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EERC Technology – Putting Research into Practice

Effect of SCR on Mercury Speciation for Coal-Fired Power Plants

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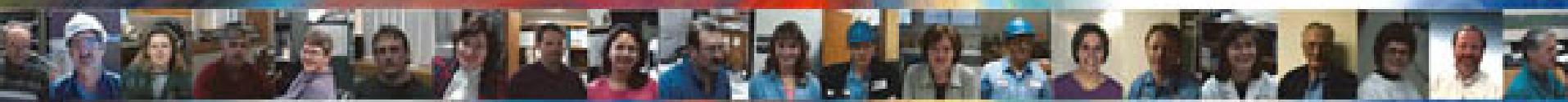

University of North Dakota

Potential Impacts of an SCR on Mercury Speciation

- Catalytically oxidizing the mercury
- Changing the flue gas chemistry (NO_x, SO_3 and NH_3)
- Changing the fly ash chemical composition
- Increasing residence time

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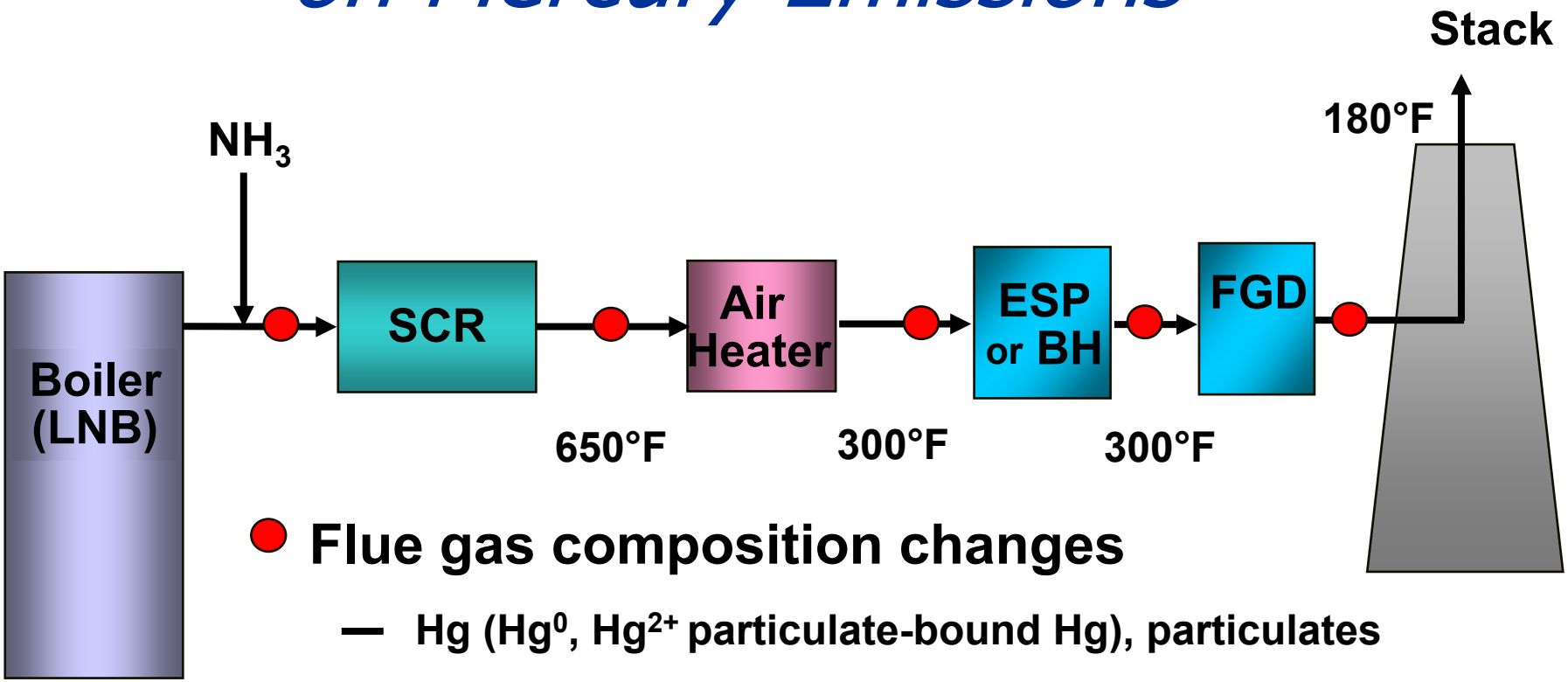
Impact of Pollution Control Devices on Mercury Emissions



- **Flue gas composition changes**
  - Hg (Hg^0, Hg^{2+} particulate-bound Hg), particulates
  - HCl, SO_x, NH_3, NO_x, LOI, others?

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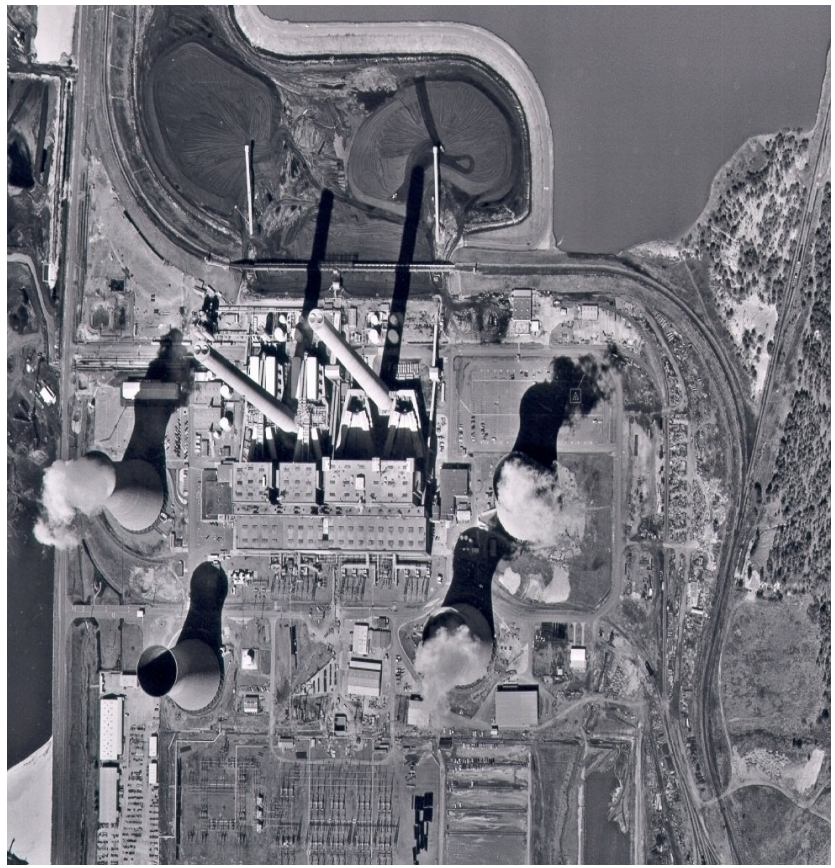
Project Objectives

- Determine the change in mercury speciation across the SCR catalyst.
- Determine the net effect of the SCR on mercury speciation
- Determine mercury removal by each pollution control device.
- Understand the effect of SCR catalyst properties and coal type.



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Plants Tested

Plant	Coal	Particulate Control	SO_2 Control	Catalyst Age, hrs
S1	PRB sub.	ESP	None	~8000
S2	OH bit.	ESP	Wet FGD	~2500
S2*	OH bit.	ESP	Wet FGD	~6000
S3	PA bit.	ESP	None	~3600
S4	KY bit.	Venturi scrubber	Venturi scrubber	~3600
S4*	KY bit.	Venturi scrubber	Venturi scrubber	~7000
S5	WV bit.	ESP	Wet FGD	~2200
S6	KY & WV Bit.	ESP	None	~5000

*Plants tested in 2001 and 2002.

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Coal Analyses
(Dry Basis)

Plant	Coal	Ash, %	Sulfur, %	Mercury, µg/g	Chlorides, ppm
S1	PRB sub.	4.7	0.3	0.09	<60
S2	OH bit.	12.6	4.2	0.17	1300
S2*	OH bit.	10.0	4.1	0.14	520
S3	PA bit.	15.0	1.8	0.40	1250
S4	KY bit.	9.1	2.9	0.13	360
S4*	KY bit.	9.6/8.6	3.5/2.7	0.16/0.10	250/760
S5	WV bit.	12.7	3.8	0.13	470
S6	KY & WV Bit.	12.3	1.1	0.07	1020

*Plants tested in 2001 and 2002.

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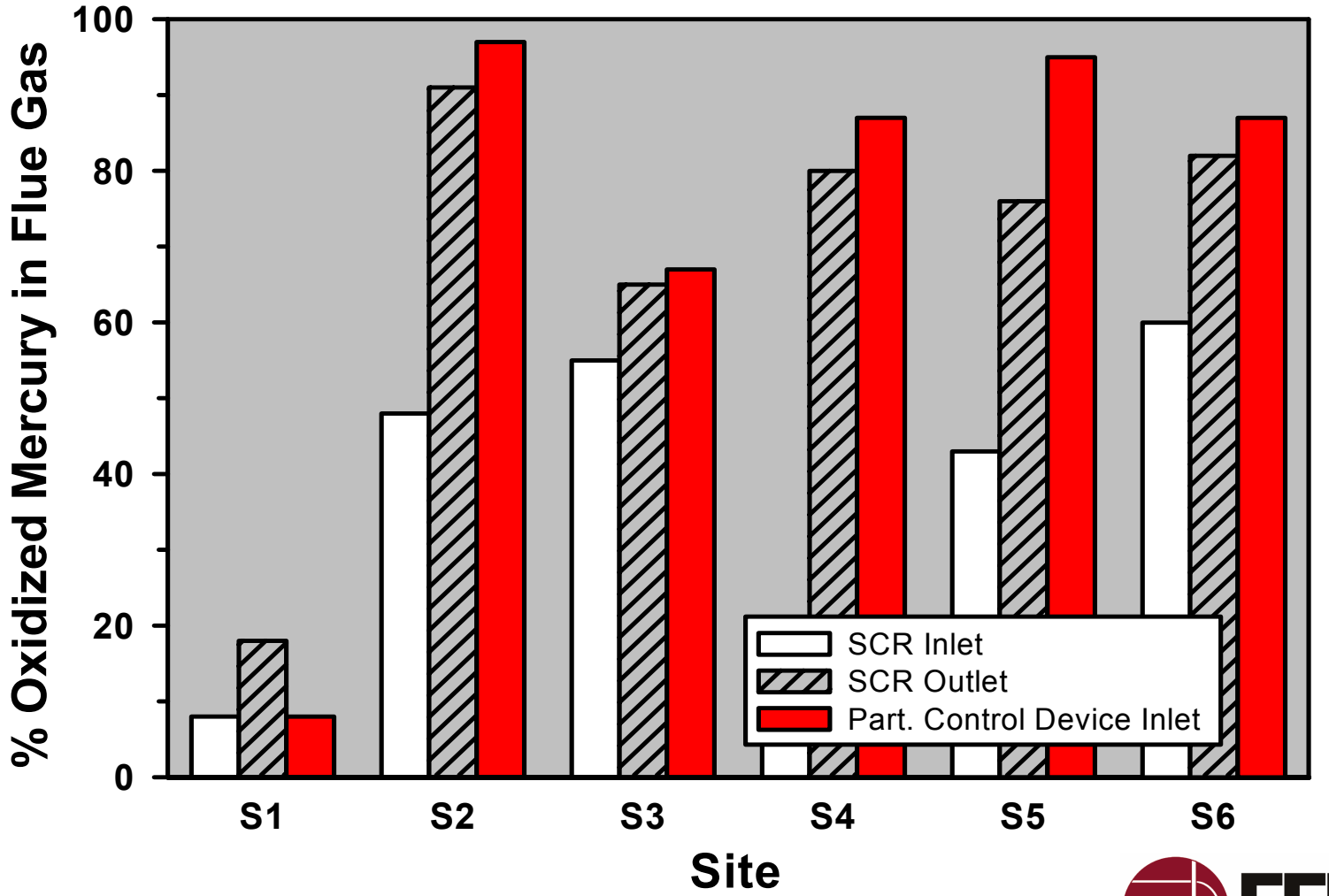
Effect of the SCR Catalyst on Mercury Speciation



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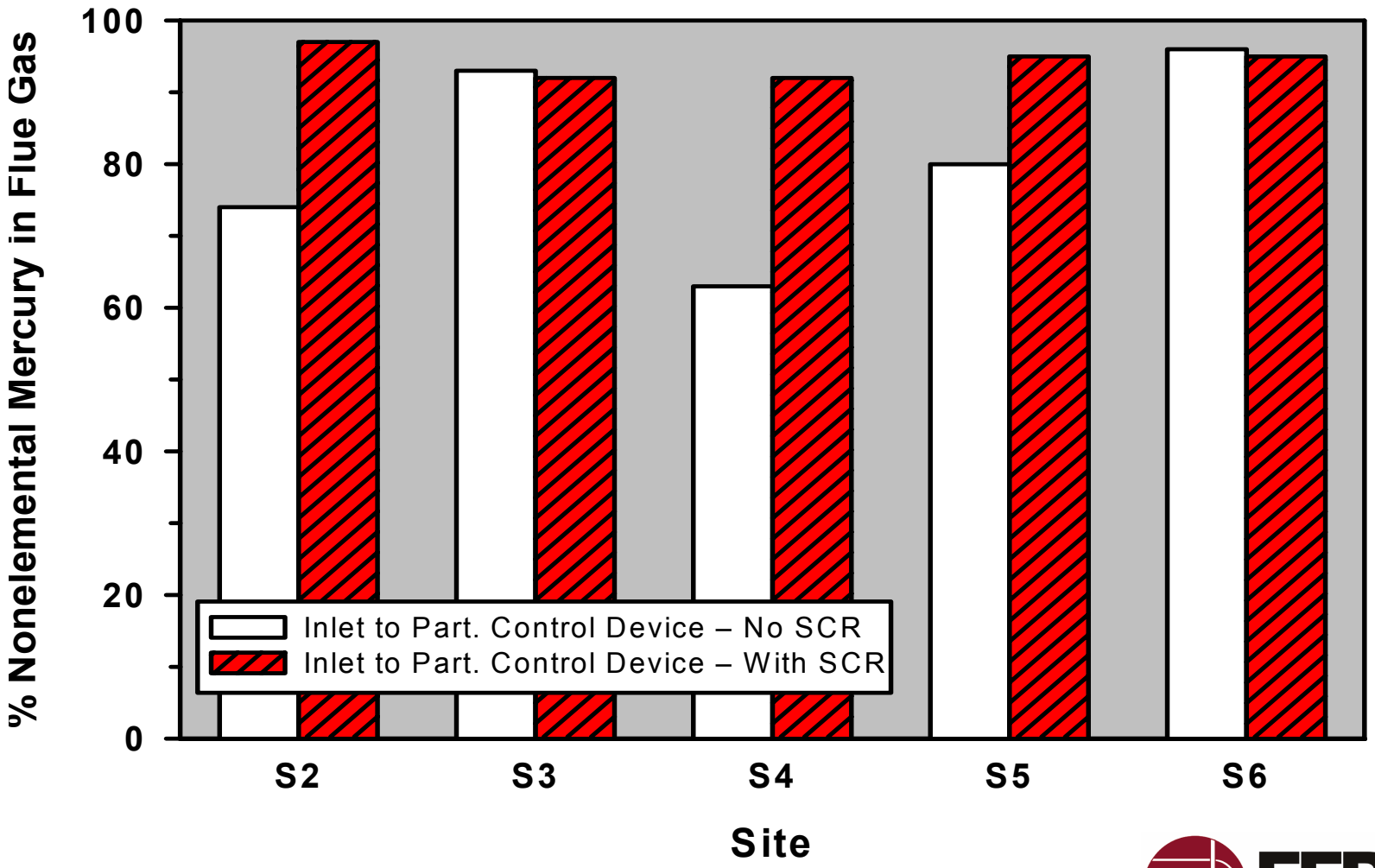
Overall Effect of the SCR on Mercury Speciation



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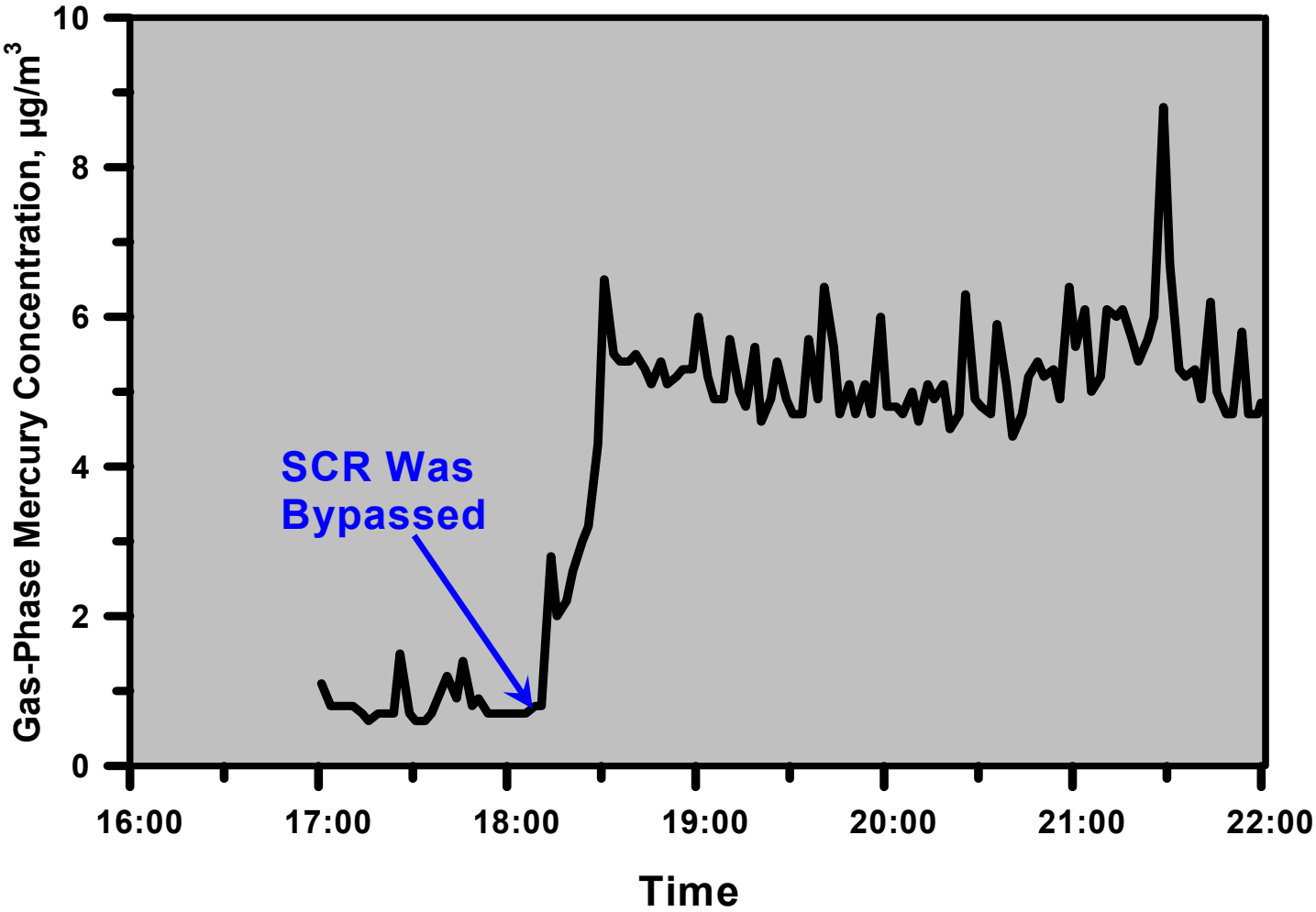
Effect of SCR on Mercury Emissions



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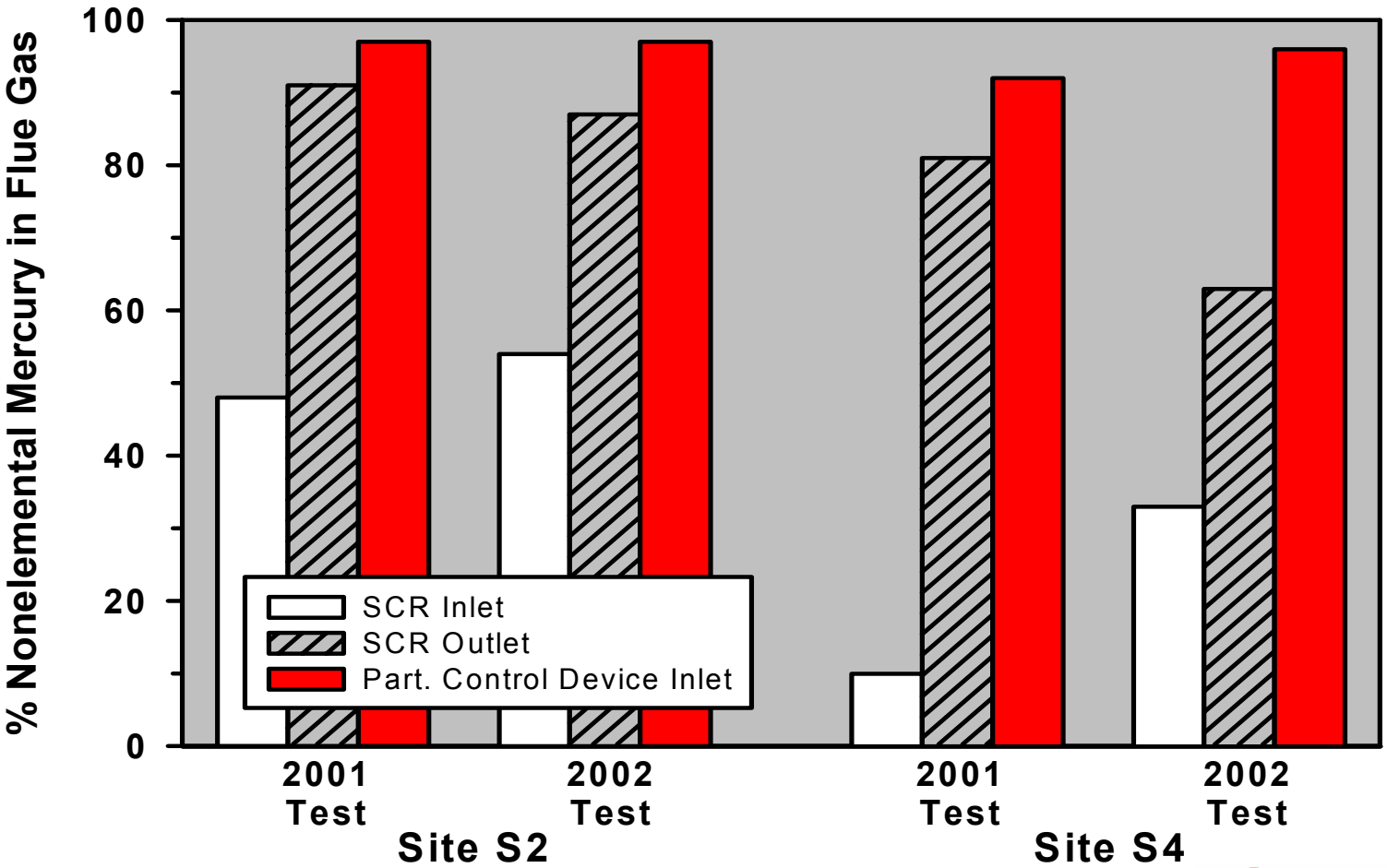
Effect of SCR Catalyst Aging on Mercury Speciation



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Effect of SCR on Mercury Reemission from a Wet FGD

Plant	Year Sampled	FGD Inlet Hg^0 Conc., µg/Nm³	FGD Outlet Hg^0 Conc., µg/Nm³	Increase, µg/Nm³	Total Hg Removal, %
With SCR					
S2	2001	0.4	0.9	0.5	89
S2	2002	0.3	1.3	1.0	84
S4	2001	0.5	0.8	0.3	90
S4	2002	1.0	1.3	0.3	91
S5	2002	0.7	1.0	0.3	91
Without SCR					
S2	2001	3.4	5.0	1.6	51
S4	2001	5.6	7.1	1.5	46
S4	2002	5.7	8.0	2.3	44
S5	2002	4.7	6.1	1.4	51

Conclusions for the SCR Project

- For plants firing eastern bituminous coals, mercury oxidization occurs across SCR catalysts. However, it appears to be variable and most likely related to a variety of factors, including coal characteristics and catalyst type, structure, space velocity, and age.
- At both sites that were retested, there appeared to be a decrease in mercury oxidation across the catalyst with time. However, other explanations are also possible, so a definitive conclusion cannot yet be reached.

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Conclusions for the SCR Project

- For the sites tested (three plants) that had wet FGD systems, there was an apparent increase in the concentration of Hg^0 across the wet FGD (less when the SCR was operating), indicating some reemission. It should be noted that these three plants with wet FGDs are not representative of the industry.

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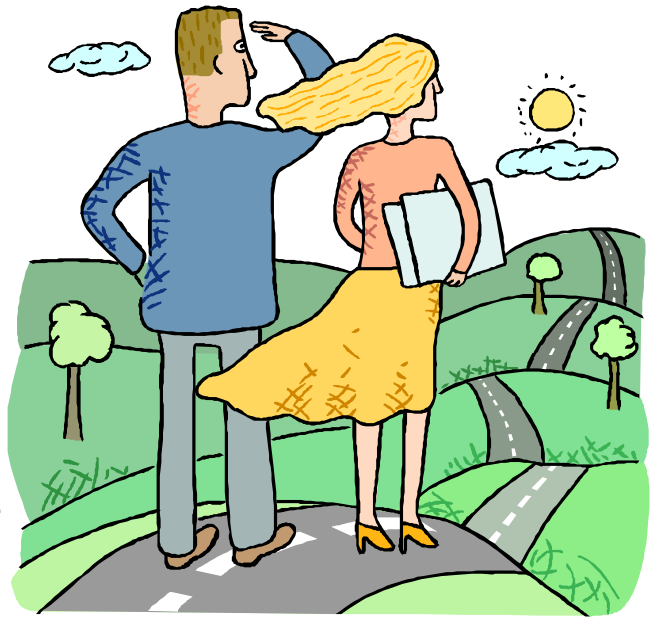
Future Testing Being Proposed



- Test a representative power plant with an SCR and firing a pulverized PRB subbituminous coal
  - Potential for two sites.
- Evaluate the impact of blending fuels (PRB and eastern bituminous coal) on mercury speciation.
- Catalyst aging
  - Provide a third year of data for one and possibly both sites tested in 2001 and 2002.

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Future Testing Being Proposed

- More fully evaluate the effect of an SCR on the mercury reemission potential of wet FGD systems.
  - Complete tests at a more representative wet FGD (forced oxidation).
- Determine the level of variability of mercury speciation using Hg SCEMs.
- Evaluate the impact of blending fuels (PRB and eastern bituminous coal) on mercury speciation.

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Key Partners

- **Cosponsors**
  - Paul Chu, EPRI
  - Lynn Brickett, DOE, NETL
  - CW Lee, EPA
- **Sampling leaders**
  - Jeff Thompson and Richard Schulz, EERC
  - Wei-Ping Pan, Western Kentucky University
- **Power plants**
- **Analytical support**
  - WE Energies

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