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# Holistic Impacts of NOx Control Technologies on Boiler Equipment and Hg/$SO_3$ Emissions

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**McIlvaine Hot Topic Hour**
**NOx Control – Low NOx Technology Update**
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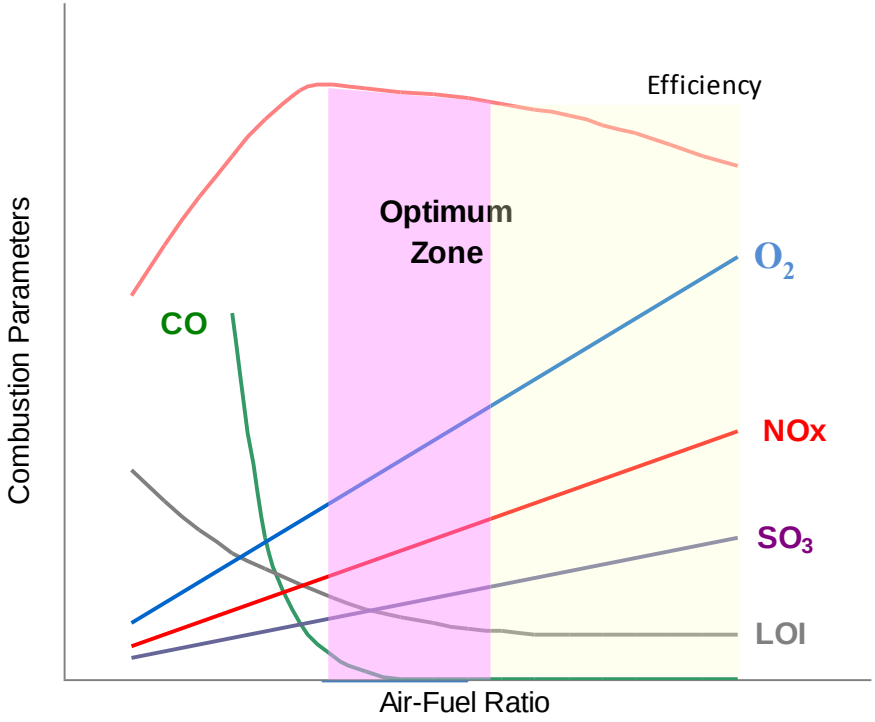
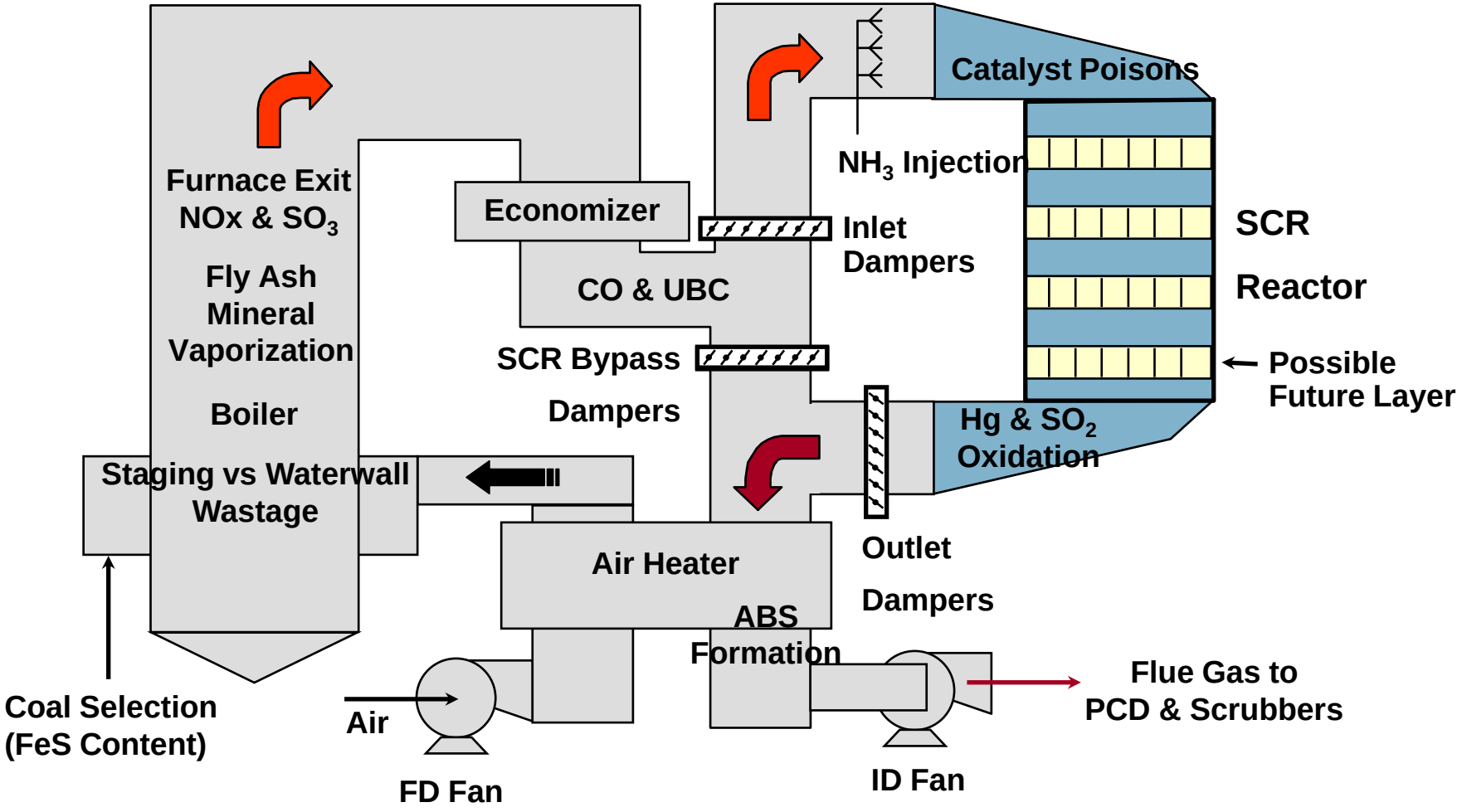
# Background
# Holistic Emissions Impacts

- NOx reduction approach must be made in context of coal burned, potential impacts on other pollutants, and overall unit performance
- Need to quantify tradeoffs
  - Goal of minimizing costs while complying with regulatory framework
  - Cannot operate combustion system in isolation of post combustion pollution control devices
- Research being conducted to evaluate potential impacts from combustion operation on post combustion systems




**Combustion modifications can affect post combustion systems**

# Boiler / SCR Optimization

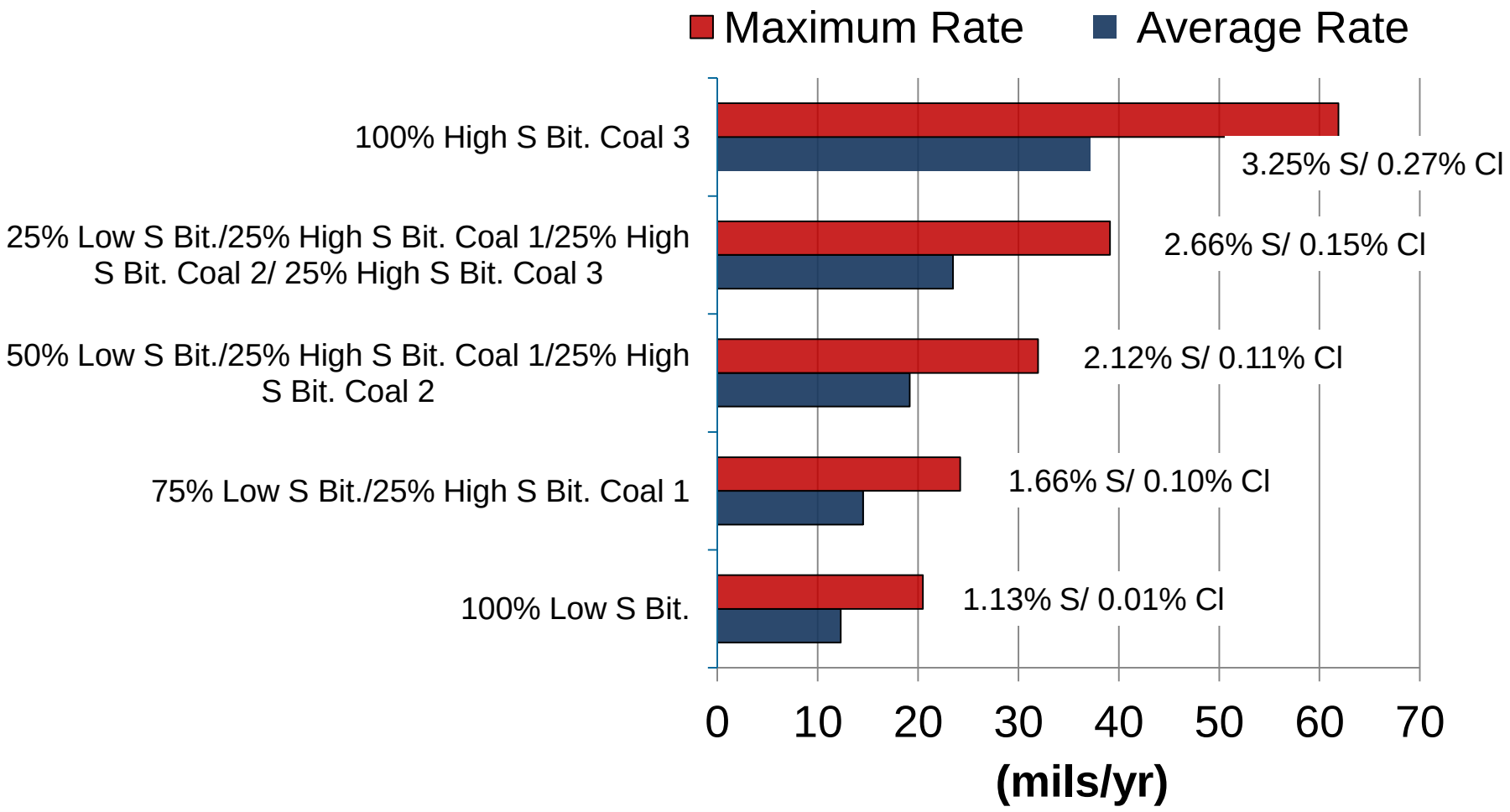


# Boiler / SCR Optimization Example

- Two different coals
- Two boiler stoichiometric ratios (different NOx levels)

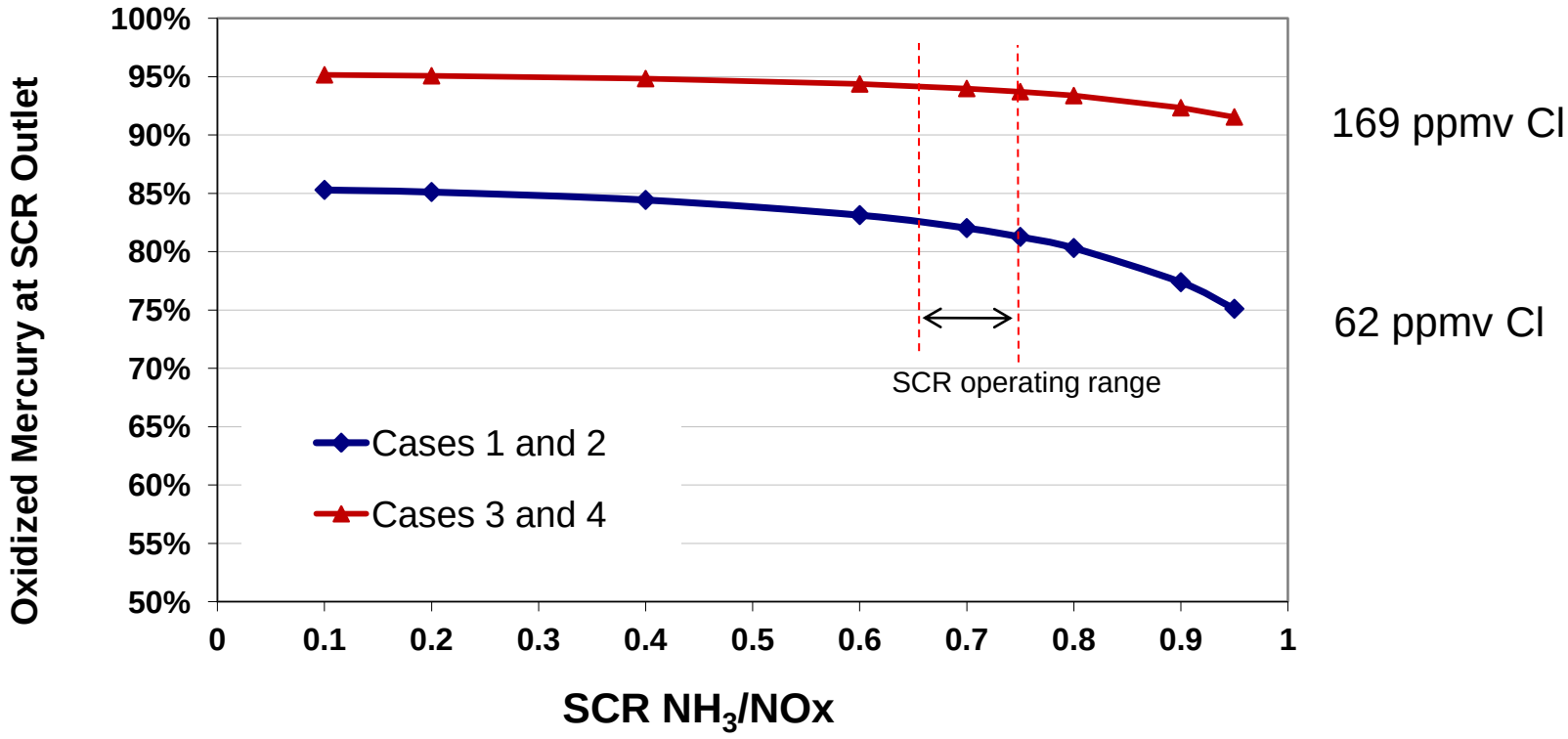
| Coal Properties | Low Sulfur Bituminous | High Sulfur Bituminous |
|---|---|---|
| **Proximate Analysis (%wt, dry)** | | |
| **Moisture** | - | - |
| **Volatiles** | 36.04 | 39.04 |
| **Fixed Carbon** | 52.38 | 50.98 |
| **Ash** | 10.45 | 9.98 |
| **Sulfur** | **1.13** | **3.25** |
| **Btu/lb** | 13430 | 11645 |
| **Ultimate Analysis (% wt, dry)** | | |
| **Carbon** | 76.35 | 74.84 |
| **Hydrogen** | 5.04 | 4.52 |
| **Nitrogen** | 1.54 | 1.55 |
| **Chlorine** | **0.01** | **0.27** |
| **Oxygen** | 5.48 | 5.6 |

# Simple Corrosion Predictor Model
## Predicted Fireside Wastage Rates




**Predicted corrosion rate of higher sulfur coal increases by factor of 3**

# Predicted Mercury Oxidation Results




| Case | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| Fuel | Low Sulfur Bit | Low Sulfur Bit | High Sulfur Bit | High Sulfur Bit |
| Staging | Y | N | Y | N |
| SCR inlet | 0.32 lb/MBtu | 0.40 lb/MBtu | 0.27 lb/MBtu | 0.34 lb/MBtu |
| Requierd deNOx | 70% | 75% | 65% | 72% |
| SCR Hg Oxidation | 82% | 81% | 94% | 93.50% |

# Summary

- Pollutant emission regulations require multi-pollutant considerations
  - Trade-offs can exist in system performance and cost impacts with different operating scenarios
  - Additional information required to enable optimization
- EPRI working to quantify impacts and potential costs associated with different operating scenarios
  - Conducting field tests to quantify trade-offs
    - Program 71 – Boiler Performance and NOx Control
    - Program 73 – Post Combustion NOx Control
  - Seeking/evaluating potential host sites

**For more information contact Rick Himes at rhimes@epri.com**

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