



Low Sulfur Distillate and Residual Oil Strategy

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Regional Initiative for Low Sulfur Distillate/Residual Oil

- MANE-VU States have agreed to pursue low sulfur standards for distillate & residual fuel oil to reduce regional haze & particulate matter
- Strategy is among the most significant SO₂ control options available in the region
- May end up being only regional haze emission control strategy to emerge out of the RPO planning processes

Rationale & Challenges of Low Sulfur Distillate Oil Strategy

- Distillate combustion is major source of SO₂
- Fuel de-sulfurization is proven emission control strategy
- Implementation challenges are economic rather than technical
- 3 primary issues must be addressed:
 - Supply
 - Cost
 - Political viability

Goals of Presentation

- Review importance of fuel oil combustion as source of SO₂ emissions & the emission benefits of lowering fuel sulfur content
- Discuss supply issues
- Look at cost impacts of strategy
- Tee-up discussion of strategy for moving this program forward
- Focus is primarily on #2 distillate oil

Proposed Sulfur Requirements in MANE-VU Region

Geographic Region	500 ppm #2 Distillate	15 ppm #2 Distillate	0.25% (wt) #4 Oil	0.3-0.5% #6 Oil
Inner Zone (DE, NJ, NY, PA)	no later than 2012	2016	no later than 2012	no later than 2012
Outer Zone (all other states)	no later than 2014	2018 “depending on availability”	no later than 2018	no later than 2018

Largest Sources of SO₂ Emission in the MANE-VU Region

Source Category	Emissions (tpy)	% of Regional Total
EGUs	1,628,333	71%
ICI Boilers	156,333	7%
Residential/Commercial Oil Heat Burners & Furnaces	153,225	7%

Largest Sources of SO₂ Emission in the NESCAUM Region

Source Category	Emissions (tpy)	% of Regional Total
EGUs	433,754	53%
Residential/Commercial Oil Heat Burners & Furnaces	120,508	15%
ICI Boilers	58,683	7%

Estimated Emission Benefits of 500 ppm Sulfur Heating Oil

(% reduction compared to 2,500 ppm sulfur fuel)

•Pollutant	500 ppm	15 ppm
SO₂	75 %	93%
PM	80 %	?
NO_x	10 %	?
Hg	?	?
CO₂	1%-2%%	1%-2%

Annual Emission Benefits in the MANE-VU Region of 500 ppm Sulfur Limit

2009	SO ₂	NO _x	PM
Emissions 2,500 ppm fuel	176,742 tons	65,087 tons	6,541 tons
Projected Reductions 500 ppm	132,557 tons	6,509 tons	5,211 tons
Remaining Emissions	44,185 tons	58,578 tons	1,303 tons

Annual SO₂ Emission Benefits in the MANE-VU Region in 2018

2018	15 ppm #2 (from 2000+ ppm baseline)	5,000 ppm #4 & #6 (from 10,000 ppm baseline)	Total Reductions from Low Sulfur Oil Strategy
Emission Reductions	167,000 tons	19,000 tons	186,000 tons

Supply Issues

- Dramatic changes in fuel composition are occurring on global scale due to sulfur regulation
- Heating oil is seasonal product with demand tied to vagaries of weather
- Offshore markets & reserves provide a “safety valve” for Northeast market during peak demand
- Response of offshore refiners to U.S. low sulfur regulations is uncertain in near-term

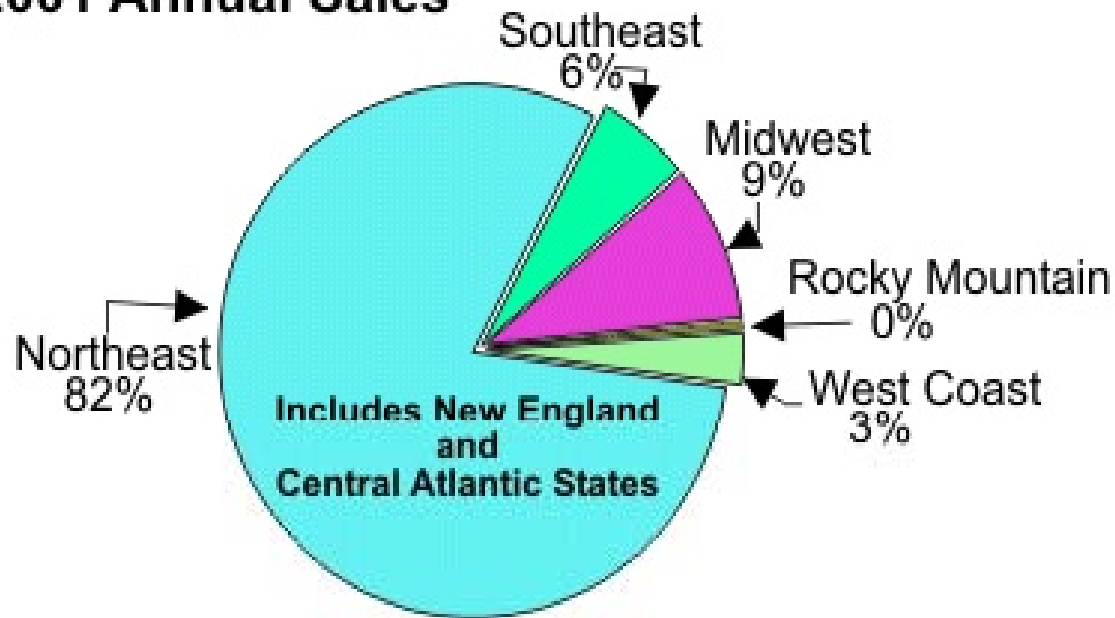
Heating Oil Market in the Region

- Collectively the Northeast/Mid-Atlantic States constitute one of the world's largest markets for heating oil
- In NESCAUM states, 55% of total distillate demand is for heating oil (42% residential/13% commercial)
- This compares to 38% for highway diesel

Regional Sale of Heating Oil



2001 Annual Sales

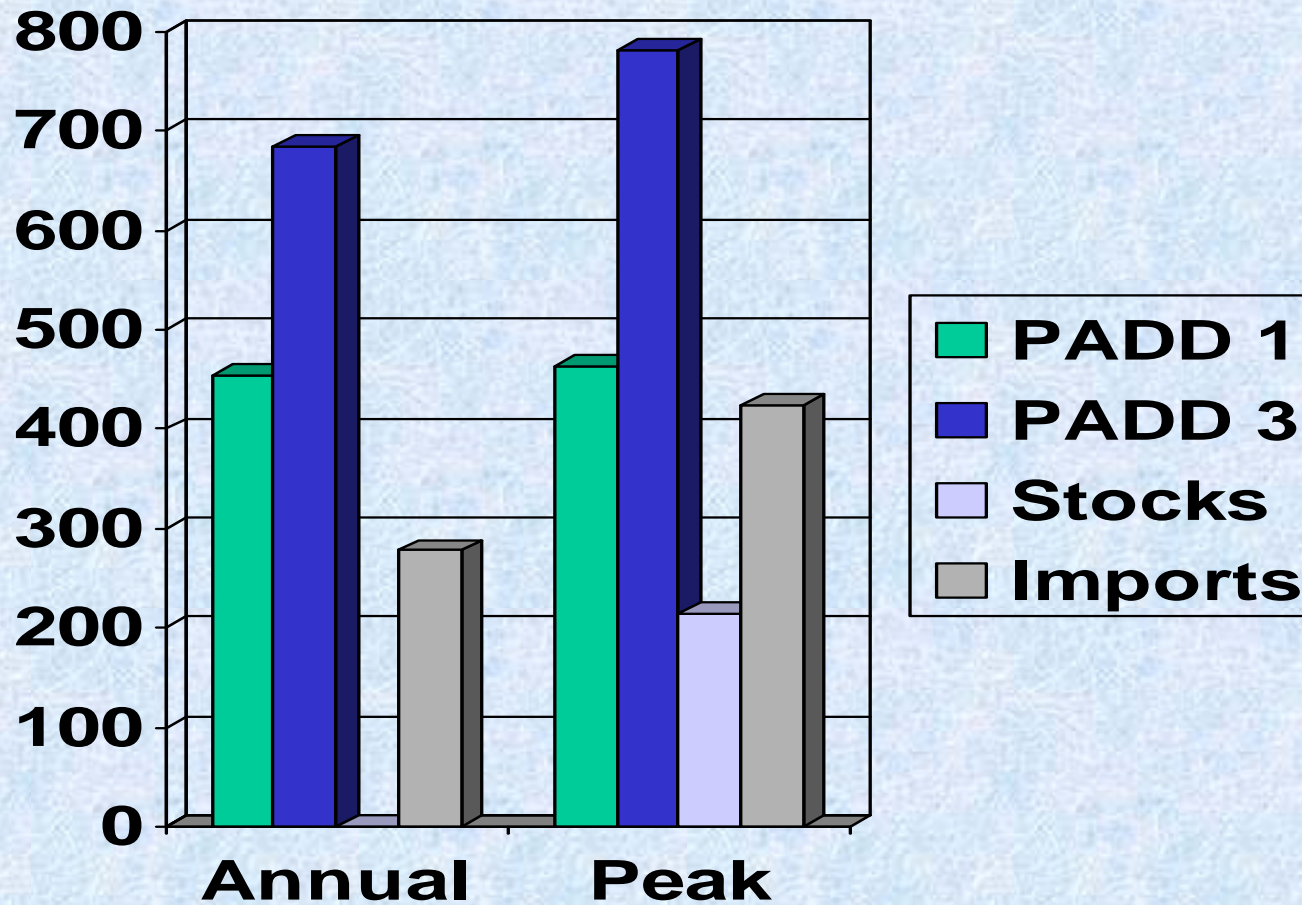


Source: EIA *Fuel Oil and Kerosene Sales, 2001*.

Note: Due to rounding, Rocky Mountain region appears as zero percent. Gulf Coast Sales too small to display.

Sources of Northeast Distillate

(avg. 2001-04 in TBD)



Federal Diesel Sulfur Standards



Who	Covered Fuel	2006	2007	2008	2009	2010	2011	2012	2013	2014
	Highway Diesel		80% 15 ppm / 20% 500 ppm			15	15	15	15	15
Large Refiner & Importer	Nonroad (NR)		500	500	500	15	15	15	15	15
Large Refiner & Importer	Loco/Marine (LM)		500	500	500	500	500	15	15	15
	NRLM w/Credits		HS	HS	HS	500	500	500	500	15
Small Refiner	NRLM		HS	HS	HS	500	500	500	500	15
Transmix & In-use	NR		HS	HS	HS	500	500	500	500	15
Transmix & In-use	LM		HS	HS	HS	500	500	500	500	500

Meeting the Supply Demands of Mane-VU Low Sulfur Regulations

- In the past refiners, wholesalers and retailers have questioned their ability to meet the supply demands of this strategy
- However, a recent study conducted for the National Oilheat Research Alliance (NORA) suggests that supplies of low and ultra-low sulfur distillate should be available to meet the demands of the M-V program in the general timeframes laid out by the states

Supply & Demand

“With the rapid changes required through 2012, the low sulfur market will be strained and undergo a transition throughout the period. Any additional shift to <15 ppm for the Northeast market will further tighten and constrain supply. In the 2010 to 2012 period, most of the market will be moving from 500 ppm to <15 ppm. Adding a requirement for additional shift from 2000 or higher to <15 ppm will be more difficult and have a far greater marginal impact on the market”

Supply & Demand

“Shifting the heating oil to 500 ppm in 2012, would be more reasonable but would still add to what will likely be a constrained market. The 500 ppm standard may provide some positive synergies with other markets shifting from 500 ppm to <15 ppm”

Supply & Demand



“By 2018, with the entire Northeast heating oil market at <15 ppm, the ultra low sulfur market will be about 94 percent of the market. Most supply sources will be marketing all or predominately ultra low sulfur distillate. The on-road and non-road diesel conversions to <15 ppm were complete more than 5 years earlier. Supplying the additional <15ppm product would not place significant strain on the market, assuming adequate notice was provided to suppliers”

Cost of Compliance



- Over a ten year period (1993-2003), the incremental cost between 2500 ppm and 500 ppm distillate averaged 1.5 cents per gallon
- Over past several years this delta has been higher, due in part to rapid changes in the oil industry as result of environmental regulations
- In the past year the gap has begun to close
- As market moves toward nearly all ULSD, the incremental cost of high, low and ultra-low product should normalize

Cost of Compliance



NORA study estimates:

- 6.3 to 6.8 cents/gal incremental production cost for 500 ppm vs. 2500 ppm sulfur distillate, including capital costs
- Cost will increase to as high as 8.9 cents/gal for 15 ppm
- However, where refiners have de-sulfurization capabilities, incremental cost of producing ultra low sulfur distillate will be less than 5 cents/gal

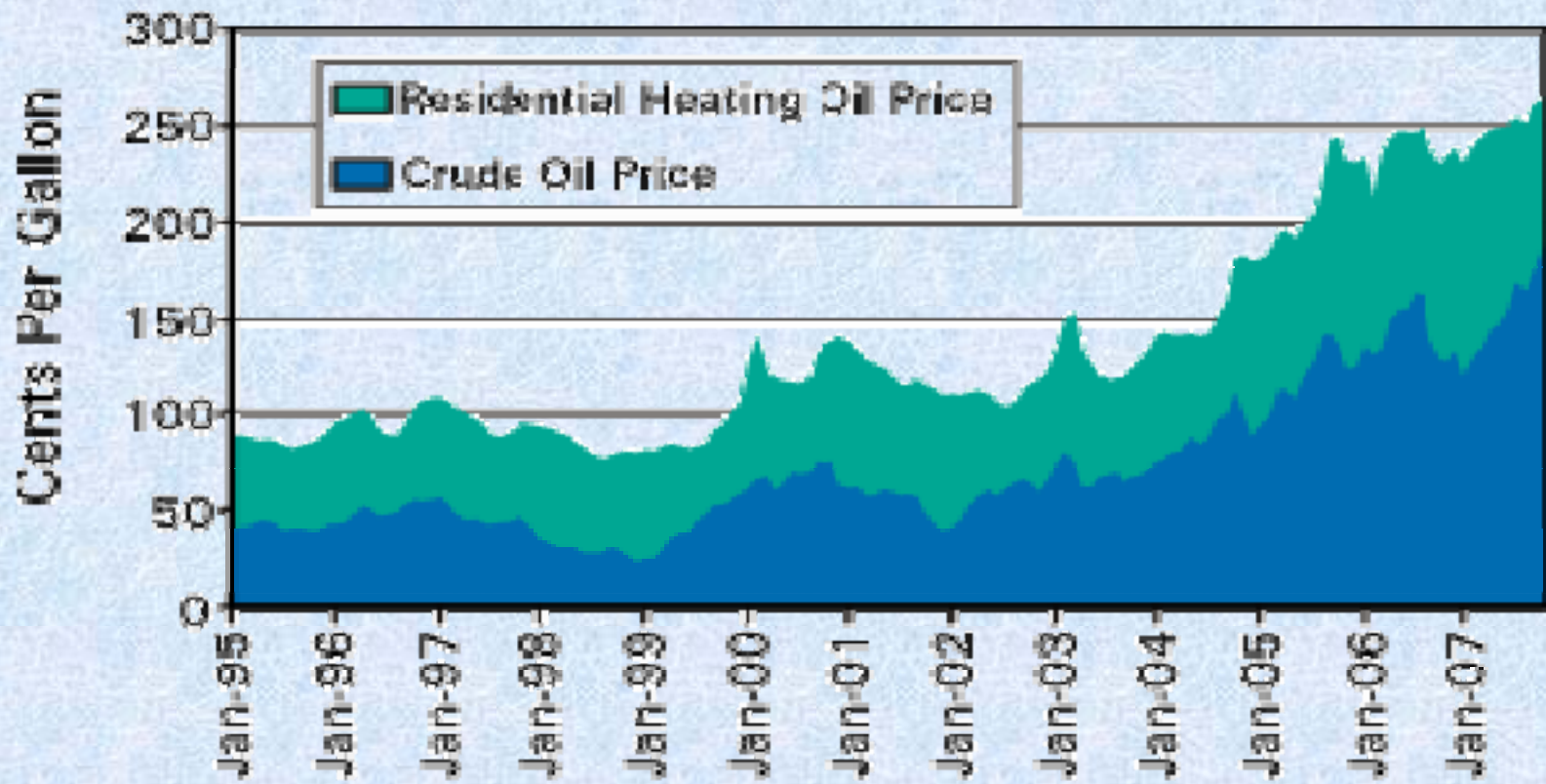
Cost vs. Price



- Forces other than production costs will also play role in determining the price differential that consumers will pay for cleaner heating oil
- Relative cost of diesel fuel compared to gasoline this past year is good example
- Similarly, heating oil prices didn't always track well with crude oil prices
- It is difficult to predict actual price impact of low sulfur regs and of course this is what consumers & politicians want to know

Historical Price

Monthly Prices



Source: EIA, Petroleum Marketing Monthly, January 1995-present

Heating Price on NY Spot Market \$/gallon



1-2-04	\$1.01
1-2-05	\$1.17
1-2-06	\$1.77
1-2-07	\$1.66
1-2-08	\$2.73
7-14-08	\$4.03

Comparative Price \$/gal on NY Spot Market



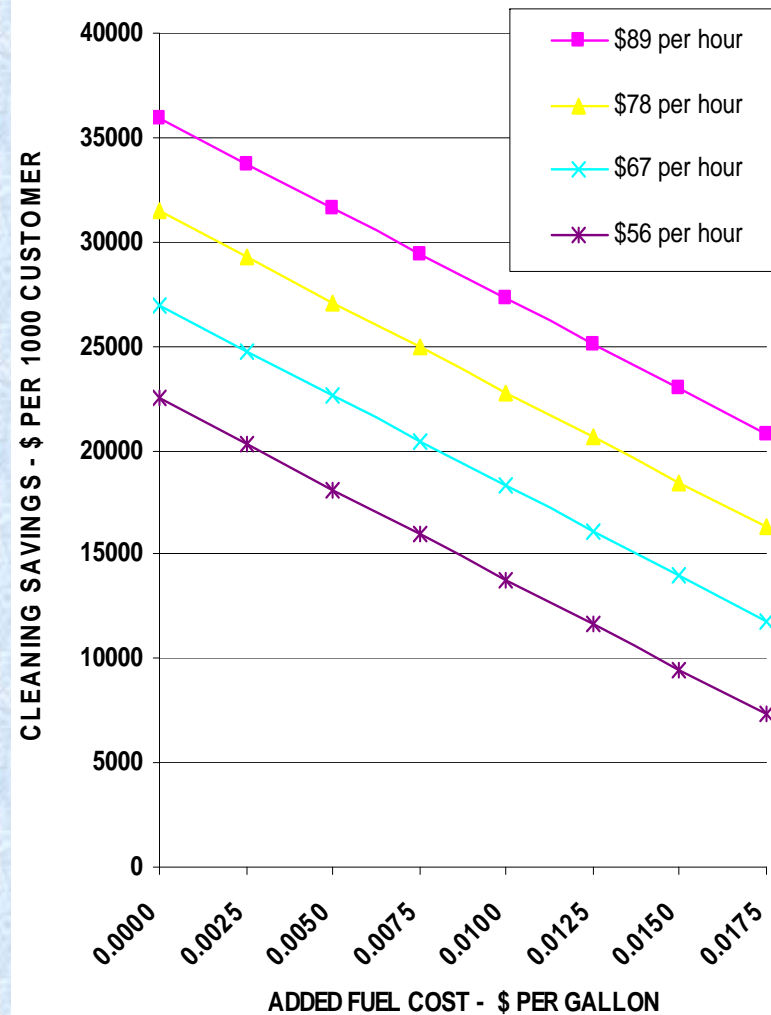
	9/10/08	9/10/07
#2 Fuel Oil	\$2.87	\$2.21
500ppm Diesel	\$2.94	\$2.27
15ppm Diesel	\$2.97	\$2.33

Consumer Benefits of Low Sulfur Heating Oil



- Sulfur reductions can save consumer money
- Low sulfur heating oil reduces rate of fouling of heating equipment & therefore reduces maintenance
- Cleaner furnaces/boilers burn less fuel
- Table shows net cost savings per 1,000 households at various cost points

For: 0.25% S (initial) and 865 Gal per Year



Politics of Adopting Low Sulfur Heating Standards

- Cost increment of cleaner fuel is tiny compared to other economic factors that have already increased price by 3x to 4x since states began to consider this strategy in 2004
- However, in light of the tremendous increase in heating oil prices over the past couple of seasons, heating costs are “prime time” political issue today
- States are concerned about their ability to get regulations through in this political climate without buy-in of industry & strong support from environmental community

Regional Initiative for Low Sulfur Distillate/Residual Oil

- States will need to clearly articulate both the environmental/public health & supply/cost impacts of this strategy
- Successful adoption and implementation of low sulfur strategy will likely hinge on states, industry, consumer groups & environmental community providing a unified message to Governors & state legislatures about the program's merit & viability

Oilheat Industry Perspective

- Oilheat dealers are generally supportive of lowering sulfur as means of “greening” their image relative to natural gas competitors
- In recent hearings in NYC, wholesalers & retailers voiced support for M-V approach & timeline
- Timing & avoiding patchwork of different requirements are key to this support
- Rapidly rising oil heat costs may temper industry support

Potential Next Steps

- Hold small meetings with:
 1. wholesalers
 2. retailers
 3. refiners
- Hold more public workshop/conference with above groups, energy officials, equipment manufacturers, consumer groups

Other Heating Oil Issues

- Biofuels
- Mercury in heating oil
- Low carbon fuel standard

Adding Biodiesel to Low Sulfur Heating Oil

- Biofuels can be blended with low sulfur diesel to further reduce emissions and extend heating oil supplies with domestic feedstocks
- Biofuels, including soy-based biodiesel, contain negligible amounts of sulfur and nitrogen and no mercury
- Biofuels can be produced locally from variety of materials

Benefits of Adding Biodiesel to Low Sulfur Heating Oil



Emission Benefits of Low Sulfur Heating Oil and Biodiesel Blends
 (% reduction compared to 2,500 ppm sulfur fuel)

Pollutant	Reduction with 500 ppm Sulfur Heating Oil	Reduction with 500 ppm Sulfur Heating Oil/Biodiesel Blend (80/20)
SO₂	75%	84 %
PM	80	>80 %¹
NO_x	10	20 %
Hg	n/a	20 %²
CO₂	1-2%	17-18 %³

•1 Additional PM reductions are expected, but no known test data exists to substantiate this assumption.

•2 Value based on the assumption that biodiesel contains no mercury.

•3 Does not include lifecycle emissions

Mercury Content of Heating Oil

- AP-42 emission factor suggests fairly high mercury content in heating oil
- Neither states, nor industry have been comfortable with this factor
- Northeast states raised this with EPA, but they never followed up
- NESCAUM secured funding from NYSERDA to conduct sampling of #2 & #6 oil to quantify Hg and metal content
- Major suppliers are providing samples

Hg Emission Factors



	#2 Fuel Oil	#6 Fuel Oil
Study Report to Congress-1997	0.96 lbs./10 ⁶ Gallons	1.1 lbs./10 ⁶ Gallons
AP-42 1995 / EPCRA 2000	0.42 lbs./10 ⁶ Gallons	0.113 lbs./10 ⁶ Gallons
L&E Report 1997	0.86 lbs./10 ⁶ Gallons	0.071 lbs./10 ⁶ Gallons
EPCRA 1999	3.34 lbs./10 ⁶ Gallons	0.04 lbs./10 ⁶ Gallons
NHDES 2003	0.013 lbs./10 ⁶ Gallons	0.415 lbs./10 ⁶ Gallons
NESCAUM Preliminary Results	0.02 lbs./10 ⁶ Gallons	Not yet available

Next Steps for Hg Study

- Study will be complete in 2009
- Assuming final results remain consistent with early sampling, Northeast states and heating oil industry intend to present results to EPA
- Goal is to convince EPA to modify the AP-42 emission factor as appropriate

Low Carbon Fuel Standard



- States in the region are exploring the viability of a low carbon fuel standard as a GHG reduction strategy
- Whereas CA is expected to include only transportation fuels, Northeast is considering including space heating fuels
- One of the options that is being evaluated is fuel switching from high carbon distillate oil to potentially lower carbon (on lifecycle basis) solid and gaseous fuels (wood, natural gas & propane)