



ISA – Hamilton Chapter – OPG Overview
October 2007

Agenda

- ⦿ OPG Profile
- ⦿ Nanticoke GS Overview
- ⦿ Role of Fossil Fleet
- ⦿ Nanticoke Operations
- ⦿ Emissions
- ⦿ Summary
- ⦿ Tour

1999 Ontario Hydro Demerger



April 1, 1999 – split into five entities

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GENERATION

GENERATION

hydro **One**
Connecting at the speed of life™

DISTRIBUTION

Ontario Electricity
Financial Corporation



Independent
Electricity
Market Operator



Power to Ontario. On Demand.



Electrical
Safety
Authority

For Your Safety

DEBT AND SERVICE ENTITIES

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OPG Profile



Beck 2 GS



Lambton GS

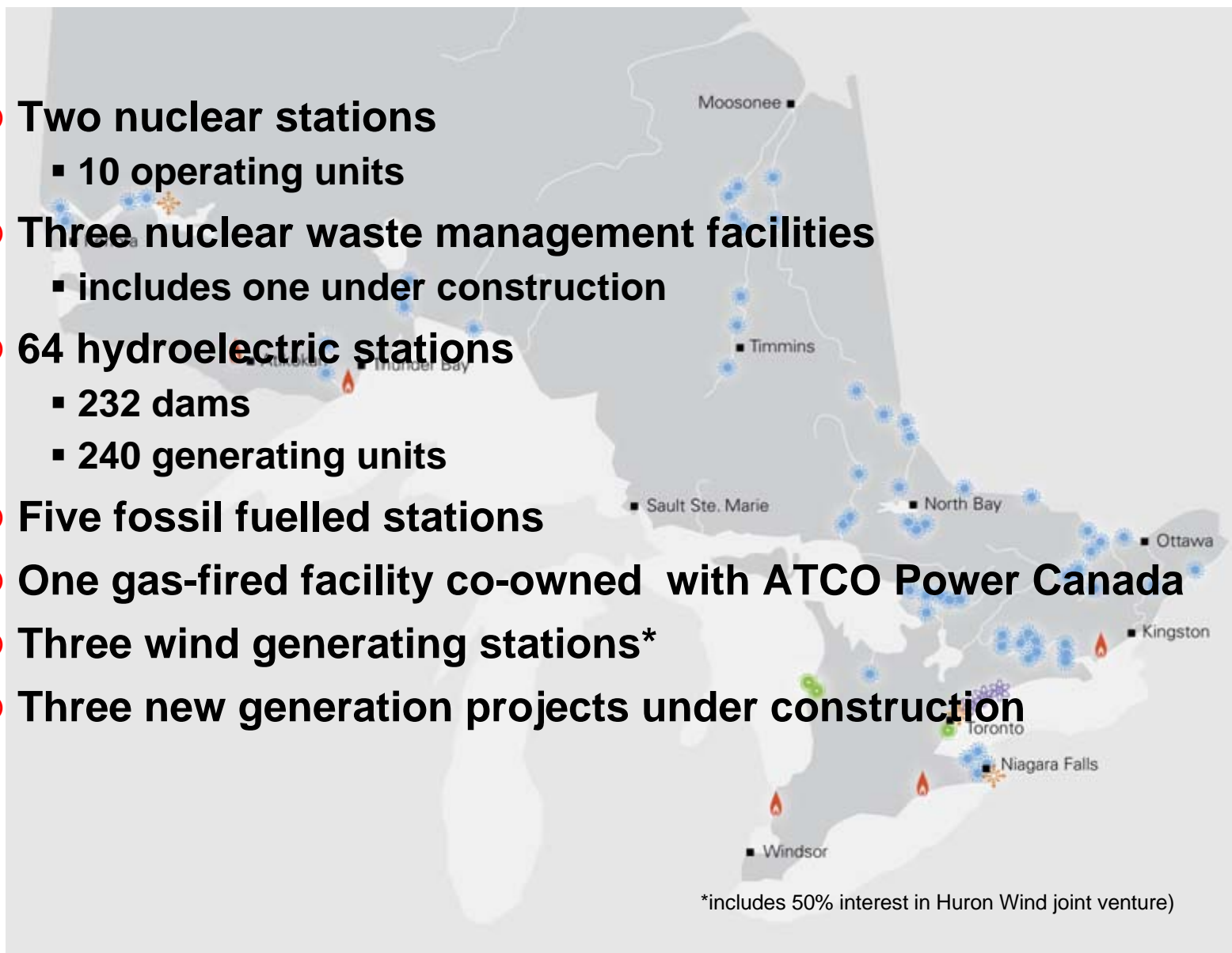


Pickering B GS

- ⦿ Generated 105.2 TWh in 2006 – Fossil generated 25.7 TWh
- ⦿ Produces approx. 70% of Ontario's electricity
- ⦿ Employs approx. 11,500 employees – 1,400 Fossil employees
- ⦿ Capacity: 22,147 MW (at end of 2006) – Fossil capacity: 8,578 MW

OPG Facilities

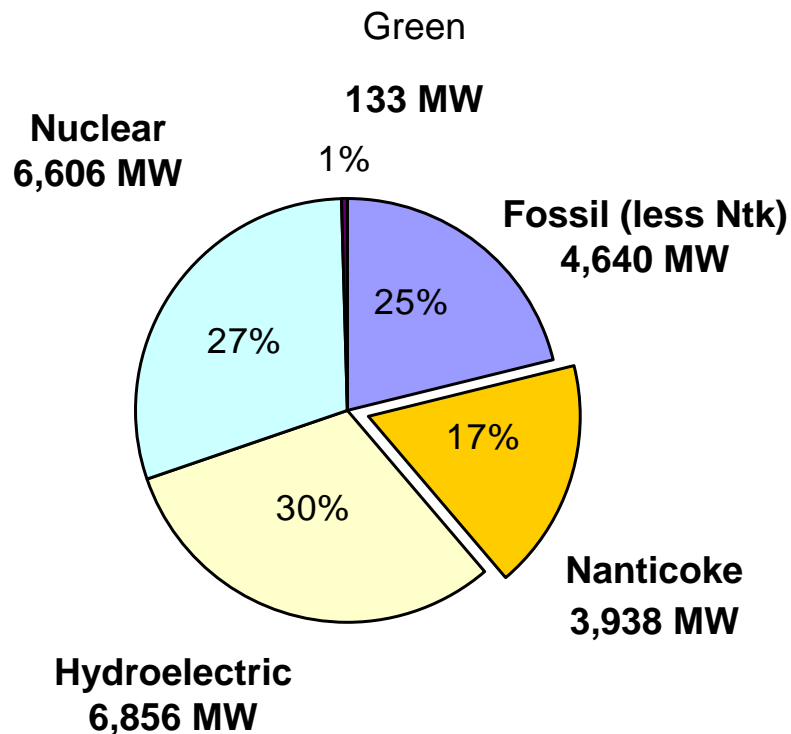
- ⊙ **Two nuclear stations**
 - 10 operating units
- ⊙ **Three nuclear waste management facilities**
 - includes one under construction
- ⊙ **64 hydroelectric stations**
 - 232 dams
 - 240 generating units
- ⊙ **Five fossil fuelled stations**
- ⊙ **One gas-fired facility co-owned with ATCO Power Canada**
- ⊙ **Three wind generating stations***
- ⊙ **Three new generation projects under construction**



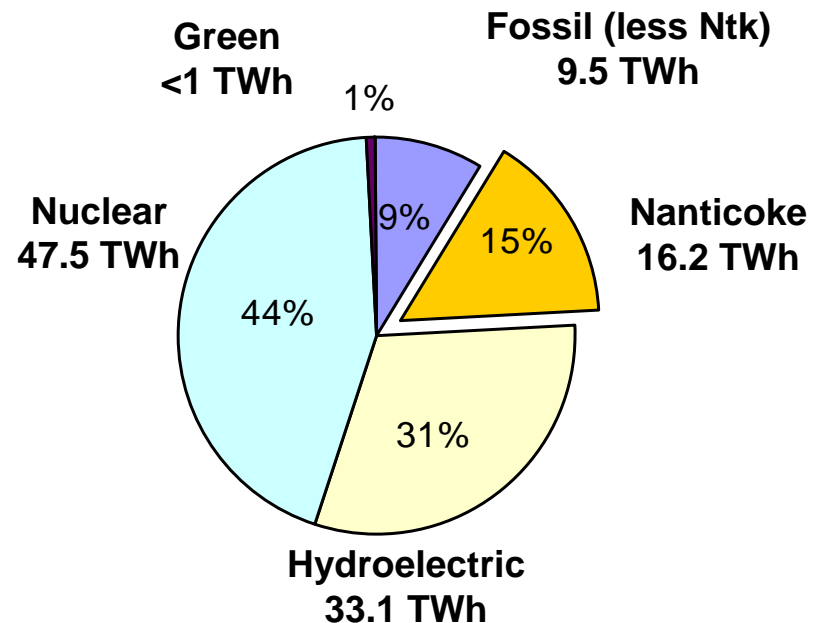
*includes 50% interest in Huron Wind joint venture)

OPG's Capacity and Energy Production

2006 OPG Capacity 22,173 MW



2006 OPG Energy Production 106.4 TWh



Nanticoke - History

- Construction started September 12, 1968
- Planned as a 4 unit 2,000 MW plant
- Doubled to 8 unit 4,000 MW plant in 1971
- First Power January 1972
- Unit 8 in-service 1978
- Construction cost \$840 million

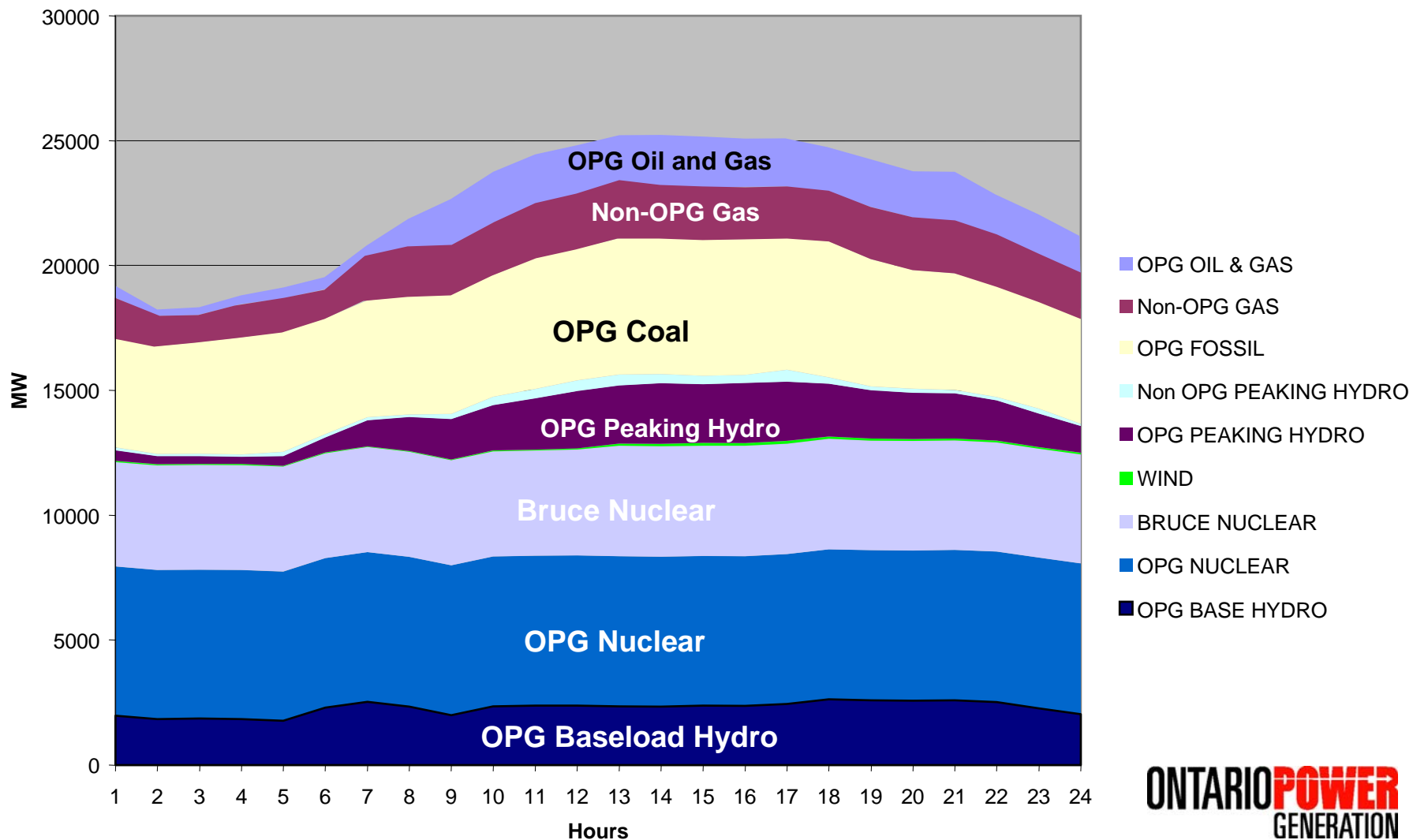


Nanticoke – Contribution to Supply



- ⊙ **Capacity - Ontario's largest capacity plant**
- ⊙ **Energy - Ontario's third largest producer of electricity**
- ⊙ **Flexibility –large range in annual production**
- ⊙ **Transmission support**

Ontario Generation Supply – Summer Day



OPG's Fossil Fleet

Lambton



Nanticoke



Atikokan



Thunder Bay



Lennox



Lakeview –
shut down April 2005,
demolition complete 2007



Brighton Beach (partnership with ATCO Power)

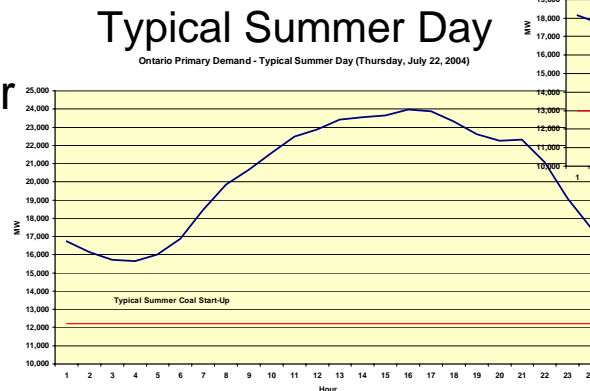
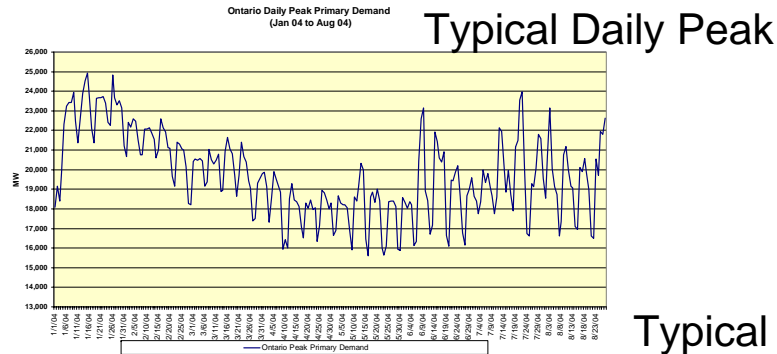


Portlands Energy Centre
(partnership with
TransCanada Energy)

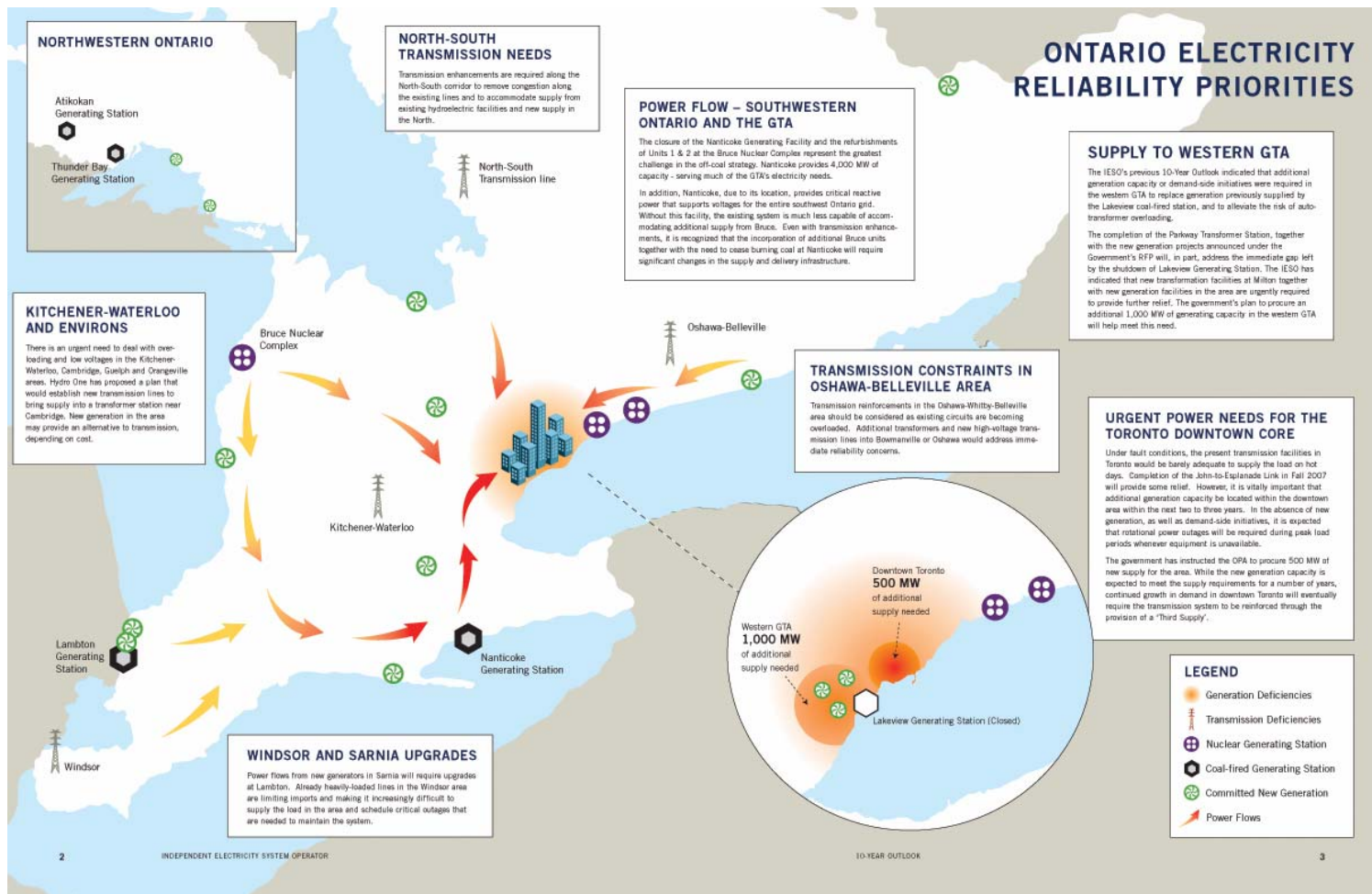
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The Role of Fossil

- Meets changing energy needs
 - Fossil stations have recently accounted for over 30% of OPG's production during the extended high heat periods
- Peak periods (day, week or season) when demand is high
 - Daily demand declines after 8:00 pm
 - Winter: mid-morning and around 6:00pm
 - Summer: 8:00 am to peaks in afternoon



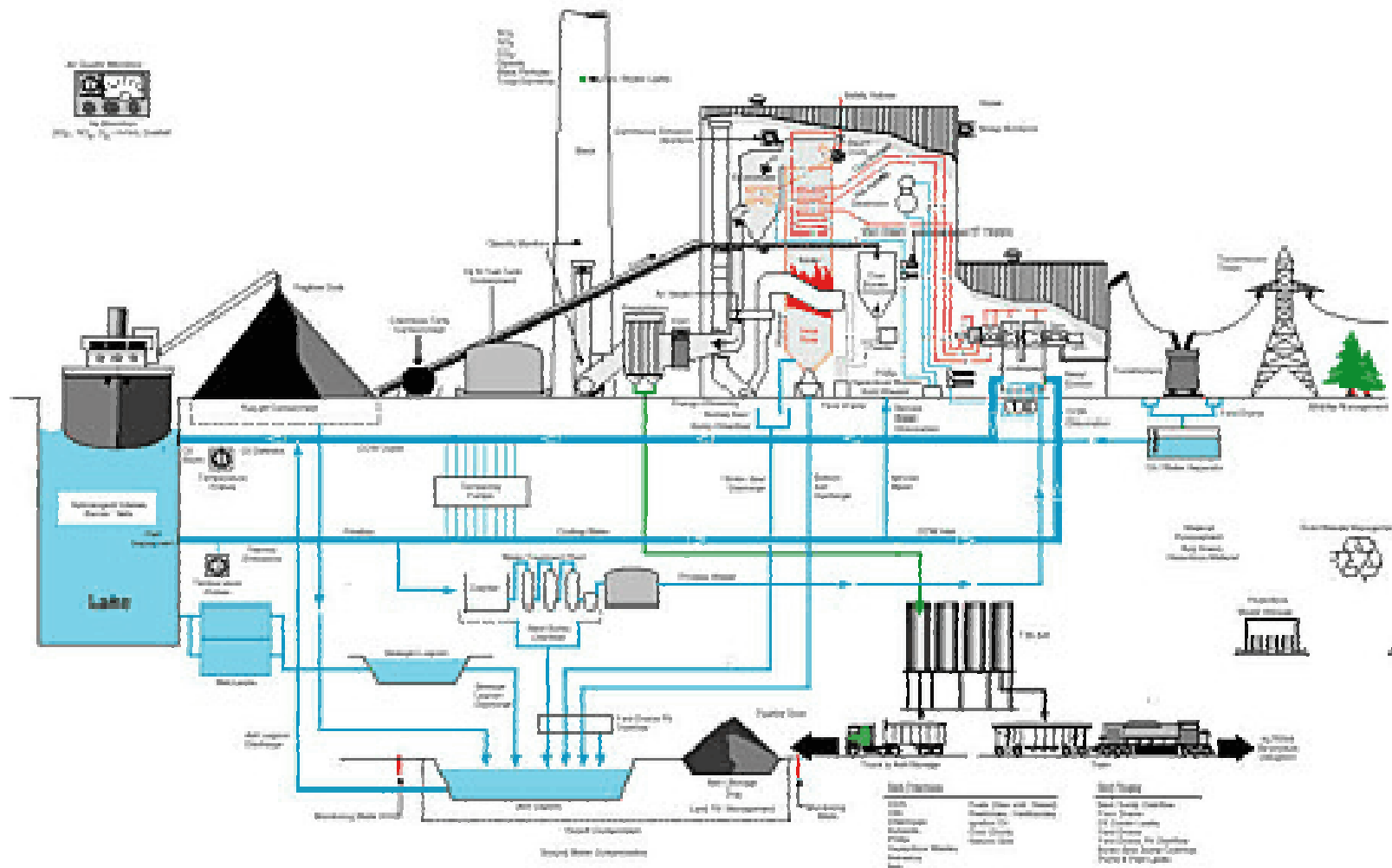
Nanticoke's Support for the Tx System



Nanticoke Generating Station

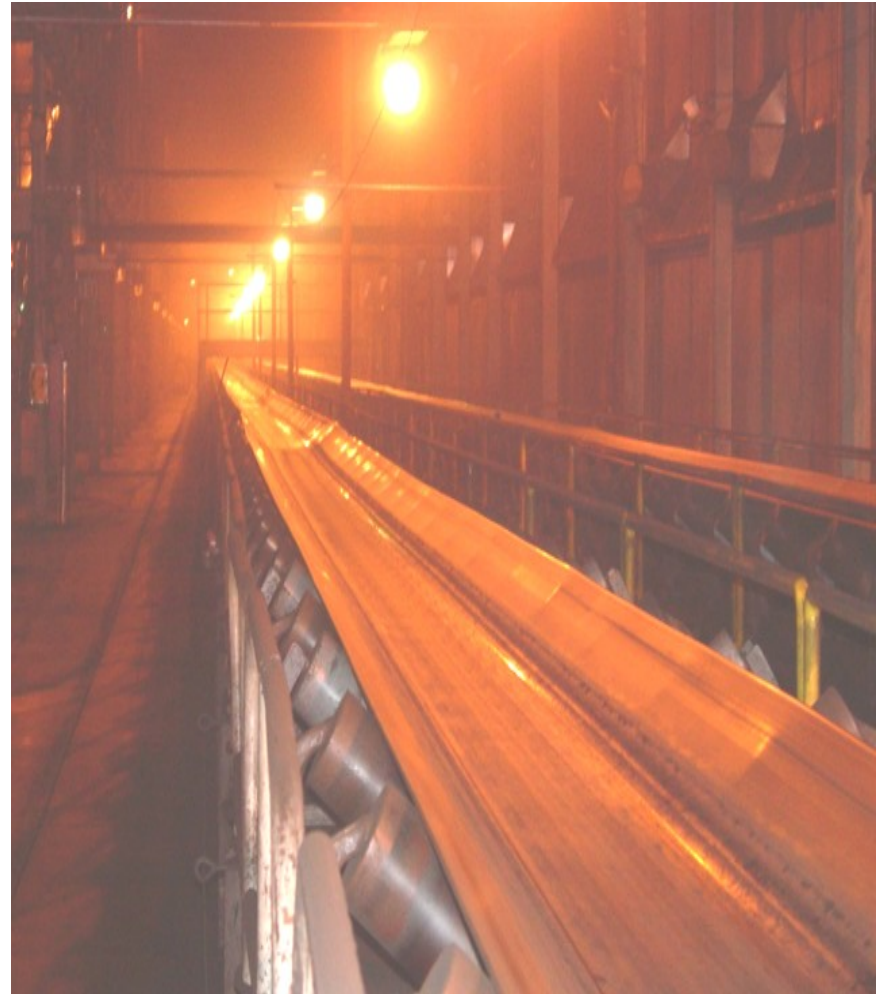


Fossil Plant Processes



Powerhouse Conveyors

- Conveyors transfer coal ½ mile in length, from unit 1 to unit 8.
- Each conveyor is capable of conveying 1000 ton of coal per hour.
- Nanticoke has a total of 111 conveyors (9.1 miles)
- Conveyors range in size from 150 feet - 3000 feet.
- Guarding on our conveyors meet industry standards.



Stacker Reclaimers

- ① 2 stacker reclaimers are capable of stacking out 3000 tons of coal an hour and reclaim max of 2000 tons per hour.
- ① Tractor scrapers are utilized to haul to and reclaim coal from our long term stock piles for winter usage.
- ① Our heavy equipment fleet consists of tractor scrapers capable of hauling 40-50 tons of coal.



Fly Ash Processing

- Fly ash is stored in four ash silos each with a storage capacity of 4000 tons of ash each.
- 70% of ash is diverted offsite to cement processing companies
- Transferred through rail car (85 tons each) or tractor tankers (40 tons).
- Onsite storage through mixing of dry ash with water to eliminate dust during transportation of the ash to our long term storage area located on site.

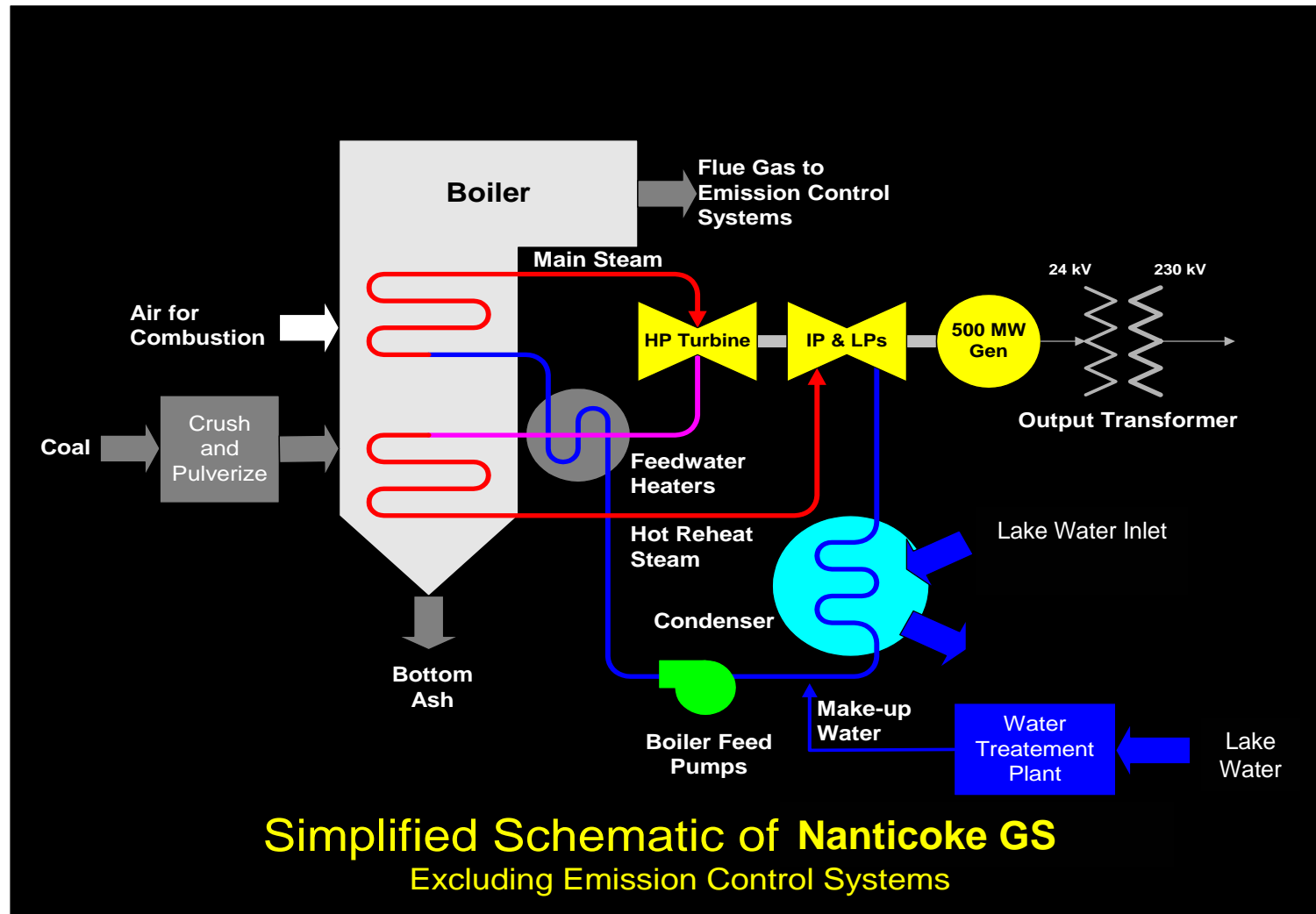


Bottom Ash

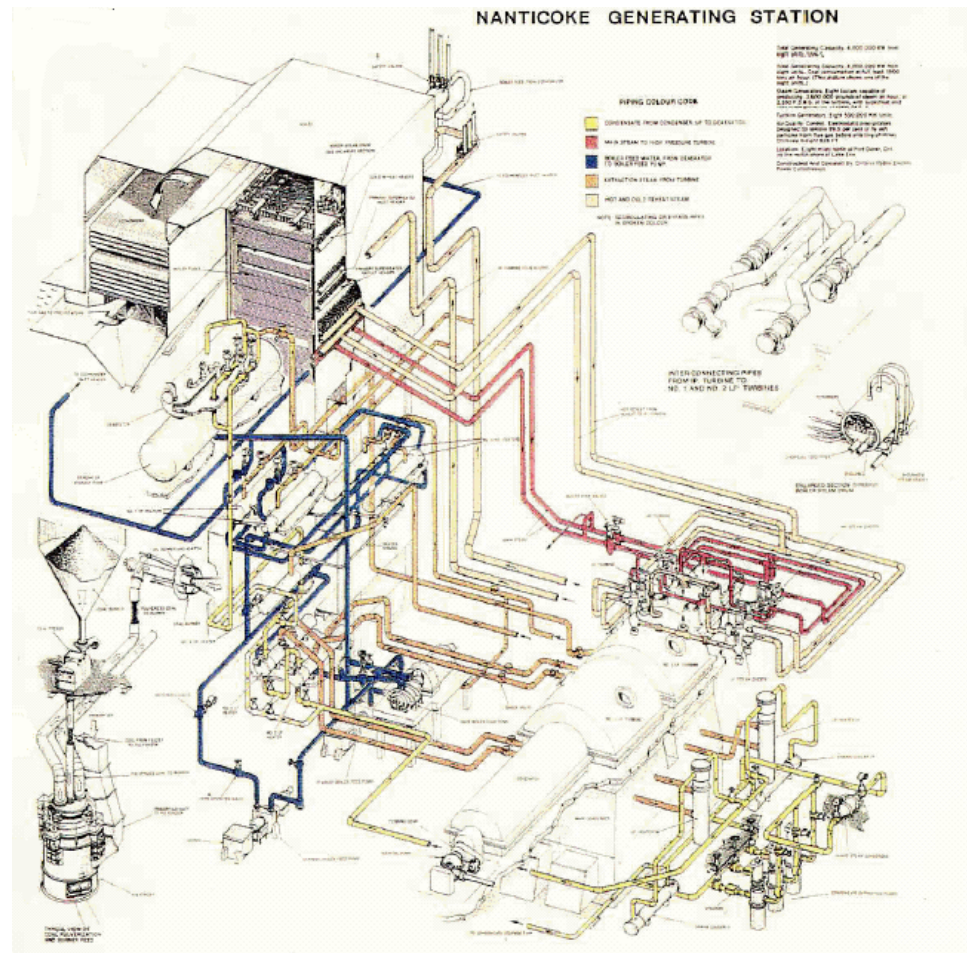
- ⦿ The station bottom ash sluice is directed into a holding cell. Once settled an excavator used to remove the ash and store in a temporary pile
- ⦿ Bottom ash is transported to the dock using 40 ton dump trucks and loaded into vessels.



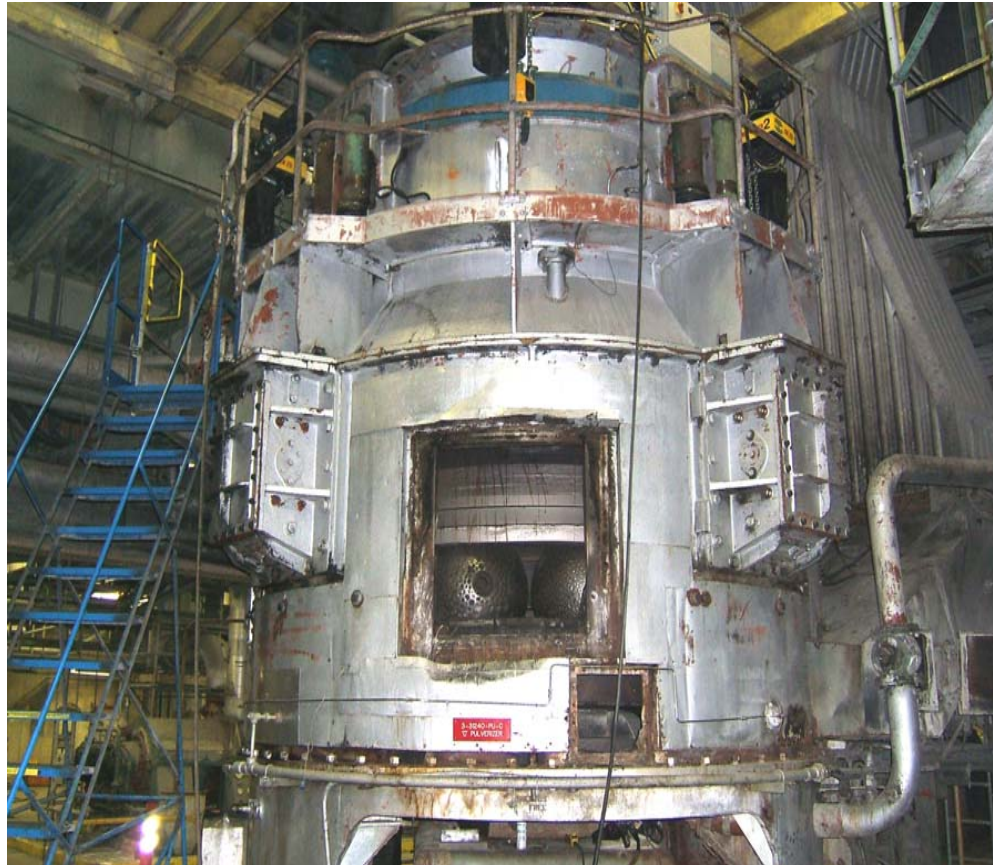
Nanticoke Generating Station Schematic



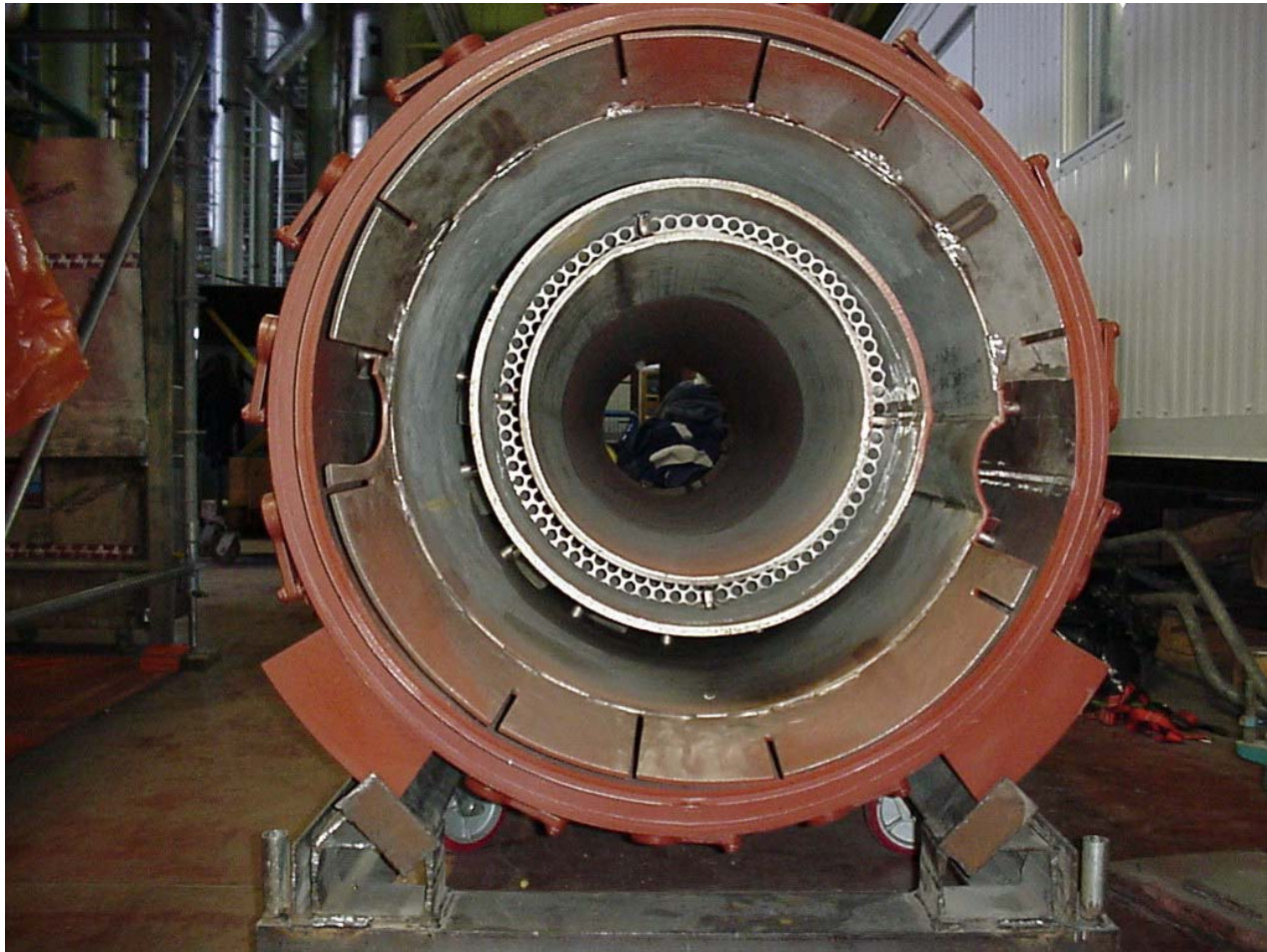
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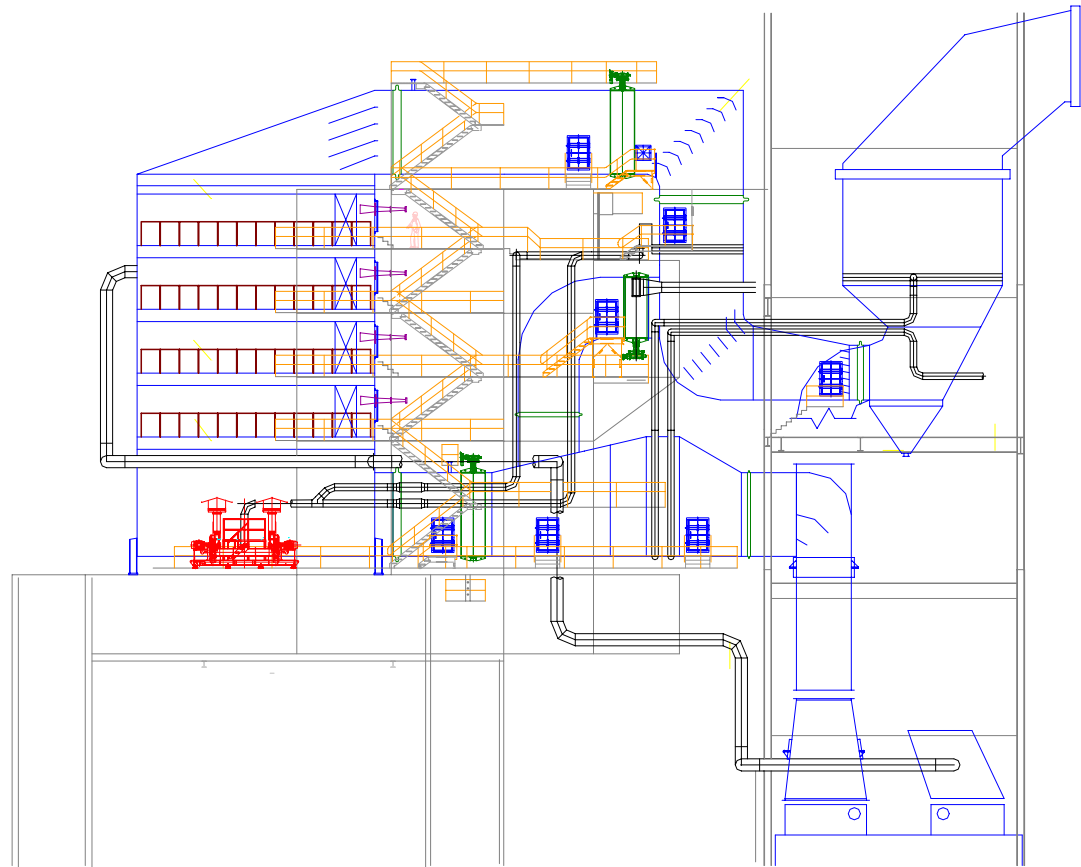
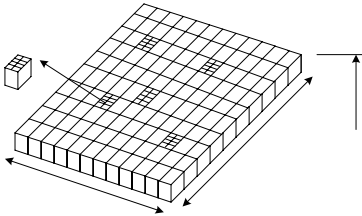
10E Pulverizer



Burners - Nanticoke

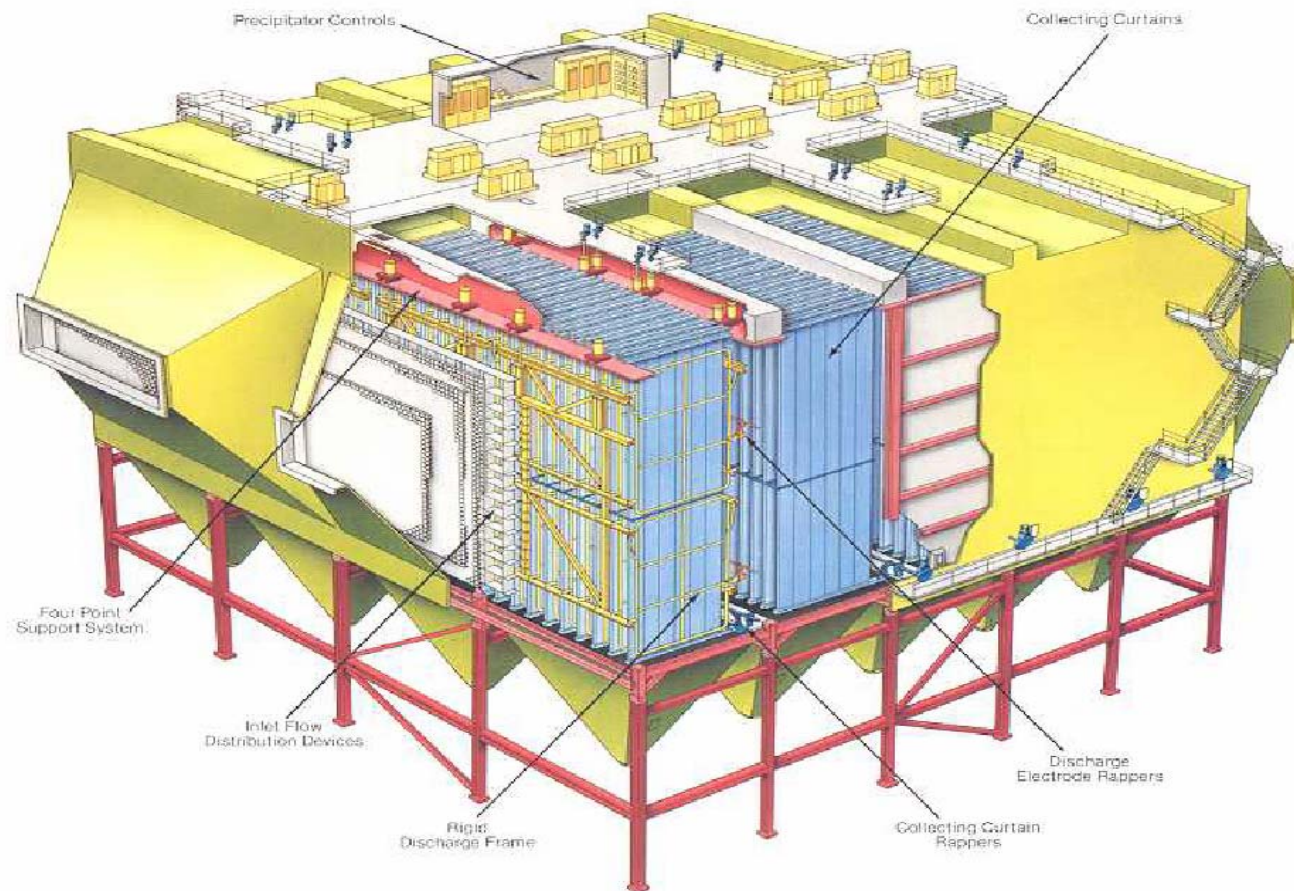


SCR



Outline of Catalyst

Electrostatic Precipitator



Turbine



Turbine - Generator



Instrumentation, Systems and Controls - Nanticoke

- Legacy Controls:
 - Bailey 721 Boiler Modulating Controls (BMC) (Units 1-4)
 - Bailey 820 Boiler Modulating Controls (BMC) (Units 5-8)
 - Bailey 760 Burner Management System (BMS)
 - IBM 1800 computers Data Acquisition System (DAS)
 - Digital PDP 8/11 Operation Sequence Analyzer (OSA)

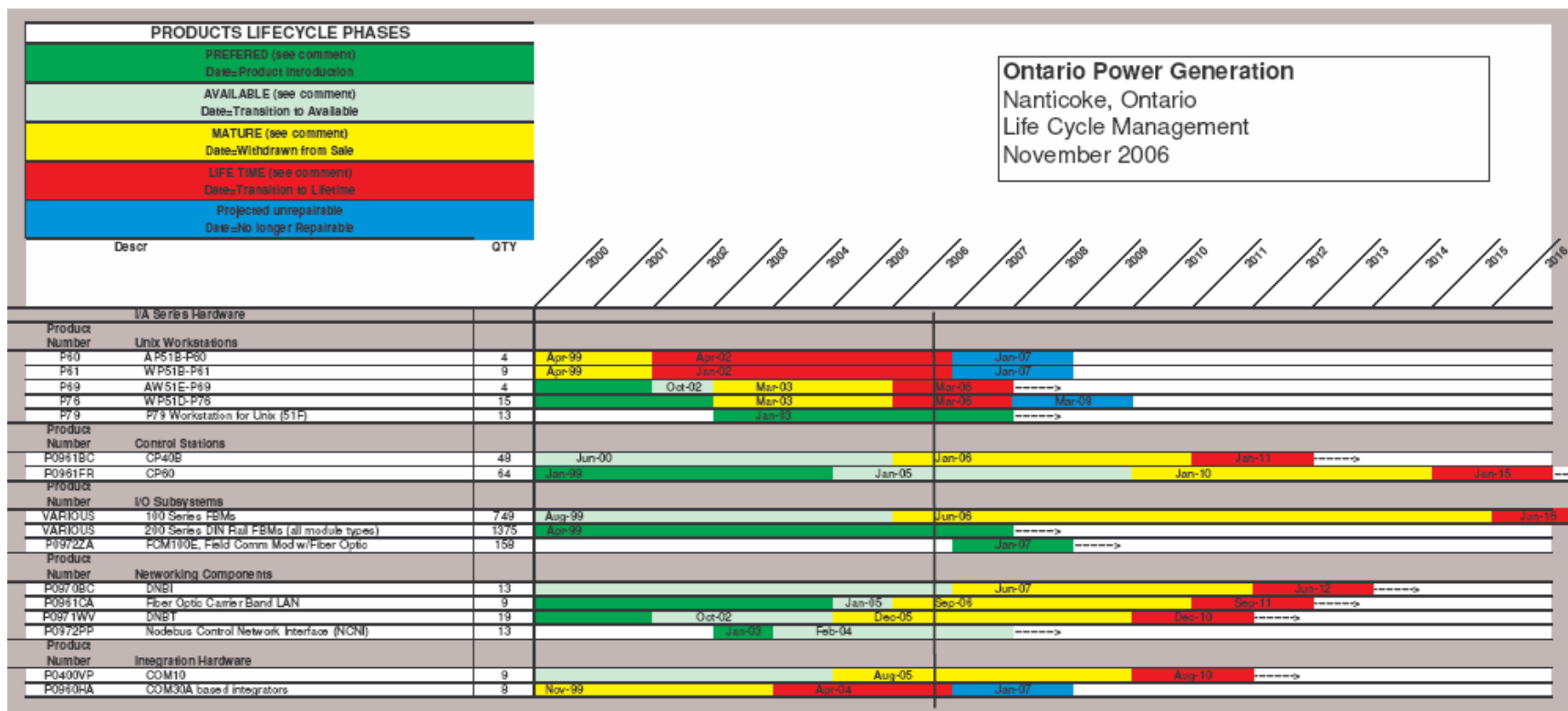
- Upgrade Controls:
 - 1998 (all 8 units): BMC replaced by Foxboro DCS
 - 2003 (units 5-8): BMS replaced by Foxboro DCS
 - 2003 (units 5-8): DAS replaced by Foxboro DCS
 - 2003 (units 5-8): OSA replaced by Foxboro DCS
 - Others: SCR, FGC, Biomass controlled by Foxboro DCS

- On-going Projects:
 - DAS (units 1-4): DAS replacement with Foxboro DAS (1,2 compl, 4 underway, 3 Fall 2008)
 - SOE (units 1-4): proposal evaluation

Foxboro DCS

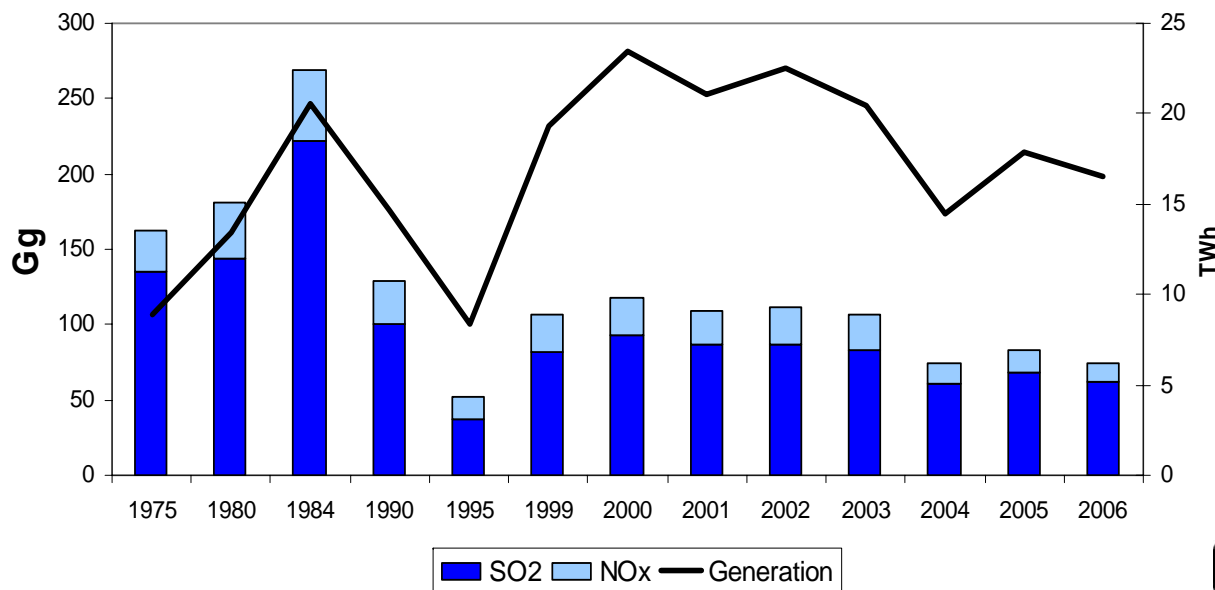


Life-cycle Replacement Strategy – typ.

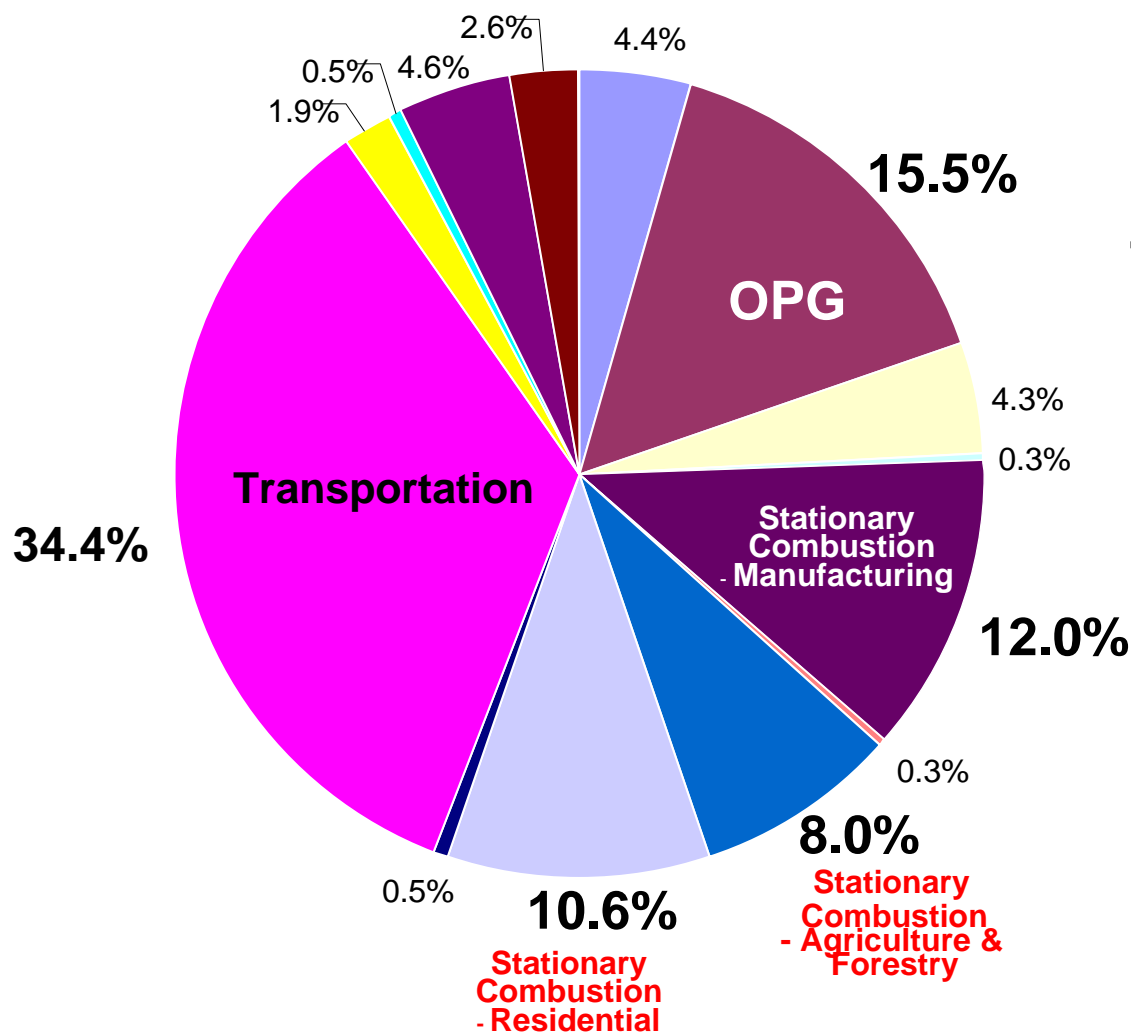


Nanticoke's Production History

- 1974 to 2005 average generation 15 Twh
- 1998 to 2003 average generation 20.5 Twh
- Highest annual generation in 2000 - 23.4 Twh
- Lifetime capacity factor - 44%
- Record output 4,440 Mw January 17/84



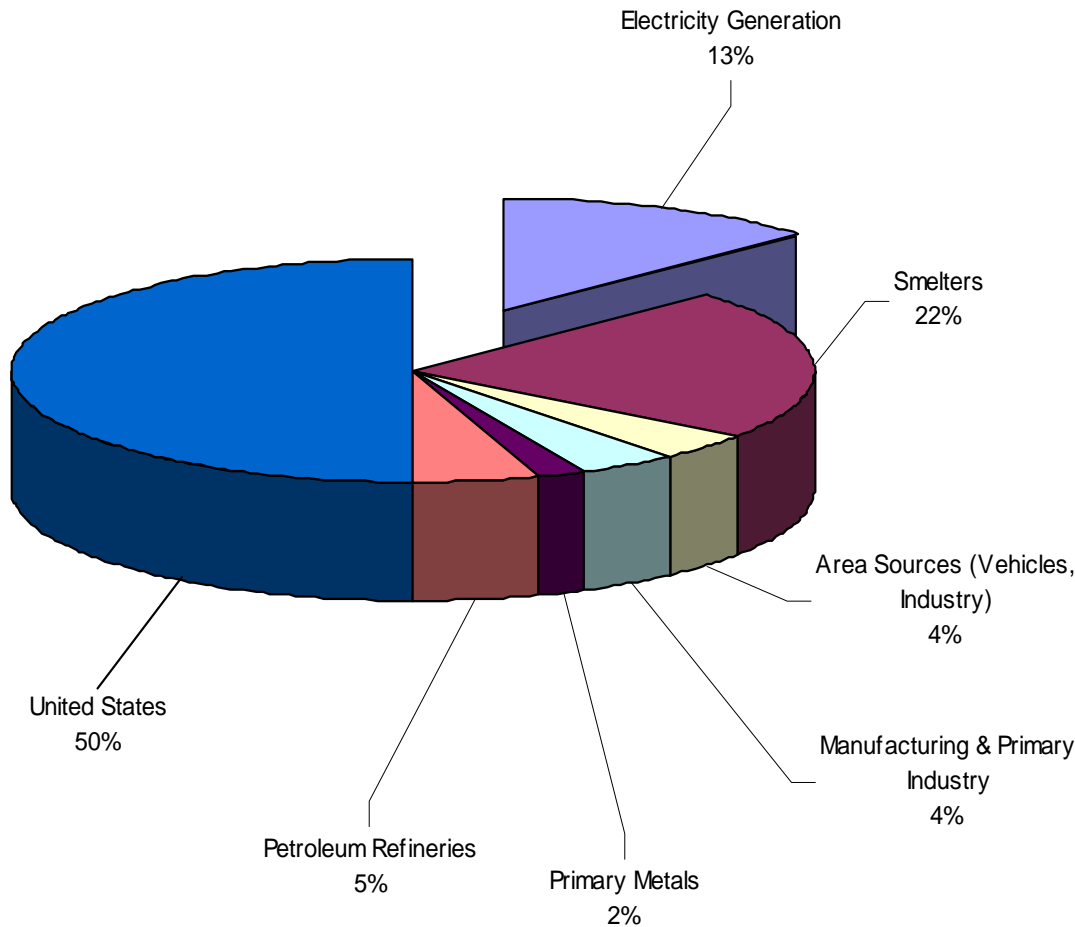
Sources of CO2 in Ontario (2004)



OPG accounts for 15.5% of CO2 produced in Ontario

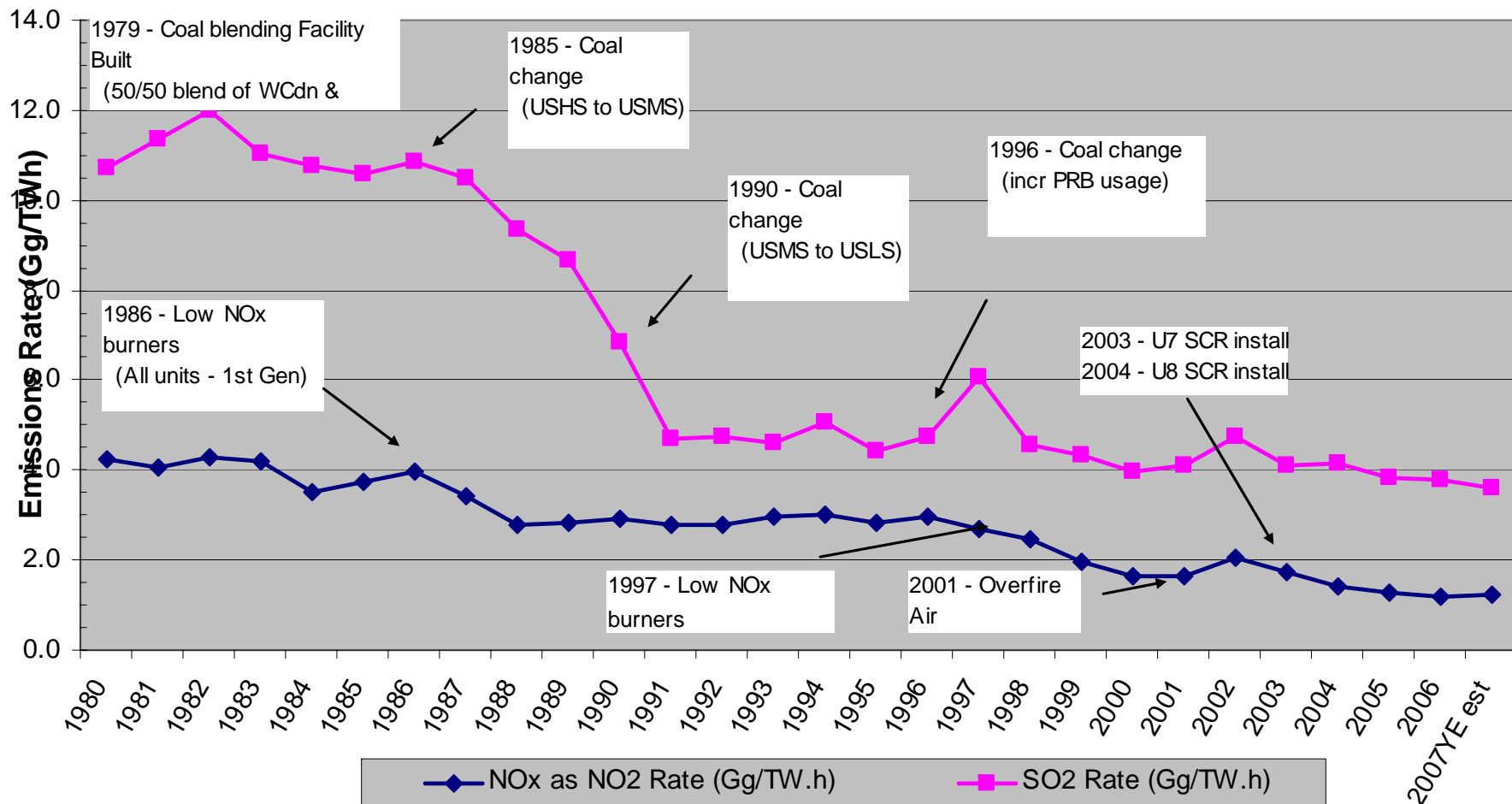
Environmental Impact in Ontario

SO2 Emissions Affecting Ontario's Air Shed



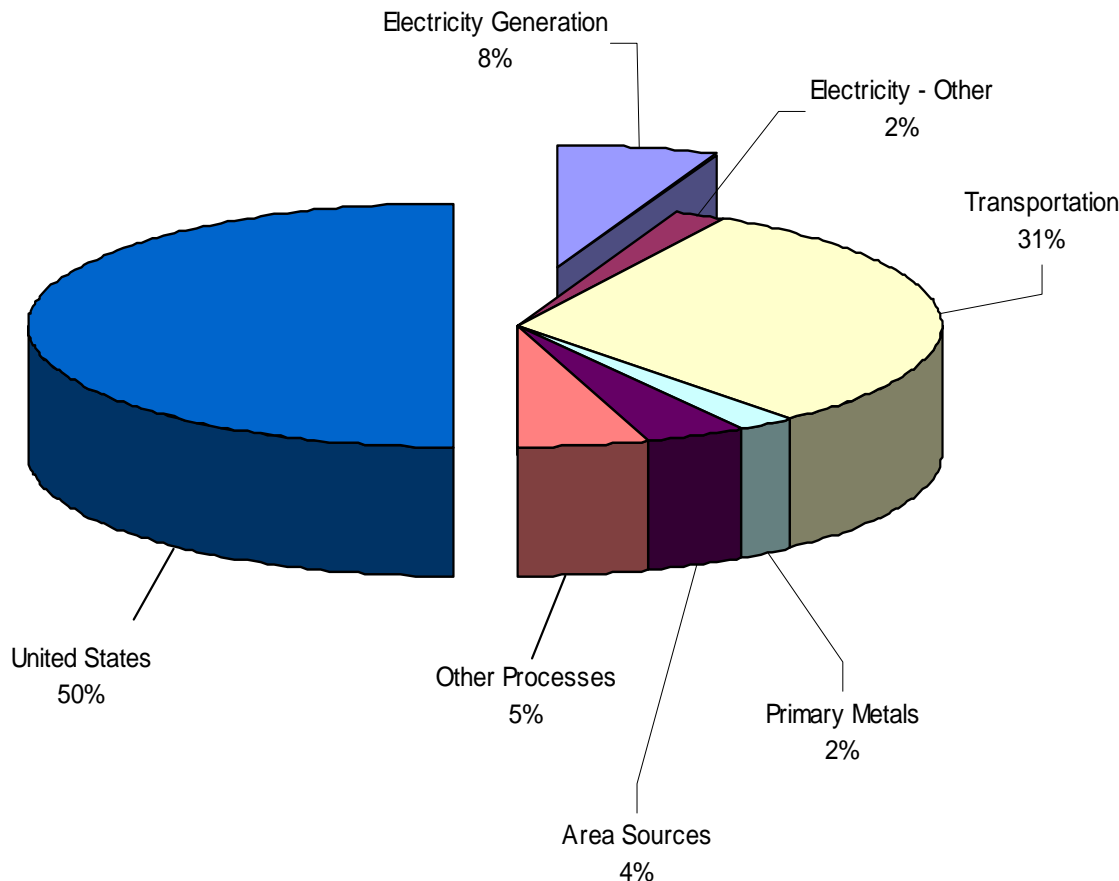
- Currently the Ontario electricity sector contributes about 13% of SO2 emissions affecting Ontario's air shed
- Shutting down existing coal plants (without replacement with new fossil generation) will reduce the electricity sector contribution to <1%.
- Replacing existing coal units with combined cycle natural gas units will result in an electricity sector contribution <1%
- Installing FGD emission control technology on existing coal units will result in an electricity sector contribution of about 1-2%.

Nanticoke's SO₂ and NO_x Emission Rates: 1980-2006



Environmental Impact in Ontario

NOx Emissions Affecting Ontario's Air Shed



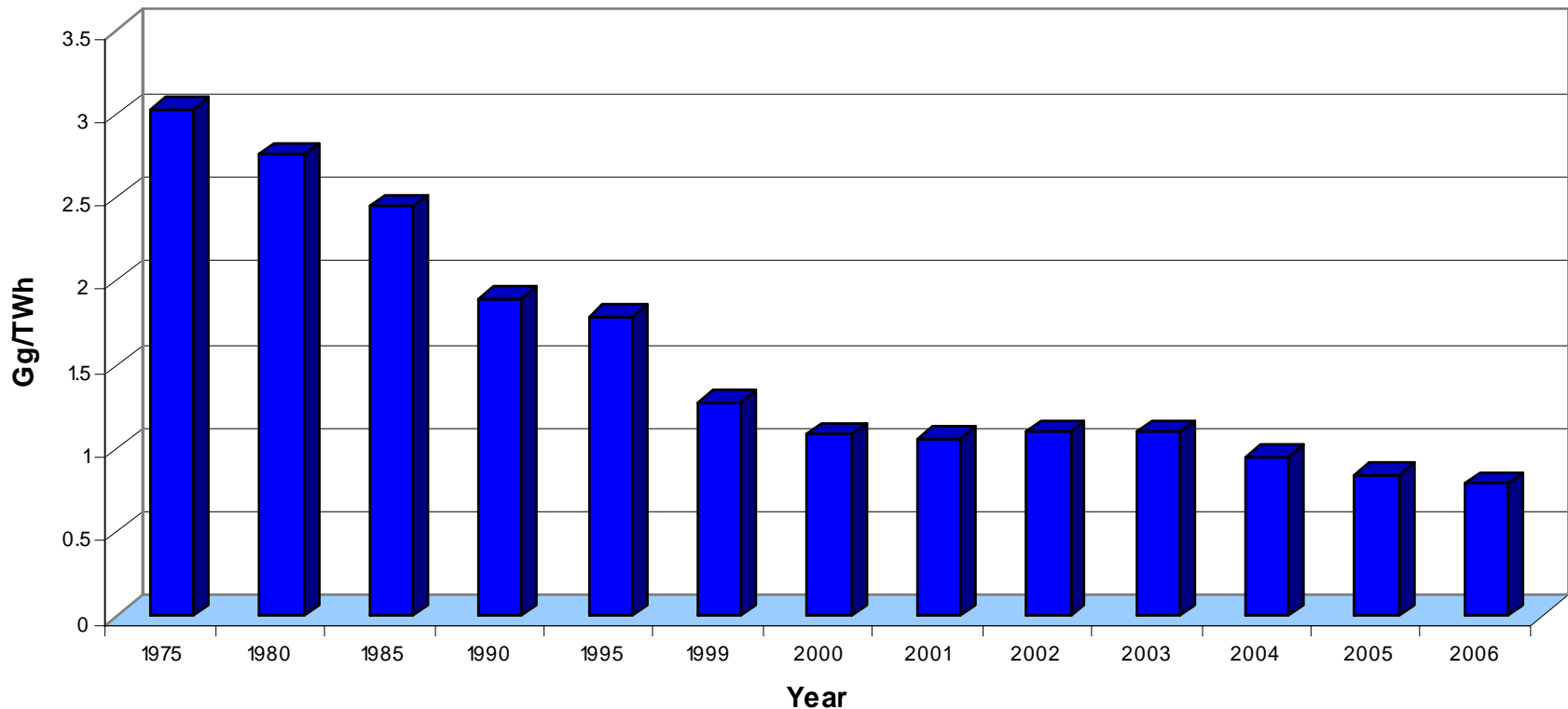
- The Ontario electricity sector contributes 10% of NOx emissions affecting Ontario's air shed
- Shutting down existing coal plants (without replacement with new fossil generation) will reduce the electricity sector contribution to about 2%.
- Replacing existing coal units with combined cycle natural gas units will result in an electricity sector contribution of about 2-3%.
- Installing SCR emission control technology on existing coal units will result in an electricity sector contribution of about 3-4%.

Nanticoke GS



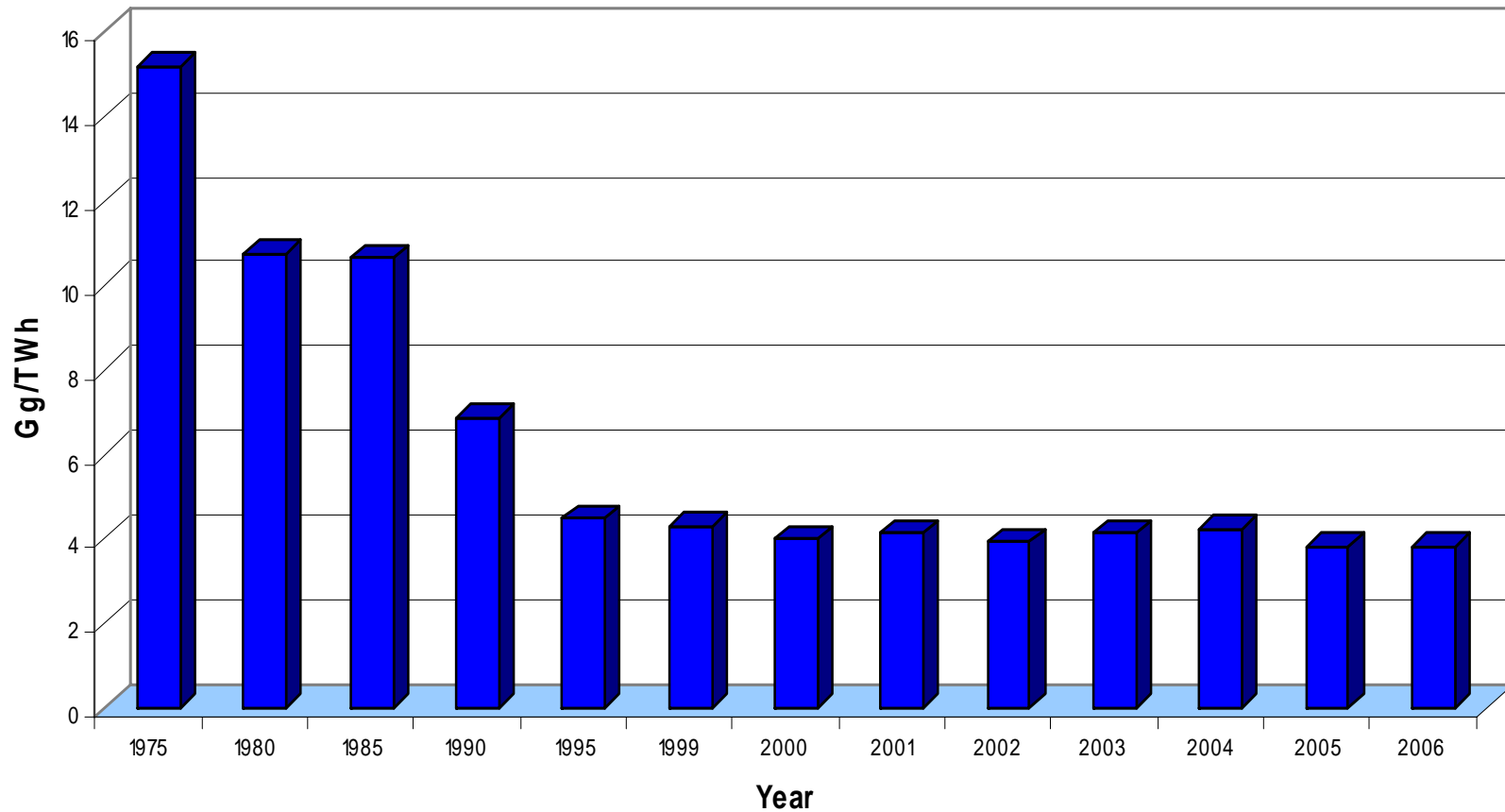
Progress on Air Emissions

Nanticoke NO_x Emission Rate



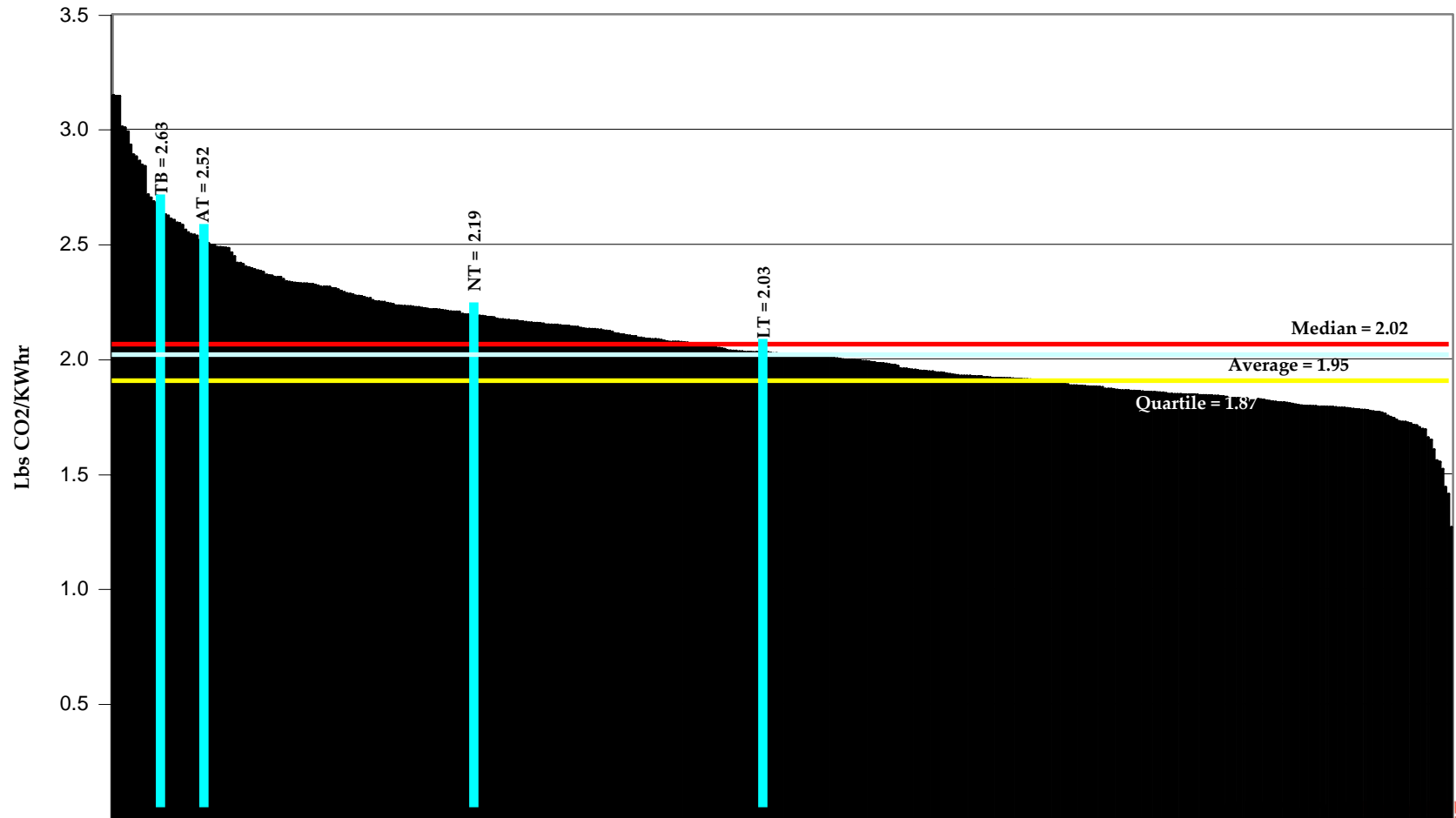
Progress on Air Emissions

Nanticoke SO₂ Emission Rate



Emission Comparison

Coal Fired Units
CO2 Emisissions Comparison
OPG 11 State Impact Area

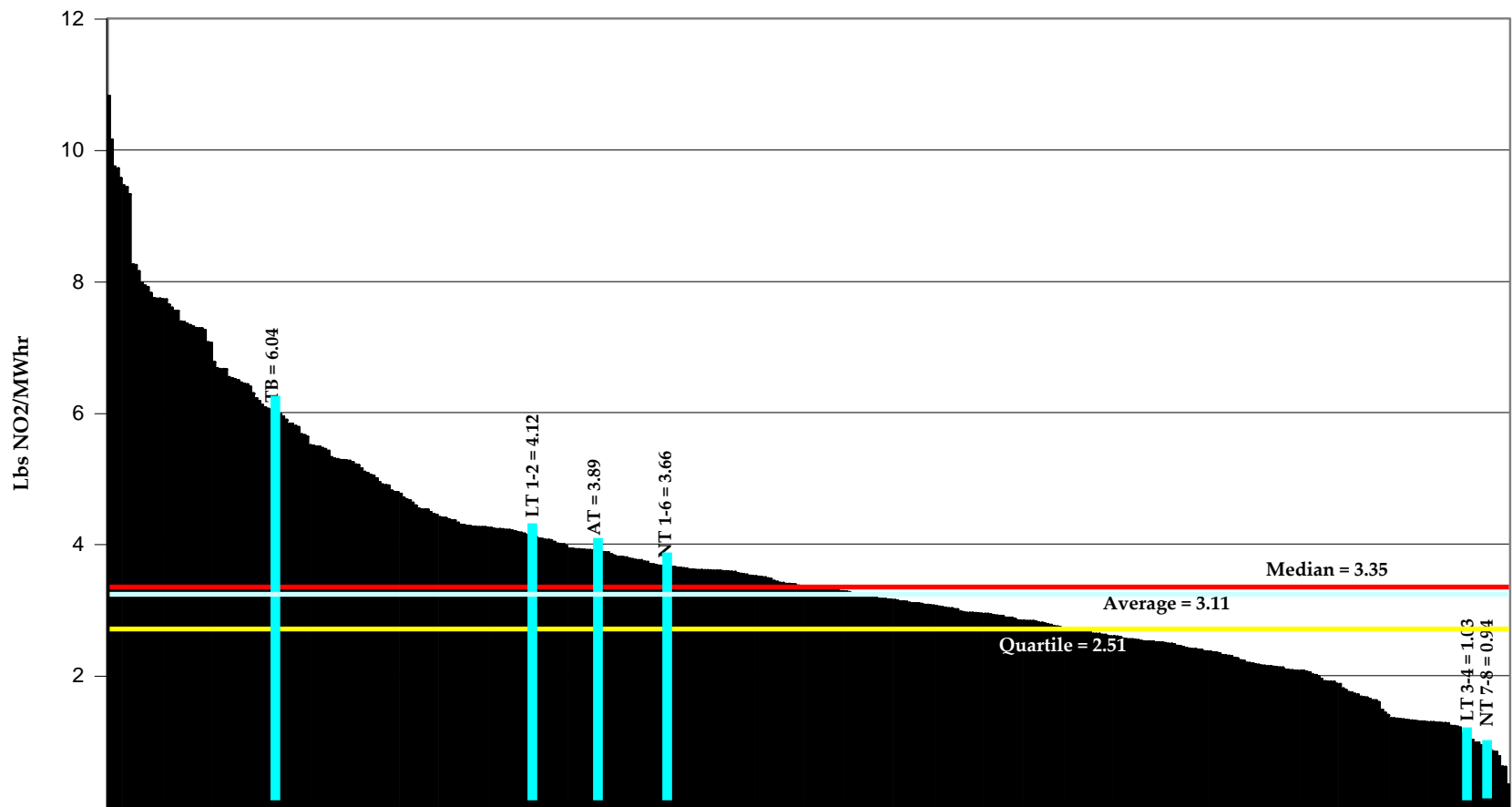


Data Represents 470 Coal Fired Units Operating In The 11 State Impact Area (IL, IN, KY, MI, MO, NY, OH, PA, TN, VA, WI)

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Emission Comparison

Coal Fired Units
NO₂ Emissions Comparison
OPG 11 State Impact Area

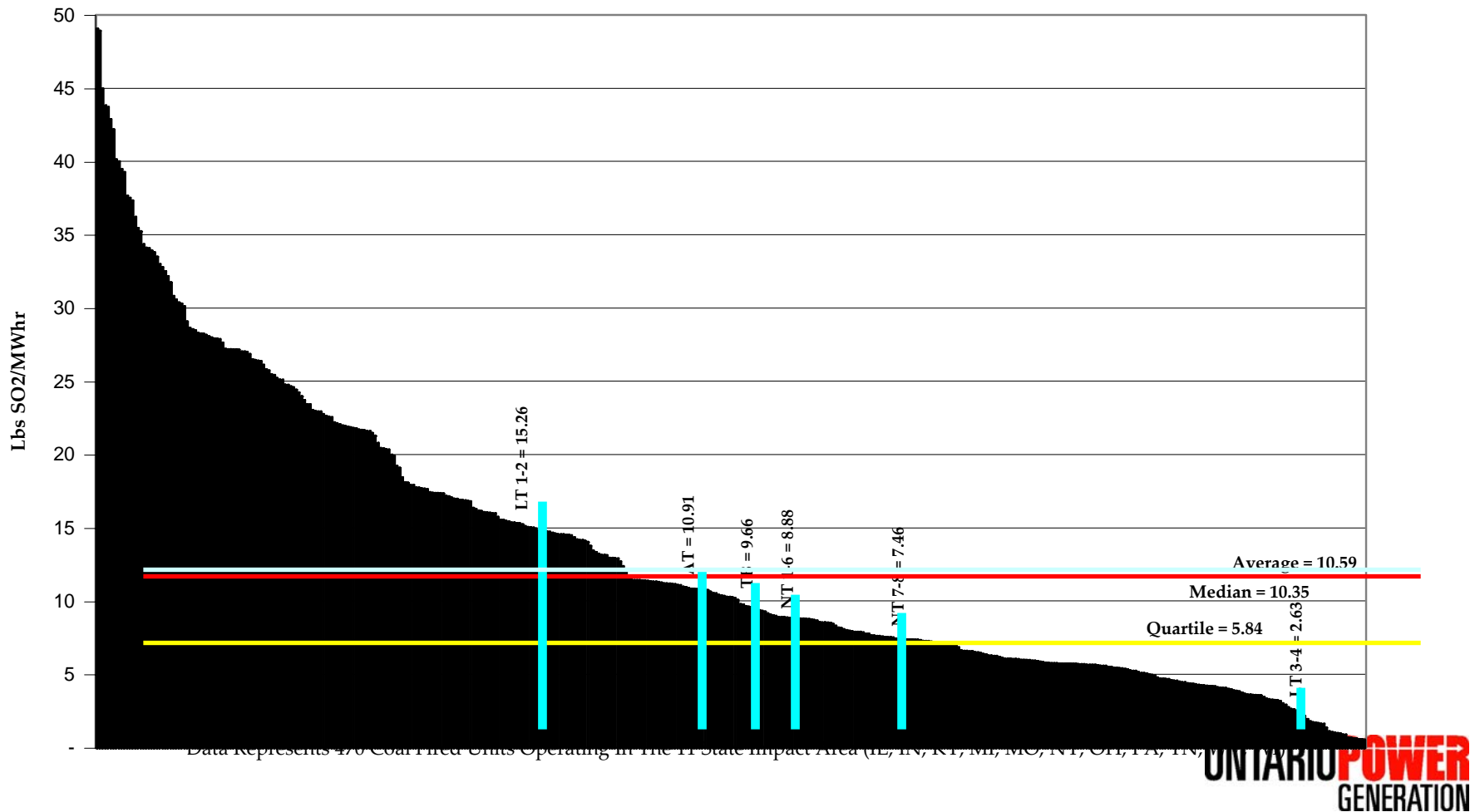


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Emission Comparison

Coal Fired Units
SO₂ Emissions Comparison
OPG 11 State Impact Area



Biomass Co-firing Program



Co-firing: Fuel Examples

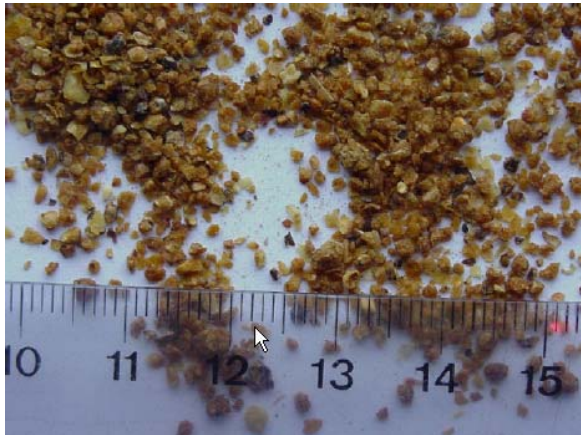
Wheat Shorts



Grain Screening Pellets



Wood Chips



Dried Distillers Grain



Soybean Hulls



Wood Pellets
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Biomass Co-firing: Potential

Environmental benefits

- ◉ Single biomass co-firing unit (@ 10% heat input)
 - 160,000 MWh of renewable energy production (about 51 Wind mill equivalents)
 - Renewable off-set of 140,000 tonnes of CO₂
 - Approximately 600 tonne reduction in SO₂ emissions.

Social/Economic

- ◉ Market for surplus agricultural feedstocks
- ◉ Alternative energy crops

Staff

Plant employment:

- Plant staff 679
(increase of 116 from 2005)
 - Temporary plant staff 65
(estimated average through 2006)
 - Contractors 319
(estimated average through 2006)
- Total: 1,063**



In the Community

- ⊙ Over 600 regular OPG employees – 80% live in Haldimand and Norfolk
- ⊙ Will continue to maintain required staff level
- ⊙ Spending on goods and services in 2006:
 - In Haldimand-Norfolk-Brant - \$4.3 million
 - In Ontario - \$120.5 million
- ⊙ Tax payments to Haldimand County - \$4.5 million

Coal Phase Out

- ⦿ All coal units required through 2010
- ⦿ Half of the coal units required through 2014
- ⦿ Plan subject to periodic review
- ⦿ Government will determine direction

OPG's Approach to Operation of Coal Plants



- Until coal-plants are no longer needed: OPG will meet all environmental regulations
- OPG will staff, operate and maintain plants as safe, reliable producers of electricity
- OPG will make additional, prudent investments in environmental equipment

Tour

Needs

- ⊙ Hard hat, eye protection, ear protection

Tour Agenda

- ⊙ Powerhouse
 - Turbine Hall
 - Control Room
 - SCRs
 - Ground Floor Equipment
 - Mills
 - Condenser