

# DNREC Presentation

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## City of Dover McKee Run Unit 3

3/9/06





# Items to Discuss

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- About Dover
- Correct a Couple Issues
- Look at Technology
- Look at the Impacts

# About Dover

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- Dover owns two sites McKee Run and VanSant
- City Owns-Duke Energy Operates.
- McKee Run has Units 1/2, 3
- McKee Run 3
  - Newest and most efficient unit
  - Caps price for Dover customers
  - Capacity factor of less than 8% (2005)
  - Critical for Restoration of Dover and DAFB



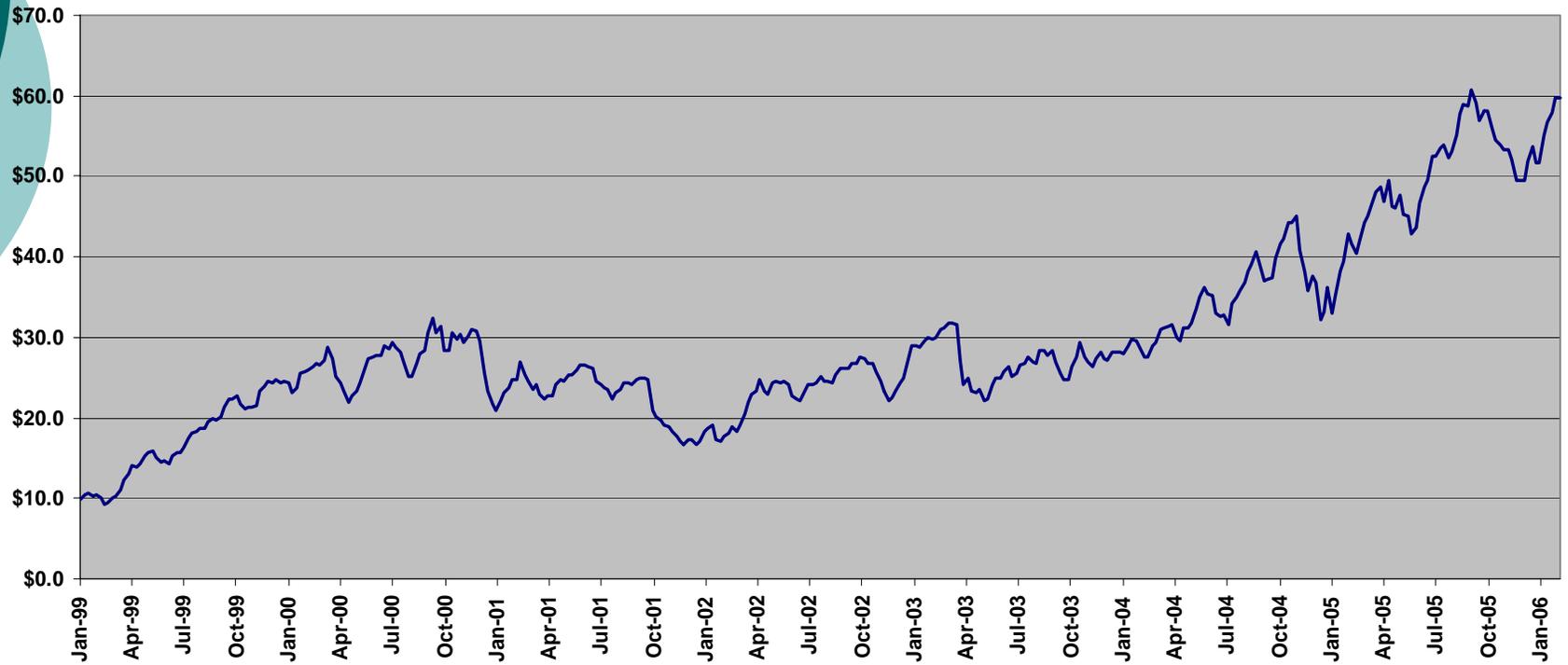
# About Dover

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- McKee Run 3
  - Residual oil (No 6)
  - Natural gas
  - 75% of production costs are Fuel

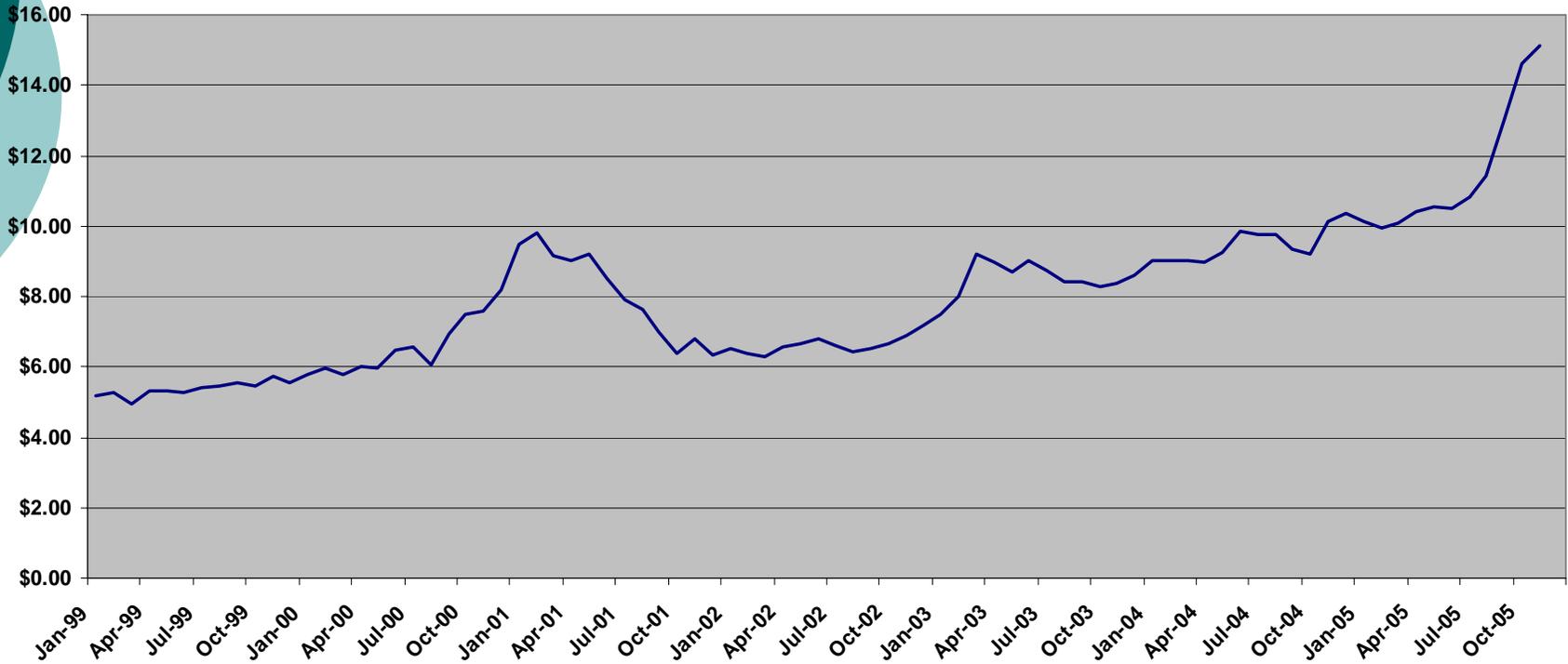
# About Dover

World Spot Crude Oil Price per Barrel



# About Dover

Commercial Natural Gas prices (dollars per 1000 cu ft)





# Correct a Couple Issues

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- Regulated?



# Correct a Couple Issues

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- Regulated?
- **Emission Rates**

# In the January DNREC Presentation

Unit (year built)	Age	Fuel	NOx Controls - Current Emission Rate	SOx Controls - Current Emission Rate	Mercury Controls - Current Emission Rate
Indian River 1 (1957)	48	Coal	First generation low NOx burners & overfire air - <b>0.38 lb/mmbtu</b>	Uncontrolled - <b>2.2 lb/mmbtu</b>	Uncontrolled
Indian River 2 (1959)	46	Coal	First generation low NOx burners & overfire air - <b>0.33 lb/mmbtu</b>	Uncontrolled - <b>2.1 lb/mmbtu</b>	Uncontrolled
Indian River 3 (1970)	35	Coal	First generation low NOx burners, overfire air & selective non-catalytic reduction - <b>0.28 lb/mmbtu</b>	Uncontrolled - <b>2.2 lb/mmbtu</b>	Uncontrolled
Indian River 4 (1980)	25	Coal	First generation low NOx burners, overfire air & selective non-catalytic reduction - <b>0.30 lb/mmbtu</b>	Uncontrolled - <b>1.0 lb/mmbtu</b>	Uncontrolled
EdgeMoor 3 (1954)	51	Coal	Selective non-catalytic reduction - <b>0.17 lb/mmbtu</b>	Uncontrolled - <b>1.01 lb/mmbtu</b>	Uncontrolled
EdgeMoor 4 (1966)	39	Coal	First generation low NOx burners & gas reburn - <b>0.18 lb/mmbtu</b>	Uncontrolled - <b>1.04 lb/mmbtu</b>	Uncontrolled
EdgeMoor 5 (1973)	32	Residual Oil	First generation low NOx burners - <b>0.35 lb/mmbtu</b>	Uncontrolled - <b>0.60 lb/mmbtu</b>	NA
McKee Run 3 (1975)	30	Residual Oil	First generation low NOx burners & overfire air - <b>0.35 lb/mmbtu</b>	Uncontrolled - <b>0.73 lb/mmbtu</b>	NA

Reported to be 2002 data

# Dover Corrected Emission Rates

Unit (year built)	Age	Fuel	NOx Controls - Current Emission Rate	SOx Controls - Current Emission Rate	Mercury Controls - Current Emission Rate
Indian River 1 (1957)	48	Coal	First generation low NOx burners & overfire air - <b>0.38 lb/mmbtu</b>	Uncontrolled - <b>2.2 lb/mmbtu</b>	Uncontrolled
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# 2003 Overfire Air NOx Project

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- City of Dover financed \$2M in a NOx reduction project to comply with CAA reduction.
- Reduced emission rate from 0.35 to 0.28 average (0.23 lowest)
- 20 - 35% reduction

# 2003 Overfire Air NOx Project

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NOx

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5 to

# 2003 Overfire Air NOx Project

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a NOx  
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35 to

# 2003 Overfire Air NOx Project

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○ NOx

○ 5 to

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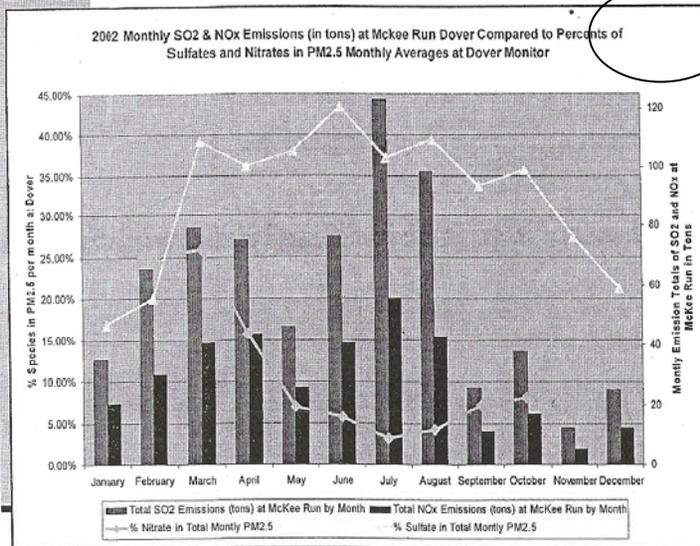
# Correct a Couple Issues

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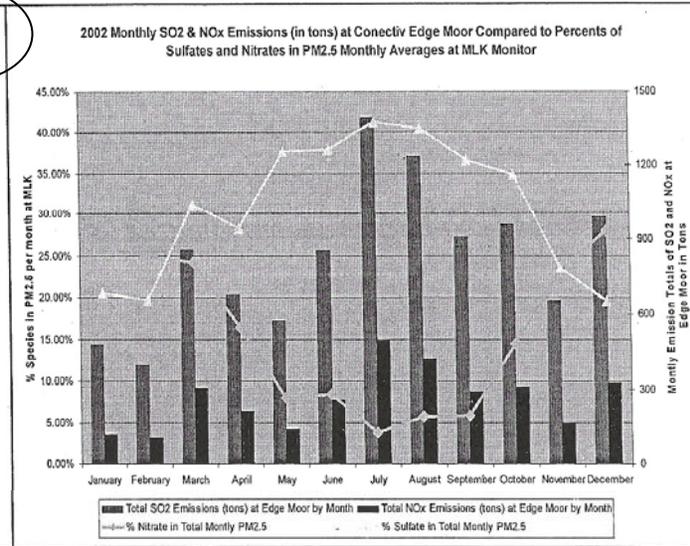
- Regulated?
- Emission Rates
- Coal and Oil

# From Air Quality Summit June 4, 2003

## Source Analysis



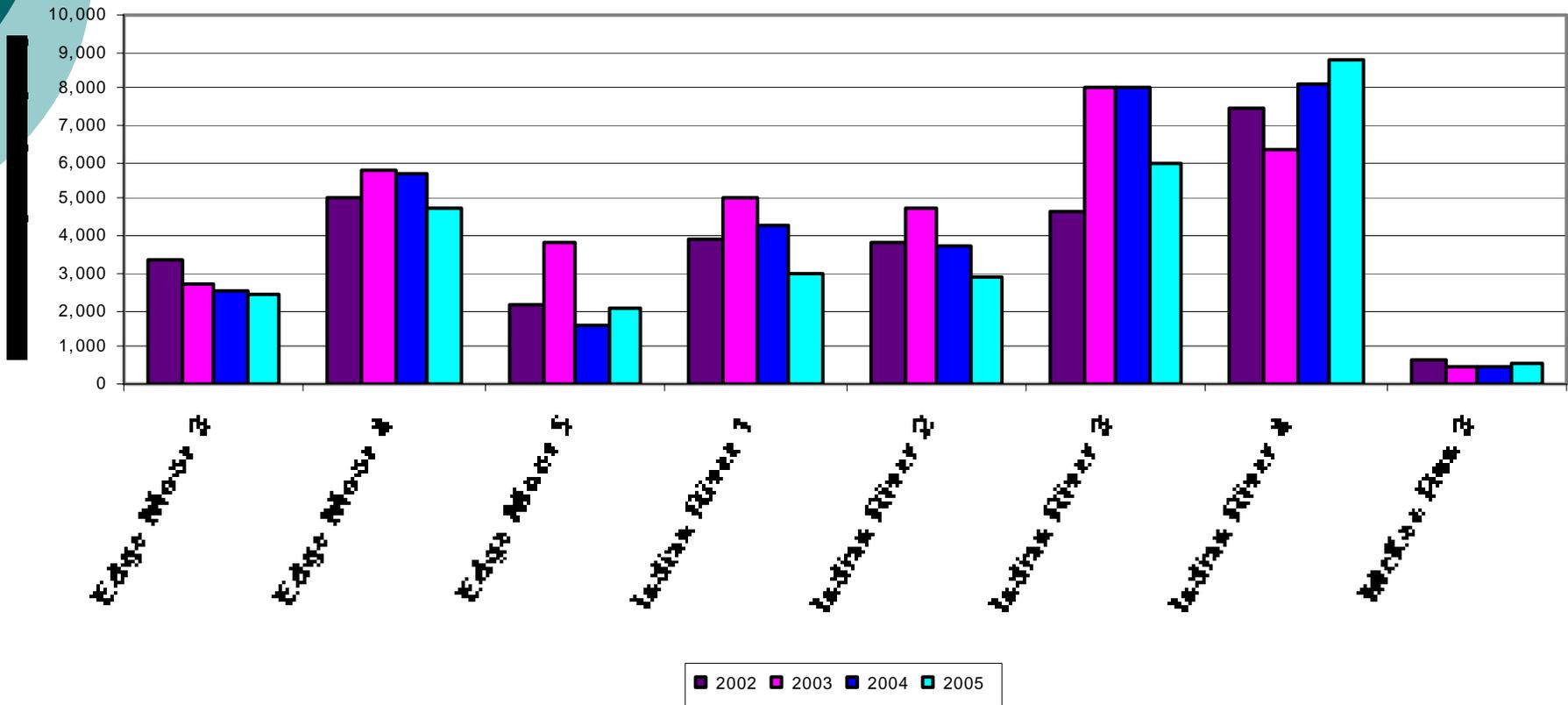
City of Dover McKee Run  
Generating Station data



Conectiv Edge Moor data

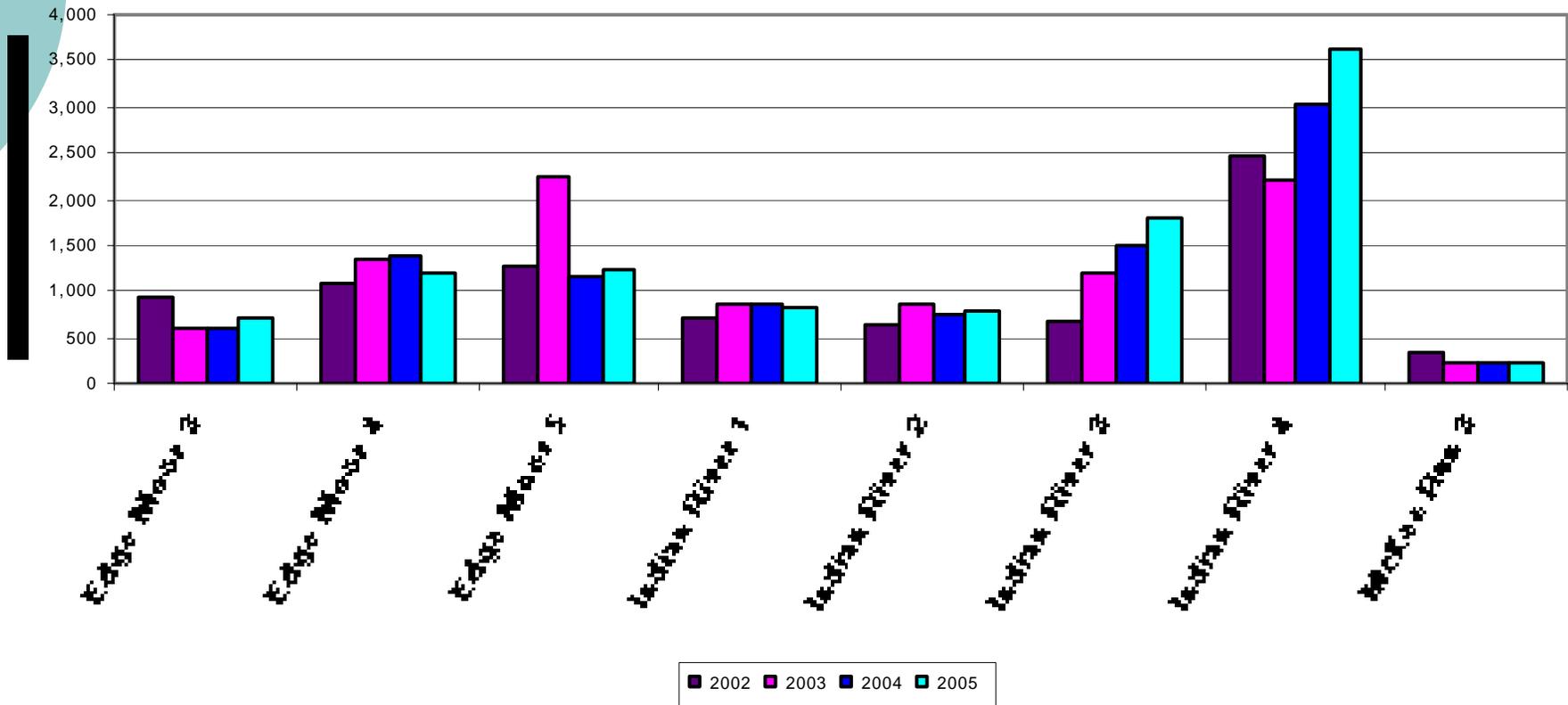
# Actual Emissions

## SO2 Emissions from Multi-P Targeted Units



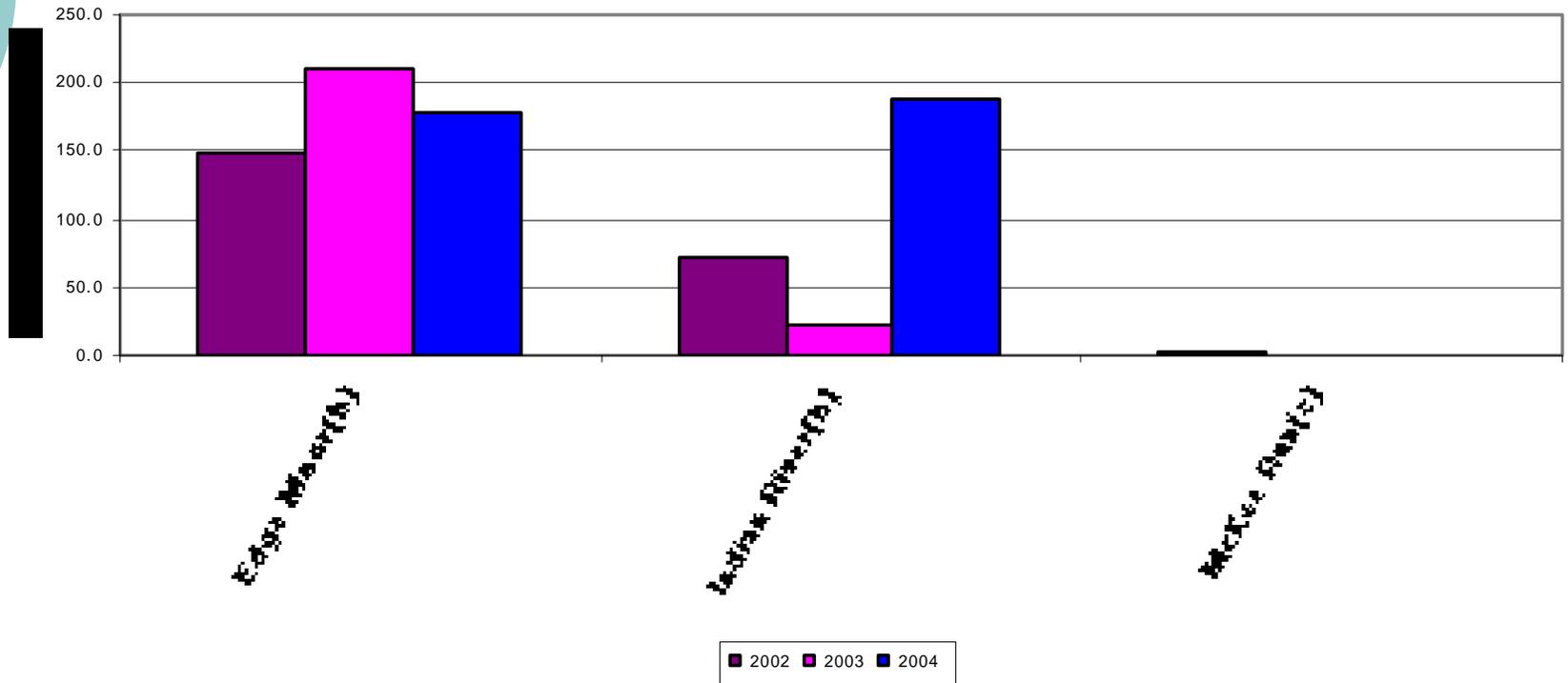
# Actual Emissions

## NOX Emissions from Multi-P Targeted Units



# Actual Emissions

Mercury Emissions from Multi-P Targeted Facilities



# Actual Emissions – 2003 TRI Report

- 2003 is most recent report
- Data taken from State Website

[http://www2.state.de.us/serc/information/TRI/2003/TRI\\_Data\\_Detail\\_Report.shtml](http://www2.state.de.us/serc/information/TRI/2003/TRI_Data_Detail_Report.shtml)

## Persistent, Bioaccumulative, Toxic (PBT) Chemicals

For reporting year 2000 and beyond, EPA established substantially lower reporting thresholds for 15 chemicals and 3 chemical categories that are highly persistent and bioaccumulative in the environment (PBT's). Five chemicals were also added to the PBT list in 2000. The new thresholds apply regardless of whether the PBT chemical is manufactured, processed, or otherwise used. Table 2 provides a list of these PBT chemicals and their thresholds.

Beginning with reporting year 2001 and beyond, lead and lead compounds also have a reduced threshold of 100 pounds, down from the previous 25,000 pounds for manufactured and processed and 10,000 pounds otherwise used thresholds, except lead contained in stainless steel, brass, or bronze alloys.

**TABLE 2  
PBT CHEMICALS AND  
REPORTING THRESHOLDS  
(pounds/year)**

Chemical or Chemical Category	Threshold
Aldrin	100
Benzo[g,h,i]perylene	10
Chlordane	10
Dioxin and dioxin-like compounds	0.1 grams
Heptachlor	10
Hexachlorobenzene	10
Isodrin	10
Lead *	100
Lead compounds *	100
Mercury	10
Mercury compounds	10
Methoxychlor	100
Octachlorostyrene	10
Pendimethalin	100
Pentachlorobenzene	10
Polychlorinated biphenyls (PCB's)	10
Polycyclic aromatic compounds	100
Tetrabromobisphenol A	100
Toxaphene	10
Trifluralin	100

\* Lower Threshold Beginning with 2001 Reports

# Actual Emissions – 2003 TRI Report

- 2003 is most recent report
- Data taken from State Website

[http://www2.state.de.us/serc/information/TRI/2003/TRI\\_Data\\_Detail\\_Report.shtml](http://www2.state.de.us/serc/information/TRI/2003/TRI_Data_Detail_Report.shtml)

**TABLE 3  
CARCINOGENS REPORTED BY  
DELAWARE FACILITIES FOR 2003**

CHEM NAME	IARC	NO. OF REPORTS
Acrylonitrile	2A	1
Benzene	1	7
1,3-Butadiene	2A	2
Chromium Compounds	1	8
Cobalt Compounds	2B	2
Dichloromethane	2B	1
1,3-Dichloropropylene	2B	1
Diethyl Sulfate	2A	1
Ethylbenzene	2B	6
Ethyl Acrylate	2B	2
Ethylene Oxide	1	2
Formaldehyde	2A	2
Hexachlorobenzene	2B	1
Lead	2B	5
Lead Compounds	2B	14
4,4'-Methylenebis(2-Chloroaniline)	2A	1
Nickel	2B	3
Nickel Compounds	1	6
Nitrobenzene	2B	1
P-Chloroaniline	2B	1
Polychlorinated Biphenyls (PCB's)	2A	1
Polycyclic Aromatic Compounds	2A,B	12
Propylene Oxide	2B	1
Styrene	2B	7
Tetrachloroethylene	2B	1
Toluene Diisocyanate (Mixed Isomers)	2B	2
Trichloroethylene	2A	2
Vinyl Acetate	2B	2
Vinyl Chloride	1	2
<b>Total =</b>		<b>97</b>

## Carcinogenic TRI Chemicals

Some chemicals are reportable under TRI because they are either known or suspected human carcinogens. Known human carcinogens are those that have been shown to cause cancer in humans. Suspected carcinogens are those that have been shown to cause cancer in animals. Table 3 contains those known and suspected carcinogens that were reported by Delaware facilities for 2003. Next to each chemical is its International Agency for Research on Cancer (IARC) rating as a: Known (1), Probable (2A), or Possible (2B) carcinogen. Polycyclic aromatic compounds is a class of chemicals with chemicals in both 2A and 2B IARC classifications. Of the 9.6 million pounds of TRI chemicals reported by facilities as released on-site to the environment in 2003, 6.1% (591,000 pounds) were known or suspected carcinogens. Releases on-site of all carcinogens decreased 2% compared to 2002 data and decreased 31% since its peak in 1998. For additional information on cancer rates and causes, please go to the Public Health cancer web site listed in the "For Further Information" section on page 48. Additional carcinogen detail is presented in the Trend Analysis section on page 46.

# Actual Emissions – TRI Report

**TABLE 5**  
**2003 TRI DATA BY PRIMARY SIC GROUP**  
(In pounds)

SIC CODE	INDUSTRY GROUP	NUMBER OF REPORTS	NUMBER OF FACILITIES	FORM A	FORM R	ON-SITE RELEASE	OFF SITE TRANSFERS	ON-SITE WASTE MGMT.
10	Metal Mining	5	1	0	5	7,091	0	0
20	Food Products	22	8	12	10	343,448	0	0
22	Textiles	5	2	2	3	29,126	744,943	2,639,957
24	Lumber and Wood Products	14	1	0	14	1,463	31	0
25	Furniture and Fixtures	1	1	0	1	9,454	0	0
26	Paper Products	1	1	0	1	6,411	51,094	1,950,000
28	Chemicals	124	26	8	116	1,182,933	8,311,446	29,439,327
29	Petroleum Refining and Products	59	5	6	53	1,767,618	143,088	20,521,709
30	Rubber and Plastics	15	12	4	11	53,855	205,003	133,740
32	Stone, Clay and Glass	1	1	0	1	0	3,274	0
33	Primary Metal	13	4	0	13	18,357	2,184,939	13,100,000
34	Fabricated Metal Products	4	2	0	4	10	175,603	1,700
35	Industrial Machinery and Equipment	2	1	0	2	0	13,010	0
36	Electronic Equipment Not Computers	5	3	0	5	237	4,313,554	44,590
37	Transportation Equipment	35	3	3	32	457,277	542,432	112,170
38	Measuring Instruments,	8	3	0	8	822	54,521	0
39	Miscellaneous Manufacturing	1	1	0	1	2,288	0	0
4911	Oil and Coal Fired Power Plants	43	4	1	42	5,736,094	345,836	1,199,335
5171	Wholesale Petroleum Terminals	19	4	19	0	0	0	0
97	National Security	1	1	0	1	7	0	0
<b>TOTAL</b>		<b>378</b>	<b>84</b>	<b>55</b>	<b>323</b>	<b>9,616,491</b>	<b>17,088,774</b>	<b>69,142,528</b>

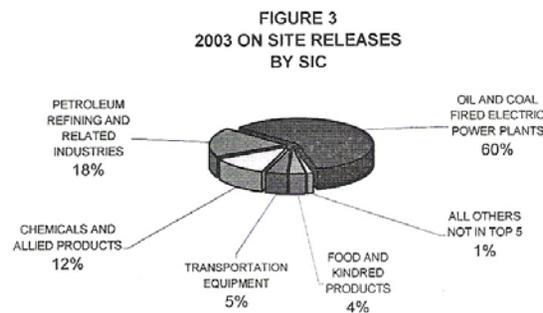


Figure 3 shows the relative contribution of each of the top 5 SIC groups to the total on-site releases and all others not in the top 5. Three of these - SIC groups 4911 (Oil and Coal Fired Power plants), 29 (Petroleum refining), and 28 (Chemicals) combined for 90% of the total on-site releases within the state. Facilities not in the top 5 industry groups contributed only 129,000 pounds on-site, or about 1.3% of the on-site release total.

# Actual Emissions – TRI Report

APPENDIX E 2003 ON-SITE RELEASE SUMMARY BY FACILITY RANKED BY ON-SITE RELEASES (in pounds)						
FACILITY	AIR	WATER	LAND	ON-SITE RELEASES	OFF SITE TRANSFERS	ON-SITE WASTE MGMT.
INDIAN RIVER POWER PLANT	3,283,231	3,105	607,140	3,893,476	0	1,005,000
EDGE MOOR/HAY ROAD POWER PLANTS	1,792,081	4,525	0	1,796,606	345,415	157,335
PREMCO	744,251	338,444	845,038	1,727,732	143,018	20,521,706
INVISTA SEAFORD	340,966	217,637	2,854	561,457	11	242,201
DAIMLERCHRYSLER	334,342	0	0	334,342	285,907	49,400
PERDUE GEORGETOWN	0	320,000	1	320,001	0	0
DUPONT EDGE MOOR	257,312	22,706	0	280,018	3,679,134	19,513,733
GENERAL MOTORS	122,625	310	0	122,935	237,750	57,770
FORMOSA PLASTICS	110,315	0	0	110,315	0	249,712
HONEYWELL	101,951	0	0	101,951	341,409	0
NRG DOVER	46,011	0	0	46,011	421	37,000
SUNOCO	39,881	0	0	39,881	0	0
CIBA SPECIALTY CHEMICALS	30,371	0	0	30,371	2,418,915	763,077
ROHM & HAAS	29,030	0	0	29,030	744,943	2,639,957
KANEKA	21,821	1	0	21,822	5	223,876
JUSTIN TANKS	20,202	0	0	20,202	240	0
D&B INDUSTRIAL PRODUCTS	19,200	0	0	19,200	7,121	0
AIR LIQUIDE AMERICA	17,000	0	0	17,000	8,880	0
GENERAL CHEMICAL	12,324	2,445	0	14,769	9,704	62,127
CAMDEL METALS	14,200	0	0	14,200	70,389	13,100,000
DOW REICHHOLD	13,387	0	0	13,387	1,307	1,469,594
HANOVER FOODS	13,117	0	0	13,117	0	0
MACDERMID	10,203	0	0	10,203	52,524	851,046
MOUNTAIRE FARMS OF DELAWARE	1,782	15	8,281	10,078	0	0
HIRSH INDUSTRIES	9,454	0	0	9,454	0	0
AMERICAN MINERALS	6,574	517	0	7,091	0	0
NVF YORKLYN	0	6,411	0	6,411	51,094	1,950,000
HARDCORE COMPOSITES	5,626	0	0	5,626	0	0
NORAMCO	4,651	0	0	4,651	1,534,639	2,122,998
UNIQEMA	4,496	0	0	4,496	18,841	2,529
SPATZ FIBERGLASS	4,256	0	0	4,256	0	0
CITISTEEL	3,459	102	596	4,157	2,105,299	0
JOHNSON POLYMER	4,145	0	0	4,145	4,055	2,516
ROHM & HAAS TECH CENTER	3,043	0	0	3,043	66,643	0
ORIENT	2,891	0	0	2,891	421	10,271
MARBLE WORKS	2,288	0	0	2,288	0	0
ARLON	1,500	0	0	1,500	3,865	131,740
OCCIDENTAL CHEMICAL	1,459	16	0	1,475	2,486	1,579,282
BERACAH HOMES	1,463	0	0	1,463	31	0
AGILENT TECHNOLOGIES NEWPORT	1,440	0	0	1,440	8,277	0
AVECIA	1,211	0	0	1,211	58,941	70,941
AGILENT TECHNOLOGIES LITTLE FALLS	822	0	0	822	37,760	0
MEDAL	750	0	0	750	67,810	2,242,862
CYTEC	603	0	0	603	56,065	31,071
PICTSWEEP	250	0	0	250	0	0
JOHNSON CONTROLS	182	5	0	187	4,313,323	0
GREEN TREE CHEMICAL	110	0	0	110	2,040	0
AMETEK	0	48	48	96	0	0
ASTROPOWER SOLAR PARK	48	0	0	48	0	44,580

APPENDIX E 2003 ON-SITE RELEASE SUMMARY BY FACILITY RANKED BY ON-SITE RELEASES (in pounds)						
FACILITY	AIR	WATER	LAND	ON-SITE RELEASES	OFF SITE TRANSFERS	ON-SITE WASTE MGMT.
TFL USA-CANADA	29	0	0	29	7,801	0
PLAYTEX PRODUCTS	24	0	0	24	23,500	2,000
KUEHNE CHEMICAL	16	0	0	16	0	0
PPG DOVER	12	0	0	12	13,685	0
SPI POLYOLS	10	0	0	10	24,494	1,491
METAL MASTERS	10	0	0	10	169,979	0
DOVER AFB	7	0	0	7	0	0
VP RACING FUELS	5	0	0	5	0	0
E-A-R	4	0	0	4	6,755	0
PINNACLE FOODS	2	0	0	2	0	0
ASTROPOWER PENCADER	2	0	0	2	230	0
W.L. GORE OTTS CHAPEL	0.2250	0.0000	0.0000	0.2250	490	0
MCKEE RUN POWER PLANT	0.1370	0.0000	0.0000	0.1370	0	0
INSTEEL WIRE	0.0005	0.0000	0.0000	0.0005	8,761	0
ALLENS HATCHERY	0	0	0	0	0	0
BLADES BULK PLANT	0	0	0	0	0	0
CARL KING	0	0	0	0	0	0
CHROME DEPOSIT	0	0	0	0	5,624	1,700
CLARIANT	0	0	0	0	0	0
CUSTOM DECORATIVE MOULDINGS	0	0	0	0	0	0
DENTSPLY LAKEVIEW	0	0	0	0	7,600	0
DENTSPLY WEST MILFORD	0	0	0	0	9,162	0
GARDNER ASPHALT	0	0	0	0	0	0
HALKO MFG.	0	0	0	0	18,775	5,000
IKO	0	0	0	0	70	3
INTERVET	0	0	0	0	2	0
MOUNTAIRE FARMS FEEDMILL	0	0	0	0	0	0
PERDUE BRIDGEVILLE	0	0	0	0	0	0
PPG WORKS 32	0	0	0	0	3,274	0
ROLLER SERVICE	0	0	0	0	0	0
SARA LEE APPAREL	0	0	0	0	96,660	0
SERVICE ENERGY DOVER	0	0	0	0	0	0
SERVICE ENERGY MILFORD	0	0	0	0	0	0
SPI PHARMA	0	0	0	0	0	0
SUNROC	0	0	0	0	13,010	0
<b>FACILITY TOTALS</b>	<b>7,436,246</b>	<b>916,287</b>	<b>1,263,958</b>	<b>9,616,491</b>	<b>17,088,774</b>	<b>69,142,528</b>

Includes all three McKee Units



# Items of Interest

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- About Dover
- Correct a couple issues
- **Look at Technology**
- Look at the Impacts

# In the January DNREC presentation

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## [ ***NO<sub>x</sub> Control Technology*** ]

<u>Technology</u>	<u>Applicability</u>	<u>Reduction Potential</u>
Selective Non-Catalytic Reduction (SNCR)	Coal, oil, and gas fired	Up to 60%
Selective Catalytic Reduction (SCR)	Coal, oil, and gas fired	Up to 90%

# In the January DNREC presentation

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## [ *SO<sub>2</sub> Reduction Technology* ]

<u>Technology</u>	<u>Applicability</u>	<u>Reduction Potential</u>
Furnace or Duct Sorbent Injection	Coal fuel	Up to 60%
Flue Gas Desulfurization	Coal fuel	Up to 90%
Low Sulfur Oil	Oil	About 50%

# In the January DNREC presentation

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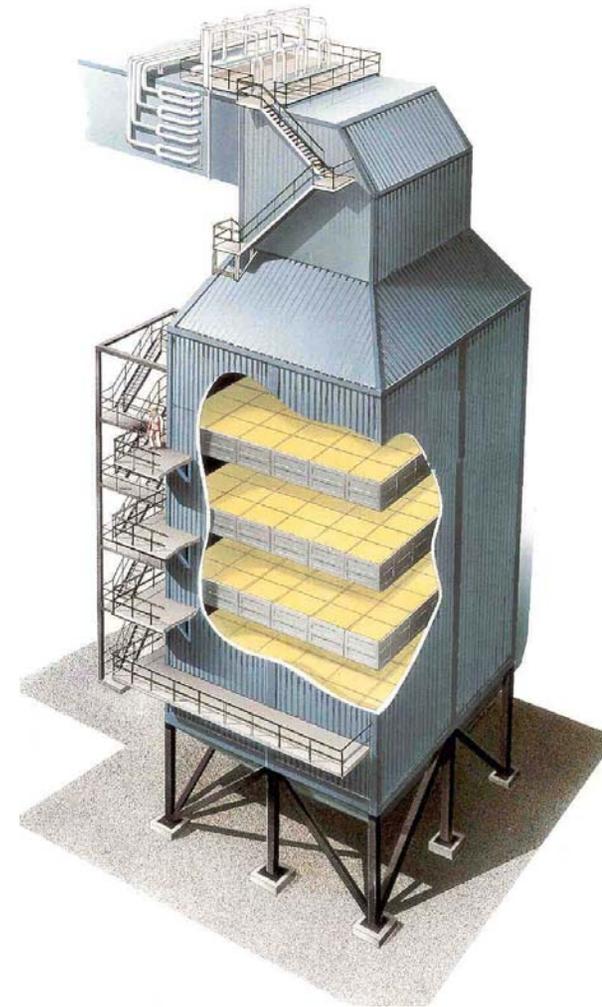
## [ *Hg Reduction Technology* ]

	<u>Technology</u>	<u>Applicability</u>	<u>Reduction Potential</u>
N/A	Side Benefit of SO <sub>2</sub> Reduction Technology	Coal Fuel	Up to 50%
	Activated Carbon Injection	Coal Fuel	Up to 90%

# For Dover it's NO<sub>x</sub> and SO<sub>x</sub>

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- NO<sub>x</sub>
  - Overfire air – done \$2M
  - SCR
  - SNCR
- SO<sub>2</sub>
  - Lower sulfur fuel





# Items of Interest

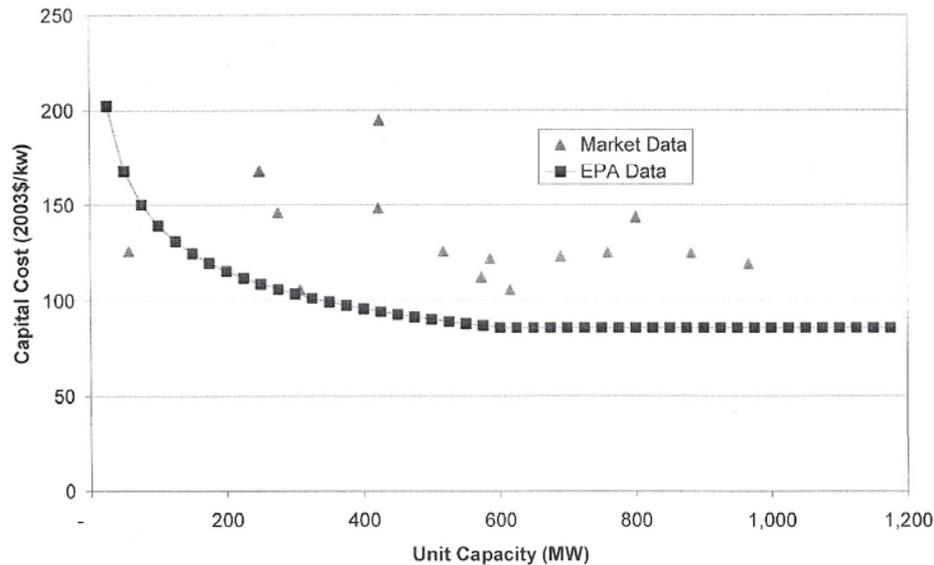
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- About Dover
- Correct a couple issues
- Look at Technology
- **Look at the Impacts**

# For Dover it's NOx and SOx

## Assumptions - Comparison of NOx Control Costs

Figure 5.2 - EPA vs. Market Comparison of SCR Capital Costs



# For Dover it's NOx and SOx

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- NOx – SCR - \$10M capital
  - Assume similar run history
  - Assume O&M costs \$300K (catalyst and NH<sub>3</sub>)
  - 28% premium over current costs.

# For Dover it's NOx and SOx

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- NOx – SNCR - \$4M capital
  - Assume similar run history
  - Assume O&M costs \$ 150K (NH<sub>3</sub>)
  - 12% premium over current costs.

# For Dover it's NOx and SOx

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- SO<sub>2</sub>

- Lower Sulfur fuel

- Used 3% oil until 1992

- Currently use 1% sulfur

- Lower sulfur available at 10% premium

- Fuel is 75% of our production costs

- 7.5% premium over current costs

# For Dover it's NOx and SOx

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- Total cost estimates
  - NOx -> 12% – 28%
  - SOx -> 8%
- 20% - 36% for this regulation

# Items of Interest

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- About Dover
- Correct a couple issues
- Look at Technology
- Look at the Impacts
  - Multi-pollutant – (20% - 36%)
  - CO<sub>2</sub> – (?)
  - Combustion Turbine (?)
  - Regional Haze Reg - Particulate (?)
  - Other ?



# Dover Summary

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Switched from Coal to Oil in 1970's

Switched from 3% to 1% in 1990's

Installed NOx OFA NOx Reduction in 2003

Faced with 100% fuel cost increase

Faced with compounded Environmental Regulations

Probably forced to shut down



# Dover's Electric Strategy

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Wholesale Power Purchaser

Plant Caps our costs

Not Base loaded – Seasonal – less than 2000 hrs.

DAFB and State Government are two largest customers

Fuel cost increases provide current sticker shock



# Dover's Electric Strategy

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Black start capability

McKee Run is critical link

Dover service territory

(Local, State, regional medical, DAFB)



Any Questions?

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