Reducing Idling Emissions From New and In-use Heavy-duty Trucks

Public Hearing

October 20, 2005

Sacramento, California

California Environmental Protection Agency
Air Resources Board

Today's Presentation

- Background
- Staff's Proposal
- Regulatory Impacts
- Air Quality and Other Benefits
- Issues
- Summary

Reasons for Truck Idling

- Operate power takeoff e.g. cement mixers, fire trucks, trash trucks
- Cabin climate control
  - Waiting
  - Sleeping
- Power in-cabin appliances
- Warm up engine in cold weather

Emission From Idling Sleeper Trucks Are Significant

- Smog emissions

2010 Statewide (tons per day)		
NOx	HC	PM
53	4.6	0.73

- Greenhouse gas emissions (CO_2)
  - 2010 GHG emissions = 1.1 megatons per year
- Fuel consumption
  - Typically 1 gallon per hour
  - 2100 gallons per year per truck

Current Regulations Restrict Idling: Sleeper Trucks Excluded

- School buses
  - Prohibits idling at or near schools
  - Applies to other vehicles too
- Commercial vehicles (diesel-fueled)
  - 5 minute limit
  - Sleeper trucks excluded

Summary of Staff's Proposal

- Limits idling of all sleeper trucks to 5 minutes
  - Same limit as currently applies to other trucks
- New engine requirements
  - Equip with automatic engine shutoff device
    - Or demonstrate low engine idle emissions
- New and existing trucks
  - Sets emission requirements for alternative devices that provide cabin comfort and power
- Begins in 2008

New Engine Requirements

- Applies to
  - Heavy-Duty Diesel Engines
  - 14,001+ pounds
  - 2008+ model year
- Exemptions:
  - motorhomes
  - buses

New Engine Requirements

- Automatic engine shutdown system required
  - After 5 minutes
  - Non adjustable
  - Tamper resistant
  - Similar devices used on some engines today
- Alternative compliance
  - Limit main engine idle NOx emissions to 30 grams/hour
  - May be technically possible for 2010+ engines

Engine Shutdown System - New Engines

- Activates when vehicle stops, transmission is in “neutral” or “park” position
- Allows manual reset
- Use of power takeoff overrides shutdown
- Engine warm up overrides shutdown (up to 60°F)

Benefits of Automatic Engine Shutdown – New Engines

- Helps ensure compliance with idling restrictions
  - Sleeper and non-sleeper trucks
- Encourages use of cleaner, alternative technologies for cabin comfort and power
- Helps assure emission reductions achieved

Optional NOx Idling Limit - New Engines

- Auto-shutdown device not needed if idle emissions low
  - 30 g/hour standard ~ 80% reduction
- Engine manufacturers requested option
- Transparent to trucker
- Eliminates cost of alternative technologies to provide cabin comfort and power
- Not yet clear if technically feasible

In-use Idling Restrictions - New and Existing Trucks

- Ends exemption for sleeper trucks
  - 5 minute limit applies to CA and out-of-state registered sleeper trucks
  - Exceptions for traffic congestion, during repairs, power take-off, etc.
- Establishes emission limits for alternative technologies that provide cabin comfort and power
  - More stringent limits for technologies used on 2007+ trucks

Alternative Technologies That Provide Cabin Comfort and Power

- Small auxiliary power system (APS) engines
  - Run A/C, provide electricity
- Battery powered A/C and power
- Fuel fired heaters
- Thermal storage devices
- Plug-in at electrified parking spaces
- Off board power, heating, and cooling, e.g. IdleAire

Special Emission Considerations for Diesel APUs

- Pre-2007 truck: Meet current new diesel engine emission standard
- 2007+ truck (low PM emissions):
  - Plumb exhaust through truck's PM filter, or
  - Install verified level 3 retrofit device
  - Without this requirement, PM emissions would be higher than main engine
  - Note: This requirement a major issue with EMA

Special Emission Considerations for Fuel Fired Heaters

- Pre-2007 truck:
  - Any heater
- 2007+ truck:
  - Meet ULEV standards
  - Currently commercially available

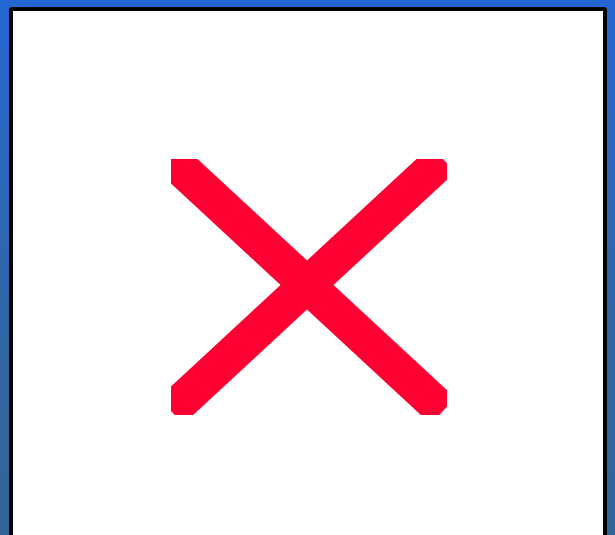
Cost of Engine Shutdown Devices 2008+ Engines

- Shutdown system is a standard feature in current electronic engines
  - No significant cost to develop the technology
- Cost to track engines destined for sale in California and minimal engine shutdown reprogramming cost:
  - $ 100 per engine

Cost of Alternative Technologies for Cabin Comfort and Power

Fully Integrated Diesel-Fueled APS

- OEM option, available on new trucks only
- Cost less than aftermarket APSs
- Heating, Cooling, Electrical Power
- Fuel use: ~ 0. 2 gal/hour
- Manufacturers: Caterpillar, Cummins



Cost of Alternative Technologies for Cabin Comfort and Power

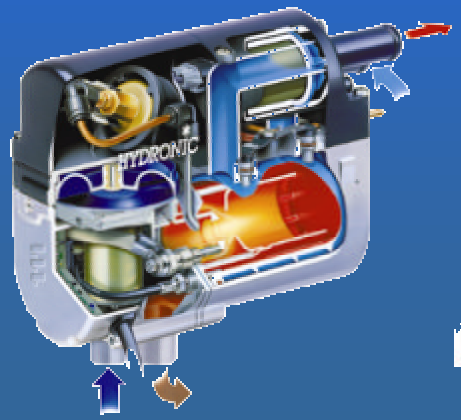
Diesel-Fueled APS

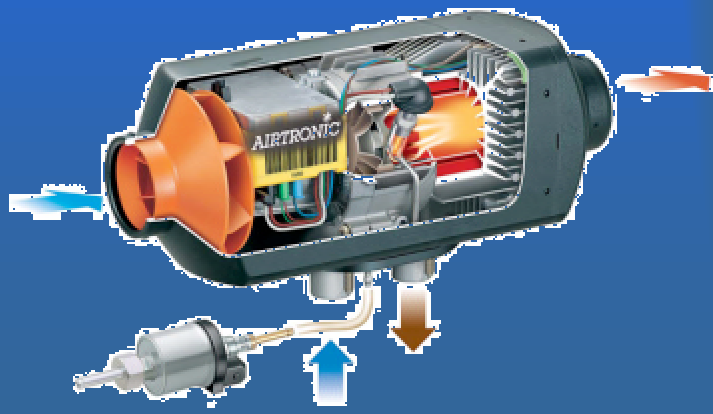
- Heating, Cooling, Electrical Power
- Fuel use: ~0.2 gallon/hour
  - Main engine ~ 1 gallon/hour
- Cost including installation : $6,000 - $8,500
- Cost of APS with verified PM control device $8,000 to $10,500

Cost of Alternative Technologies for Cabin Comfort and Power

Fuel Fired Heaters

- Engine and/or cab heating only
- Fuel use: 0.02-0.16 gal/hour
- Cost: ~ $1,000 - $3,000

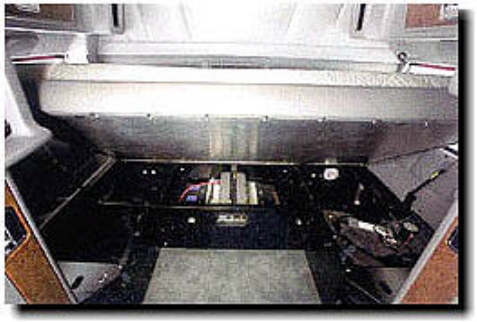




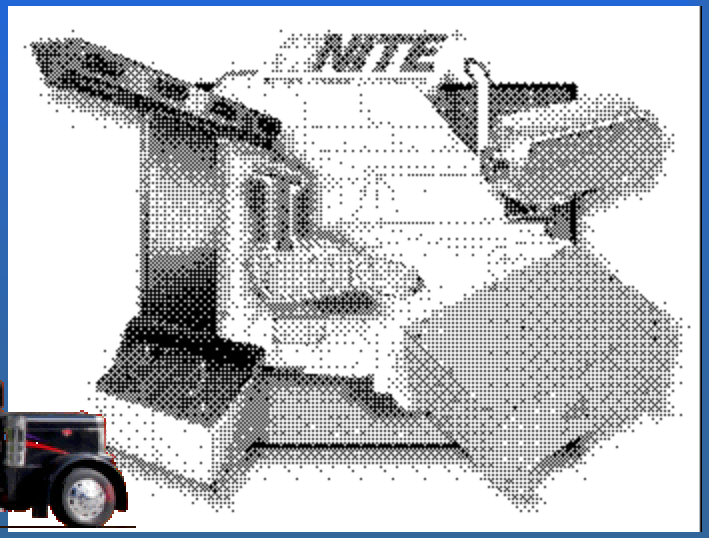
Cost of Alternative Technologies for Cabin Comfort and Power

Battery Electric APS

- Heating, cooling, electrical power
- Battery recharged while driving
- Cost: $4,000 - $10,000



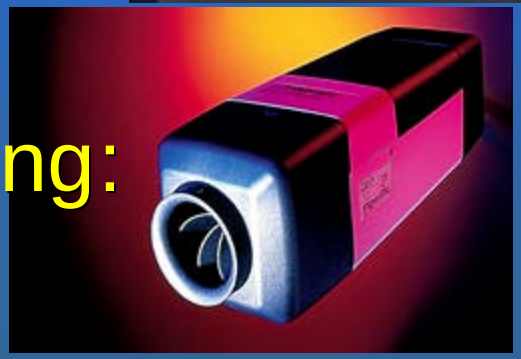
Power Pack



Cost of Alternative Technologies for Cabin Comfort and Power

Thermal Energy Storage

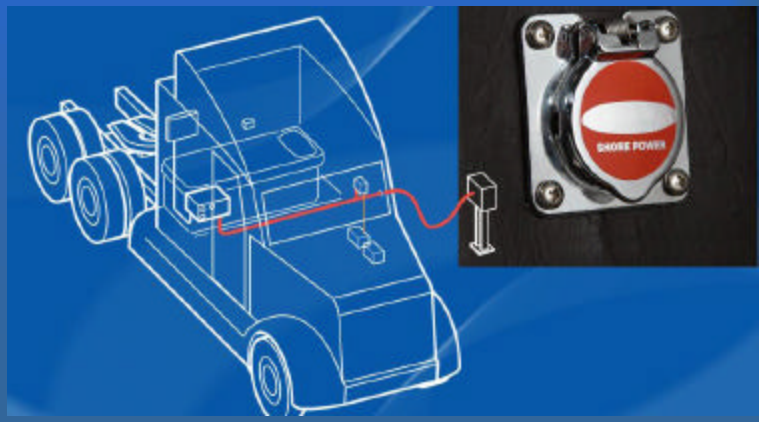
- Cooling energy stored while driving
- Cab cooling only
- Cost: ~ $3,600
- Can be integrated with fuel-fired heater for heating (Cost for cooling and heating: $4,600)



Cost of Alternative Technologies for Cabin Comfort and Power

Shore Power with On-Board Truck Equipment

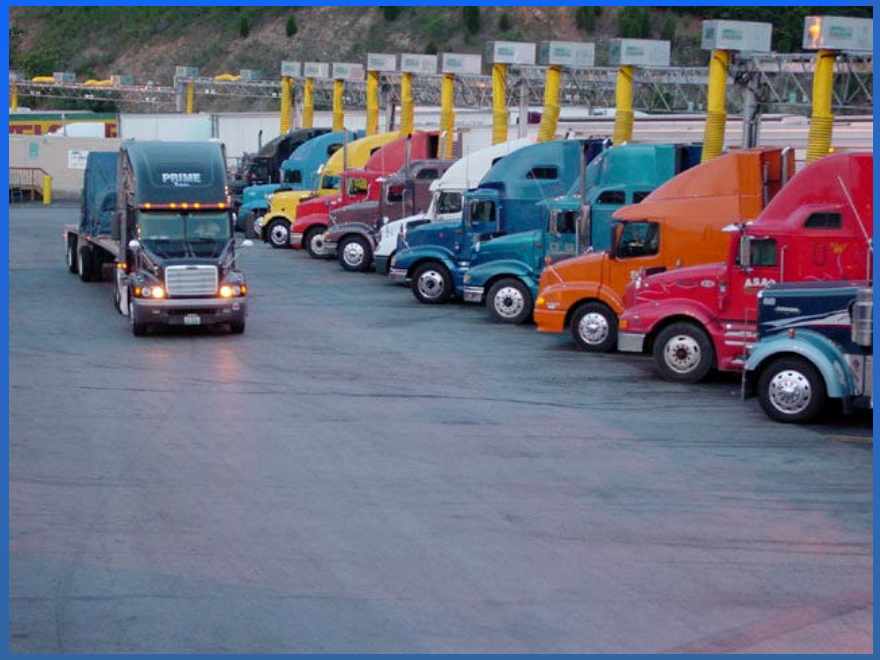
- 110 Volts electrical power, internet, cable television
- Cost ~ $3,500-$6,000 per parking space
- Cost of electric AC unit, inverter/charger, electrical connections: ~$4,000 per truck



Cost of Alternative Technologies for Cabin Comfort and Power

Off-Board Power Infrastructure

- Heating, cooling, 110 Volt electrical power, internet, telephone, television
- Cost for truck operator $1.60 to $1.88 per hour, for basic services (climate control)
- Cost ~ $12,000 - $20,000 per parking space



Payback Time With Fuel Savings

Manufacturer	Technology	Cost ($)	**Payback** (years)
Thermoking	Diesel APS (APS+PM trap)	8500 (10500)	**1.7 (2.1)**
Pony Pack	Diesel APS (APS+PM Trap)	7000 (9000)	**1.4 (1.8)**
Idling Solutions	Battery Electric	10000	**1.6**
Bergstrom (NITE System)	Battery Electric for AC + Fuel Fired Heater	4200	**0.7**
Webasto (BlueCool Truck + Air Top 2000)	Cold Storage for AC + Fuel Fired Heater	4600	**0.7**
Xantrex/Dometic	Inverter/charger + Electric AC and Heat	4000	**0.6**

Idle Hours/year = 2100; Fuel Use = 1 gal/hour; Fuel Cost: = $3.05/gal

Availability of Carl Moyer Funding

- Funding possible for technologies that go beyond the proposed requirements
  - Cleaner than diesel APS
    - Battery electric APS
    - Thermal energy storage
    - Truck on-board equipment for use with on-shore power
- Carl Moyer Program guidelines will be revised in November 2005
  - Staff still evaluating guidelines for alternative technologies

Emission Benefits

2010 Statewide Emission Reductions*

	NOx	HC	PM	CO2
Reductions (tons per day)	46	4.2	0.42	1930

*Sleeper truck population = 75,000

Other Benefits

- Consistent with Board adopted SIP, Diesel Emission Reduction Plan, EJ Policy
- Consistent with Governor's GHG reduction plan
  - 2010 GHG reductions of ~1 megaton per year
- Reduces petroleum use consistent with ARB/CEC policy recommendations
  - 160 million gallons/year saved

Issues

- EMA: Changes current practice of aligning new engine standards with USEPA
  - Tier 4 standards for off-road engines in the 0 to 25 hp category
  - New NOx idling emissions standard for on-road heavy-duty diesel engines
- Staff Response:
  - Requirement for use of filter on APS (2007+) applies to truck operator, not engine manufacturer
  - NOx idling emission standard is optional

Issues

- ATA and CTA :
  - More lead time needed to adjust to requirement
  - Nationwide requirements would provide consistency for truck operators
- Staff Response:
  - Emissions are significant and need to be addressed
  - Alternative technologies already available
  - US EPA has no plans for adopting nationwide idling rule (model rule for states only)

Staff Recommended Modifications 15-day Changes

- New Engine Requirements
  - Minor change to PTO override provisions
- In-Use Idling Requirements
  - Exempt battery-electric and electric infrastructure technologies from EO approval requirement
  - Clarification on electric shore power availability as a compliance option

Summary

- Provides needed smog emission reductions
- Consistent with SIP, DRRP, EJ policy
- Consistent with achieving Governor's GHG reduction goals
- Consistent with ARB/California Energy Commission's recommendation to reduce demand of petroleum use
- Feasible technologies provide cabin comfort and power w/o engine idling
- Payback to typically 2 years or less
- Staff recommends Board approval