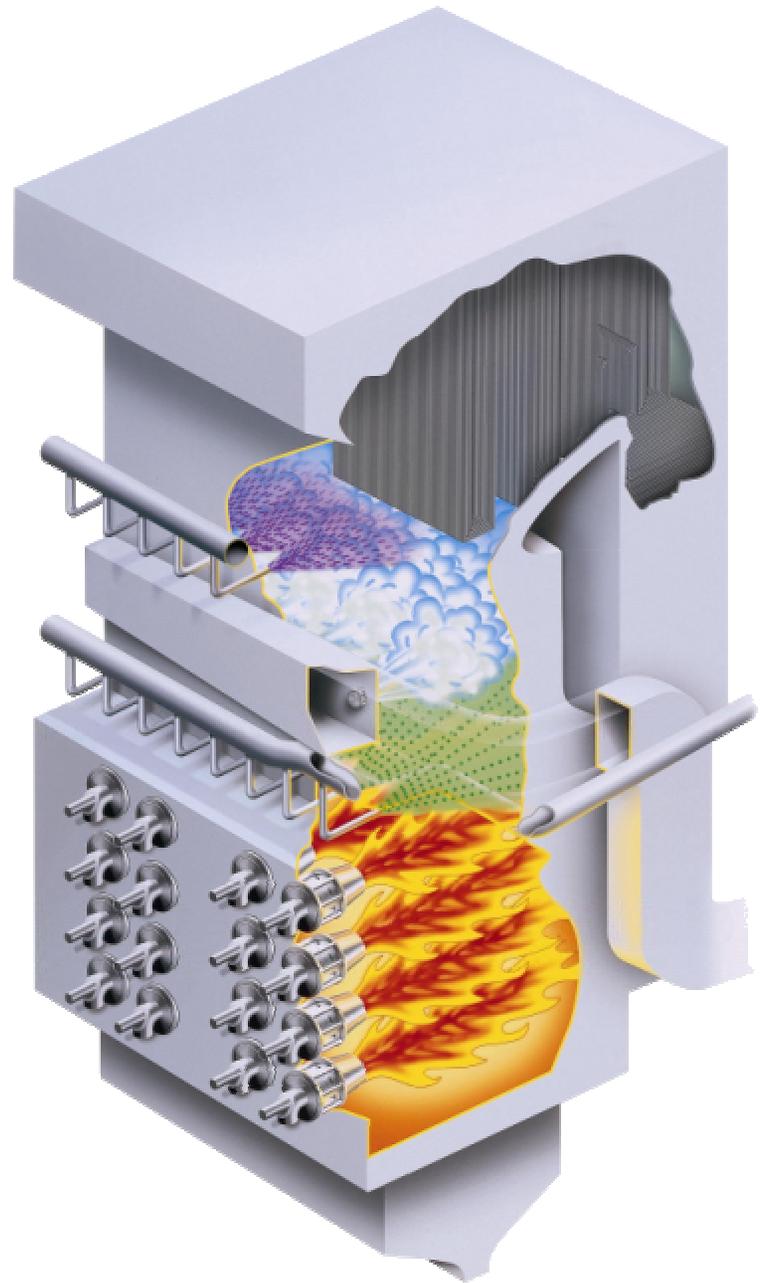


Experience with Reburn for NOx Emissions Control

David Moyeda

DOE NETL Conference on
Reburning for NOx Control
Morgantown, West Virginia
18 May 2004



Overview

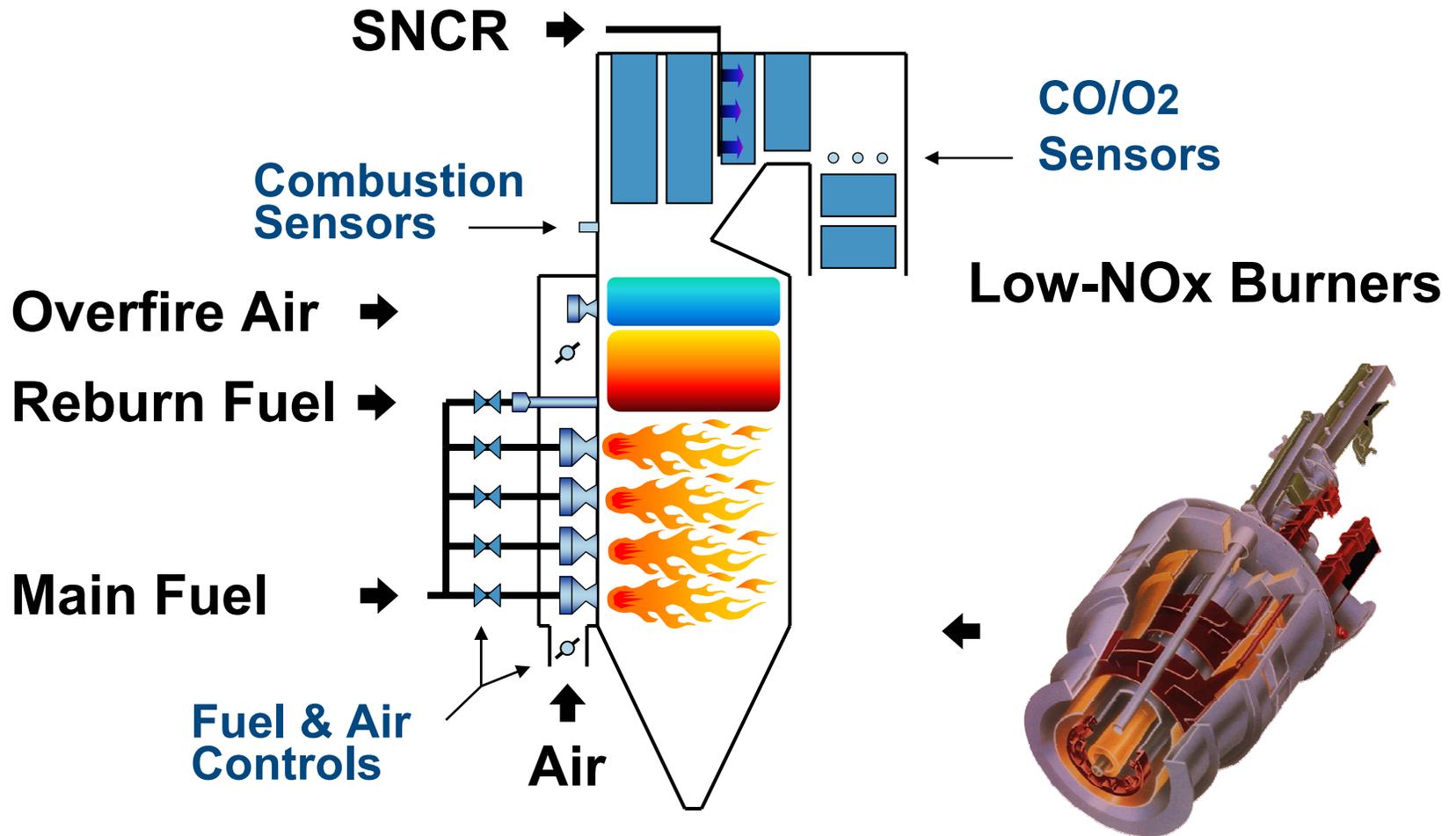
NOx Control Technology Layering

GE Energy Reburn Experience

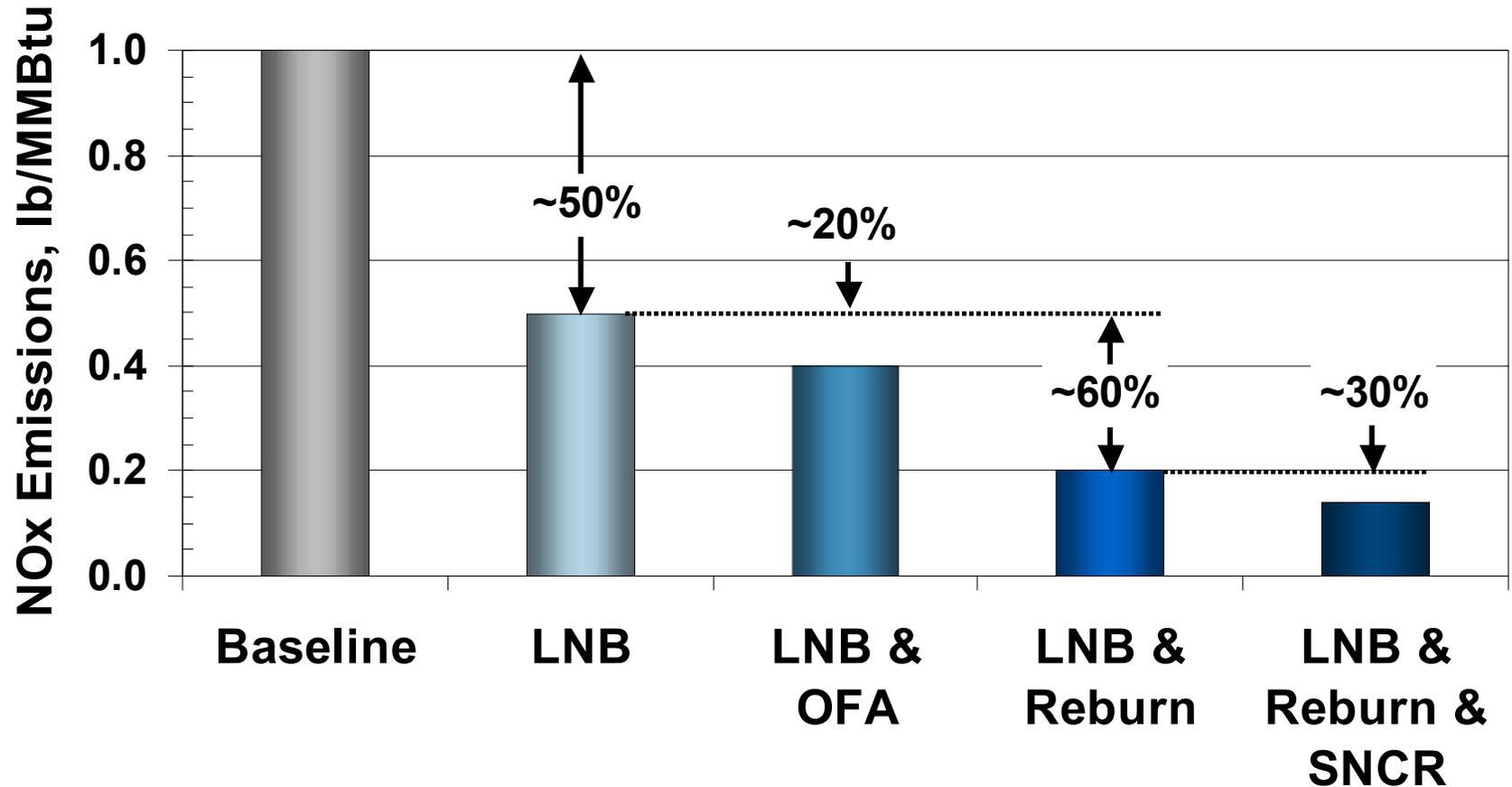
Specific Reburn Applications

Coal Reburn Economics

Layering NOx emissions controls for utility and industrial boilers



Layering technologies permits significant reductions in NO_x emissions



GE has successfully applied reburn to a broad range of utility boiler designs

Experience Range

**Firing
Configuration**

Reburn Fuel

Capacity

Wall

Gas

14 MW

Tangential

Oil

To

Cyclone

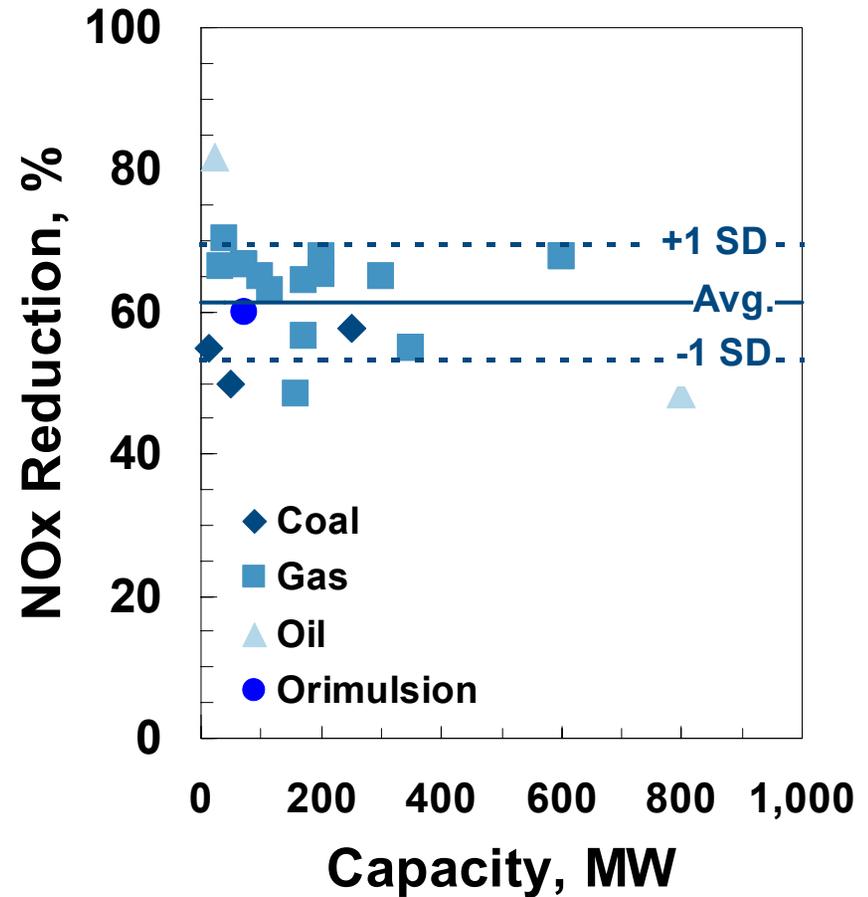
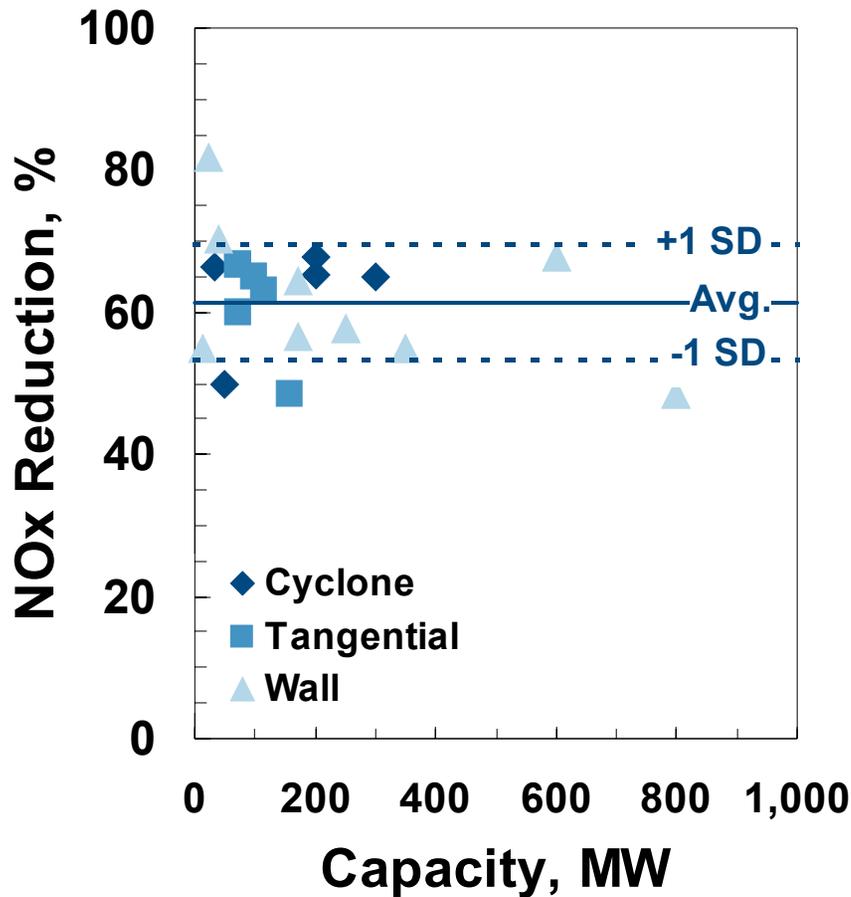
Coal

800 MW

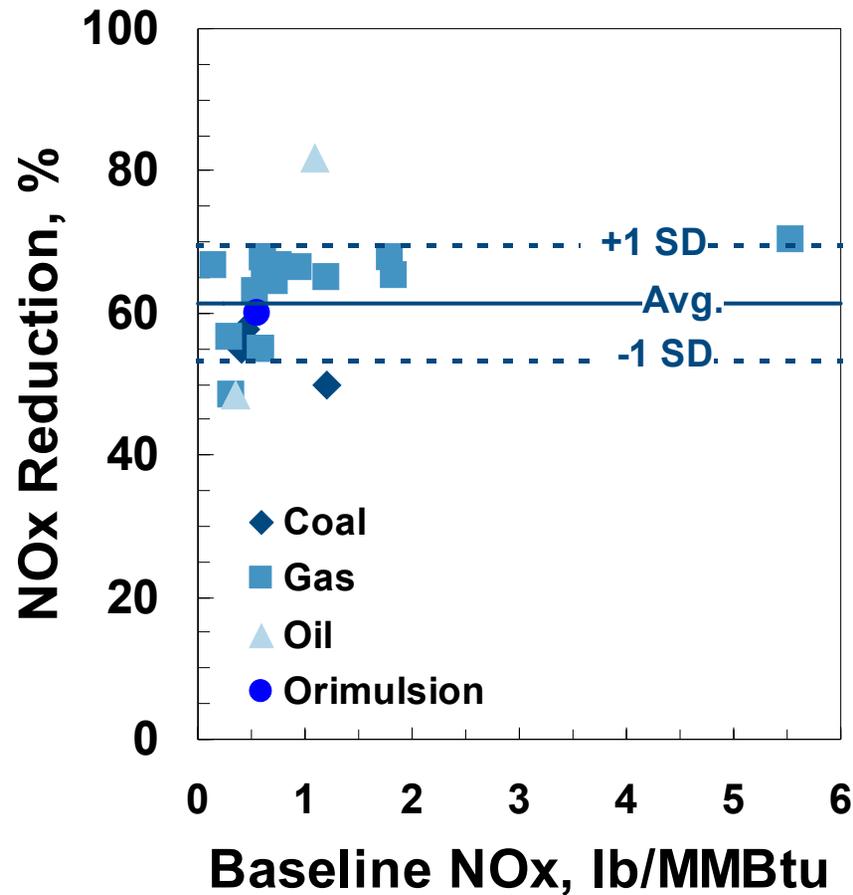
Orimulsion

**Totals 5,800 MW
24 Units**

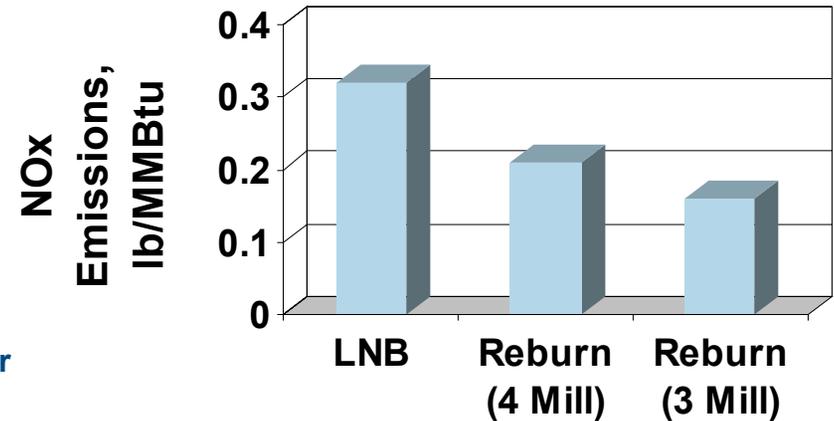
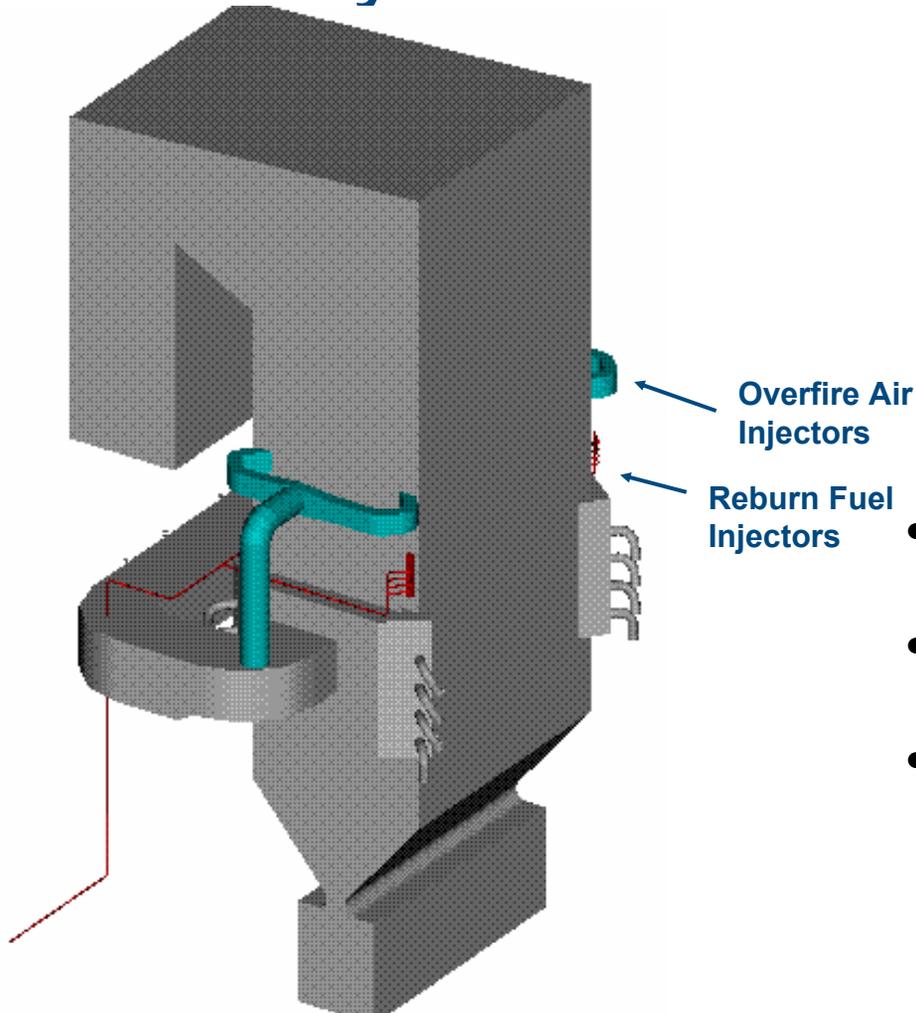
Reburn achieved 50-70% NOx reduction on all units



Reburn performance maintained over wide range of baseline NOx levels



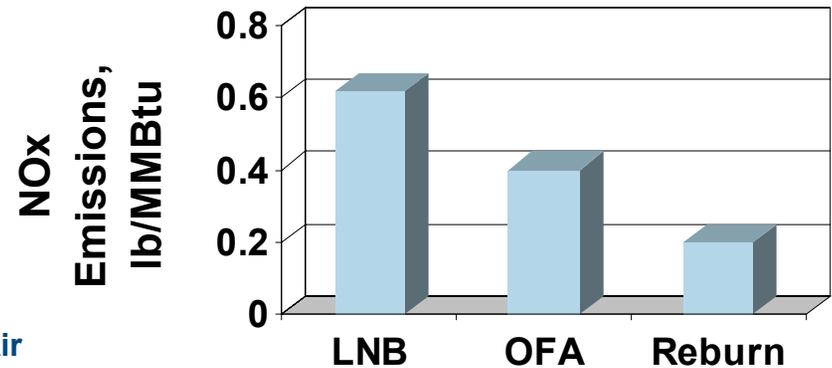
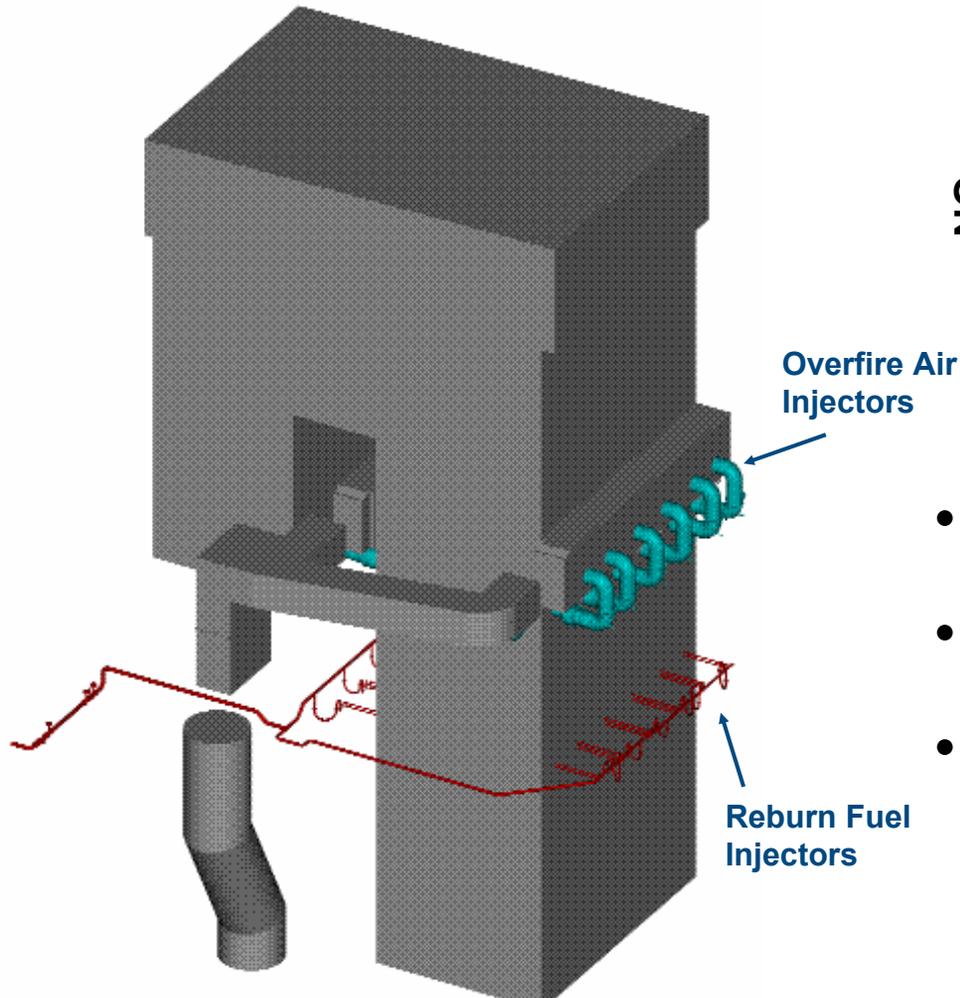
Tangentially fired boiler retrofit with gas reburn system



- Capacity: 160 MW
- Fuel: Bituminous Coal
- System: LNCFS Level II Gas Reburn

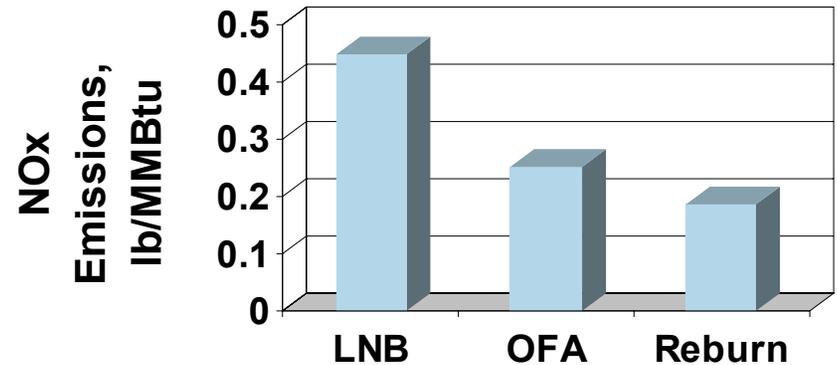
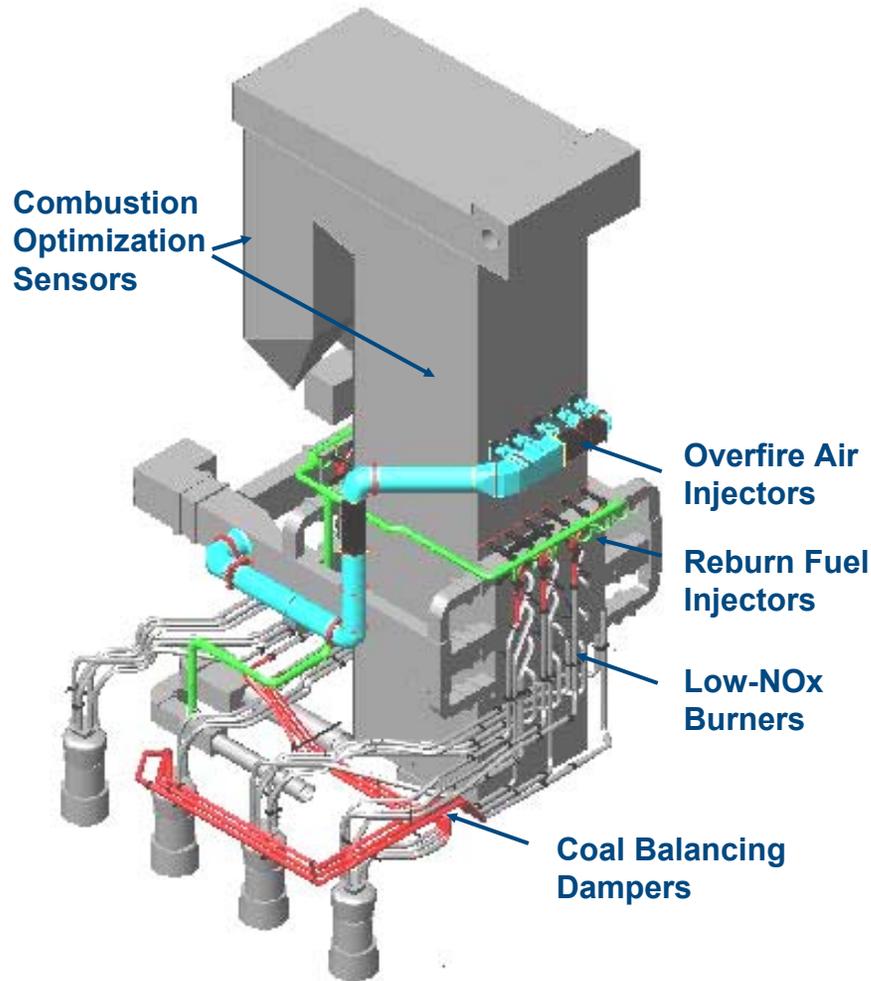
Gas injection without FGR
OFA injection without boost fan

Cell fired boiler retrofit with gas reburn system



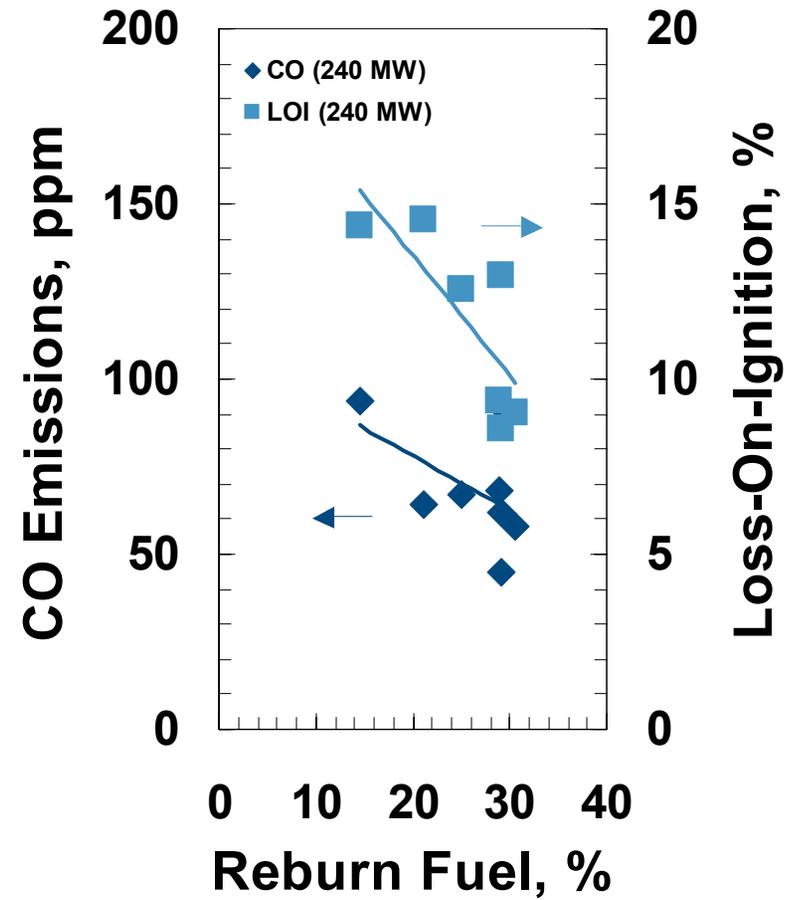
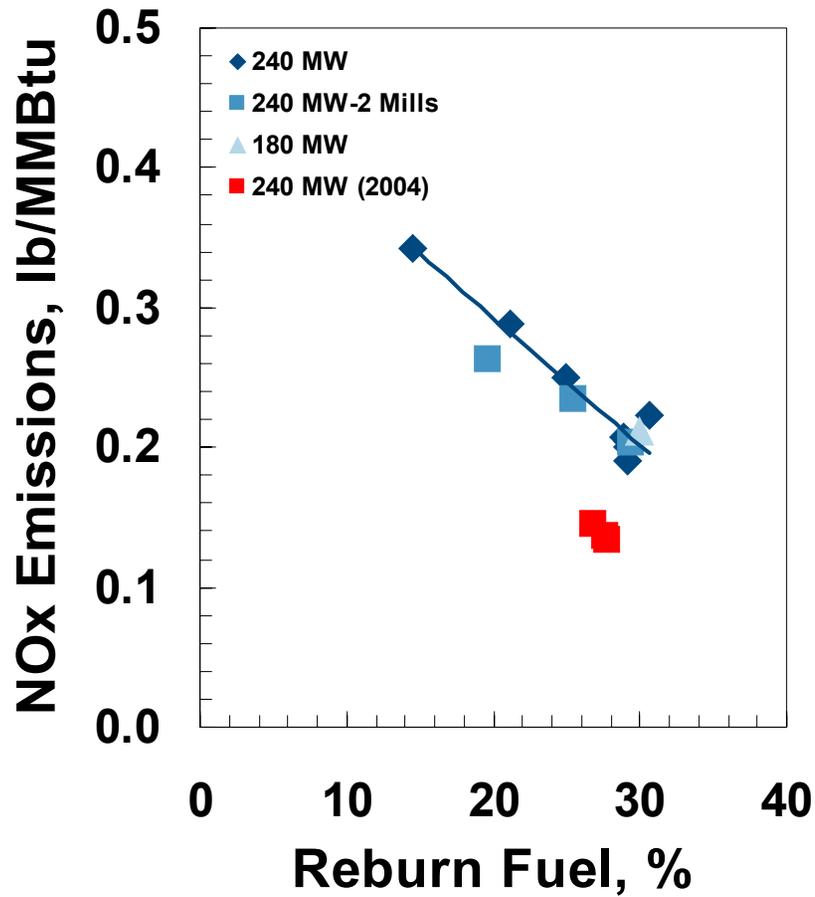
- Capacity: 595 MW
- Fuel: Bituminous Coal
- System: Low-NOx Burners
Gas Reburn
Boosted OFA

Opposed wall-fired boiler retrofit with coal reburn system

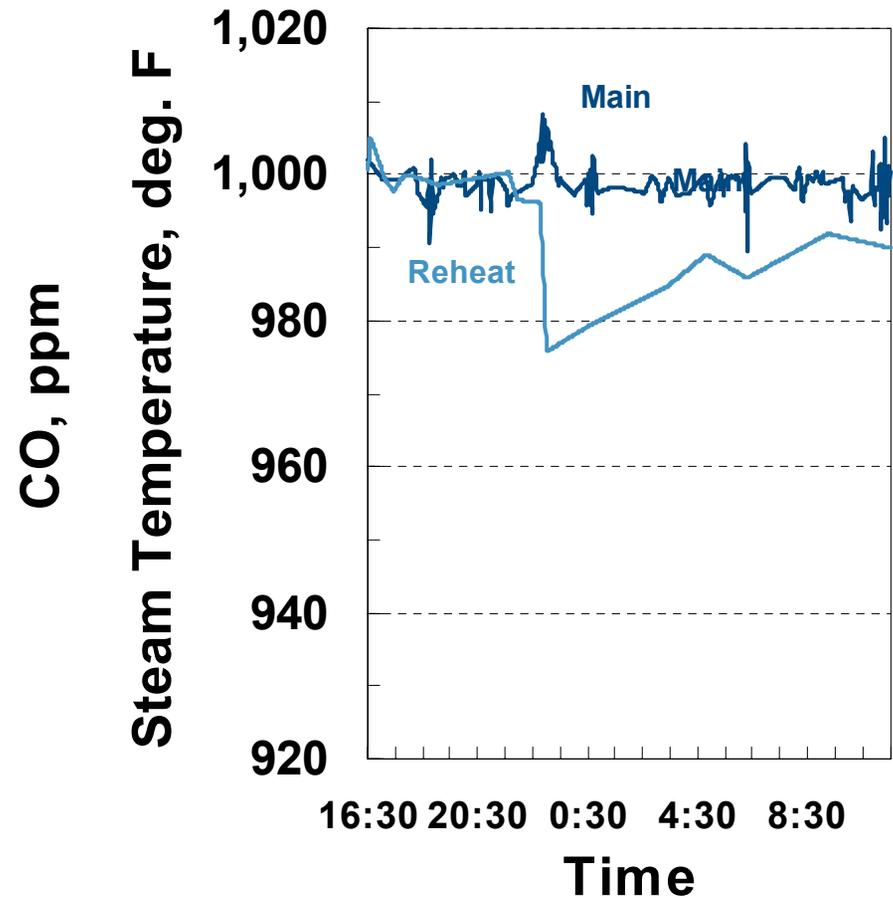
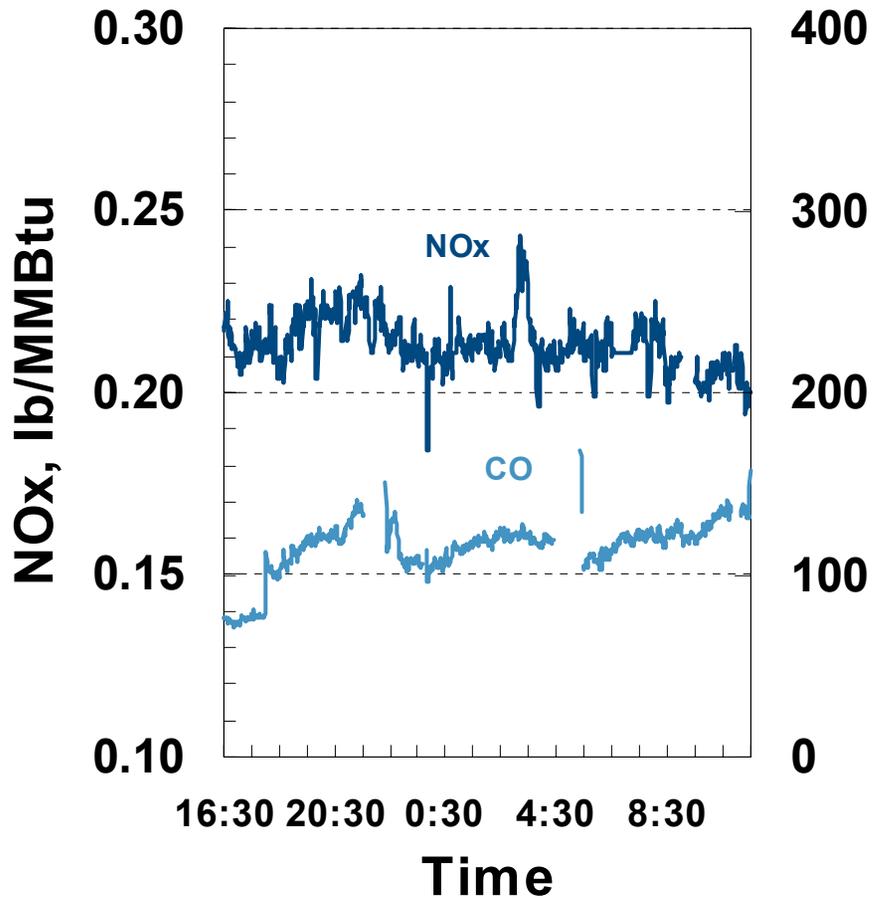


- Capacity: 250 MW
- Fuel: Bituminous Coal
- System: Low-NOx Burners
Coal Reburn
Dampers/Sensors

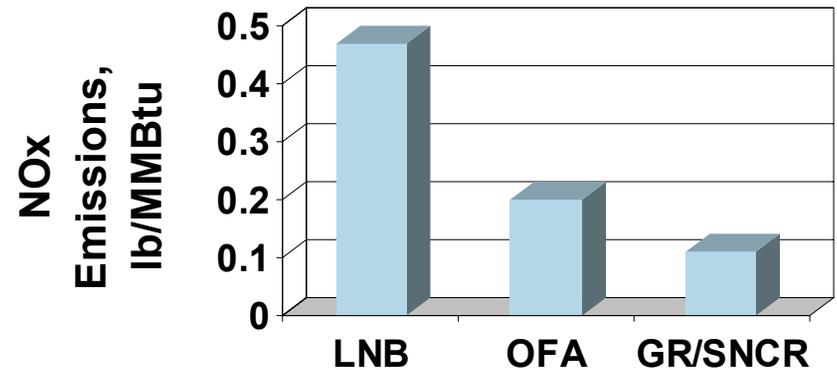
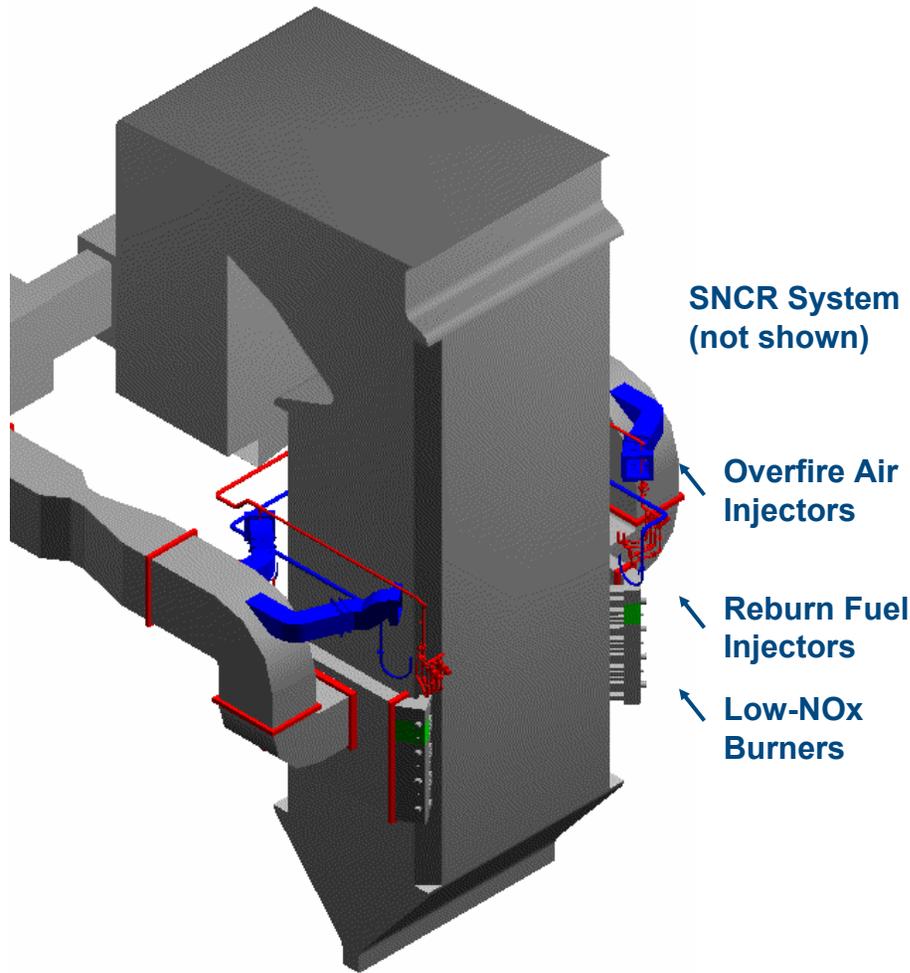
Coal Reburn provides effective NOx control with minimal impact on CO & LOI



Coal Reburn reduces NOx and does not impact normal unit operation



Tangentially-fired boiler retrofit with low-NOx burners, gas reburn & SNCR



- Capacity: 120 MW
- Fuel: Bituminous Coal
- System: Low-NOx Burners
Gas Reburn
SNCR System

Reburn economics analysis for unit in SIP call region

Capital costs are highly site specific

Same reburn & main fuel avoids differential cost

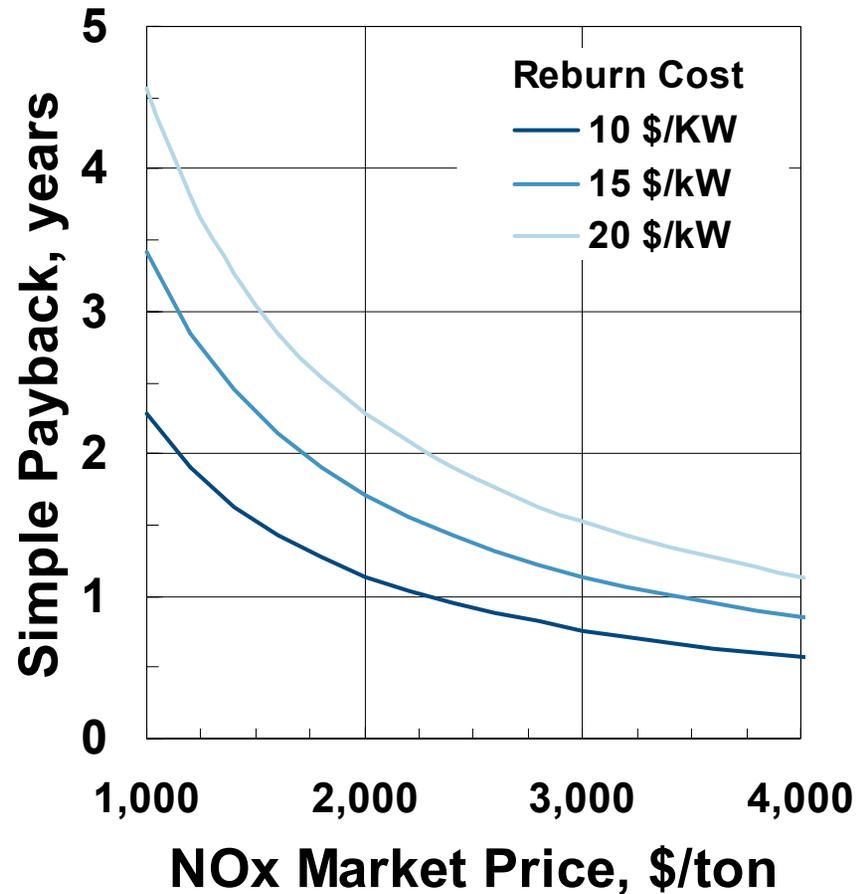
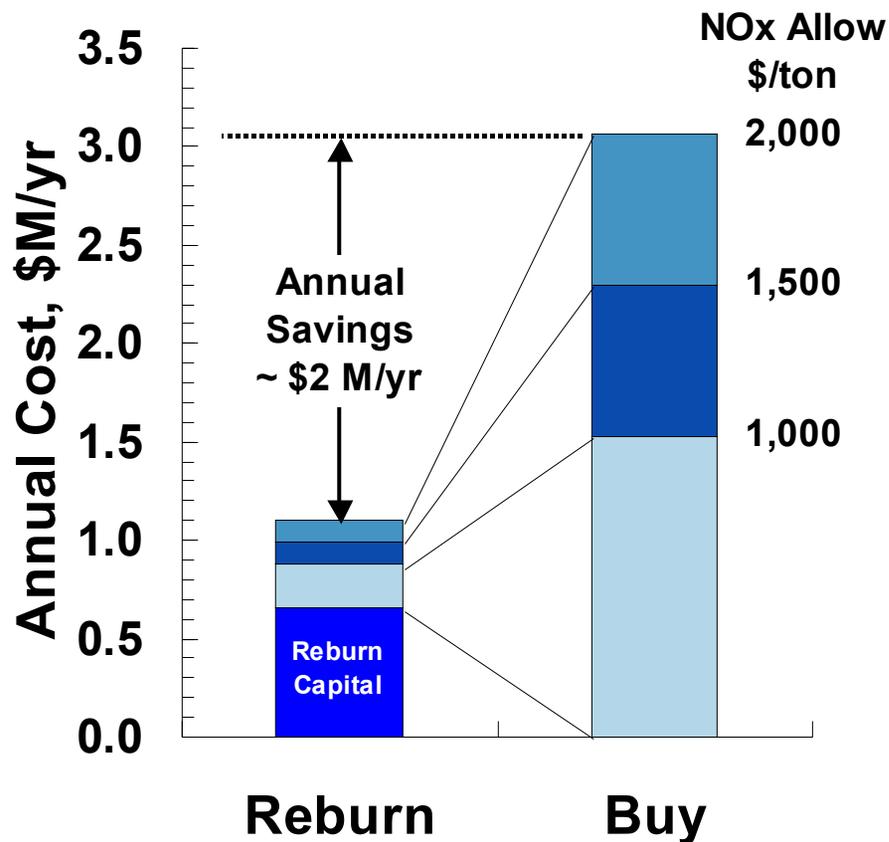
Operational cost impacts are usually minimal

Coal reburn example

- > SIP call compliance
- > Target = 0.15 lb/MMBtu
- > Reburn to reduce allowance purchase cost

Parameters	Value
Unit	
Capacity	300 MW
Configuration	Wall
Heat Rate	10,000 Btu/KWH
Cap. Fact.	80 %
NOx	
Baseline	0.50 lb/MMBtu
Reburn	0.20 lb/MMBtu
Reduction	60 %
Cost	
Capital Cost	6 \$ M
Capital Cost	20 \$/KW
Control Cost	752 \$/Ton

Coal reburn can reduce cost of NOx emissions compliance



Summary

Reburn: demonstrated performance for broad range of combustion systems

Layering Combustion Controls & SNCR can achieve $\text{NO}_x < 0.15 \text{ lb/MMBtu}$

Same fuel (e.g. coal over coal reburn) is cost effective compared to NO_x allowance costs