KeySpan Power Plant Emission Trends and Modernization Opportunities

Northport 1500 MW

Port Jefferson 450 MW

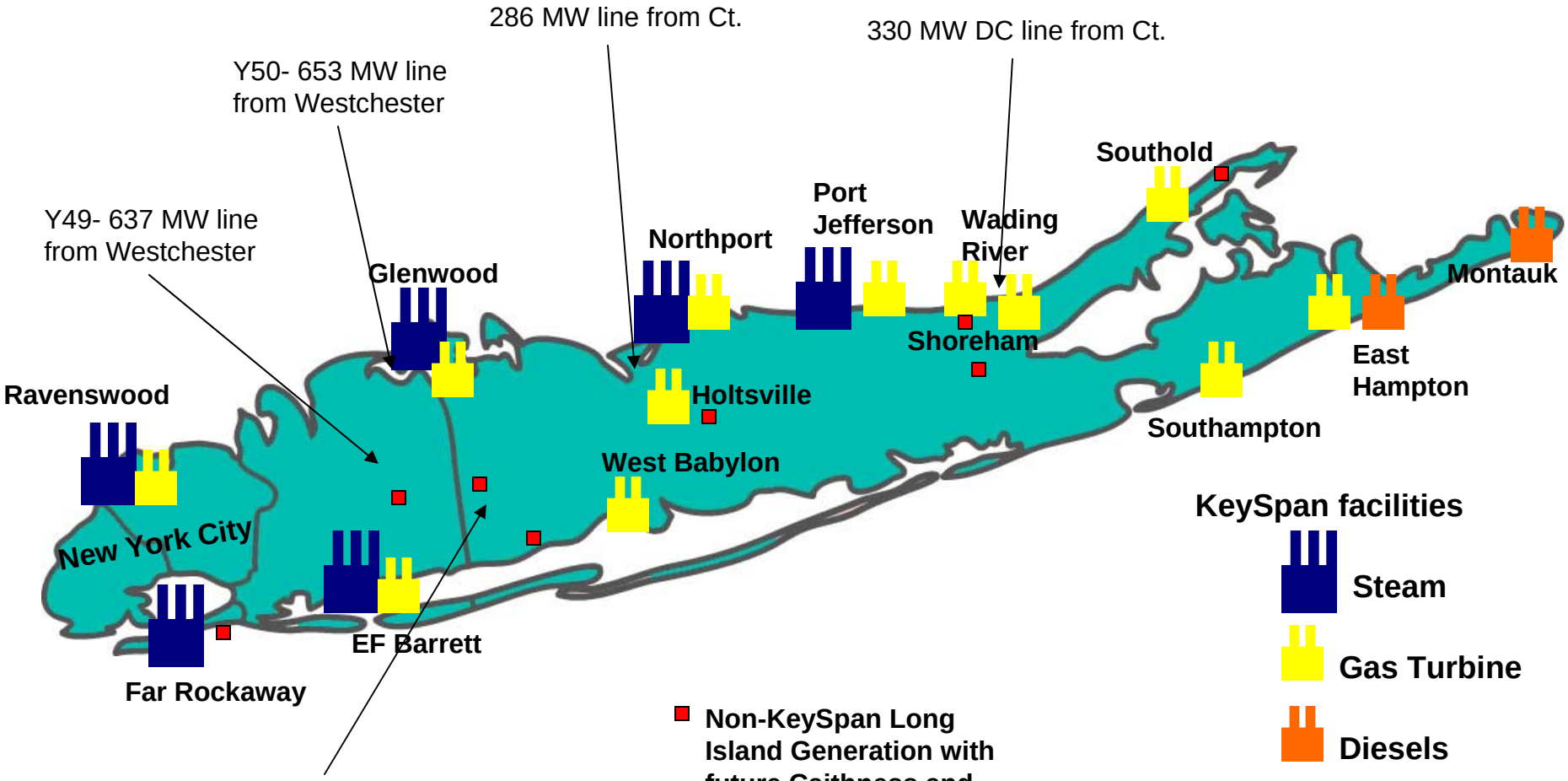
KEYSPAN

Objectives

- Understand the facts about KeySpan power plant emissions and Long Island air quality

- Provide insight on the nature, opportunities, obstacles and economics of modernizing Long Island's energy supply infrastructure

Long Island Generation Facilities and Long Island Transmission Interconnects



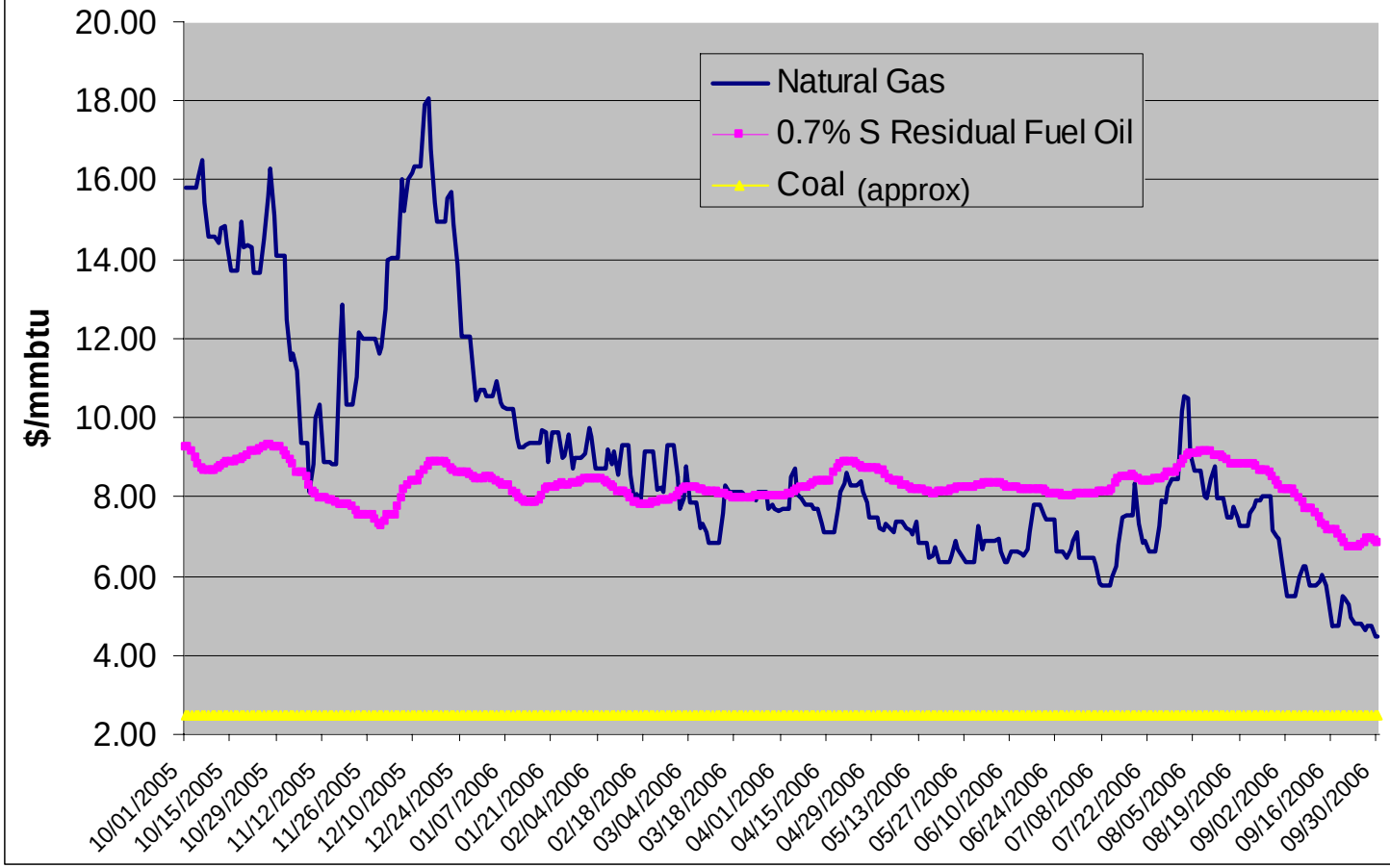
KeySpan Long Island Plants
Characteristics and Relative Emission Trends

- Unlike 50% of U.S. generation, KeySpan plants use NO coal
  - Clean fuels contribute significantly to higher energy prices on L. I.
  - Oil and gas plants emit significantly lower levels of NOx, SO2, CO2 than coal plants and essentially no mercury.

- Northport, Port Jefferson and E.F.Barrett - Dual fuel capable
    - Low sulfur #6 oil or natural gas
    - Dual fuel capability provides critical price stability and electric system reliability advantages
    - Ability to switch to oil in 2005 saved L. I. rate payers > $180 Million when gas prices spiked due to Katrina and other factors
    - LIPA contractual obligation to burn most economic fuel
    - Gas capability positions KeySpan plants well for RGGI compliance

- Far Rockaway and Glenwood – use natural gas only

Natural Gas vs Low Sulfur (0.7%) Residual Fuel Oil (incl Taxes)
10/1/05 - 9/30/06



Dual Fuel Capability is Critical For Stabilizing Electric Energy Prices

- ***NRDC Power Plant Benchmark Report Issued April 2006 compares emissions among 100 largest generating companies in the US***
- ***Benchmark data is based on 2004***
- ***KeySpan's system wide emissions are very favorable compared to US fossil plants even when burning predominantly oil - More typical gas use at KeySpan plants in 2006 indicates even better comparative results***

Benchmarking Air Emissions

OF THE 100 LARGEST ELECTRIC POWER PRODUCERS
IN THE UNITED STATES - 2004

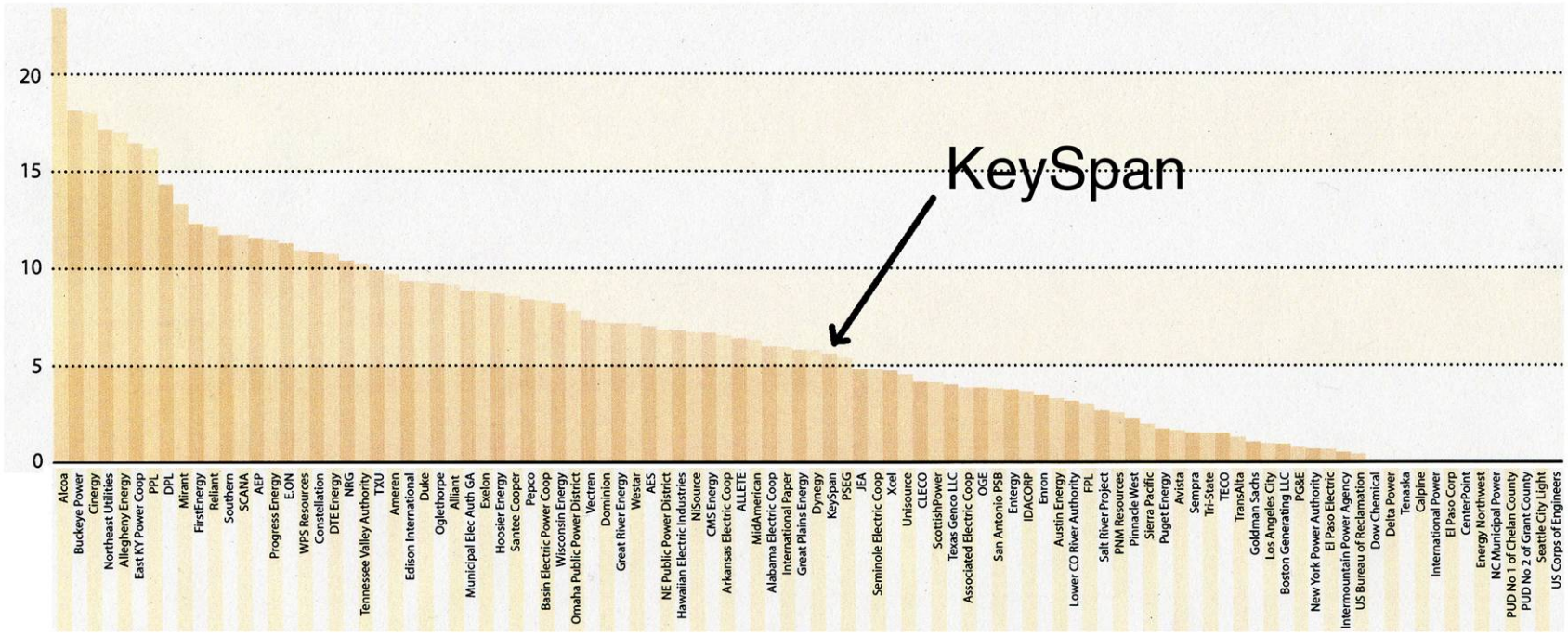
APRIL 2006

Ceres NRDC PSEG

http://www.nrdc.org/air/pollution/benchmarking/default.asp#toc

Emission comparison to our peers SO_2

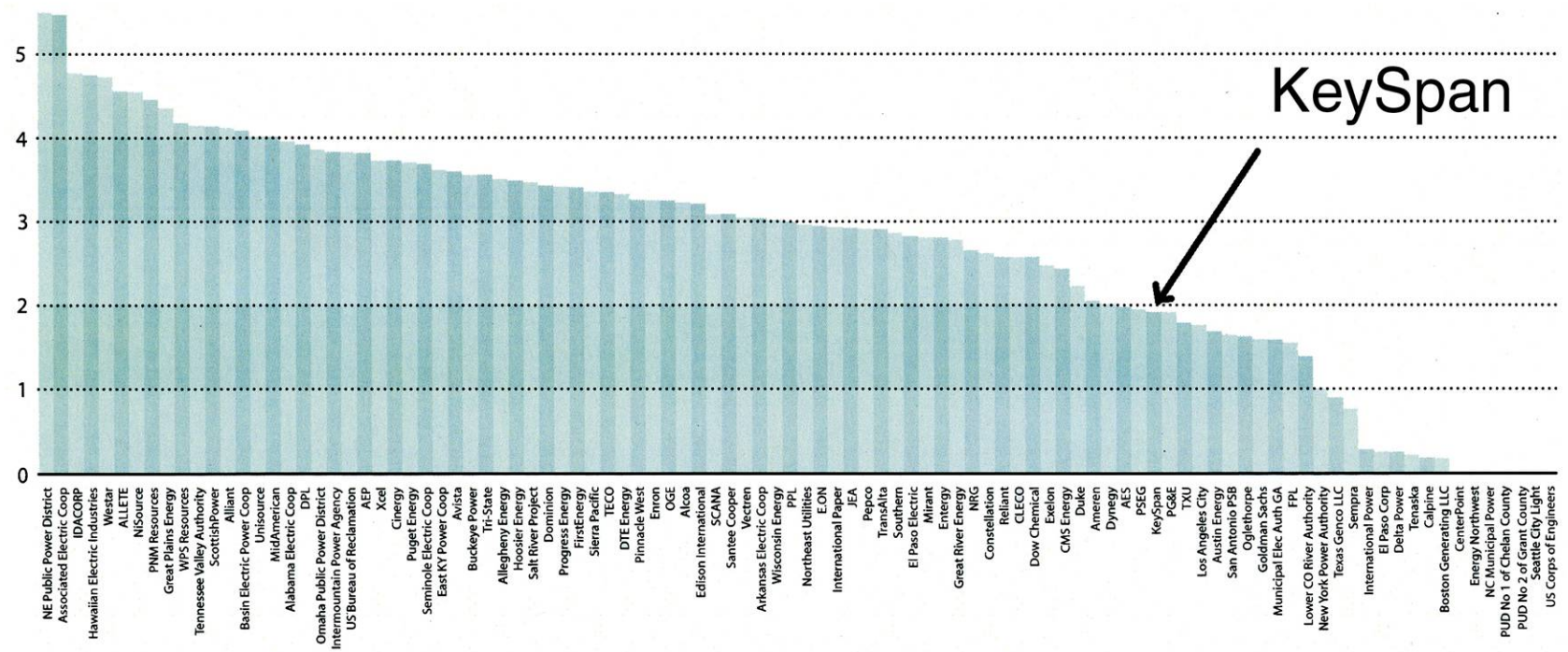
SO_2 – lbs/MWh
Pounds of SO_2 emitted per MWh of electricity produced from fossil fuel generating sources



Source: NRDC Benchmark Report on 100 Largest Generating Companies – April 2006

Emission comparison to our peers - NO_x

NO_x – lbs/MWh
Pounds of NO_x emitted per MWh of electricity produced from fossil fuel generating sources

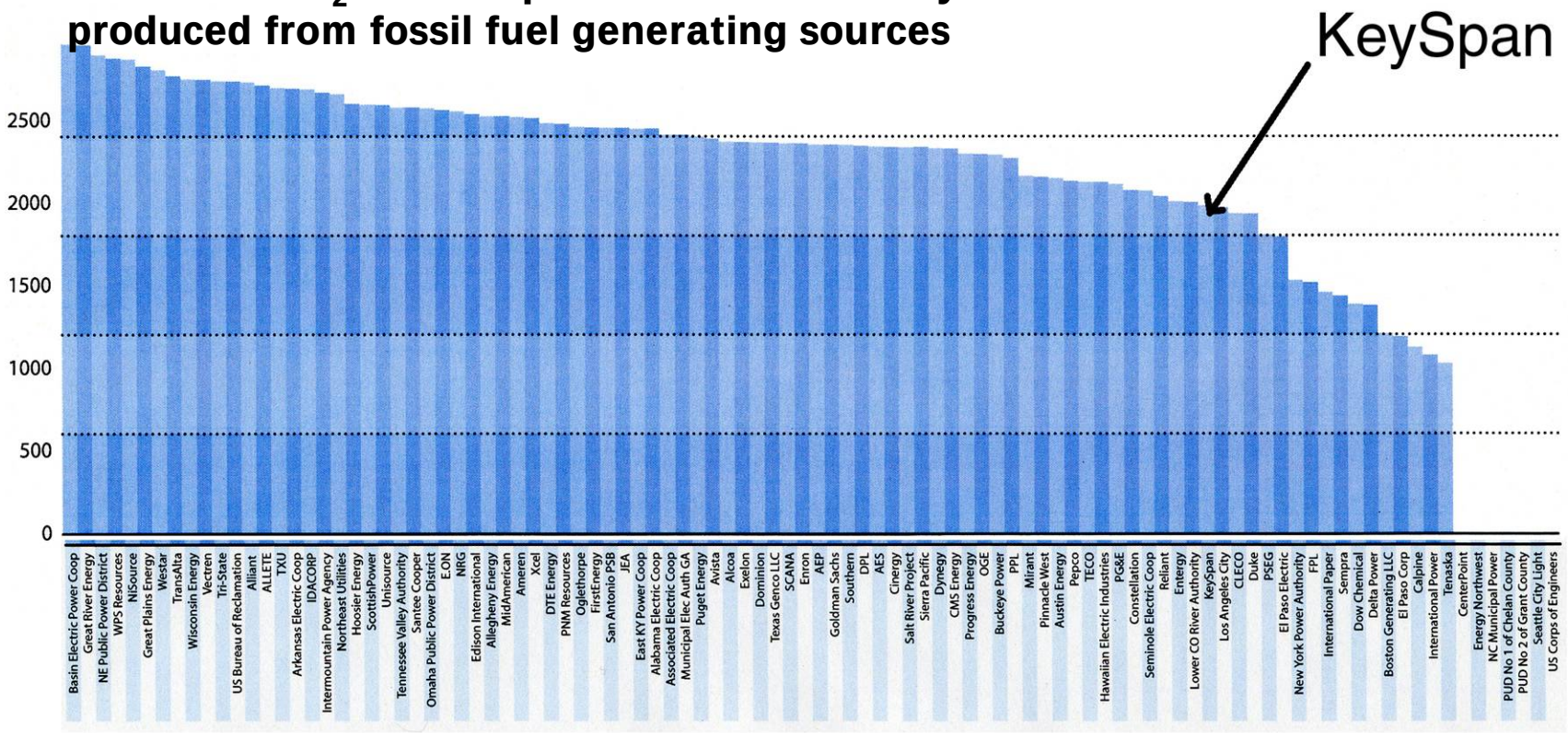


Source: NRDC Benchmark Report on 100 Largest Generating Companies – April 2006

Emission comparison to our peers – CO_2

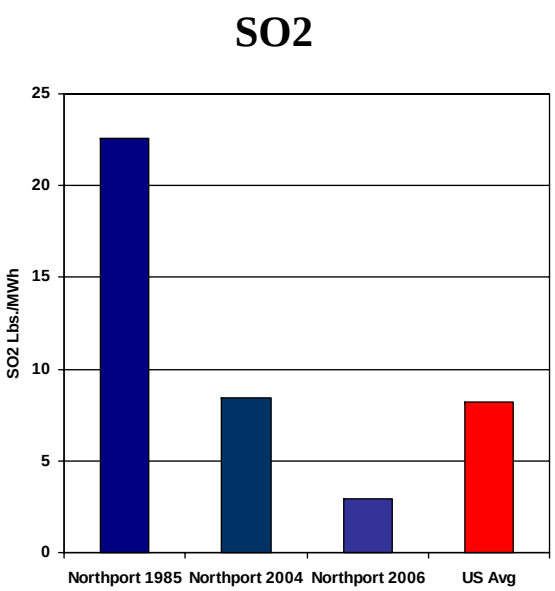
CO_2 – lbs/MWh

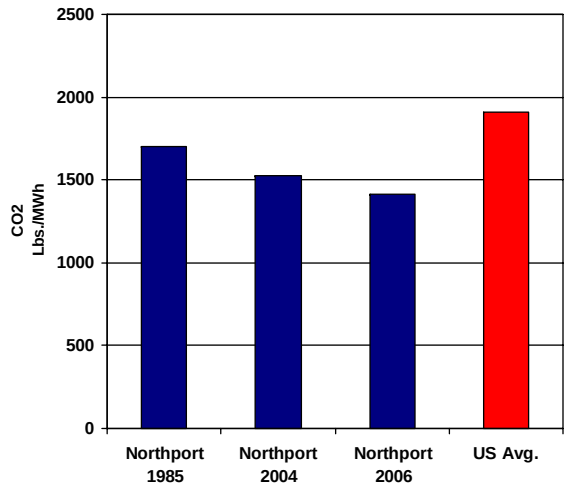
Pounds of CO_2 emitted per MWh of electricity produced from fossil fuel generating sources

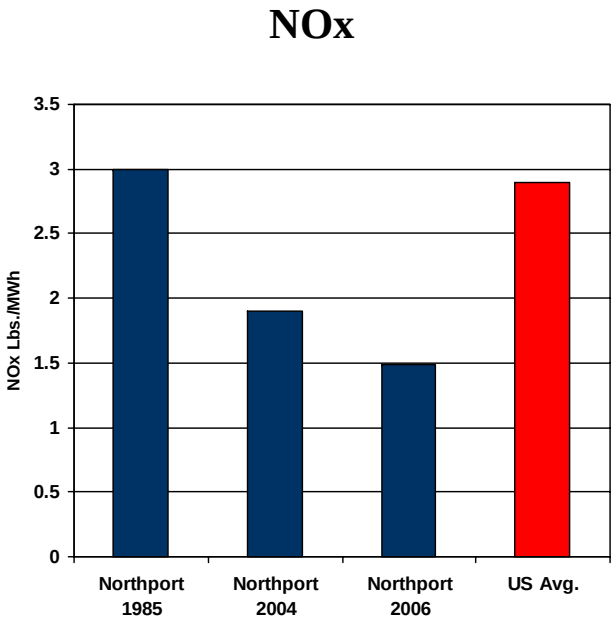


Source: NRDC Benchmark Report on 100 Largest Generating Companies – April 2006

NORTHPORT - *Addition of gas capability and emission control systems at a cost of ~$80 Million since 1993 has resulted in dramatic emission reductions.*







US Avg. fossil fuel generating units per NRDC Benchmark report issued April 2006

Northport Power Station Emission Rankings

	NOx Rate	SO2 Rate	CO2 Rate
Northport 2004	1.9	8.4	1,526
Northport 2005	1.8	5.7	1,453
Northport 2006	1.5	2.9	1,415
US Avg. - NRDC Benchmark report	2.9	8.2	1,911
Northeast Avg.- NRDC Benchmark report	2.1	8.0	1,687
Number of US Plants in NRDC Benchmarking Study with higher emission rate than Northport 2006	634	466	667
Number of Northeast Plants in NRDC Benchmarking Study with higher emission rate than Northport 2006	71	52	78

All rates in pounds per megawatt-hour

Megawatt-Hour Rankings 2004	US	Northeast
Total Plants in Analysis	1099	137
Northport	86	4

Sources:

- 2004 data from NRDC Benchmark Data located at http://www.nrdc.org/air/pollution/benchmarking/
- Data used from NRDC Benchmark report, plants with Fossil Generation of 10,000 megawatt hours/year or more
- 2005 data from USEPA Clean Air Markets http://cfpub.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard
- 2006 data from KeySpan- NP 1-4
- Northeast Plants from CT, DE, MA, ME, MD, NH, NJ, NY, RI, VT

Port Jefferson Power Station Emission Ranking

	NOx Rate	SO2 Rate	CO2 Rate
Port Jefferson 2004	1.8	9.8	1,700
Port Jefferson 2005	1.6	5.6	1,556
Port Jefferson 2006	0.94	2.42	1,278
US Avg.- NRDC Benchmark Report	2.9	8.2	1,911
Northeast Avg.- NRDC Benchmark Report	2.1	8.0	1,687
Number of US Plants in NRDC Benchmarking Study with higher emission rate than Port Jefferson 2006	704	485	746
Number of Northeast Plants in NRDC Benchmarking Study with higher emission rate than Port Jefferson 2006	82	53	88

All rates in pounds per megawatt-hour

Megawatt-Hour Rankings 2004	US	Northeast
Total Plants in Analysis	1099	137
Port Jefferson	388	32

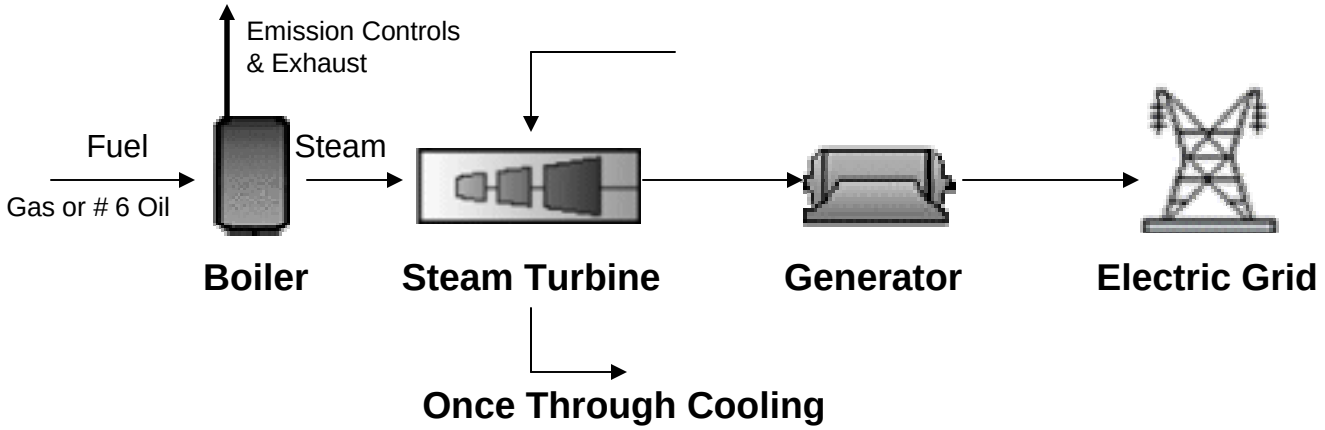
Sources:

- 2004 data from NRDC Benchmark Data located at http://www.nrdc.org/air/pollution/benchmarking/
- Data used from NRDC Benchmark report, plants with Fossil Generation of 10,000 megawatt hours/year or more
- 2005 data from USEPA Clean Air Markets http://cfpub.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard
- 2006 data from KeySpan- PJ 3&4 plus LM600s
- Northeast Plants from CT, DE, MA, ME, MD, NH, NJ, NY, RI, VT

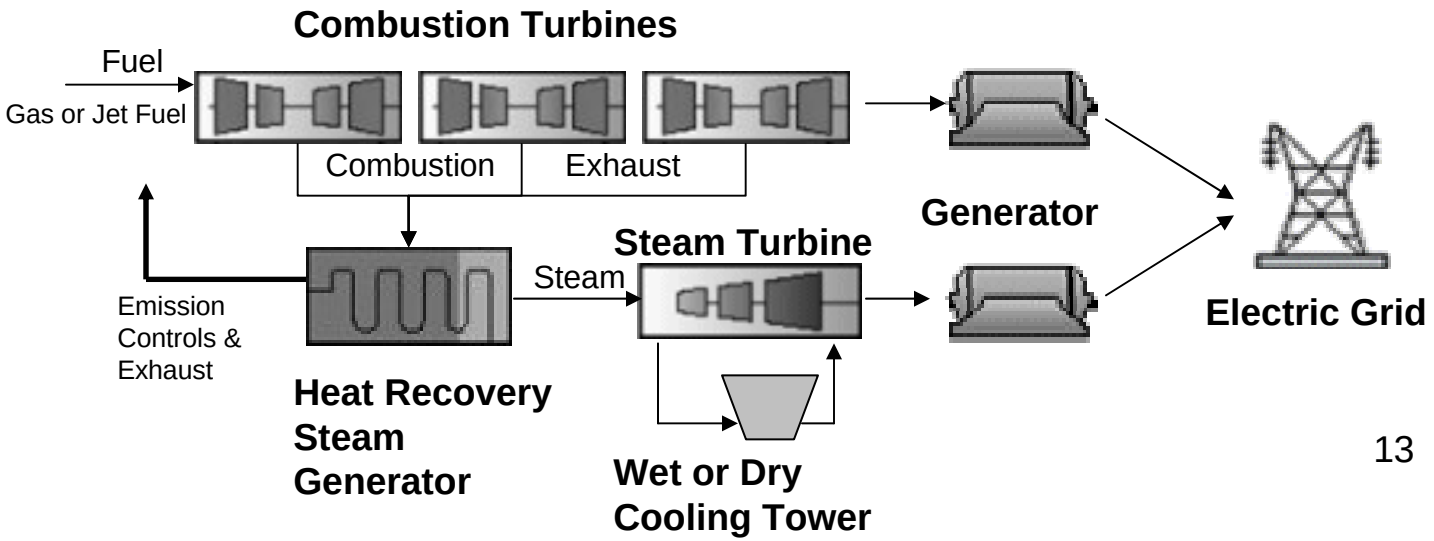
Repowering Primer

- Repowering refers to the modernization or retirement of conventional generating technology resource and it's replacement or upgrade to a more efficient combined cycle generating resource.

Conventional Steam Electric Power Plant



Combined Cycle Power Plant



Repowering Options

- **Hybrid repowering-**
  - Replaces existing dual fueled boiler with one or more gas fueled combustion turbines creating old/new hybrid combined cycle facility
    - Increased capacity, improved efficiency, reduced emissions
    - Eliminates dual fuel capability
    - Highly complex engineering, costly, re-use of aging components – reduced reliability
    - Not economic without continued once through cooling system- unlicensable
    - Real estate footprint and interconnect infrastructure constraints
- **Backyard repowering-**
  - Retire or curtail existing unit(s) – build new state of the art combined cycle gas fired unit at the existing site
    - Increased capacity, improved efficiency, reduced emissions
    - Reduced dual fuel capability depending on existing unit status – retired/retained
    - Stand alone design can be less costly than hybrid
    - Real estate footprint and interconnect infrastructure constraints
- **Fleet, System or "Virtual" repowering-**
  - Modernize system wide generation resources by adding new efficient generating capacity to displace the utilization of older, less efficient resources
    - Increased capacity, improved efficiency, reduced emissions
    - Reduced dual fuel capability depending on existing unit status – retired/retained
    - Interconnect costs minimized by siting near fuel supply, electric infrastructure and load

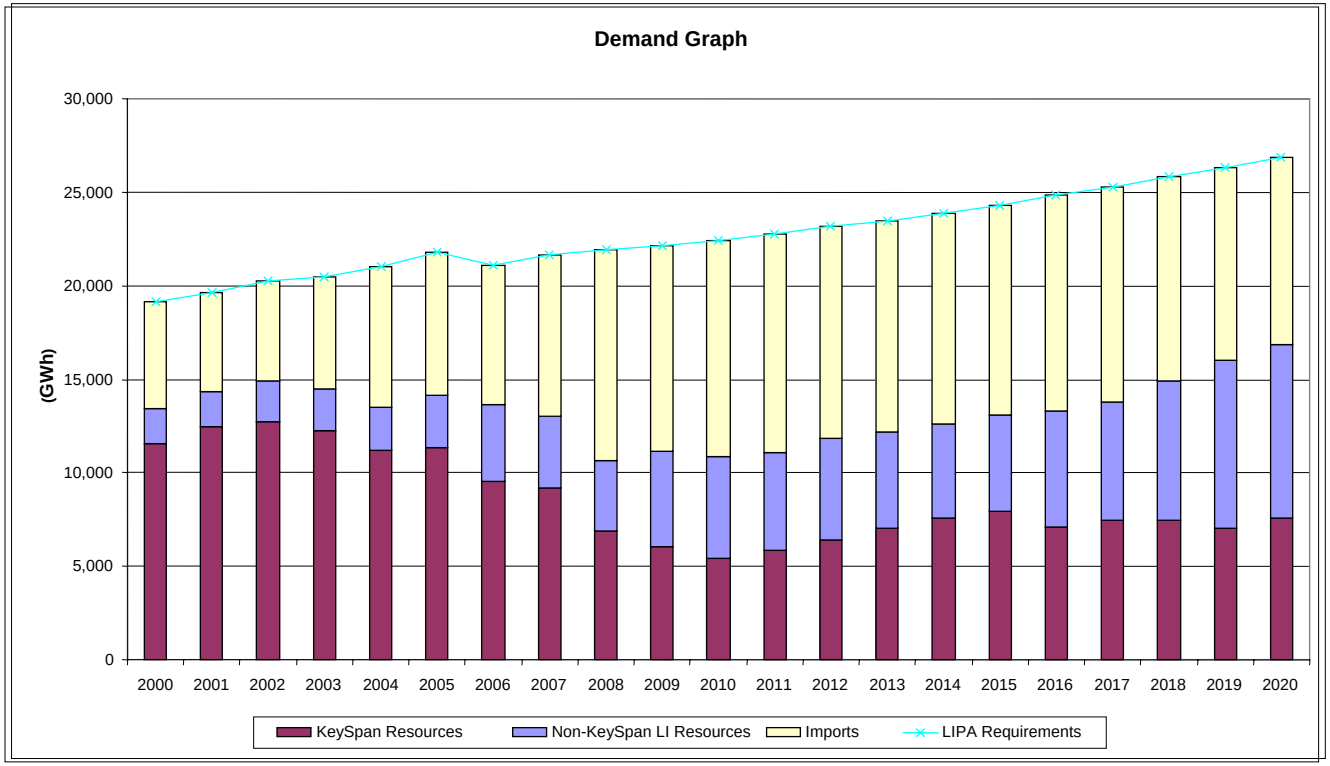
System Repowering - Already Under Way

- The introduction of significant increased capacity and import capability on Long Island will continue to curtail the operation of older less efficient generators and reduce L.I. emissions:

  - Caithness 320 MW combined cycle – 2009

  - Long Island Wind Farm 140 MW - 2009-10

  - 660 MW Neptune transmission line – 2007



Historic and Projected Long Island Energy Supply Mix

Opportunities for improving system efficiency, reducing KeySpan emissions, preserving fuel diversity and economically meeting growing demand

Burn Cleaner Fuels in Lieu of Oil

- Gas emits ~30% less CO2, 99% less SO2 and 40% less NOx than fuel oil
  - Take steps to assure more economic and reliable natural gas availability for use at existing dual fuel power plants
    - Build Islander East Pipeline
  - Add remaining gas firing capability to Northport 3
    - Unit 3 currently only capable of 50% gas
    - Upgrade budgeted for 2007 ~$1 Million
- Burn **biofuel** as quantities become available and cost competitive with existing fuels
  - Carbon neutral fuel reduces CO2; little or no sulfur
  - Demonstration in KeySpan peaking units to begin in 2007

Repower higher feasibility sites when added capacity is required

- Higher feasibility sites under assessment:
  - E.F. Barrett Power station for possible backyard repowering
    - Retire one or both 185MW Units - replace with 500 MW combined cycle
  - Far Rockaway Power station for possible backyard repowering
    - Retire 100MW unit replace with 250 MW combined cycle
  - Wading River generating facility for possible hybrid repowering
    - Hybrid repowering of 240 MW unit to 400 MW
    - Requires Islander East Pipeline for natural gas supply
- Repowering of high feasibility sites will further improve system-wide efficiencies resulting in reduced operation of other lower efficiency, higher emitting plants
  - With Neptune, Caithness and L I. Wind Farm, added capacity not needed for several years

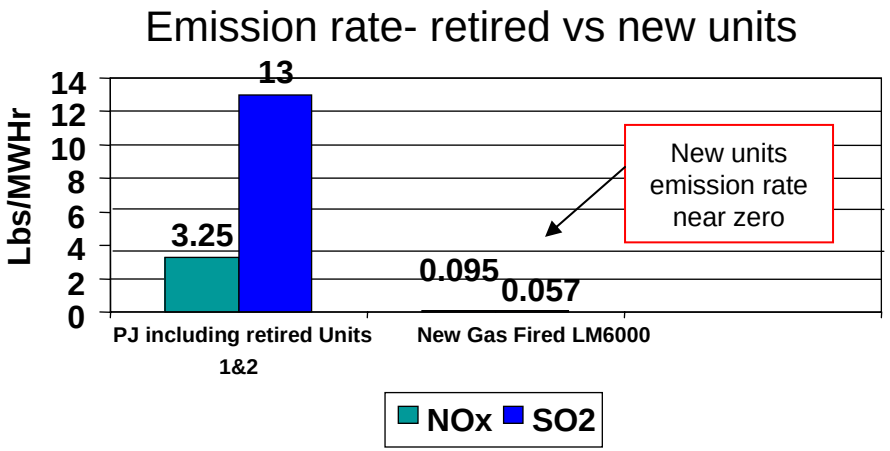
Case Study - Northport

- **Hybrid repowering of <u>one</u> Northport unit**
  - Requires four new combustion turbines to feed existing 385 MW steam turbine
  - Increases 1500 MW station capacity by 600+ MWs
  - Substantial reduction in NOx, and CO2 emission rate but higher utilization could increase total annual emissions at the site
  - Eliminates dual fuel (#6 oil) capability
  - Costly transmission upgrade required to accommodate injection of 600+ MWs into LIPA grid
  - Use of once through cooling not licensable – cooling tower required
  - Estimated cost $1.3 Billion (~ $2200/KW) - rate increase required

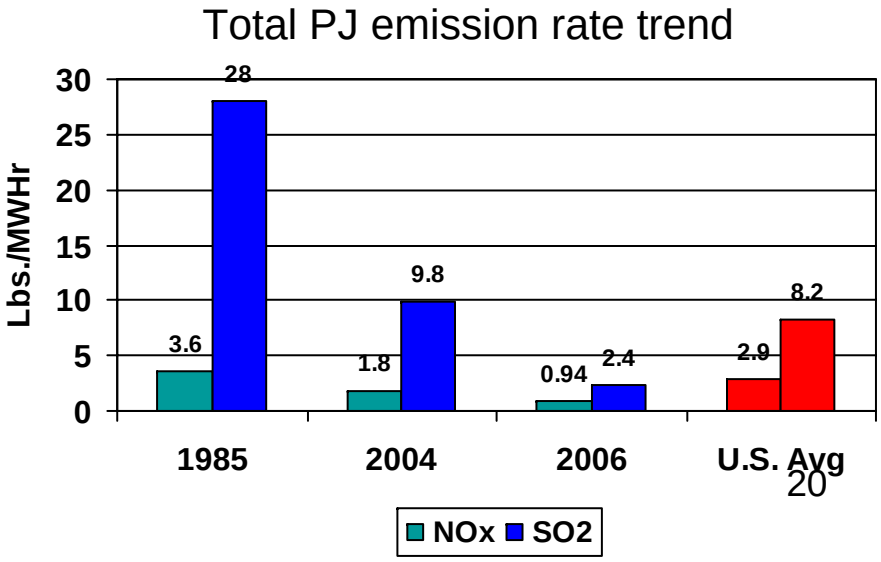
- **Backyard repowering (500MW) - more economic ~$800 Million ($1600/KW)**
  - transmission upgrade still required
  - Possible candidate for repowering when next increment of capacity is needed
  - Requires Long term power purchase agreement with LIPA
  - Other sites have higher economic feasibility

PORT JEFFERSON - *No further physical space for repowering. Already added gas firing to reduce emissions and completed the equivalent of a backyard repowering project*

- Retired (2) 45MW 1940s vintage oil fired units in 1995.
- Capacity was replaced in 2002 with (2) 47MW state of the art (LM6000) gas fired units ($105 million) demonstrating the impact of repowering.
- Natural gas reduces CO2 by ~30%



- Also added gas firing capability to existing PJ 3&4 ($23 million). Combined projects achieved significant reductions station-wide.



System Repowering
Glenwood – Spagnoli Rd.
200 MW to 250 MW

Approach	System (Virtual) Repowering – Build fully licensed Spagnoli Rd. Combined Cycle plant and retire or curtail operation of Glenwood 4 & 5 – KeySpan's oldest and least efficient steam units
Costs	Approx $400+ million. Negligible rate impact
Benefits	Reduces: fuel consumption by 40%, NO_X by 94%, SO_2 and CO_2 by 40%. Minimal electric and gas infrastructure needed for tie-in to grid
Issues	Too limited space and costly demolition for hybrid or backyard repowering of Glenwood. System repowering with Spagnoli is best fit – fully licensed. Requires long term power purchase agreement with LIPA

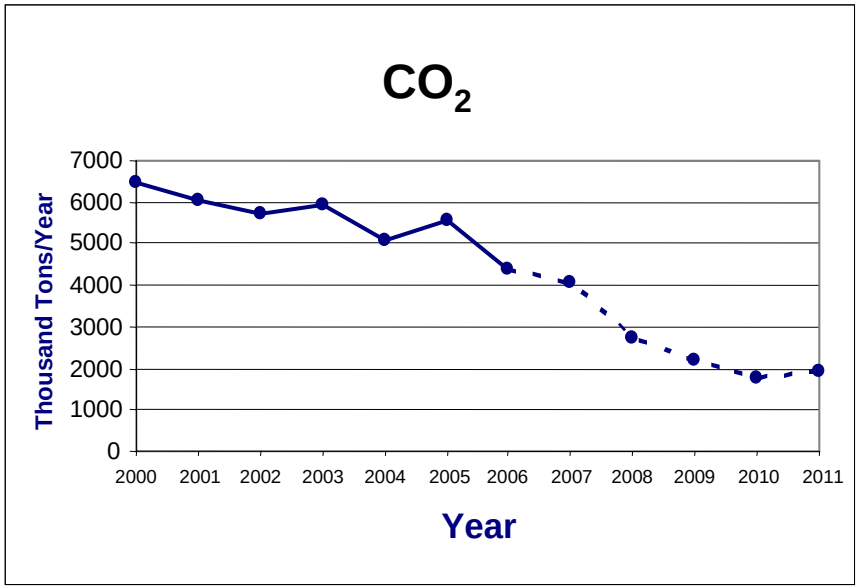
Modernize Existing Generating Facilities

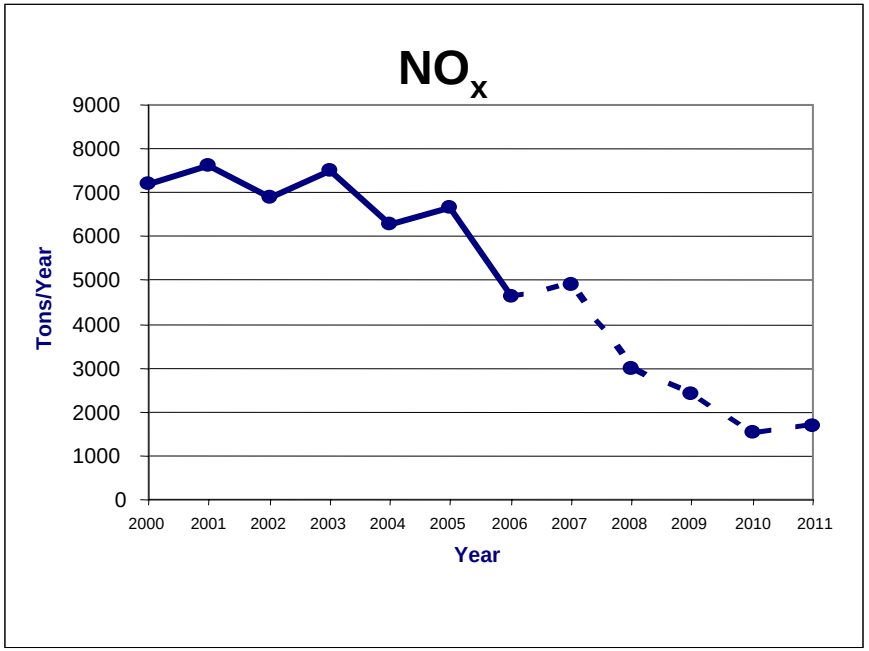
- Northport - Install new steam turbine technology
  (General Electric Dense Pack or equivalent)
  - Cost ~ $40 to 45 million
  - Improved efficiency
  - Cut CO2 emissions by about 65,000 tons/year (4 units)
  - CO2 reductions help support RGGI objectives
  - Cut fuel use by equivalent 7million gallons of oil/year (4 units)

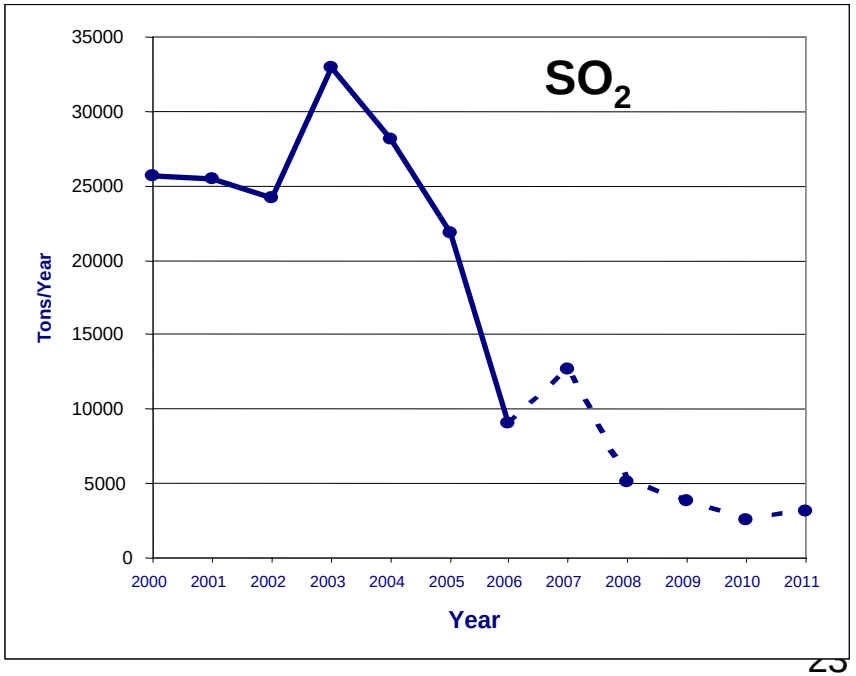
- Northport and Port Jefferson – install advanced NOx control systems
  - Cost ~ $10 million per unit (~$55 - $60 for all of NP and PJ)
  - Reduce NOx emission rate by an additional ~20%

Northport Power Station

Historic and projected annual emissions after new Long Island capacity additions and plant modernization investments

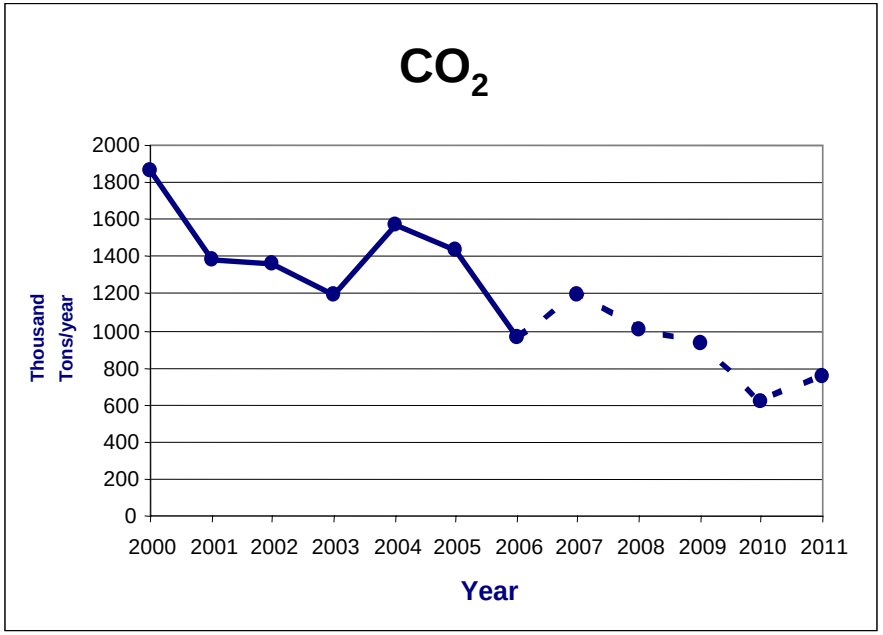


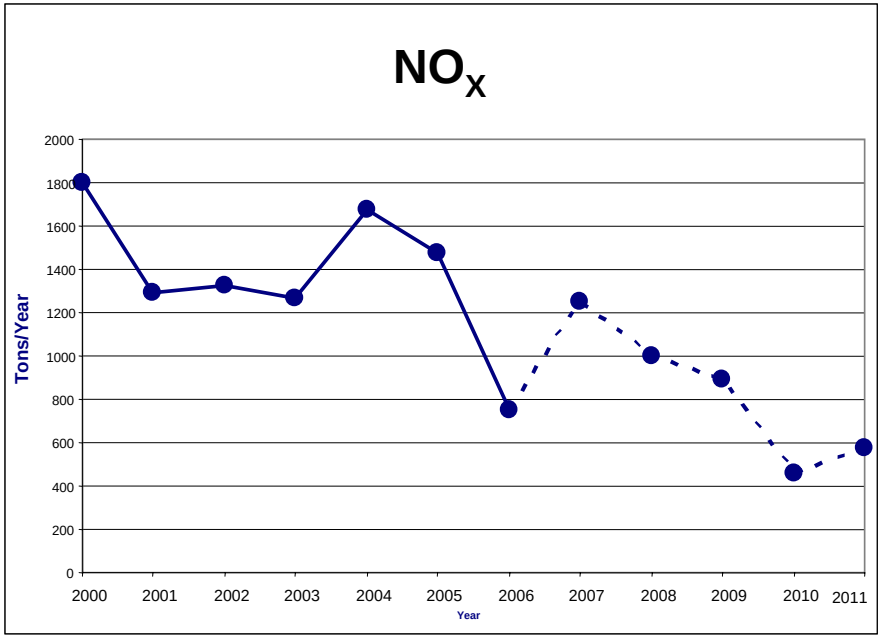


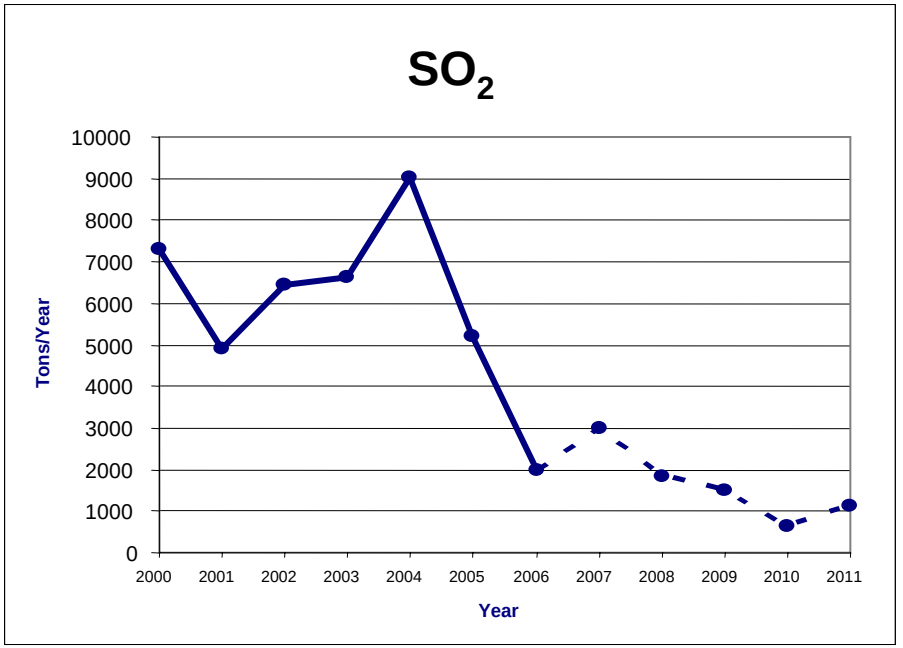


Port Jefferson Power Station

Historic and projected annual emissions after new Long Island capacity additions and plant modernization investments.







It's About Air Quality

- Air quality conditions are regional by nature
  - Long Island air quality meets all state and federal air quality health standards with the occasional exception of ground level ozone (0-5 days per year). NOx + VOC's + Sun = Ozone
  - Fine particulates (PM2.5) air quality is at borderline of federal/state standard
- Government air quality modeling shows that ozone and PM2.5 problems are driven mostly by:
  - motor vehicle emissions (***Electric generation accounts for less than 20% of total Long Island NOx emissions)***
  - transport of industrial pollutants from upwind states
- ***Models conclude that even when all local generating sources are "zeroed out" NY-Metro air quality is not measurably improved***
- New Federal and State power plant emission reduction regulations are aggressively addressing these two air quality problems on a regional basis (CAIR – Clean Air Interstate Rule)
  - Wide scale regional industrial and motor vehicle emission reductions are required in order to achieve full attainment with all health based ambient air quality standards in the Northeast (including Long Island).

Conclusions

- **KeySpan plant emissions have decreased significantly and compare very favorably to both US and Northeast plants.**
- **Maintenance of fuel diversity is critical for hedging against oil and gas fuel price spikes and for assuring system reliability.**
- **KeySpan plant emissions will decrease further through efficient L. I. system-wide capacity and transmission additions, greater gas utilization, and modernization of Northport and Port Jefferson.**
- **Backyard and system repowering economics and feasibility differs from site to site depending on physical space, electric and transmission access and the need for added capacity**
- **The electric rate implications of investments in repowering and/or power plant emission controls must be measured against their effectiveness in achieving actual air quality improvements and economically meeting electric system capacity and reliability needs.**