmental Impact Report (see Public Resources Code, section 21080.5). In addition, ARB staff will respond, in the Final Statement of Reasons for the regulation, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the ARB's environmental impact analysis 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 regulation.

The proposed regulation is designed to reduce GHG emissions from long-haul combination trucks. The reductions are needed to reduce global warming which poses a threat to the public health, natural resources, economic well being, and the environment of California as required by AB 32.

Alternatives to the proposed regulation are discussed in Chapter X of this report. ARB staff has concluded that there are no alternative means of compliance that would achieve similar GHG emission reductions at a lower cost.

B. Reasonably Foreseeable Environmental Impacts

Staff has identified air quality benefits and minimal negative environmental impacts of compliance with the proposed regulation.

1. Estimated GHG Benefits

The GHGs associated with diesel exhaust are CO_2, methane, and nitrous oxide, with CO_2 being the major component of the three. Since CO_2 is emitted in direct proportion to the fuel combusted, any reduction in CO_2 emissions requires reduction in the fuel burned to propel the vehicle. The proposed regulation would reduce GHG emissions by reducing the fuel consumption of HDVs achieved through improvements in aerodynamic drag and tire rolling resistance. The GHG reductions would contribute towards attaining AB 32 goals for the year 2020.

Equation XI-1 was used to calculate the GHG reductions from the proposed regulation.

$$CO_2e\ Reduced = Fuel\ Savings * EF / 1000 \qquad \text{(Equation XI-1)}$$

Where: CO_2e Reduced = average annual reduction in GHGs in metric tons CO_2e
Fuel Savings = Annual fuel savings in gallons per year
EF = GHG emission factor from diesel fuel combustion (10.4 kilograms CO_2e per gallon of diesel fuel (ARB, 2008c))
1000 = Conversion factor from kilograms (kg) to metric tons (1000 kg = 1 MT)

Annual Fuel Savings: The annual fuel savings is determined from the percent fuel efficiency improvement, annual VMT, and the baseline fuel economy.

Percent Fuel Efficiency Improvements: The percent fuel efficiency improvements used to quantify the GHG benefits are shown in Table XI-1. These were determined based on the minimum aerodynamic and tire rolling resistance performance

requirements specified in the proposed regulation. For example, the proposed regulation would require a minimum fuel efficiency improvement of 3 percent from low-rolling resistance tires on the combined tractor and the trailer, a minimum of 4 percent from trailer side skirts, and a minimum of 1 percent from front or rear gap fairings on dry-van trailers. Thus, for this example, an in-use pre-2011 model year tractor pulling a dry-van trailer would achieve an overall fuel efficiency improvement of 8 percent, as shown in Table XI-1.

The fuel efficiency improvements of currently certified aerodynamic devices are determined from track tests conducted at speeds of 60 to 62 miles per hour according to "SAE J1321 Type II" test procedures. These aerodynamic devices also reduce drag at lower speeds, though to a lesser extent, since aerodynamic drag varies with the square of the vehicle speed.

Annual VMT: The annual VMT applicable to tractors pulling 53-foot or longer box-type trailers was determined using the methodology described in Chapter VI. However, the resulting total VMT cannot be directly applied to the fuel efficiency improvements shown in Table XI-1, since the VMT is accrued at various speeds, while the fuel efficiency improvements are determined at speeds of approximately 60 miles per hour. Thus, the speed-VMT distribution of the impacted tractors and fuel efficiency improvements at different speeds are needed in order to accurately quantify the GHG emission benefits. However, such data were not available and therefore staff estimated the GHG benefits using only the VMT accrued at highway speeds, without taking into account benefits that occur at lower speeds. Accordingly, for non-neighboring out-of-state tractors, staff assumed 85 percent of the VMT to be at highway speeds, since these tractors travel long distances, spending the majority of their VMT at highway speeds. For neighboring out-of-state, California interstate, and California intrastate tractors, staff assumed 75 percent of the VMT to be at highway speeds, benefiting fully for 75 percent of the VMT from the aerodynamic devices.[9]

[9] This assumption is consistent with assumptions made by other studies. For example, a report by Rocky Mountain Institute indicates 75 percent of the VMT is at highway speeds. (Ogburn, 2007).

Table XI-1: Fuel Efficiency Improvements – Based on Proposed Requirements

	Tractor Improvements	Trailer Improvements[10]	Fuel Savings
1	2011+ model year SmartWay certified sleeper cab tractor (3.5%)	Dry-van trailer – SmartWay certified or retrofitted with side skirts and front gap fairings (6.5%)	10.0%
2	2011+ model year SmartWay certified sleeper cab tractor (3.5%)	Refrigerated-van trailer – SmartWay certified or retrofitted with side skirt (5.5%)	9.0%
3	2011+ model year day cab tractors and all pre-2011 model year in-use tractors - Tire Improvements (1.5%)	Dry-van trailer – SmartWay certified or retrofitted with side skirts and front gap fairings (6.5%)	8.0%
4	2011+ model year day cab tractors and all pre-2011 model year in-use tractors - Tire Improvements (1.5%)	Refrigerated-van trailer – SmartWay certified or retrofitted with a side skirt (5.5%)	7.0%

Baseline Fuel Economy: Staff also used model year specific baseline fuel economy values to estimate the fuel savings from the proposed regulation. The fuel economy values used are developed by ARB staff and are applicable for on-road HDVs operating in California (See Appendix C for a discussion of the development of fuel economy values for HDVs).

For the purposes of quantifying the emission reductions, staff also assumed that all fleets will adopt the large fleet trailer compliance plan which provides a compliance option for in-use pre-2011 trailers based on a phase-in schedule specified in Appendix F of this report. Staff also assumed that in the absence of the proposed regulation, 20 percent of the tractors sold each year from 2010 to 2020 would be SmartWay certified and 25 percent of the in-use pre-2011 model year tractors would use fuel efficient tires.

The GHG emission benefits were calculated for the years 2010 to 2020 based on VMT accrued within California and nationwide. Table XI-2 summarizes the 2010, 2015, and 2020 statewide and nationwide GHG emission benefits of the proposed regulation. Staff estimates that from 2010 to 2020, as new fuel efficient tractors and trailers are introduced and in-use ones retrofitted with fuel efficient technologies, GHG emissions will be reduced by a cumulative total of approximately 8 MMT CO_2e statewide and approximately 52 MMT CO_2e nationwide. The 2020 benefits are approximately 1 MMT CO_2e statewide and 6 MMT CO_2e nationwide. Figure XI-1 shows the statewide

[10] The trailer aerodynamic technologies specified in the table are meant for illustration purposes. Fleets can meet the requirements using other aerodynamic technologies that meet or exceed the minimum performance requirements.

baseline and controlled GHG emissions for calendar years 2010 to 2020. As seen in Figure XI-1, GHG emissions from long-haul tractors continue to increase even with implementation of the proposed regulation because the trucking industry will grow substantially between now and 2020 (ARB, 2008a).

Table XI-2: 2010, 2015, and 2020 GHG Emission Benefits - Statewide and Nationwide (MMT CO_2e)

	California		Nationwide	
Calendar Year	**Baseline**	**Reductions**	**Baseline**	**Reductions**
2010	8.5	**0.2**	55.6	**0.9**
2015	10.1	**0.8**	65.7	**5.5**
2020	11.4	**1.0**	74.6	**6.7**

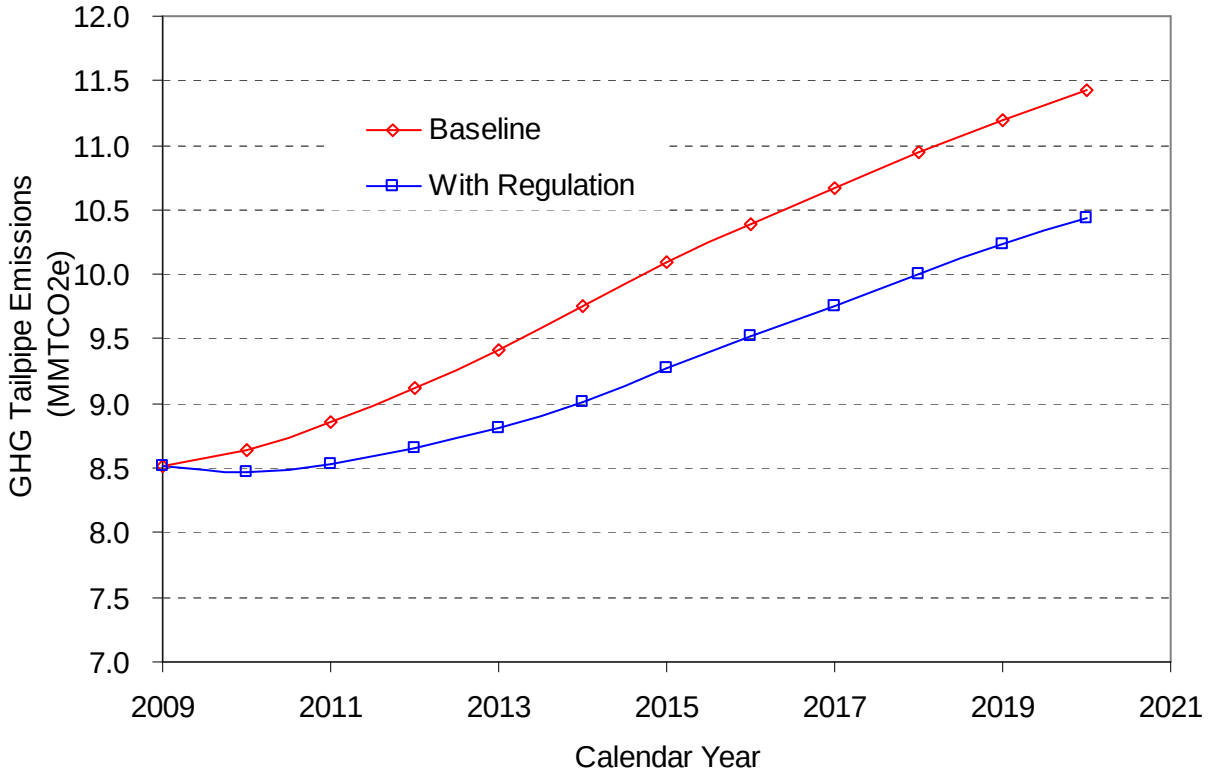

Figure XI-1: Statewide GHG Emissions With and Without the Regulation

2. Estimated Oxides of Nitrogen (NOx) Emission Benefits

In addition to GHG benefits, reducing aerodynamic drag and rolling resistance also reduces NOx emissions (Bachman, 2005; Bachman, 2006). Thus, the proposed regulation is expected to provide NOx emission reduction benefits that would contribute towards attainment of ambient air quality standards for ozone. Staff used the methodology specified in the U.S. EPA SmartWay State Implementation Plan (SIP) and Transportation Conformity guidance document (U.S. EPA, 2007) to quantify the NOx emission benefits from the proposed regulation.

Because the effects of the SmartWay technologies on NOx emissions of trucks with particulate matter and NOx aftertreatment controls is not yet determined, the U.S. EPA recommends that, for SIP and conformity determinations, the NOx reductions not be applied to trucks of model years newer than 2006. Furthermore, the NOx emission reductions associated with SmartWay retrofit applications vary by speed, requiring the VMT to be distributed by speed. Since speed distribution data for the fleet that is impacted by the proposed regulation were not available, staff made the following assumptions on VMT-speed distribution of long-haul tractors. That is, for non-neighboring out-of-state tractors, staff assumed 85 percent of the VMT to be at highway speeds and a corresponding NOx reduction of 9.5 percent. For the remaining 15 percent of the VMT staff assumed an average speed of 35 miles per hour and a NOx reduction of 4.6 percent. For California intrastate, California interstate, and neighboring out-of-state tractors, staff assumed 75 percent of the VMT to be at highway speeds and a corresponding NOx reduction of 9.5 percent. For the remaining 25 percent of the VMT, staff assumed an average speed of 35 miles per hour and a corresponding NOx reduction of 4.6 percent. Based on these assumptions and U.S. EPA guidelines, California specific NOx reductions were estimated to be 4.3 and 1.4 tons per day in 2014 and 2020 respectively. These reductions assume a “business as usual” scenario, where they do not take into account the impact of other proposed regulations that would impact NOx emissions.

3. Potential Negative Impacts

Staff has identified one potential negative impact resulting from the proposed requirement to use fuel efficient tires. Waste tires may increase during the phase-in periods because fleet owners, in order to comply with the proposed requirements, may be forced to replace usable tires before the end of their useful life. If not managed properly, waste tires can cause serious public health risks and environmental problems, such as fires, air and groundwater contamination resulting from burning tires, providing habitats for vector breeding, and reduction of landfill capacity.

Staff believes the proposed requirement would result in minimal or no increase in tire waste for the following reasons. The proposed regulation requires that in-use 2010 and older model year tractors use fuel efficient tires by January 1, 2012, giving fleet owners 2 years to comply with the requirements. It also provides in-use 2010 and older model year trailers the option to meet the proposed requirements during a 6-year phase-in period by January 1, 2016. For long-haul operations, fleets normally replace old steer tires with new tires once every year. Thus, replacing steer tires with new fuel efficient

tires during the two-year phase-in period will not result in increased tire waste since the replacement can be done at the end of the tire's normal life. Drive tires, depending on the fleet's tire maintenance program, may be replaced with new tires once every one to two years, or recapped once or twice during their lifetime and reused as drive or trailer tires. Thus, similar to the steer tires, the drive tires replaced with new fuel efficient tires during the two-year compliance period would not result in increased tire waste since replacement can occur at the end of the tire's normal life. Retreaded drive tires that would have been reused as drive tires, but because of the proposed requirements are now replaced with new fuel efficient tires, could also be used as trailer tires or sold to out-of-state fleets or for use on tractors and trailers not affected by the proposed regulation, resulting in no increase or minimal increase in tire waste. Trailer tires are normally retreaded and reused multiple times. However, the proposed regulation provides a phase-in period of six years for fleets to comply with the trailer retrofit requirements, providing enough time to retread and reuse trailer tires before they are forced to replace them with fuel efficient tires. Trailer tires that cannot be reused in California but have remaining life for retread could also be sold to out-of-state fleets, thus minimizing tire waste.

C. Reasonably Foreseeable Mitigation Measures

ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of and compliance with the proposed regulation. Therefore, no mitigation measures would be necessary.

D. Alternative Means of Compliance with the Proposed Regulation

Alternatives to the proposed regulation are discussed in Chapter IX of this report. ARB staff has concluded that the proposed regulation provides the most effective and least burdensome approach to reducing GHGs from on-road HDVs.

XII. COST AND ECONOMIC IMPACT

A. Summary

AB 32 requires that climate change regulations must consider the impacts on the economy of the state. The consideration should include, but not be limited to, the impacts of the regulations on jobs and businesses, and California business competitiveness. The regulations must take into account the impacts on local communities with minority/low-income populations, and affiliated businesses. This section discusses the economic methodology and cost impacts staff anticipates from implementation of the proposed climate change regulation on the California economy. The results are intended to provide an overall picture of the economic impacts on the economy although an individual business or consumer may experience different impacts than anticipated.

The cost analysis was computed based upon an 11-year equipment lifespan, from 2010 to 2020. Over that time span, staff expects a net savings of approximately $4.3 billion to the affected stakeholders in 2008 dollar values. During the first six years of

implementation from 2010 to 2015, an estimated net savings of $3.5 billion is expected. The net savings will be realized by truck operators because of improved fuel economy. Businesses that own only trailers and no tractors may not be able to recover the cost of retrofitting their trailers through fuel savings, and therefore, they may need to recover their investment by paying less to haulers or by passing it on to customers by increasing the cost of their merchandise. Ultimately, the substantial operating cost savings seen by the truck haulers should result in lower costs to ship goods and result in lower cost for consumers. Staff calculated the savings based upon the projected retail price per gallon of ultra low sulfur diesel fuel of $3.14 in 2010 to $3.69 in 2020.[11] However, staff believes this may be a conservative estimate of the savings since recently the California average retail price for diesel fuel was about $4.00 per gallon.[12] At $4.00 per gallon, the lifetime savings of the regulation (over the 11-year lifespan of the equipment) would be about $8.5 billion.

The GHG emission reductions from the proposed rule for all affected vehicles traveling in and out of California are estimated at 6.7 MMT CO_2e in 2020. An emission benefit of approximately 1 MMT CO_2e or 15 percent would occur within California. The proposed rule is also expected to achieve NOx reductions. The U.S. EPA State Implementation Plan (SIP) guidelines for implementation of aerodynamic devices on heavy-duty trucks and trailers approved through the SmartWay program estimates NOx reductions ranging from 2 to 10 percent per vehicle, depending on speed. Based on the guidelines, in addition to the GHG benefits, the proposed measure would result in a statewide NOx emission reduction of about 4.3 tons per day (tpd) in 2014[13] and 1.4 tpd in 2020.

B. Legal Requirements

The legal requirements for an economic analysis are included in the Government Code sections 11346.3 and 11346.5 and the Health and Safety Code section 57005. These statutes require all State agencies do an assessment of the potential adverse economic impacts on California business enterprises and individuals when any regulation is proposed, adopted, or amended. The assessment must include at a minimum, consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California businesses to compete with businesses in other states. State agencies also are required to estimate the cost or savings to any State or local agency and school district, in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State. The ARB must also perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major

[11] Integrated Energy Policy Report, California Energy Commission developed in 2007 and projected to 2020 (CEC, 2007).

[12] The United States Energy Information Administration tracks California retail diesel fuel price; on September 15, 2008, ultra low sulfur diesel was at $4.05 per gallon (EIA, 2008).

[13] 2014 is one of the target years for reducing emissions in the California SIP.

regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year.

C. Methodology for Estimating Cost and Economic Impact

The cost-effectiveness analysis is based on estimates of expected emissions reductions and costs for implementation of the proposed regulation. The annual discounted capital costs and operating cost savings were calculated to determine the total annual costs or net savings. The incremental cost to purchase SmartWay certified aerodynamic devices and approved tires begins with the 2011 model year (2010 calendar year) and is incurred as a lump sum. Since the equipment may last for many years, the lump sum expenditure can be "spread-out" over the expected life of the equipment. Staff used the capital recovery method, also known as the amortization method, to spread the costs of the equipment and tires over their useful life at a specified interest rate.

The following formula (Linsley, 1977) is used to calculate the annualized cost of new and in-use equipment replacement:

$$AC = (ICE)(CRF)$$

Where:
AC = Annualized cost of equipment
ICE = Incremental consumer expenditure for equipment
CRF = Capital recovery factor = [i (1 + i) ^n] / [(1 + i) ^(n – 1)]

Note that "i" in the CRF formula represents the interest rate (or "opportunity cost") for the incremental consumer expenditure, while "n" represents the equipment life. By using the capital recovery factor method, the equipment's annual depreciation and the opportunity cost is accounted for.

Annual capital cost values of the affected population of tractors and trailers were calculated by multiplying the projected population for each year by the incremental cost of the required aerodynamic equipment and tires in that year. The affected population represents the projected number of tractors sold in that year generated from the ARB's inventory. The trailer population was determined by using a trailer-to-tractor ratio of 2.5 to 1. Annualized costs are estimated using a real interest rate of 5 percent. All these costs are predictions of future prices, which could vary noticeably depending on demand, competition, and economic conditions, among other factors.

D. Estimated Costs of the Proposed Regulation

Staff estimated aerodynamic device and tire costs from currently available retail prices, fleet price quotes, and equipment manufacturer prices for new and in-use SmartWay trucks and trailers. The low, average and high cost estimates for the required equipment/tires are shown in Table XII-1. Staff assumed in absence of the regulation, 20 percent of the new tractors sold would be SmartWay certified and 25 percent of new day cabs and in-use sleepers would use fuel efficient tires. In staff's analysis, it was assumed that without the regulation, affected trailer owners would not purchase

SmartWay certified trailers nor retrofit their existing trailers. This is based on conversations with manufacturers of SmartWay aerodynamic equipment who stated that very few fleets had SmartWay equipped trailers. In addition, fleets that had purchased aerodynamic trailer equipment mostly did so because they were awarded grant funding.

Staff assumed that the tractor would be equipped with fuel tank fairings, cab side extenders, an integrated sleeper cab roof fairing, aerodynamic bumpers and mirrors, and low-rolling resistance tires. The lower price estimate for new sleeper cab equipment was based on selecting lower cost SmartWay aerodynamic component options, some of which now come standard on new sleeper tractors. Also, depending on the manufacturer, the aerodynamic package for new sleepers may include components that may not necessarily be needed to meet the minimum requirements for the proposed regulation, thereby providing even more benefits than estimated.

The trailer would be equipped with side skirts and front or rear fairings. Both the tractor and trailer are assumed to have SmartWay approved tires. Staff did not include any incentive or grant funds that may be available to offset the purchase of the proposed technologies, although these programs can provide a significant reduction in capital outlay and are discussed in section I.1 of this chapter – Summary of Current Financial Assistance and Grant Programs.

Table XII-1: Tractor and Trailer Costs

Category	Low	Average	High
New Sleeper	$1,100	**$2,100**	$3,000
Trailer	$1,900	**$2,900**	$4,200
Tractor & Trailer	$3,000	**$5,000**	$7,200

The estimated tire cost differentials for a conventional heavy-duty tire versus a SmartWay approved tire ranged from $0 to $50. For the tire cost analysis, staff assumed that the typical long-haul tractor has two steer tires and eight drive tires. Staff assumed the trailer has eight tires.

As noted in the technology discussion, SmartWay approved tire technology has made improvements to both the casing and tread design over the years, and may now last as long as conventional tires. Based on this, staff assumed that the steer tires will last one year, the drive tires will be replaced every two years, and the trailer tires would last four years and then be retreaded. One retread was assumed for the tractor drive tires and two retreads for the trailer tires. Some fleets may retread the tires as long as the casing lasts. Staff also spoke with retreaders that stated that there was no cost difference between retreads for a low-rolling resistance tire versus a conventional tire. The retreader also stated that the retread cost was based on the amount of rubber used and that a low-rolling resistance tire could be less expensive to retread since this tire typically does not have a tread depth as thick as a conventional tire. Also, some fleets noted that they will continue to use tires with tread left and then switch these tires from the steer position to drive position to trailer tire positions to reduce tire purchasing costs;

staff did not account for these additional savings in the cost analysis. From meetings with various fleets, it was noted that fleets have a variety of tire replacement practices.

Staff included maintenance costs and administrative fees, as shown in Table XII-2. No incremental maintenance cost for tires was included since it is assumed that a fuel efficient low-rolling resistance tire would be maintained in the same manner as a conventional tire.

Many fleets noted that, in general, neither the tractor nor trailer aerodynamic devices required any additional annual maintenance. However, to be conservative, staff included an annual maintenance and inspection cost of $143.00 based on the repair and replacement of a fiberglass panel for one out of every ten tractors. Most of the fleets indicated that the maintenance needed for tractor fairings was minimal. Damage to trailer side skirts was more common because of loading, environmental conditions, and driver errors. For trailer maintenance and repair, staff included a cost of $120.00 per year. This is an average of $170 per year (about 10 percent of the cost of a side skirt) reported by one fleet that used trailer skirts in a very harsh environment of snow and ice; and $75 per year from a 2.5 year maintenance study of 20 trailers (Freight Wing, Inc., 2008).

The proposed regulation specifies reporting requirements for short-haul tractors and trailers, and in-use trailer compliance schedules. Included in the overall cost is an estimated annual $500 per fleet for trailer reporting cost during the first five years of the proposed regulation. The fees are meant to account for the record keeping, tracking of California compliant tractors/trailers, updating of contract/legal fees, inspection costs for freight companies and shippers, and administrative costs during implementation.

Table XII-2: Annual Maintenance Costs/Fees

Item	Low	Average	High
Tractor	$30	**$143**	$233
Trailers	$75	**$120**	$166
Contract Administration Fees	0	**$3.50/Tractor $5/Trailer**	$5

Using the above costs, staff estimates that for the industry as a whole, the lifetime capital cost of complying with the proposed regulation would be about $10.4 billion and the cost savings over the same period of time would be $14.7 billion. This yields a net cost savings of almost $4.3 billion. On an annualized basis, the average cost savings over the lifetime of the proposed regulation would be about $0.4 billion per year from 2010 to 2020 (2008 dollars). However, at a retail diesel fuel price of $4.00 per gallon, net cost savings would increase to about $8.5 billion or $0.8 billion per year from 2010 to 2020.

Approximately 9 percent of the affected tractor and trailer population are based in California. The total estimated statewide lifetime cost for California based tractors and trailers to comply is about $0.5 billion, and the cost savings over the same period of

time are $1.1 billion. This yields a net statewide cost savings of almost $0.6 billion. This net cost savings would be realized by California fleet operators and owner operators of compliant tractors and trailers and are directly attributed to operating cost savings associated with improved fuel economy.

On a per vehicle/equipment basis, the total operating cost savings per year ranges from approximately $5,400 to $3,700 as shown in Table XII-3. The cost of add-on devices would, on average, be $5,000 (Table XII-1), making the cost recovery period less than 1.5 years.

Table XII-3: Annual Operating Cost Savings

Vehicle/Equipment	Fuel Savings (gallons/year)	Fuel Cost Savings[1] ($/year)	Maintenance Cost ($/year)	Total Savings[14] ($/year)	Fuel Savings
New Sleeper Cab & Trailer Combination	-1,819	-$5,704	$263	-$5,441	10.0%
New Sleeper Cab & Refrigerated Trailer Combination	-1,737	-$5,133	$263	-$4,870	9.0%
In-Use Sleeper Cab/New Day Cab & Trailer Combination	-1,455	-$4,563	$263	-$4,300	8.0%
In-Use Sleeper Cab/New Day Cab & Refrigerated Trailer Combination	-1,273	-$3,993	$263	-$3,729	7.0%

[1] The estimated fuel cost is $3.14 per gallon in 2010, sourced from the Integrated Energy Policy Report of the California Energy Commission in 2007 (CEC, 2007).

Staff expects that the increased production of the aerodynamic equipment needed to meet the proposed regulation would help to lower future purchase costs as economies of scale are realized. Also, staff expects additional manufacturers of approved aerodynamic equipment to enter the marketplace, providing more competitive pricing. As mentioned previously, businesses that own only trailers and no tractors may not be able to directly recover the cost of retrofitting their trailers through fuel savings, and therefore, they may need to recover their investment either by paying less to haulers who receive the direct fuel economy benefit or by passing it on to customers by temporarily increasing the cost of their merchandise.

[14] The assumptions for this calculation are as follows: a baseline fuel economy of 5.8 miles per gallon, an average long-haul mileage accrual rate of 125,000 miles per year, 84 percent of the vehicle miles traveled at highway speed that benefit fully from the aerodynamic devices, and a projected diesel fuel cost of $3.14 per gallon. If the cost per gallon in diesel fuel is higher that $3.14, the fuel savings due to the proposed regulation would be proportionately greater.

For instance, due to high fuel prices, some motor carriers are charging a fuel surcharge per truckload; however, a company with a dry-van meeting the rule's requirements should incur a lower fuel surcharge. A retrofitted dry-van will increase the fuel economy of the tractor pulling it on average by 6.5%. Therefore, it would be reasonable for a company that hires a motor carrier to haul their retrofitted or SmartWay certified trailer to negotiate a proportional reduction in the freight rate.

E. Potential Impact on a Small Business

Most businesses that operate long-haul tractors and trailers are not considered small businesses because they generate revenues where the transportation and warehousing annual gross receipts exceed $1.5 million (Government Code 11342.610) particularly when they own multiple tractors and operate multiple shifts. Similarly, logistics companies are typically not considered small businesses. These organizations, however, may contract with small fleets and truck owner-operators that could be classified as small businesses.

Based upon transportation revenue estimates, staff developed a "small fleet" definition (see Appendix F). A small fleet could own up to 8 tractors and 20 trailers using the "small fleet" definition. The typical fuel savings projected for one year for one tractor-trailer combination is $3,700 to $5,400, so the payback for an expensive option of purchasing a new SmartWay tractor (versus not SmartWay), and retrofitting a trailer is less than 1.5 years.

The notice of public hearing issued in conjunction with this staff report included a statement on page 7 that staff assumed that a small business owner did not own any trailers. This statement in the notice was in error; as noted in this section of the staff report, ARB's analysis considers that companies owning as many as 20 trailers may be small businesses, and the regulation specifically provides that those owning up to this number of trailers may utilize a "small fleet compliance schedule." This misstatement had no effect on staff's economic analysis or on ARB's determination as stated in the notice that the proposed regulatory action would affect small business.

Staff assumed that most owner-operators will fall under the small business definition. The Owner Operator Independent Drivers Association (OOIDA) has a California membership of about 5,600 (OOIDA, 2004). According to OOIDA, about 50 percent of their members are involved with long-haul, and of these 28 percent operate dry-vans and refrigerated-vans that could be affected by the regulations. According to the OOIDA survey,[15] members own, on average, 1.5 tractors; 82 percent own only one tractor. About 40 percent of owner-operators purchase their tractors new and 60 percent purchase their tractors used. About 53 percent own trailers and those that do own trailers have, on average, two trailers. Based on these statistics, the cost of compliance will vary as shown in Table XII-4 below:

[15] Not all owner-operator truck drivers are members of OOIDA. Therefore, the survey results discussed may not apply to all owner-operators.

Table XII-4: Owner-Operator Compliance Costs

Owner-Operator Equipment Configuration	Equipment Needs	Cost per One Tractor-Trailer Combination	Cost per Owner-Operator with 1.5 Tractors and 2 Trailers
Owns used tractor	Upgraded tractor tires	$0 to $500	$0 to $750
Owns used tractor and trailer	Upgraded tractor tires, retrofit trailer	$2,900 to $3,400	$5,800 to $6,500
Purchases new SmartWay tractor, owns trailer	SmartWay tractor, retrofit trailers	$5,000	$9,000

Outside of California, based on the OOIDA market survey, there are approximately 160,000 owner-operator businesses (OOIDA, 2004). Of these, staff estimated that there are about 18,000 long-haul owner-operator businesses that operate dry-vans and refrigerated-vans that may be subject to the proposed rule.

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

There are modest up-front costs associated with the proposed regulation before fuel efficiency gains occur. It is possible that some very marginal trucking companies would not be able to finance the required upgrades. Financial assistance and grant programs will be available to assist these businesses. Fuel costs have been shown to have a direct correlation to the survivability of many long-haul transport businesses, and this proposed regulation is expected to provide a net fuel savings once the required equipment is installed.

The regulation should result in an increased demand for aerodynamic devices and low-rolling resistance tires. This in turn may result in the creation or expansion of some businesses as a result of manufacturing, distributing, and marketing of these devices. The increased demand in approved aerodynamic devices may also result in the creation of some new jobs related to research and development for further improvement of these devices.

Most of these types of jobs are expected to be located near chassis or trailer manufacturing facilities located outside of California, although some will be created in California dealerships and maintenance facilities. New jobs for maintaining/replacing aerodynamic devices may also be created.

The regulation is not expected to affect the ability of California businesses to compete with other states by making it more costly to produce goods or services because the proposal affects both interstate and intrastate long-haul freight distribution. In addition, most of the tractors and trailers affected by the proposed regulation are owned by businesses located outside of California.

G. Estimated Costs to Local, State, and Federal Agencies

The proposed regulation is not expected to have any impact on local public agencies. However, there would be a cost to the State for additional staff to provide the ongoing regulatory development, implementation, and enforcement of the regulation. The costs for the additional staff would be approximately $3,613,223 in fiscal year 2009-2010 (this includes one-time contract and equipment costs). In fiscal year 2010-2011 and going forward, the cost to the State would be $6,494,463 annually (in 2008 dollars). The total costs for fiscal years 2009-2010 and 2010-2011 are shown in Table XII-5.

Table XII-5: Fiscal Year Costs for State Agencies

Fiscal Year	State Cost (2008 $)
FY: 2009 – 2010	$3,613,223
FY: 2010 – 2011	$6,494,463

The cost is based on 20 new staff to conduct ongoing regulatory development and program implementation and 11 staff for enforcement of the regulation. The need for 20 new positions was estimated based on the number of staff it has taken to develop and implement similar rules.[16] It is envisioned that there would be a significant amount of coordination and program development work with U.S. EPA SmartWay staff. The proposed program would be dynamic in nature, meaning that regulatory amendments are expected to be routinely brought before the Board for approval as the program is expanded to include new aerodynamic components, trucks, and trailers. Given that the heavy-duty truck fleet accounts for 20 percent of the GHG emissions from the transportation sector (or 36 MMT CO_2e), expansion of the program is not only expected, but vitally needed.

Because ARB's enforcement staff already has major commitments to other diesel regulations, it is expected that existing staffing levels will not be adequate to meet the increased demand for inspections and other enforcement activities. Staff anticipates additional inspectors will be required to conduct an enforcement program involving field

[16] Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Title 13, Section 2485; Regulation for In-Use Off-Road Diesel Vehicles, Title 13, Sections 2449, 2449.1, 2449.2 and 2449.3

inspections, office investigations, and case development for the affected population of over 400,000 tractors and over 1 million trailers. A robust enforcement program is necessary to assure a level playing field for those that comply, and to assure the GHG emission reductions are achieved.

Staff does not expect any costs to federal agencies as these agencies typically contract out for long-haul freight services.

H. Cost-Effectiveness of the Proposed Regulation

The basic methodology ARB staff uses to determine cost-effectiveness of a regulation is to determine what costs are involved to comply with the proposed regulation and to compare those costs to the emission reduction benefits to the public. Since the proposed regulation would result in an overall savings to the affected industry, it would be cost effective.

This regulation would result in an estimated CO_2 benefit of approximately 1 MMT CO_2e in California and 6.7 MMT CO_2e nationwide in 2020. In addition, the regulation is estimated to provide NOx emission reductions of about 4.3 tons per day (tpd) in 2014 and 1.4 tpd in 2020.[17]

The regulation would provide a cost savings of $4.3 billion. The annualized net savings are the cost savings for the tractors and trailers subject to the regulation from 2010 to 2020, as shown in Table XII-6. On an average annualized basis, this is equivalent to an operating cost savings of about $0.4 billion per year over the 11 years.

Table XII-6: Average Annualized Cost Savings

Model Year	Cumulative Annual Capital Costs	Annual Operating Cost Savings	Net Savings Total
2010	$71,994,512	-$586,464,631	-$514,470,120
2011	$233,058,924	-$809,739,777	-$576,680,853
2012	$411,434,088	-$1,176,648,403	-$765,214,315
2013	$613,503,052	-$1,292,353,131	-$678,850,079
2014	$822,210,899	-$1,361,253,981	-$539,043,082
2015	$1,040,505,088	-$1,423,881,061	-$383,375,973
2016	$1,169,863,202	-$1,477,348,117	-$307,484,915
2017	$1,300,497,855	-$1,538,439,022	-$237,941,167
2018	$1,435,448,768	-$1,585,812,457	-$150,363,689
2019	$1,572,800,765	-$1,666,974,913	-$94,174,148
2020	$1,727,329,806	-$1,755,052,155	-$27,722,349
Total Savings	$10,398,646,958	-$14,673,967,648	-$4,275,320,691

[17] U.S. EPA methodology entitled, “SmartWay SIP and Transportation Conformity Guidance: Accounting for NOx Reductions from Trailer Aerodynamic Kits and Low-rolling Resistance Tires”

Total Savings over 6 year implementation	**-$3,457,634,422**
Total Savings over 11 years to 2020 per AB 32	**-$4,275,320,691**

I. Summary of Current Financial Assistance and Grant Programs

1. Federal grants and state incentive programs

a) U.S. EPA: EPA's National Clean Diesel Campaign

Under the Energy Policy Act of 2005, the Diesel Emissions Reduction Act (DERA) authorized $200 million per year for 5 years for implementation of diesel emissions reduction projects. The U.S. EPA National Clean Diesel Campaign Program (NCDC) consists of the NCDC Grants and Funding Program and the State Clean Diesel Grant Program, with the first appropriation of $49.2 million authorized by Congress in 2007. The NCDC includes the SmartWay Clean Diesel Finance Program. The programs provide technical assistance and grants to assist eligible partners to adopt diesel emissions reduction strategies. Grant opportunities are announced at the national level or via regional agreements such as Region 9 and 10 via the West Coast Collaborative (Federal Register & NCDC website).

b) U.S. EPA SmartWay Partnership Financing Program

The U.S. EPA SmartWay Finance Center provides a website to assist the trucking industry with the purchase of fuel savings and emissions reducing vehicles and technologies. This website works by bringing interested buyers and lenders together in one place. The interested tractor or tractor equipment buyer submits an application for an approved vehicle or technology, and interested lenders submit loan or lease offers to the applicant. The applicant decides which lenders he/she wants to work with, and both applicant and lender discuss the specific terms and conditions of each loan or lease.

In September 2008, U.S. EPA was awarded $3.4 million in grants to provide financial assistance for truckers under the SmartWay Clean Diesel Finance Program. These loans will help small trucking firms lower their fuel costs and their carbon footprint by purchasing newer used trucks and idling and emissions reduction technologies. However, the loans and leases on this web site are limited to SmartWay certified vehicles and/or approved technologies and not available to the general public.

Information on financial institutions that provide loans for purchase of new or pre-owned tractors can be found at the following website www.SmartwayFinanceCenter.com. The following provides SmartWay Program details from the U.S. EPA website:

- Interest rates: 5.5 to 8.5 percent, depending on, among other things, each applicant's business history, available collateral, cash flow, and credit score

- Loan payback period: 3 to 6 years, depending on, among other things, business history, available collateral, and cash flow
- Geographic location: Nationwide
- Eligible activities: Purchase used trucks that are already upgraded, or upgrade them with SmartWay or CARB verified idle reduction and/or emission reduction technology.
- Program Goal: Establish a revolving loan fund for the purchase of used trucks that have SmartWay upgrades or will receive SmartWay upgrades.
- Service fee: 2 to 3 percent

2. California incentive programs

While ARB's existing incentive grant programs, such as the Carl Moyer Program, have a proven success record in accelerating fleet turnover to newer, cleaner vehicles, funding opportunities for regulatory compliance are limited by statutory requirements to achieve surplus emission reductions, i.e., reductions that occur early and/or are in excess to what is required by regulation. As such, staff is currently developing an air quality loan program comprised of various financing options to provide an additional, more flexible financial assistance tool to regulated fleets.

The 2008-2009 fiscal year State budget contains a $48 million appropriation to fund a heavy-duty vehicle air quality loan program to assist on-road fleets affected by staff's proposal and the proposed Truck and Bus Rule. In developing this air quality loan program, ARB staff is coordinating with the State Treasurer's Office (STO) to tailor a program to meet the specific needs of the heavy-duty vehicle sector.

One option being developed by ARB staff is a program with loan guarantees as the core component. Loan guarantees are advantageous for two primary reasons: 1) by reducing the financial risk to lenders, they create opportunities for borrowers that fall slightly below normal lending criteria and may not otherwise qualify for loans to obtain affordable financing packages; and 2) they provide an inherent benefit of fund leveraging to significantly increase the amount of funds available for direct loans to fleet owners. For example, the $48 million budget appropriation could result in nearly $340 million in competitive-rate loans to heavy-duty vehicle fleet owners, based on a seven-to-one leveraging ratio found in similar financing programs within the STO. In conjunction with loan guarantees, staff is evaluating other economic assistance tools to extend repayment periods and further reduce interest rates, as well as evaluating financial mechanisms that maximize State funds to create a large-scale, sustainable air quality loan program.

Because this loan program specifically supports the ARB's two proposed regulations for on-road heavy-duty vehicle fleets, ARB staff will update the Board

on the program at the same time the regulatory proposals are presented for Board consideration; funds should be available to assist fleets in early 2009.

a) Assembly Bill 118

Assembly Bill 118 (Nunez, 2007) created the Alternative and Renewable Fuels and Advanced Technology Program to be administered by the California Energy Commission, and the Air Quality Improvement Program to be administered by ARB. The Energy Commission program will have about $120 million annually beginning in fiscal year 2008-2009, and is geared toward transforming California's fuel and vehicle types to help attain California's climate change goals. ARB will receive $50 million annually to support clean air programs, and the first year appropriation is the source of the loan program funds described above. AB 118 provides the Energy Commission with over seven years in program funding. AB 118 requires that grants received pursuant to this program must achieve emission reductions that are early or go beyond what is required by regulation. ARB and the Energy Commission are currently developing guidelines and eligible project categories for their respective programs, with initial year project solicitations expected in mid-2009.

b) Local Agency Programs

Most Federal and State programs are administered by local agencies. In most cases, equipment operators should check with their local air district for funding opportunities, apply to, and be funded through them. Many local programs administered in conjunction with Carl Moyer funds operate under the title of "Heavy-duty Incentives" or similar. In the same manner, federal funding may be distributed through special programs like Sacramento Air Quality Management District's Emergency Clean Air and Transportation Program, supplemented by CMAQ (Congestion Mitigation and Air Quality) and state funds.

In addition, certain vehicle types and uses of trucks may have their own specially funded programs. The Ports of Long Beach and Los Angeles fund the Gateway Cities Clean Air Action Program fleet modernization plan via a combination of use fees (concession and container), Goods Movement and other matching sources. This program operates in conjunction with the San Pedro Bay Ports Clean Air Action Plan and Local Area Council of Governments, and anticipates replacing 16,000 trucks with newer used trucks over the next five years. Other agencies and jurisdictions may also have settlement and mitigation funds available for air quality improvement programs.

XIII. REQUIREMENTS OF AB 32

AB 32, at Health and Safety Code section 38560.5, requires that ARB adopt regulations by January 1, 2010 to implement discrete early action GHG emission reduction measures. These measures must "achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions" from the sources identified for early action measures. AB 32 contains additional standards in Health and Safety Code

section 38562 that apply to regulations that will be adopted for general emissions reductions consistent with ARB's scoping plan. Among other things, this section requires that reductions must be real, permanent, quantifiable, verifiable, and enforceable. ARB is also required to adopt rules and regulations in an open, public process. While section 38562 does not directly apply to early action items enacted under section 38560.5, ARB is interested in ensuring that its early action measures for GHG reductions such as those contained in this proposed regulation meet the broader criteria for the GHG reduction regulations that will follow. For that reason, these criteria are summarized here, with staff's assessment as to why the proposed regulatory action meets them or is not specifically applicable to them.

The proposed regulation would reduce GHG emissions by improving long-haul heavy-duty vehicle fuel efficiency. This improvement in fuel efficiency would be accomplished through the required use of aerodynamic technologies and low-rolling resistance tires. Below is a discussion of why staff believes the proposed regulation meets the requirements of State law.

1. ***The State Board shall adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reduction from sources or categories of sources.***

The proposed regulation was developed in consultation with affected parties in an open, public process. ARB staff conducted numerous outreach efforts to inform affected parties of the proposal and to obtain stakeholder comments. Outreach efforts included public workshops, individual meetings, and email and telephone contacts. See Chapter III, Public Outreach and Environmental Justice, for a description of the public process.

2. ***Design the regulations, including distribution of emissions allowances where appropriate, in a manner that is equitable, seeks to minimize costs and maximize the total benefits to California, and encourages early action to reduce greenhouse gas emissions.***

The proposed regulation requires the use of U.S. EPA SmartWay approved aerodynamic technologies and low-rolling resistance tires on long-haul heavy-duty vehicles. Long-haul heavy-duty vehicles are the focus of the proposed regulation because GHG emission benefits resulting from the use of aerodynamic improvements are maximized when vehicles travel a majority of their miles at highway speeds. Heavy-duty vehicles that travel a majority of their miles at slower speeds, e.g., short-haul delivery vehicles, are exempted from the regulatory requirements.

The proposed regulation would apply equally to California-registered and out-of-state registered long-haul heavy-duty vehicles. All long-haul vehicles (heavy-duty tractors pulling 53-foot or longer box-type trailers) subject to the requirements would need to comply, regardless of state or country of registration. The proposed regulation would also establish requirements for drivers and owners of heavy-duty tractors and 53-foot or longer box-type trailers, motor carriers, California-based brokers, and California-based shippers. Drivers, motor carriers, tractor owners, and trailer owners would be directly

responsible for ensuring that noncompliant tractors and trailers do not operate on California's highways. Although California-based shippers and brokers would not initially be held responsible for noncompliant tractors and trailers, they could be held responsible, under certain circumstances, if a motor carrier, tractor owner, or trailer owner with whom they did business failed to settle a previously issued notice of violation. Under this strategy, staff expects that motor carriers, tractor owners, and trailer owners, including those domiciled out of state, would have an incentive to settle outstanding violations in order to avoid any potential detriment to their relationships with California-based shippers and brokers. Ensuring that out-of-state fleets are treated the same as California-registered fleets with respect to enforcement, would provide an equitable playing field for doing business in California. See Appendix G, Implementation and Enforcement for further information.

Owners of long-haul vehicles affected by the proposed regulation may have up-front costs associated with acquisition of aerodynamic technologies and low-rolling resistance tires. These initial costs are expected to be recouped through savings from reduced fuel use, and the proposed regulation is expected to result in a substantial net savings for the businesses that operate long-haul vehicles in California. See Chapter XII, Cost and Economic Impacts, for a more detailed discussion.

The proposed regulation would provide an incentive for owners of trailers to retrofit their trailers early. For every 2010 and earlier model year 53-foot or longer box-type trailer that is compliant with the proposed regulation by December 31, 2009, the owner could delay the retrofit of 1.5 nonconforming trailers until 2016. This provision encourages early compliance and is structured such that GHG emissions would not be lost. The early compliance option is discussed in more detail in Appendix F, Optional Trailer Fleet Compliance Schedules.

3. Ensure that activities undertaken to comply with the regulations do not disproportionately impact low-income communities.

Long-haul heavy-duty vehicles operate throughout California; no disproportionate localized impacts are expected. Greater GHG and NOx reductions would occur in populations located near interstate highways, typically where low-income communities are located.

4. Ensure that entities that have voluntarily reduced their greenhouse gas emissions prior to the implementation of this section receive appropriate credit for early voluntary reductions.

The U.S. EPA SmartWay Partnership program is a voluntary program that encourages the use of approved aerodynamic technologies and low-rolling resistance tires. In response to this program, some long-haul vehicle owners have voluntarily installed aerodynamic technologies and low-rolling resistance tires that meet the requirements of the proposed regulation. The proposed regulation would allow extra flexibility to fleets that have complied early with the requirements by providing additional time to meet the requirements. See Appendix F, Optional Trailer Fleet Compliance Schedules.

5. Ensure that activities undertaken pursuant to the regulations complement, and do not interfere with, efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminant emissions.

The proposed regulation requiring the use of aerodynamic technologies and low-rolling resistance tires on long-haul heavy-duty vehicles would aid in efforts to achieve federal and state standards by reducing NOx emissions. Long-haul heavy-duty vehicles equipped with aerodynamic devices and low-rolling resistance tires are able to transport freight more efficiently, reducing the required load on the engine. Engines operating at lower loads have lower peak combustion temperatures and thus lower NOx emission rates. The magnitude of the reduction in NOx emissions resulting from improvement in tractor-trailer efficiency is dependent on the NOx emission rate of the tractor's engine. Older engines produce more NOx emissions, and thus will realize a greater NOx reduction benefit from efficiency improvements. See Chapter XI, Environmental Impacts, for a more detailed description.

6. Consider cost-effectiveness of these regulations.

The proposed regulation is expected to result in a substantial net savings for the businesses that operate long-haul heavy-duty vehicles in California. See Chapter XII, Cost and Economic Impacts, for a more detailed discussion.

7. Consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health.

The proposed requirements for long-haul heavy-duty vehicles are not expected to cause any adverse impacts to society or the environment. California would benefit from the reduction of GHG emissions. As discussed in the response to criterion five above, the proposal would not cause an increase in volatile organic compound or toxic air contaminant emissions, and would result in NOx emission reductions. See Chapter XI, Environmental Impacts, for a more detailed description.

8. Minimize the administrative burden of implementing and complying with these regulations.

For those long-haul heavy-duty vehicle owners that comply with the requirements by the established compliance dates, the administrative burden would be minimal. The proposed regulation requires no recordkeeping or reporting for these parties.

Only those tractor or trailer owners that wish to be classified as short-haul, and exempted from the requirements of the proposed regulation, or those that choose to participate in an optional compliance schedule or the refrigerated fleet compliance provision, would be subject to reporting requirements.

To apply for the short-haul exemption, owners would need to submit an application with specific information on the vehicle, vehicle owner, and vehicle's local haul base. Once approved, the tractor or trailer would be considered short-haul and not subject to the

requirements of the proposed regulation. The short-haul exemption would be effective for one year and would require renewal on an annual basis.

To participate in an optional compliance plan, owners would need to submit a compliance plan that would include a statement of intent, information on each affected trailer, and details as to which affected trailers would be retrofitted each year to comply with the optional phase-in schedule requirements.

To participate in the refrigerated fleet compliance provision, owners would need to submit information on each affected refrigerated-van trailer, and details as to which affected trailers would be retrofitted each year to comply with the phase-in schedule requirements.

There would be no recordkeeping requirements for motor carriers, California-based shippers, or California-based brokers.

9. Minimize leakage.

Leakage is not expected as a result of the proposed regulation. Leakage occurs when an emission limit or regulatory requirement set by the State causes business activities to be displaced outside of California. If leakage were to occur, emissions, jobs and other economic benefits to California would be lost. The proposed regulation requires that long-haul vehicles traveling on California highways be equipped with aerodynamic devices and low-rolling resistance tires, regardless of state or country of registration. Therefore, there would not be a situation where a long-haul heavy-duty vehicle registered inside the State would be at a competitive disadvantage compared to vehicles registered outside of the State. Similarly, both California and out-of-state motor carriers would be subject to the same requirements; both would be required to dispatch compliant vehicles.

The proposed regulation does, however, establish additional requirements for California-based brokers and California-based shippers. These California-based businesses would be required to use compliant long-haul vehicles when dispatching vehicles and loading freight for transport, respectively. The primary intent of this strategy is to provide an incentive for out-of-state motor carriers, tractor owners, and trailer owners to comply with the proposed regulation. Historically, it has been very time consuming and costly to collect penalties from unresponsive out-of-state fleets. This is because the State has no authority to hold the registrations of out-of-state registered vehicles and limited authority to hold the vehicles themselves. Therefore, if an out-of-state registered fleet currently refuses to settle a violation, it is necessary, in many cases, for the State of California to file a lawsuit against that fleet in their state of residence to collect any penalties. However, under the strategy of the proposed regulation, staff expects that most motor carriers, tractor owners, and trailer owners, including those domiciled out-of-state, would choose to settle their violations in order to avoid any potential detriment to their relationships with California-based shippers and brokers. Ensuring that out-of-state fleets are treated the same as California-registered fleets with respect to enforcement, would provide an equitable playing field for those doing business in California.

10. Consider the significance of the contribution of each source or category of sources to statewide emissions of greenhouse gases.

The transportation sector, which includes on-road vehicles, aviation, rail, and ships, is the largest contributor to the total statewide GHG emissions inventory, producing approximately 38 percent of the state's total GHGs, or 179 MMT CO_2e. This is projected to increase to 225 MMT CO_2e by 2020 if no actions are taken to reduce emissions. Thus, emissions from the transportation sector must be significantly reduced in order to achieve the AB 32 requirement that State GHG emission levels be reduced to 1990 levels by the year 2020. See Appendix C, Emission Inventory Analysis and Results for more details.

The statewide GHG emission benefits of the proposed regulation are projected to be 1.0 MMT CO_2e emissions in 2020. From 2010 to 2020, the cumulative GHG emission benefits are estimated to be approximately 7.8 MMT CO_2e statewide. While this reduction may appear somewhat modest, when the reduction is considered in conjunction with anticipated future GHG reductions from current and future reductions from other categories, the total reductions are significant. Key to ARB's overall strategy to meet AB 32's aggressive GHG emission reduction goals is to achieve relatively small reductions from a large number of categories, and thus achieve a significant overall reduction in GHG emissions by 2020.

11. The greenhouse gas emission reductions achieved are real, permanent, quantifiable, verifiable, and enforceable by the state board.

The proposed regulation would require compliant tractors and trailers to be either: 1) retrofitted with aerodynamic technologies and low-rolling resistance tires that are U.S. EPA SmartWay approved technologies, or 2) a U.S. EPA certified SmartWay tractor or trailer. The technical requirements and specifications that compliant tractors and trailers would be required to meet are defined by the U.S EPA SmartWay Partnership Program. The proposed regulation defines the dates when specified requirements would become effective and provides ARB, CHP, and District personnel the authority to inspect heavy-duty vehicles and audit records for enforcement. The proposed regulation defines recordkeeping and reporting requirements that would provide enforcement personnel with information necessary to enforce the requirements of the proposed regulation in the field. Once the proposed regulation is approved by the Office of Administrative Law, the proposed emission limit would become State law. Based on the above, upon the effective date of the proposed emission limit, the reductions would become real, permanent, quantifiable, verifiable, and enforceable.

12. For regulations…. ….the reduction is in addition to any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that otherwise would occur.

The proposed regulation is the first GHG emission limitation affecting the long-haul heavy-duty vehicle industry. No other existing State, federal or other requirements

would affect emissions of GHGs from long-haul heavy-duty vehicles. The proposed regulation requirements are based on the requirements of the U.S. EPA's SmartWay Partnership program, which is a voluntary program. Although the SmartWay program has been in place since 2004, a relatively small number of tractors and trailers have been retrofitted with aerodynamic technologies in response to this program. This is especially true for trailers, where staff estimates that less than 0.3 percent of the total 53-foot or longer box-type trailer inventory incorporates aerodynamic technologies.

13. If applicable, the greenhouse gas emission reduction occurs over the same time period and is equivalent in amount to any direct emission reduction required pursuant to this division.

This requirement is not applicable to the proposed regulation.

14. The state board shall rely upon the best available economic and scientific information and its assessment of existing and projected technological capabilities when adopting the regulations required by the law.

ARB staff used the best available economic and scientific information available to develop the proposed regulation. The description in this section documents that the proposal was developed in accordance with AB 32 requirements. Chapter XII, Cost and Economic Impacts, contains a detailed description of the economic impact of the proposed regulation. In addition, a technological assessment of the feasibility of the required aerodynamic technologies and low-rolling resistance tire technologies required by the proposed regulation is presented in Chapter IX, Technological Feasibility of Control Measure.

XIV. ISSUES

A. Mexican Border Issues

During the regulatory development process, staff heard comments from a U.S. motor carrier regarding concerns associated with complying with the trailer aerodynamic technology requirements while routinely driving across the U.S.-Mexico border. According to the U.S. motor carrier, the maintenance costs associated with repairing or replacing side skirt technology installed on trailers that traveled throughout Mexico outweighed the cost savings associated with improved fuel economy. Reportedly, a number of the skirts became damaged when traveling on Mexican roads that were in a state of disrepair. Also, many of the installed skirts were stolen from trailers that were parked overnight in unsecured parking facilities and alongside roadways.

Mexican motor carriers also had concerns about complying with the rule. At a public workshop, a Mexican-based motor carrier stated that a number of the tractor-trailers that cross the U.S. border on a daily basis travel 20 miles or less to distribution centers in California. They "drop and hook" trailers at these facilities and return back to Mexico. "Drop and hook" refers to the activity of dropping-off a trailer at a warehouse or distribution center and hooking up to pull a different trailer to another location. Typically,

tractors engaged in drop and hook activities make several trips into the U.S. every week. The Mexican-based motor carrier, like the U.S. motor carrier, was concerned that the required aerodynamic technologies would be frequently damaged when traveling throughout Mexico. Also, there were concerns raised about the capital costs associated with these technologies and whether the smaller owner-operators that currently own one or two older tractors and trailers would be able to absorb these costs and continue doing business.

In response to the above issues, staff believes the provisions in the proposed regulation for exempting short-haul tractors and trailers can be used by many motor carriers that traverse the U.S-Mexico border. As discussed in Chapter VIII, Proposed Regulation, owners of tractors and trailers may register them as short-haul tractors and trailers as long as they only operate within 100 miles of their local base. Tractors have the option of limiting their annual vehicle miles traveled to 50,000 miles per year, rather than limiting their area of operation. Tractors and trailers that meet the short-haul criteria and that are registered with the ARB as short-haul tractors and trailers would be exempted from the proposed requirements. This would address issues associated with equipment damage and capital costs, but it would require the owners of these tractors and trailers to register them with the ARB. Motor carriers that wish to use this option may be required to alter their current method of operation, since the area of operation of these tractors and trailers would be limited.

B. Other Rulemakings

Staff evaluated the impact of having to concurrently comply with the proposed rule and two other rulemakings, the proposed Truck and Bus Rule and the previously-adopted TRU Rule. The details of this evaluation are presented below.

1. Impact with Truck and Bus Rule

Staff's proposal will be considered for adoption together with the Truck and Bus Rule, which would also have a regulatory impact on businesses operating heavy-duty vehicles. From 2010 through 2020, the Truck and Bus Rule would require the retrofit, repower, or replacement of vehicles equipped with model-year 2006 and older heavy-duty diesel-fueled engines. These requirements would phase in concurrently with requirements of staff's proposal.

Although certain fleets could end up having to bear the burden of concurrently complying with both staff's proposal and the Truck and Bus Rule, staff believes that the number of these fleets would likely be small. This is because staff's proposal would only apply to long-haul vehicles, which, according to vehicle population data, are typically newer. Therefore, staff does not expect long-haul fleets to have many vehicles within the scope of the Truck and Bus Rule's requirements during the period of regulatory overlap.

Nevertheless, staff realizes that certain businesses could still be significantly impacted by both regulations, and therefore, has included the impact analysis below.

a) New Tractor Requirements

Staff's proposal would require all 2011 and subsequent model year tractors with sleeper berths to be SmartWay certified. Staff does not believe this requirement would significantly impact businesses, including ones affected by the Truck and Bus Rule, because the incremental cost of a SmartWay certified tractor is relatively small. For example, staff estimates that a new SmartWay certified tractor is $2,100 more than a typical sleeper berth tractor. Assuming that the average price of a sleeper berth tractor is $121,000,[18] the incremental cost would be less than 2 percent of the total price of the vehicle. In addition, the regulation does not force the turnover of existing vehicles.

b) In-Use Tractor Requirements

Staff's proposal would require all 2010 and previous model year tractors to use SmartWay approved low-rolling resistance tires. Staff believes this requirement would place very little burden on businesses, primarily because the price difference between a SmartWay approved tire and a standard tire is little to none. Based on staff's verbal communication with various fleets, the incremental cost of a SmartWay approved tire ranges from $0 to $50. In addition, tires are consumables that are replaced anyway, and the tire requirement would allow adequate time for vehicles to wear down their existing tires treads before requiring them to change. Moreover, although those affected would not be allowed to recap their noncompliant casings, they could still sell these casings in the secondary market to short-haul fleets, fleets that do not service California, and rubber recyclers. Therefore, staff does not believe that this requirement would add to the impact of the proposed regulation.

c) New Trailer Requirements

Staff's proposal would require all 2011 and subsequent model year box-type trailers to be SmartWay certified or equipped with a required number of SmartWay approved devices. Because natural turnover rates of trailers are low, staff does not believe that this requirement by itself would have a significant impact on businesses. However, staff expects that many fleets would choose to purchase new SmartWay certified trailers instead of retrofitting older trailers with SmartWay approved devices to comply with the proposal's in-use trailer requirements. Therefore, the primary impact of this requirement will be considered as part of the impact of the in-use trailer requirements, discussed below.

d) In-Use Trailer Requirements

The proposed regulation would require all in-use box-type trailers that operate in California to be SmartWay certified or equipped with a required number of SmartWay approved devices by December 31, 2012. Staff expects the largest impact of this proposal to come from these requirements due to the large number of trailers that operate in California.

[18] "Truck Paper," October 7, 2008, <http://www.truckpaper.com>

Therefore, to alleviate some of the burden that a business could potentially face when trying to comply with both the current proposal and the Truck and Bus Rule, staff's regulatory proposal includes the option for a trailer fleet to participate in a compliance schedule that would allow the fleet to delay full compliance of in-use trailers beyond the December 31, 2012 compliance deadline. Two compliance schedules were developed for this purpose--one for large fleets of trailers (21 or more trailers) and one for small fleets of trailers (20 or less trailers). In addition, certain refrigerated trailers concurrently affected by the TRU Rule and staff's proposal could receive an additional delay as described in section 2 below.

Under the large fleet compliance schedule, trailer fleets would be required to begin bringing trailers into compliance in 2010, but would be given until the end of 2015 to complete their fleet transition. Additional flexibility would be available to fleets that bring trailers into compliance before December 31, 2009. Fleets that do so would be given one additional year to bring their remaining trailers into compliance. Furthermore, the large fleet compliance schedule also begins with a conservative phase-in, which would only require 15 percent of a fleet's trailers to comply by the end of the second compliance year (December 31, 2011). This would provide even more flexibility by giving fleets the opportunity to get ahead of early percentage requirements in order to reduce obligations in later years. Staff believes that the built-in flexibility would allow fleets to better manage their capital expenditures for complying with the current proposal and the Truck and Bus Rule. Moreover, because long-haul fleets typically operate newer vehicles, it would be even less likely for a long-haul fleet to be significantly impacted by the Truck and Bus Rule after December 31, 2011. Based on the reasons above, staff believes this compliance schedule would provide adequate time for large fleets to comply with the requirements of the current proposal, even if they are also concurrently subject to the Truck and Bus Rule.

To further reduce regulatory impacts on smaller fleets, they would not be required to begin bringing trailers into compliance until 2013, and would be given until the end of 2016 to complete their fleet transition.

2. Impact with TRU Rule

The TRU Rule requires the retrofit, repower, or replacement of trailers equipped with 2009 and older model year diesel-fueled TRUs from 2010 through 2016. These requirements would phase in concurrently with the large fleet and small fleet compliance schedules of staff's proposal. In addition, since both the TRU Rule and staff's proposal would affect trailers, trailer owners could face a significant burden should they be subjected to both regulations. Therefore, staff developed a special provision that would delay this proposed regulation's phase-in requirements for most 2003 through 2008 model year refrigerated trailers until after 2016. As currently proposed, the refrigerated fleet provision would provide three years (2017-2019) to phase in affected refrigerated trailers. Staff feels that this would allow fleets to better distribute the regulatory impact of complying with the two regulations.

XV. RECOMMENDATION

Staff recommends the Board adopt new sections 95300 through 95312 entitled “Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Measure” in its entirety in chapter 16 of the California Code of Regulations, title 17. The regulatory language is set forth in the proposed regulation order in Appendix A.

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