



# **Refueling Systems (Recreational Vehicle & Truck/Trailer) Workshop**

California Air Resources Board  
Monitoring and Laboratory Division  
June 23, 2010

# Workshop Agenda

- Category Description
- Rulemaking Objectives
- Emissions Points
- Population Survey Results
- Emissions Data
- Control Strategies and Cost Information
- Stakeholder Concerns
- Rulemaking Schedule
- List of Contacts



# Category Description

## Refueling Systems (RV & Truck/Trailer)



# Category Description (cont.)

- Refueling systems
  - Known as “transfer tanks”
  - Mounted on RVs, Trucks and Trailers
  - Plastic or metal fuel tanks, fuel pumps, fuel hoses and dispensing nozzles
  - Generally between 25 and 109 gallons
  - Used to store gasoline, some may be used for diesel
  - Used to fill various types of off-road vehicles, motorcycles, lawn and gardening equipment and other types of vehicles or equipment

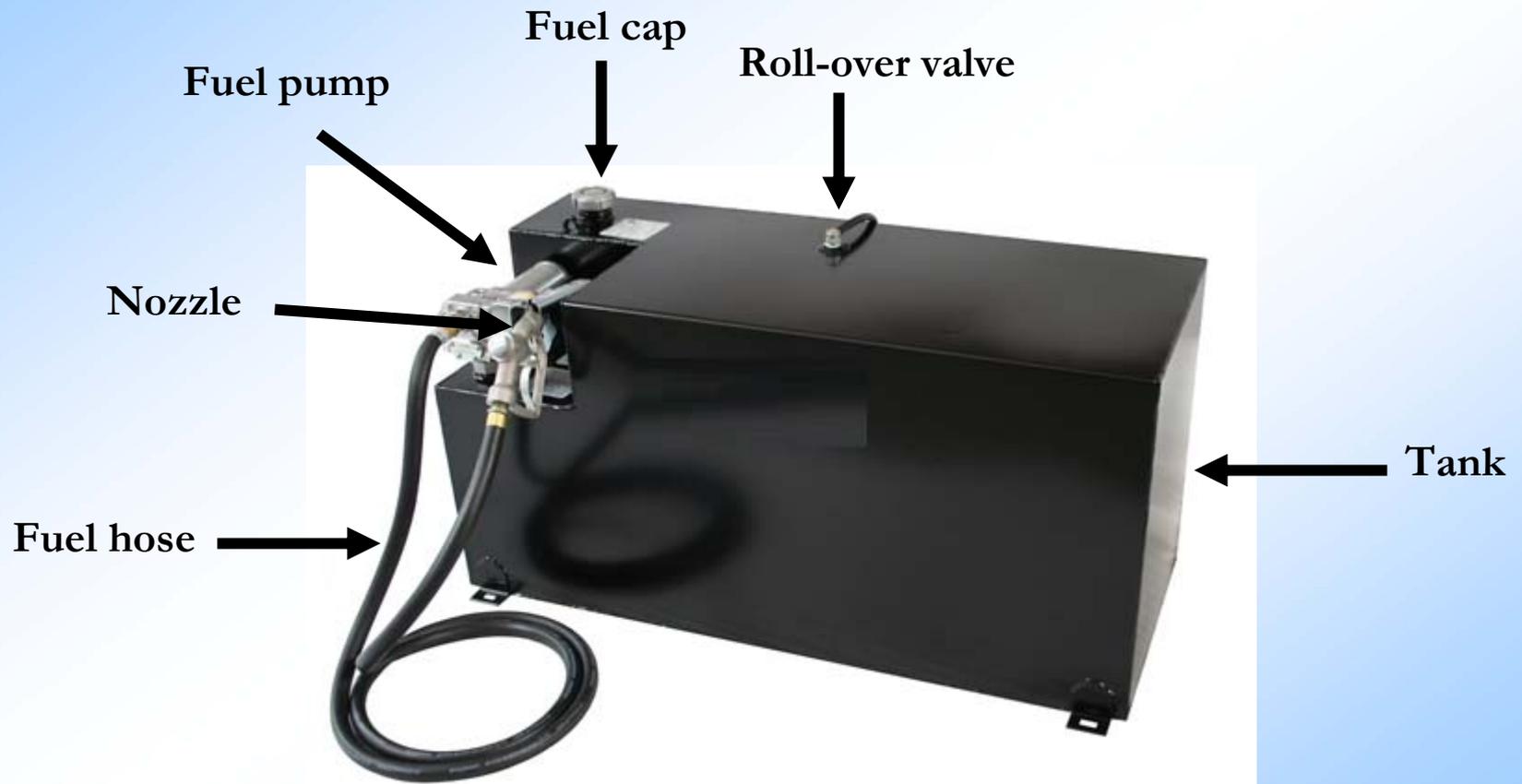
# Category Description (cont.)

- RV refueling systems under consideration
  - Stand alone
  - Installed underneath the body
  - Dual purpose (fuel hose, pump, and nozzle). Fuel tank is regulated by (SORE) rule
  
- Truck/Trailer refueling systems under consideration
  - Stand alone
  - Truck: mounted in the bed
  - Trailer: mounted on the front-end, underneath, or on top of the tongue

# Rulemaking Objectives

- Reduce permeation emissions
  - Plastic tank, fuel hose
  
- Reduce evaporative/vented emissions (including leaks/spillage)
  - Fuel cap (vented), roll-over valve
  
- Reduce gasoline refueling losses (vapor displacement)
  - Nozzle

# Emissions Points

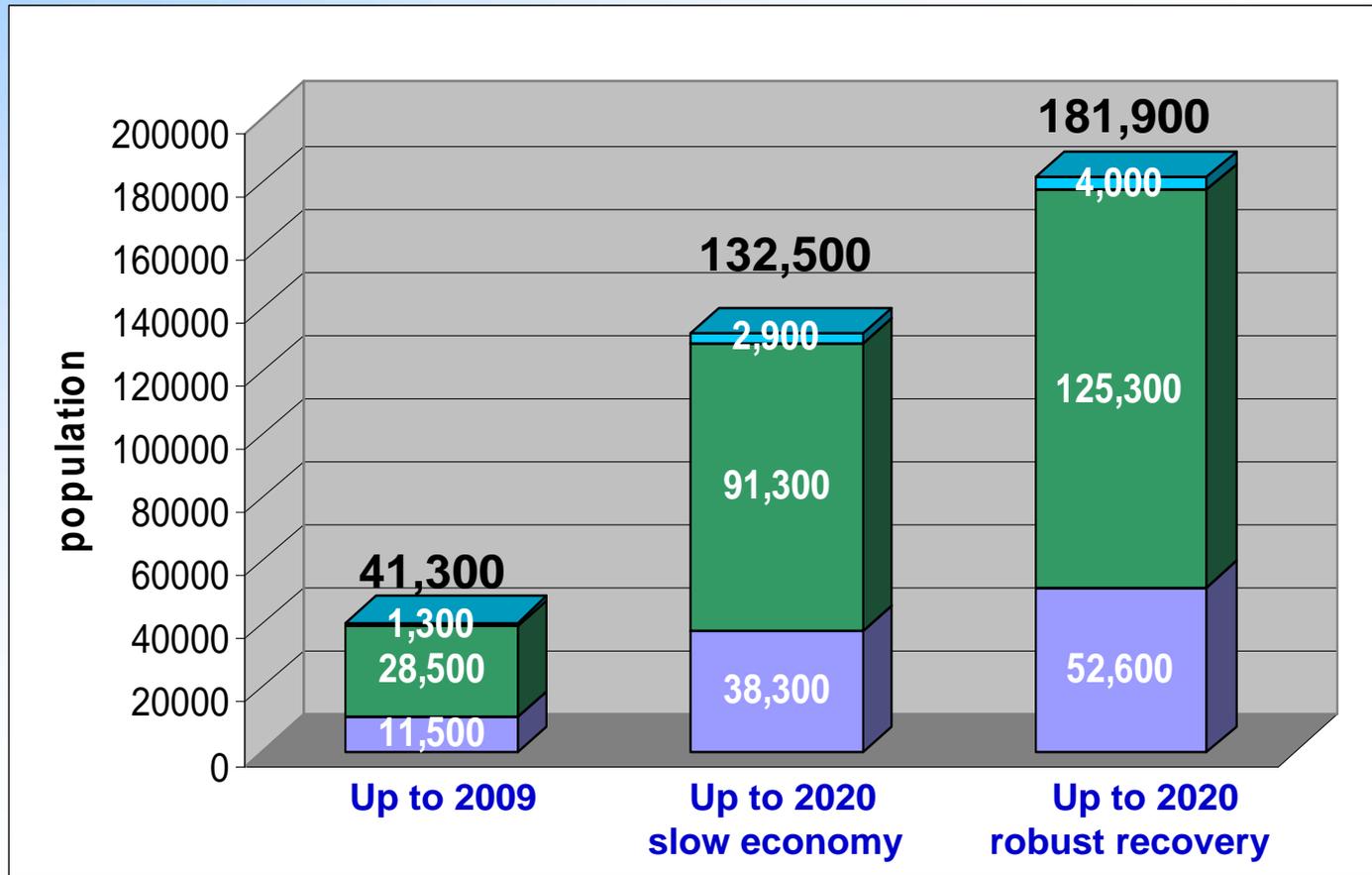


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# Population Survey Results



- Truck/Trailer Refueling Systems
- RV Refueling Systems having **dual purpose** fuel tanks
- RV Refueling Systems having **stand alone** fuel tanks

# Emissions Data

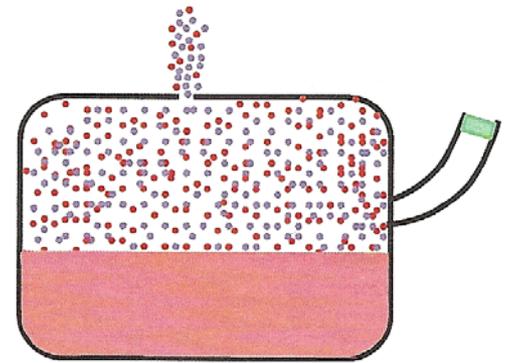
## Diurnal Emissions from Refueling Systems

- 2.0 g ROG/gal/day
  - Reactive Organic Gas (ROG) = THC + EtOH
  - SHED diurnal emissions test (65°F-105°F-65°F)
  - Metal fuel tanks + refueling hose, pump and nozzle
  - Vented tank (roll-over valve)
  - Non-vented cap
  - Half-filled tank
  - 3/4" gasoline hose



# Emissions Data (cont.)

## Diurnal Emissions from Fuel Tanks Alone



- 1.5 g ROG/gal/day
  - SHED diurnal emissions test (65°F-105°F-65°F)
  - Metal fuel tanks
  - 20-30 gal fuel tank
  - Half-filled tank
  - Vented tank (roll-over valve)
  - Non-vented cap

# Emissions Data (cont.)

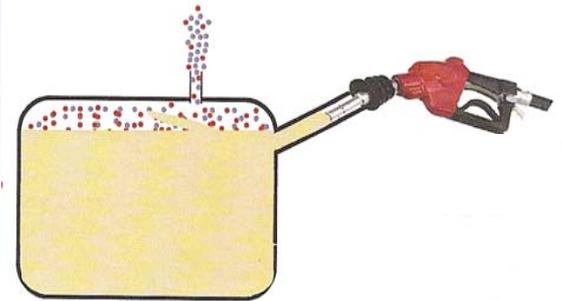
## Permeation from Refueling Hose

- 38 g ROG/m<sup>2</sup>/day for 90-100% filled hose
- 33 g ROG/m<sup>2</sup>/day for 50% filled hose
  - Constant (steady-state) temperature of 73 °F
  - Gravimetric measurement
  - Test fuel CaRFG E6 summer fuel
  - 3/4" gasoline hose, 9-12' long



# Emissions Data (cont.)

## Refueling Loss



- 3.4 g ROG/gal transferred fuel
  - Assume ambient temperature (fuel tank) 85°F
  - Fuel RVP=7.0
  - 21 refill events/year (RV Refueling Systems)
  - 15 gal/refill event (RV Refueling Systems)
  - 19 refill events/year (Truck/Trailer Refueling Systems)
  - 19 gal/refill event (Truck/Trailer Refueling Systems)

# Emissions Data (cont.)

## Spillage Loss



- 4-20 g ROG/refill event
  - Overspill + Dripping loss
  - Dripping loss: depends on customers usage
  - Overspill: looking for innovative fuel transfer technology

# Control Strategies and Cost Information

- Carbon canister
  - It is capable of achieving more than 70% diurnal emissions reduction only by passive purging
  - \$30 cost increase
  
- Low permeation hoses
  - Measure 1 g ROG/m<sup>2</sup>/day under constant 73°F using CaRFG E6 fuel
  - Compared to 38 g/m<sup>2</sup>/day (uncontrolled)
  - \$1-2/foot increase
  
- Reverse pump system
  - \$80 cost increase

# Control Strategies and Cost Information (cont.)

- Low permeation plastic fuel tank
  - Multi-layer technology (co-extrusion, blow or injection molded)
  - Special polymer (nylon and acetal)
  - Barrier surface treatment
  
- Low evaporation pressure control cap
  - 5 psi

# Stakeholder Concerns

- Safety issue

A liquid fuel tank with a capacity of more than 25 gallons of fuel must have a venting system which, in the event the tank is subjected to fire, will prevent internal tank pressure from rupturing the tank's body, seams, or bottom opening (if any)

(49 CFR Ch. III (10–1–07 Edition) § 393.67, page 415 (8))

- Roll-over vent valve
- Vented cap

# Stakeholder Concerns (cont.)

- Diesel tanks used with gasoline
  - Distributing/transporting gasoline in diesel tanks

Questions concerning

- Small Independent Manufacturers
  - Numbers of tanks from independent shops
  - Marketing strategy
  - Cost differences
  - Implementation issues

# Rulemaking Schedule

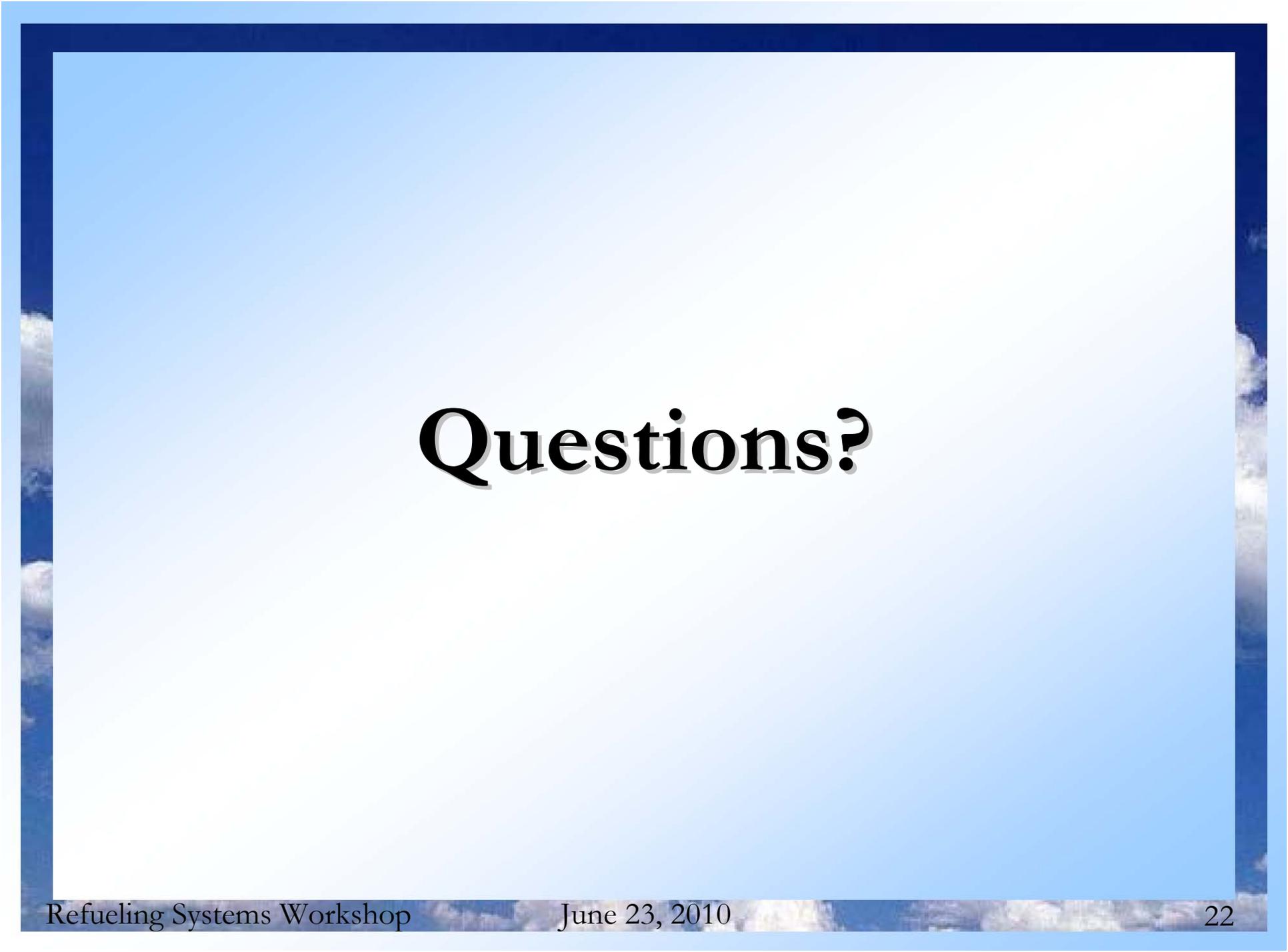
- Next Workshop (TBD):
  - Complete testing of refueling systems and components with E6 (6% ethanol) and E10 (10% ethanol)
  - Complete Refueling Systems (RV& Truck/Trailer) emissions inventory
  - Develop emission standards for category
  
- Board Meeting (2011)

# List of Contacts

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# Website

<http://www.arb.ca.gov/consprod/fuel-containers/rs/rs.htm>



# Questions?