

Overview of EPA's Low Sulfur Diesel Fuel Programs

**Ultra-low Sulfur Diesel Fuel
Implementation Workshop**



*US EPA Office of
Transportation and Air Quality*

*New Orleans, Louisiana
November 15, 2004*



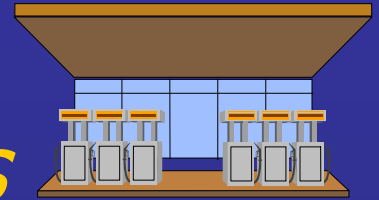
Presentation Overview

- Highway and Nonroad Diesel Engine Standards
- Highway Engine Progress
- Highway and Nonroad, Locomotive, and Marine (NRLM) Diesel Fuel Standards
- Highway Diesel Fuel Progress
- Benefits and Costs of the Clean Fuel and Engine/Vehicle Programs
- Detailed Requirements of the Highway and NRLM Diesel Fuel Programs





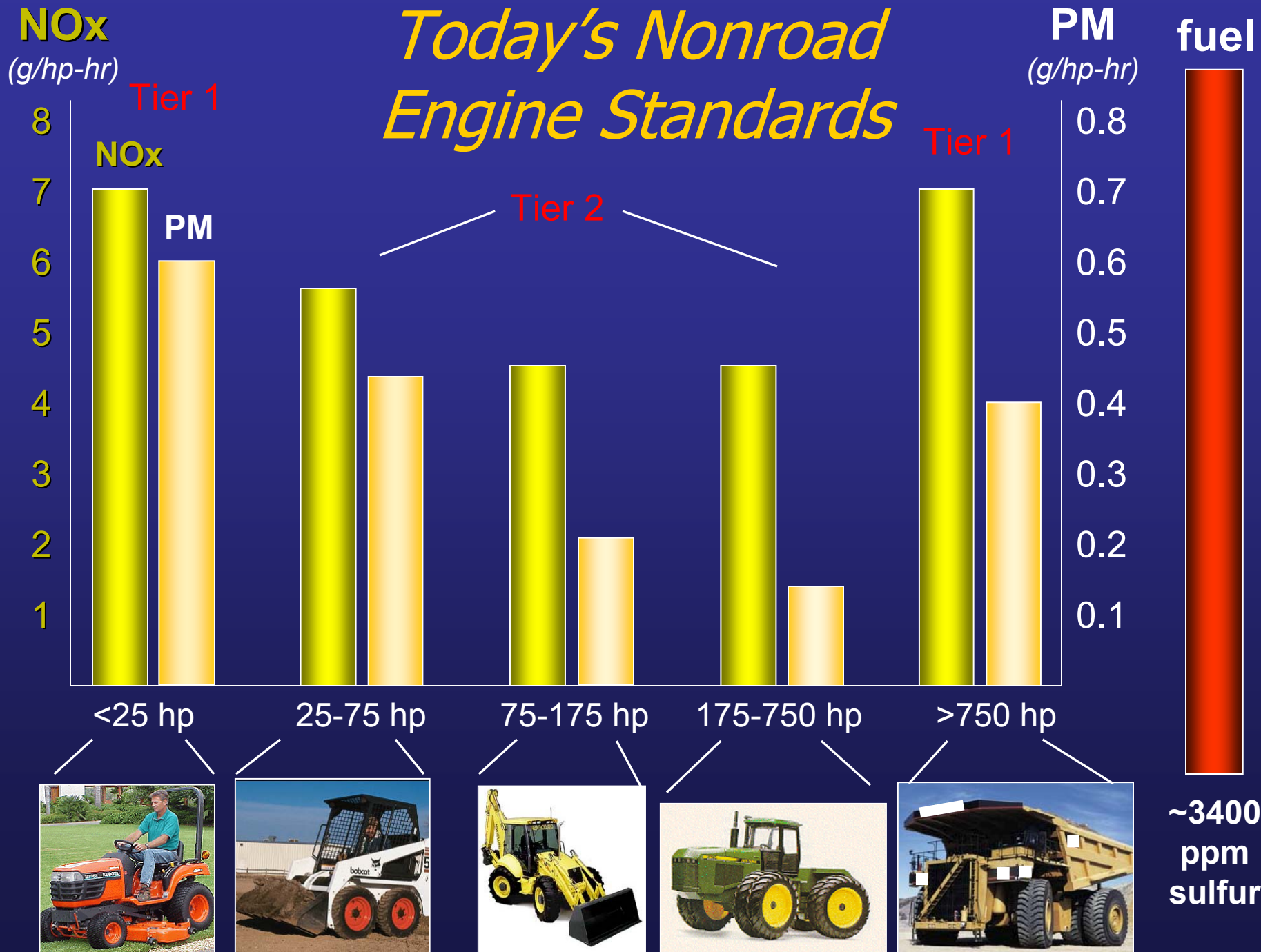
Heavy-Duty Highway Diesel Basic Program Requirements



	2006	2007	2008	2009	2010	2011	2012
PM		100% at 0.01 g/hp-hr					
NOx		50% at 0.20 g/hp-hr			100% at 0.20 g/hp-hr		
Fuel		80% at 15 ppm maximum sulfur and up to 20% at 500 ppm sulfur under the TCO Hardship Provisions			100% at 15 ppm		



Today's Nonroad Engine Standards



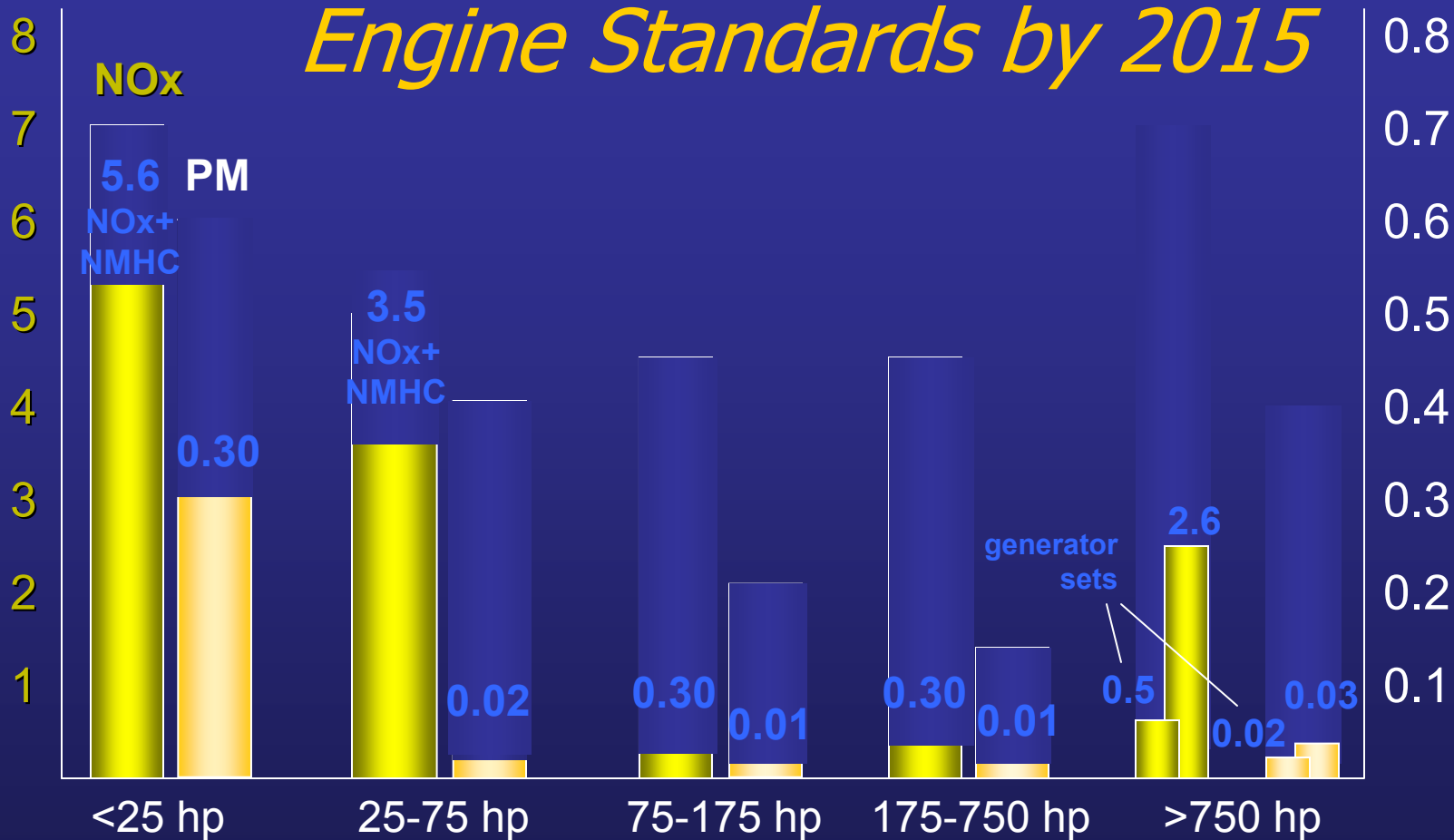
Tier 4 Nonroad

Engine Standards by 2015

NOx
(g/hp-hr)

PM
(g/hp-hr)

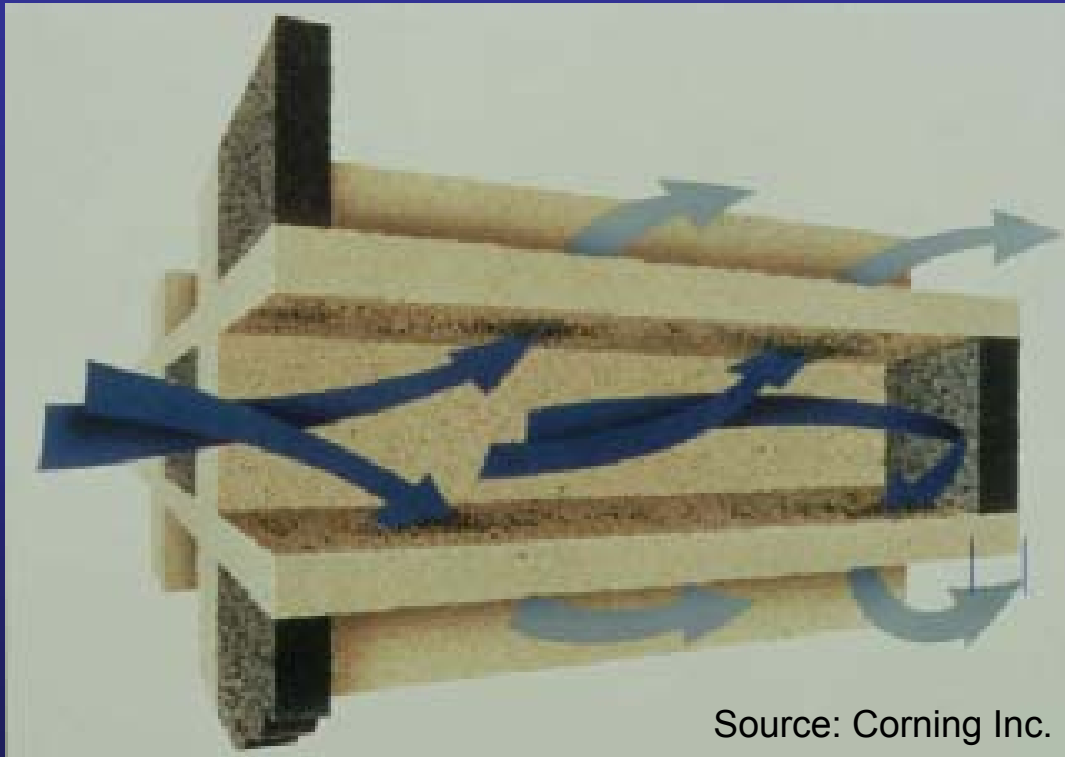
fuel



95+% reductions in PM
and ~90% reductions in NOx

15
ppm
sulfur

Enabling Near Zero Emission Levels

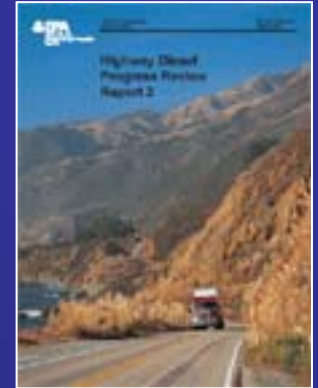


Catalyzed Diesel Particulate Filters (CDPFS)
can eliminate 99% of solid particles (soot & metals)
can eliminate >90% of semi-volatile hydrocarbons





Progress Toward 2007: Engine Status



- HD engine mfgs on track for 2007
 - Proven technologies selected for 2007
 - PM filters to meet the 0.01 g/hp-hr PM standard
 - Incremental improvements of 2004 NO_x technologies to meet 1.2 g/hp-hr averaging standard
 - Prototype vehicles being demonstrated today
 - Customer fleet testing in 2005

- EPA will continue to monitor this progress
 - Additional progress review reports
 - Beginning work to ensure smooth implementation and certification processes for 2007



Distillate Fuels



marine 2.5%



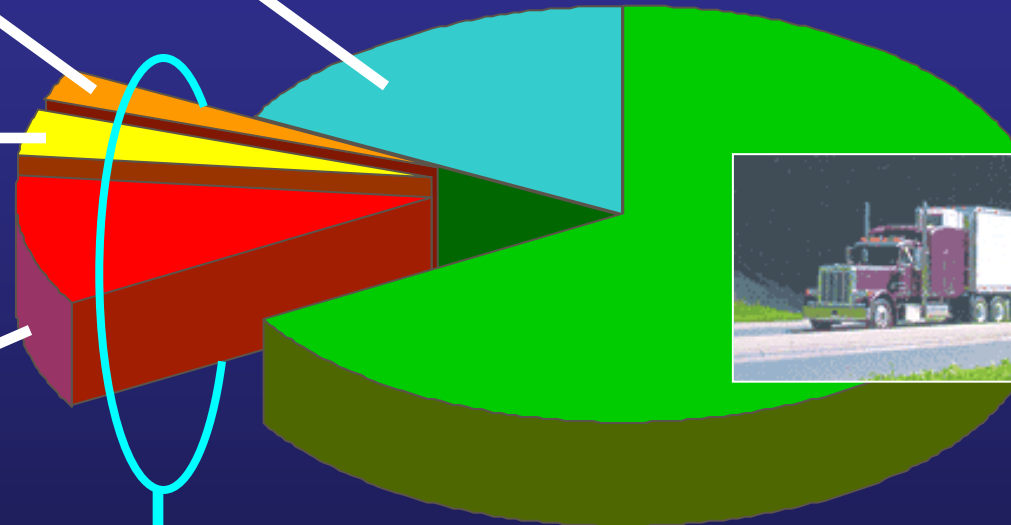
home heating,
etc. 15%
not covered



locomotive 3.5%



nonroad equipment
12%



*covered by the
nonroad program*

highway fuel 67%
*regulated
since 1993*

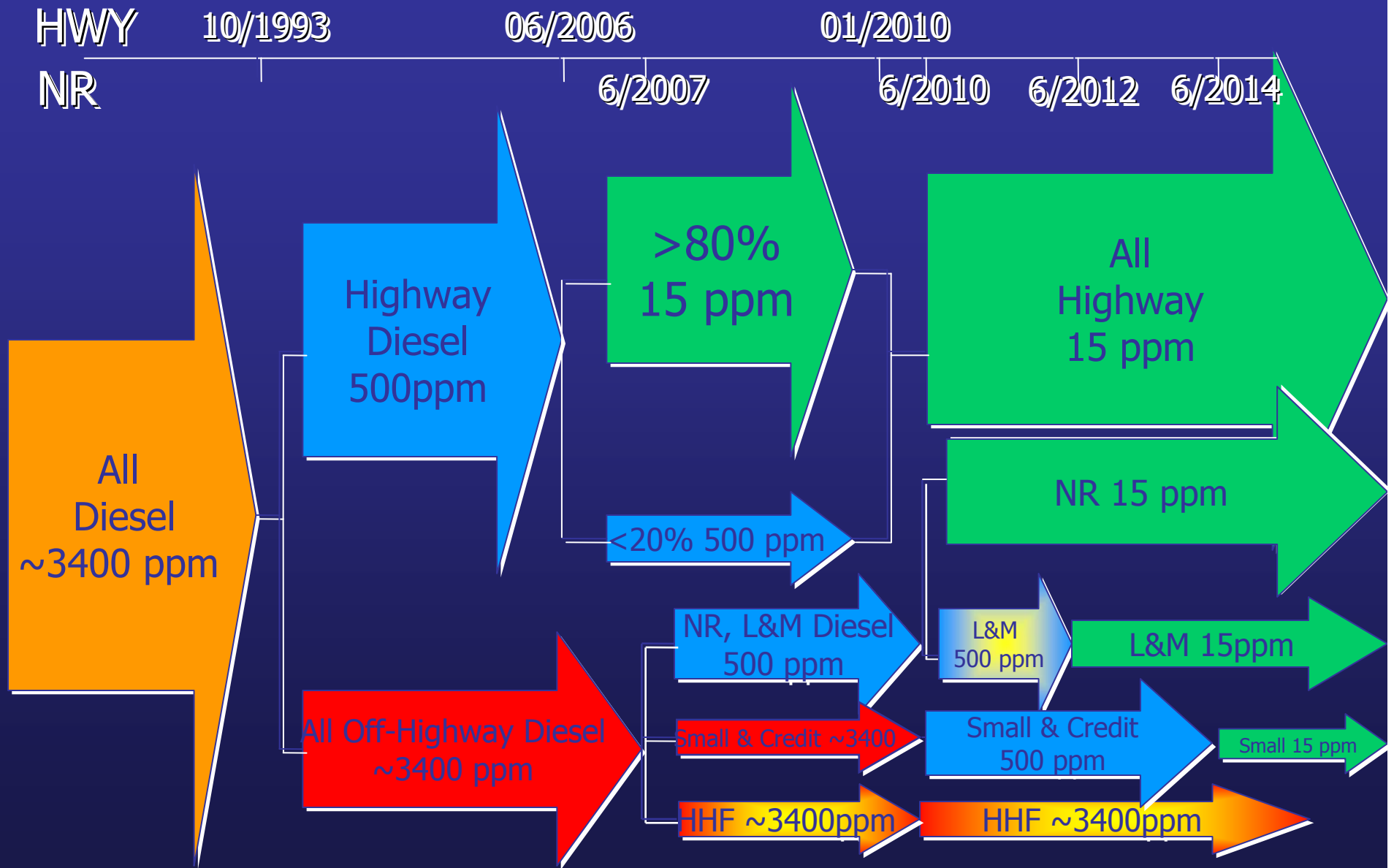


NRLM Diesel Fuel Standards

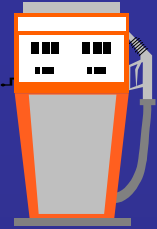
Who	Covered Fuel	2006	2007	2008	2009	2010	2011	2012	2013	2014
	Highway Diesel Fuel	80% 15 ppm / 20% 500 ppm				100% 15 ppm (including small refiner fuel)				
Large Refiner & Importer	NR		500	500	500	15	15	15	15	15
Large Refiner & Importer	LM		500	500	500	500	500	15	15	15
	NRLM with Credits (Not in NE or AK)		HS	HS	HS	500	500	500	500	15
Small Refiner	NRLM (Not in NE, w/ approval in AK)		HS	HS	HS	500	500	500	500	15
Transmix Processor & In-use	NR (Not in NE or AK)		HS	HS	HS	500	500	500	500	15
Transmix Processor & In-use	LM (Not in NE or AK)		HS	HS	HS	500	500	500	500	500

Note: Dates are June 1 at Refinery, Aug 1 at terminal, Oct 1 at retailer, and Dec 1 for in-use

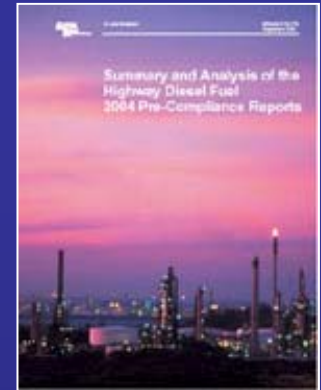
Highway & NRLM Diesel Fuel Grades



* This figure is intended to illustrate the timeline for the final highway and nonroad diesel fuel sulfur control programs. It is not drawn to exact scale. Refer to 40 CFR Part 80 for specific program dates.



Progress Toward 2007: Highway Diesel Fuel Status

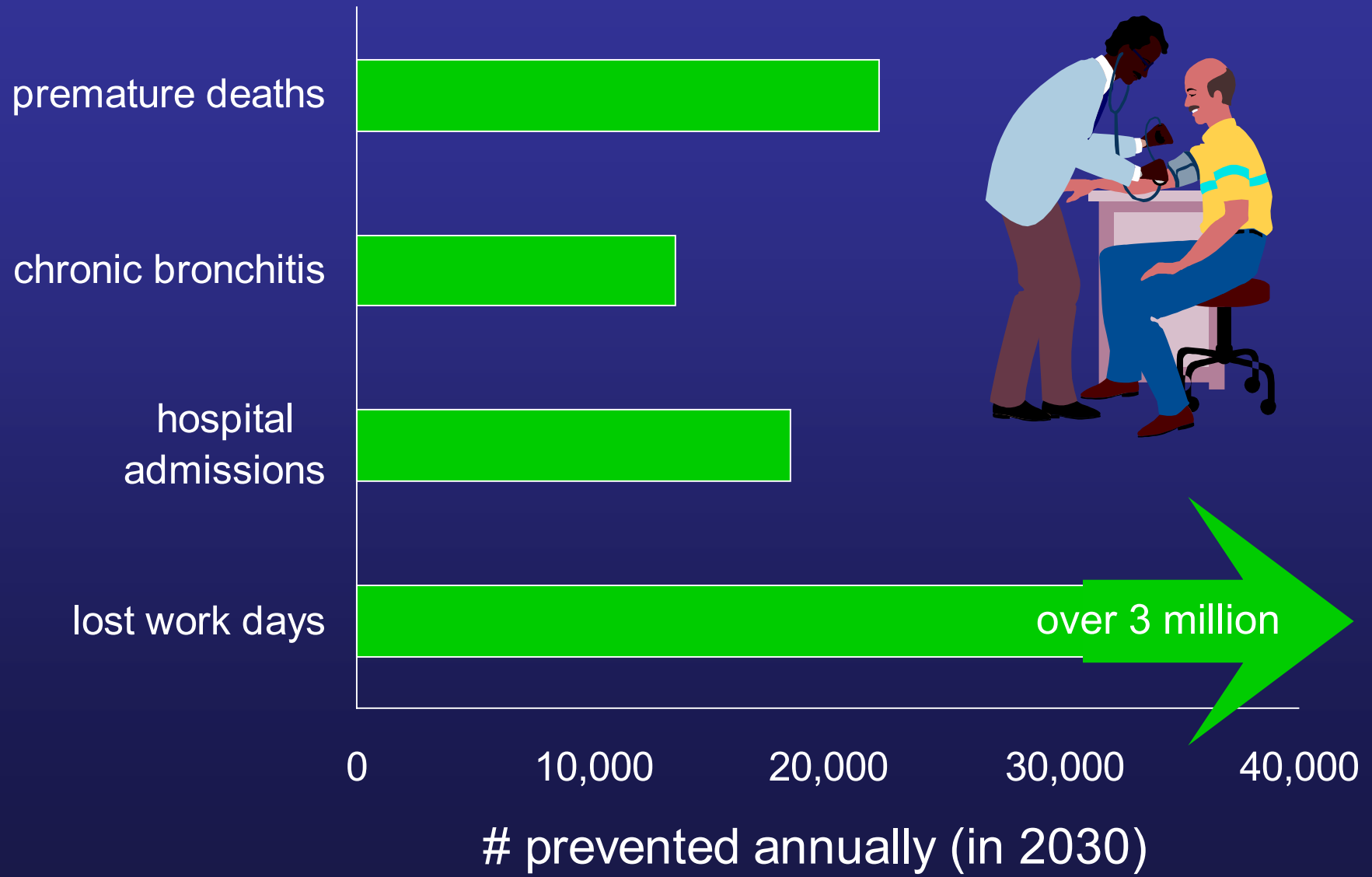


- Refiners and importers are required to report
 - Highway reports due annually June 1, 2003 through 2005
 - Nonroad reports due annually June 1, 2005 through 2011, or until a refinery produces 15 ppm NRLM

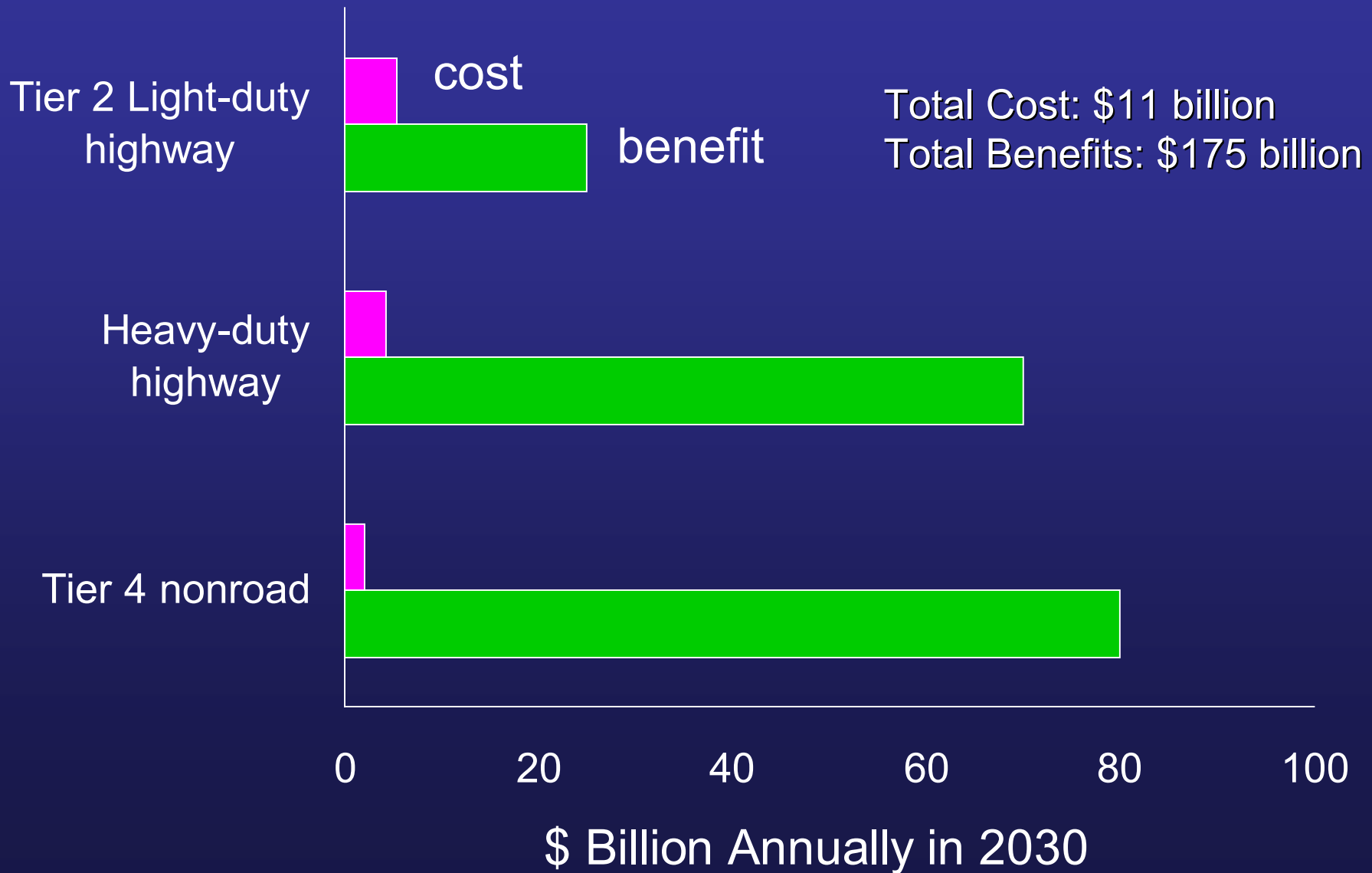
- *Summary and Analysis of the Highway Diesel Fuel 2004 Pre-compliance Reports*
 - Analysis of reports submitted by ~120 refineries
 - Published September 15, 2004

- A number of changes by individual refineries, but on balance little overall change, hence, the same general conclusions as 2003 report...
 - Highway diesel fuel production will be sufficient to meet demand
 - 15 ppm sulfur diesel fuel will be widely available nationwide
 - Refiners are on target for complying with the 15 ppm sulfur standard on time

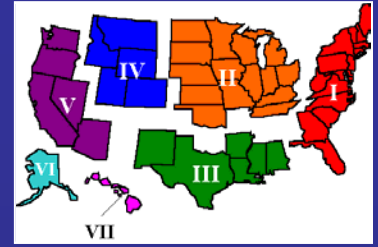
Benefits of Clean Fuel and Vehicle Programs



Costs & Benefits of Clean Fuels and Vehicles



Highway Temporary Compliance Option (TCO) and Regional Credit Program



- Credit Generation
 - From June 1, 2001 through May 31, 2005
Volume of 15 ppm sulfur diesel fuel that is used in vehicles with engines that are certified to meet the 0.01 g/bhp-hr PM standard
 - From June 1, 2005 through May 31, 2006
Volume of 15 ppm sulfur diesel fuel that is dispensed at retail outlets or wholesale purchaser-consumer facilities
 - From June 1, 2006 through December 31, 2009
Volume of 15 ppm sulfur diesel fuel produced above the 80 percent threshold

- Credit Use
 - Limited to credits generated by refineries within the same PADD
 - Credit deficits allowed but limited to 5% of annual highway diesel fuel production

- Credit Life
 - Credit generation allowed through December 31, 2009
 - Credit use allowed through May 31, 2010

- Credits are not allowed for State programs that are more stringent than the Federal program



NRLM Credit Provisions



- Credit Generation
 - *From June 1, 2006 through May 31, 2007*
High sulfur credits earned by producing 500 ppm sulfur NRLM diesel fuel
 - *From June 1, 2009 through May 31, 2010*
500 ppm sulfur credits earned by producing 15 ppm sulfur NRLM diesel fuel

- Credit Use
 - May produce HS fuel from June 1, 2007 through May 31, 2010
 - May produce 500 ppm sulfur fuel (includes credits carried over) from June 1, 2010 through May 31, 2014

- Credit Life
 - HS credits expire May 31, 2010
 - 500 ppm sulfur credits expire May 31, 2014

- Nationwide trading – no PADD restrictions



Small Refiner Hardship



Highway

1. Delay 15 ppm compliance until 2010
2. Generate credits for any complying volume of 15 ppm produced prior to 2010
3. Delay gasoline sulfur compliance for 3 years if compliance with 15 ppm sulfur standard on time*

Nonroad

(applications are due December 31, 2004)

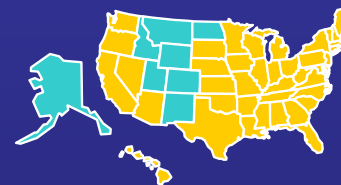
1. Delay 500 ppm compliance until 2010 and 15 ppm compliance until 2014
2. Generate credits for any complying volume of
 - 500 ppm produced from June 1, 2006 through May 31, 2010
 - 15 ppm produced from June 1, 2010 through December 31, 2013
3. 20% increase in gasoline sulfur annual average and per-gallon cap standards if compliance with 15 ppm sulfur standard by June 1, 2006*

*Absolute diesel fuel volume produced must be at least 85% of the applicable highway or non-highway diesel fuel volume baseline.



Other Refiner Hardship Provisions

- Western refiners can delay compliance with gasoline sulfur requirements by two years if 15 ppm sulfur highway diesel fuel is produced on time
- General Hardship for Any Refiners: Temporary relief if severe economic hardship is demonstrated
 - Extreme unforeseen circumstances (e.g., natural disaster)
 - Extreme hardship circumstances (e.g., financial hardship)(Applications for NRLM diesel fuel hardship are due June 1, 2005)



Downstream Provisions



- 2 ppm allowance for test variability
- 20% downgrade limitation for highway
- Product Transfer Document (PTD) requirements
- Diesel fuel pump labeling requirements
- Blending 15 ppm sulfur diesel fuel with other products
 - Diesel fuel additives
 - Kerosene
 - Used Oil

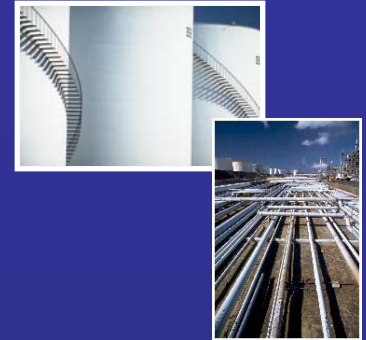
Highway Diesel Anti-downgrading Limitation



- Incorporated into the highway program due to availability concerns associated with intentional commingling of 15 ppm and 500 ppm fuel
- Intended to allow for contamination of 15 ppm fuel that will occur throughout the distribution system
- 15 ppm to 500 ppm highway: maximum of 20% annually at each facility in the distribution system
- 15 ppm to off-highway fuel: no restrictions
- Retailers and wholesale purchaser-consumers
 - Sell only 15 ppm fuel; restriction doesn't apply
 - Sell only 500 ppm fuel; restriction applies such that a max. of 20% of the total fuel volume can be downgraded 15 ppm fuel
 - Sell both 15 ppm & 500 ppm fuel; restriction doesn't apply so long as 15 ppm fuel is available for sale concurrently with 500 ppm fuel
- Begins October 1, 2006 for all downstream facilities subject to the limitation



NRLM Downgrade Allowances



- Available to pipelines, terminals, and transmix processors
 - From 2006-10 allowed to sell off-spec 15 ppm as 500 ppm hwy (subject to anti-downgrading limitations) or 500 ppm NRLM
 - From 2007-10 allowed to sell downstream off-spec 500 ppm fuel as HS NRLM diesel fuel (or heating oil)
 - From 2010-14 allowed to sell downstream off-spec 15 ppm fuel as 500 ppm sulfur NRLM diesel fuel (or heating oil)
 - From 2014+ allowed to sell downstream off-spec 15 ppm fuel as 500 ppm sulfur LM diesel fuel (or heating oil)

- Cannot be blendstocks

- Not permitted in Northeast/Mid-Atlantic Area or Alaska (no marker)

- Transmix processors allowed to produce to these downstream standards (refinery standards do not apply)
 - But must be fuel produced from transmix, not merely blending of finished fuels
 - Must be exclusively transmix processor (not refiner processing transmix)



Dye Requirements

- Modified dye requirements to allow for the fungible shipment of 500 ppm highway and 500 ppm NRLM diesel fuel
- Until June 1, 2010, #1 and #2 distillate that does not have visible evidence of dye solvent red 164 will be considered highway diesel fuel except for fuel designated and classified as:
 - NRLM or LM diesel fuel (produced beginning June 1, 2006 with a sulfur level \leq 500 ppm)
 - For use in AK
 - For use under a national security exemption or for R&D purposes
 - For use in the U.S. Territories
 - Jet fuel
 - Kerosene
- High sulfur heating oil and small refiner / credit fuel designated as NRLM or LM diesel fuel must be dyed beginning June 1, 2007



Marking Provisions

- New fuel marker requirement for heating oil to prevent heating oil from being used in NRLM equipment
- June 2007 – June 2010
 - Heating oil must have 6 mg/L of solvent yellow 124 with visible evidence of dye solvent red 164
 - All highway and NRLM diesel fuel must be marker free
- June 2010 – June 2012
 - Heating oil and 500 ppm sulfur LM diesel fuel must be marked at 6 mg/L
 - Highway and NR diesel fuel must be free of marker
- June 2012+
 - Heating oil must be marked
 - All highway and NRLM diesel fuel must be free of marker



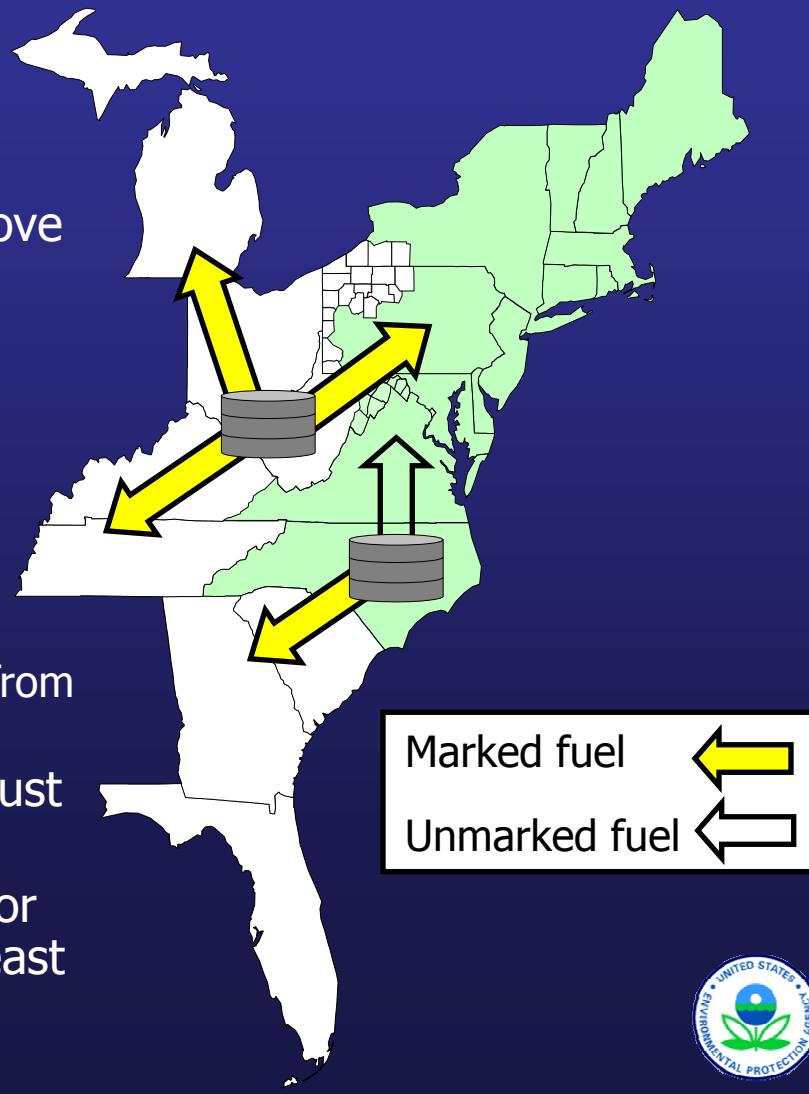
Marking Provisions (cont.)

- Marker solvent yellow 124 (Euro Marker)
- Addition at the terminal
- Not required in the Northeast/Mid-Atlantic Area or Alaska
- May still consider other markers later if acceptable for jet fuel
 - Could move injection back to refinery and eliminate Northeast/Mid-Atlantic Area
 - Unlikely that any marker would be approved for jet fuel



Northeast/Mid Atlantic Area

- No marker requirement due to
 - Cost/burden on terminals
 - No small refiners
- Eliminates flexibility for any fuel to be above the refinery gate standard, therefore
 - No small refiner fuel
 - No credit fuel
 - No downstream LM flexibility
 - No alternative transmix standards
- Off-spec fuel outlet
 - The remaining heating oil market
 - LM market for 500 ppm sulfur diesel fuel from 2010-12
- Any heating oil shipped outside the NE must be marked
- Refiners may still generate credits (early or small) and trade them outside the Northeast



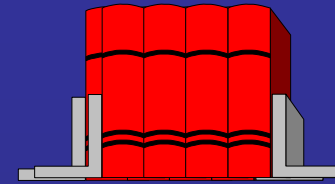
Alaska



- No dye or marker requirements
- Small refiner fuel is permitted but refiner must first obtain an EPA-approved compliance plan
 - Segregate fuel through to end-users
 - Report end-users, etc.
 - End-users must maintain fuel purchase records
- No flexibility for
 - Credit fuel
 - Downstream LM diesel fuel



Definitions



- Entity means any refiner, importer, distributor, retailer or wholesale-purchaser consumer of any distillate fuel
- Facility means any place, or series of places, where an entity produces, imports, or maintains custody of any distillate fuel from the time it is received to the time custody is transferred to another entity, except
 - Where an entity maintains custody of a batch of diesel fuel from one place in the distribution system to another place (e.g., from a pipeline to a terminal), all owned by the same entity, both places combined are considered to be one single aggregated facility, except where an entity chooses to treat components of such an aggregated facility as separate facilities.
 - If an aggregated facility includes a refinery, the entire facility must comply with the requirements applicable to refineries.
 - If an aggregated facility includes a truck loading terminal but not a refinery, the entire facility must comply with the requirements applicable to truck loading terminals.
 - A refinery or import facility may not be aggregated with facilities that receive fuel from other refineries or import facilities, either directly or indirectly.
 - Retail outlets or wholesale purchaser-consumers may not be aggregated with any other facility.
 - Where an entity maintains custody of diesel fuel in one or more mobile components (e.g., rail, barge, or trucking), the mobile components may be aggregated as a single facility. They may also be aggregated with a facility from which they receive fuel or to which they deliver fuel, but not both.
 - An individual refinery or contiguous pipeline may not be subdivided into more than one facility.
 - An individual terminal may not be subdivided into one or more facility unless approved by the Administrator.

Designate and Track

- One purpose: to allow similar fuels to be distributed together
- Four cases:
 - 500 Hwy vs 500 NRLM
 - Heating oil vs NRLM (credit, small)
 - Hwy anti-downgrading provision (limits 15 hwy to 500 hwy – instead of both 500 hwy and NRLM)
 - 500 NR (small and credit) vs 500 LM from 2010-12
- Covers all parts of the distribution system down to point where:
 - NRLM is dyed
 - Hwy taxes are assessed / paid
 - Heating oil is marked
 - LM is marked (2010-12)
- All entities for all of their facilities that handle fuels not dyed/marked/taxed must register with EPA
- Dates:
 - Registration by December 31, 2005, or 6 months prior to producing, importing, or distributing a designated distillate fuel
 - Designations begin June 1, 2006
 - Tracking calculations begin June 1, 2007



Refiners and Importers



Refiners/importers designate all distillates and report delivered volumes by facility

- June 1, 2006+
 - **MVNRLM**
 - Heating oil
 - Jet fuel
 - Kerosene
 - No. 4 fuel
 - Export
 - Exempt (R&D, U.S. Territories)
- **MVNRLM**
 - Until 2010
 - #1
 - #2
 - Until 2014
 - 15 ppm
 - 500 ppm
 - HS
 - Until 2014
 - MV
 - NRLM
 - 2010-12
 - NR
 - LM



Distributors



- (Re-)Designate all deliveries
- Designations limited to address purposes of D&T:
 - To distinguish 500 hwy from 500 NRLM from 2007-10
 - Highway volume (15 + 500) cannot increase June 1, 2007+
 - Also, if not a terminal, highway volume cannot increase by more than 2% (annual)
 - To distinguish heating oil from NRLM
 - June 1, 2007-10, high sulfur NRLM volume cannot increase by greater % than heating oil volume
 - After 2010 Heating oil volume cannot decrease
 - Marker added at terminal instead of refinery gate
 - Provision does not apply in the Northeast/Mid-Atlantic Area or Alaska
 - To distinguish 500 NR from 500 LM
 - June 1, 2010-12, 500 NR volume cannot increase by greater % than 500 LM volume
 - Marker added at terminal to volumes received designated 500 LM
 - Does not apply in the Northeast/Mid-Atlantic Area
 - For anti-downgrading
 - #2 15 ppm Hwy cannot decrease by more than 20%, or
 - Choice of 4 tests



Handling the Exceptions

- Kerosene (#1D) blending
 - 15 ppm sulfur kerosene/jet allowed to be designated as highway
 - 500 ppm sulfur kerosene/jet – must be compensated for if blended into hwy
- Volume swell, different meters, etc. handled by flex in the
 - Cumulative bank account
 - Beginning balance is positive due to highway fuel in inventory as of June 1, 2007
- Inventory changes – built into the calculations
- Downstream production of diesel from blendstocks, biodiesel, etc...
 - Covered as both a refiner and a distributor
 - Account for new volumes – must meet standards on new volumes as a refinery
- Volumes dyed, marked, on which taxes paid do not have to be tracked by facility
- Proprietary systems can break themselves up into segments (refinery, pipeline, terminal)



D&T Record keeping



- Batch number
- Batch designation
- Batch volume in gallons
- Date/time of day of transfer, and
- Name and EPA entity and facility identification number of the facility from which the batch was received or to which the batch was delivered
- Beginning and ending inventory volumes on a quarterly basis and inventory adjustments
- For NRLM diesel fuel, records must also identify whether the batch was received or delivered with or without the IRS red dye
- For heating oil, records must also identify whether the batch was received or delivered with or without the fuel marker
- From June 1, 2010 through May 31, 2012, for LM fuel, records must also identify whether the batch was received or delivered with or without the fuel marker
- Distributors must also maintain records related to quarterly and annual compliance calculations and copies of all PTDs
- All records must be maintained for a period of 5 years.

Compliance and Reporting



- Compliance
 - Annual for refiners – refiners have no compliance other than highway 80/20 TCO 2007-2010
 - Annual for pipelines 2007-2010
 - Quarterly for terminals 2007-2010
 - Annual for everyone after 2010

- Reporting
 - Quarterly 2007-10
 - Annual thereafter

Compliance Periods and Reporting Dates

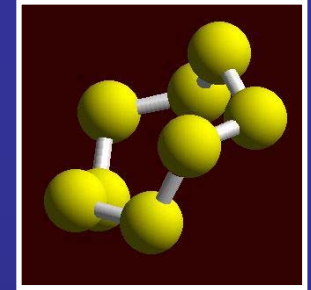


Compliance period*	Report due
1st quarter: July 1 – September 30	December 1
2nd quarter: October 1 – December 31	March 1
3rd quarter: January 1 – March 31	June 1
4th quarter: April 1 – June 30	September 1
Annual: July 1 – June 30	August 31

* Certain compliance periods are lengthened or shortened to match program beginning and ending dates. For example, the first quarterly reporting period will be from June 1, 2007 through September 30, 2010 and the last quarterly compliance period will be from April 1, 2010 through May 31, 2010. Similarly, the first annual compliance period will be from June 1, 2007 through June 30, 2008 and the last annual compliance period for the first step of the NRLM program will be from July 1, 2009 through May 31, 2010. The report due dates, however, are constant.



Sulfur Sampling and Testing



- Sampling
 - ASTM D 4057-95 – manual sampling
 - ASTM D 4177-95 – automatic sampling
- Testing
 - Method approval on a laboratory/facility-specific basis
 - Qualification criteria
 - Precision
 - 20 repeat tests over 20 days on samples of a commercially available diesel fuel
 - Precision must be less than
 - » 0.72 ppm for 15 ppm sulfur diesel fuel
 - » 9.68 pm for 500 ppm sulfur diesel fuel
 - Accuracy
 - 10 repeat tests on a standard sample
 - Mean of test results may not deviate from the Accepted Reference Value of the standard by more than
 - » 0.54 ppm for 15 ppm sulfur diesel fuel
 - » 7.26 ppm for 500 ppm sulfur diesel fuel
 - 10 tests are required on each of two sulfur standards
 - » 1-10 ppm and 10-20 ppm for 15 ppm sulfur diesel fuel
 - » 100-200 ppm and 400-500 ppm for 500 ppm sulfur diesel fuel
 - Quality control provisions based on ASTM D 6299

For More Information...



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Highway diesel web page:

<http://www.epa.gov/otaq/diesel.htm>

Nonroad diesel web page:

<http://www.epa.gov/nonroad-diesel/2004fr.htm>

