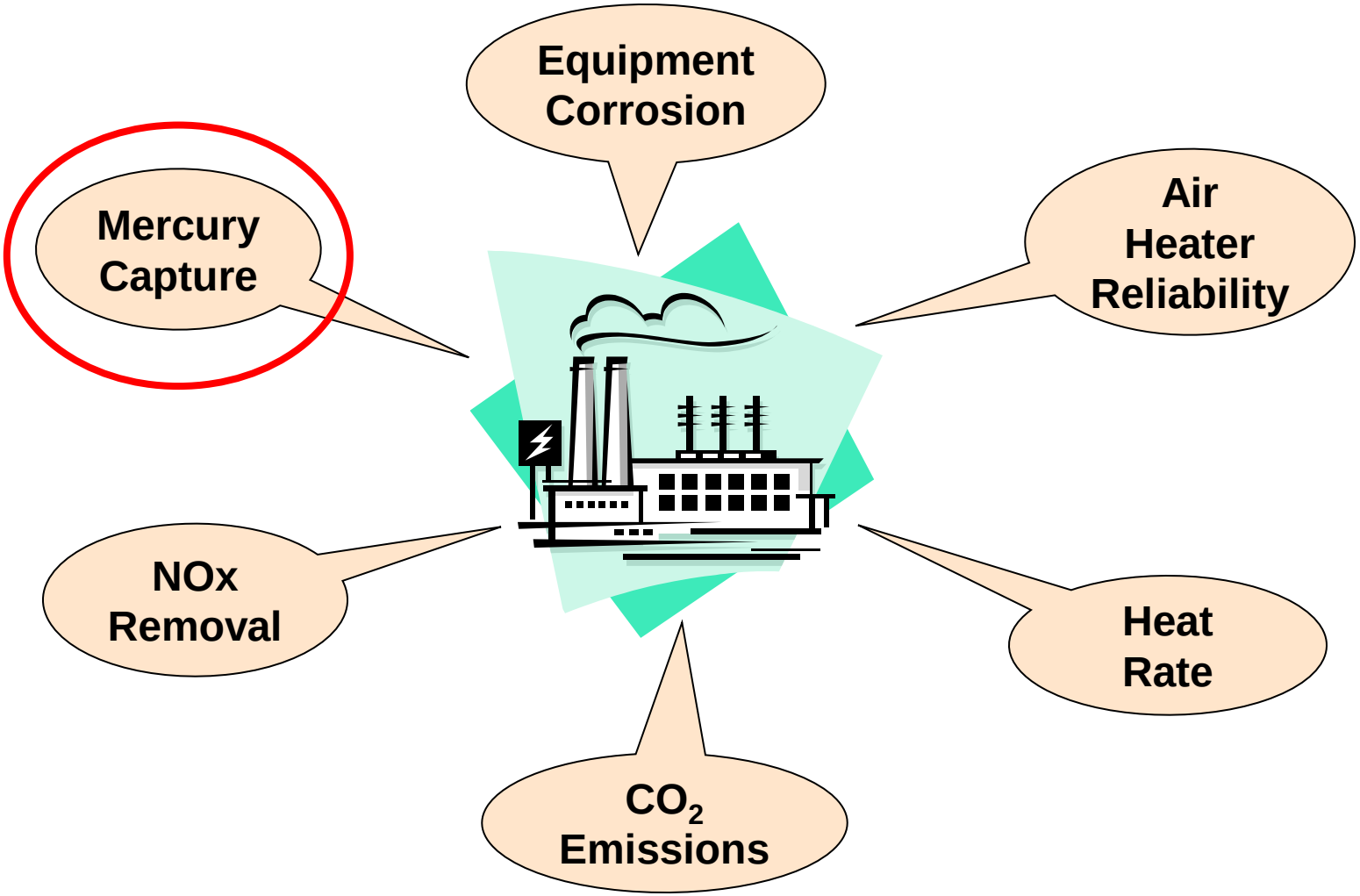
URS

"Effective SO_3 and Mercury Control Using SBS Injection™"

Sterling Gray, URS Corporation
Jim Jarvis, URS Corporation

McIlvaine Hot Topic
March 8, 2012

SO_3 Adversely Impacts …



SBS Injection™ Technology

Features

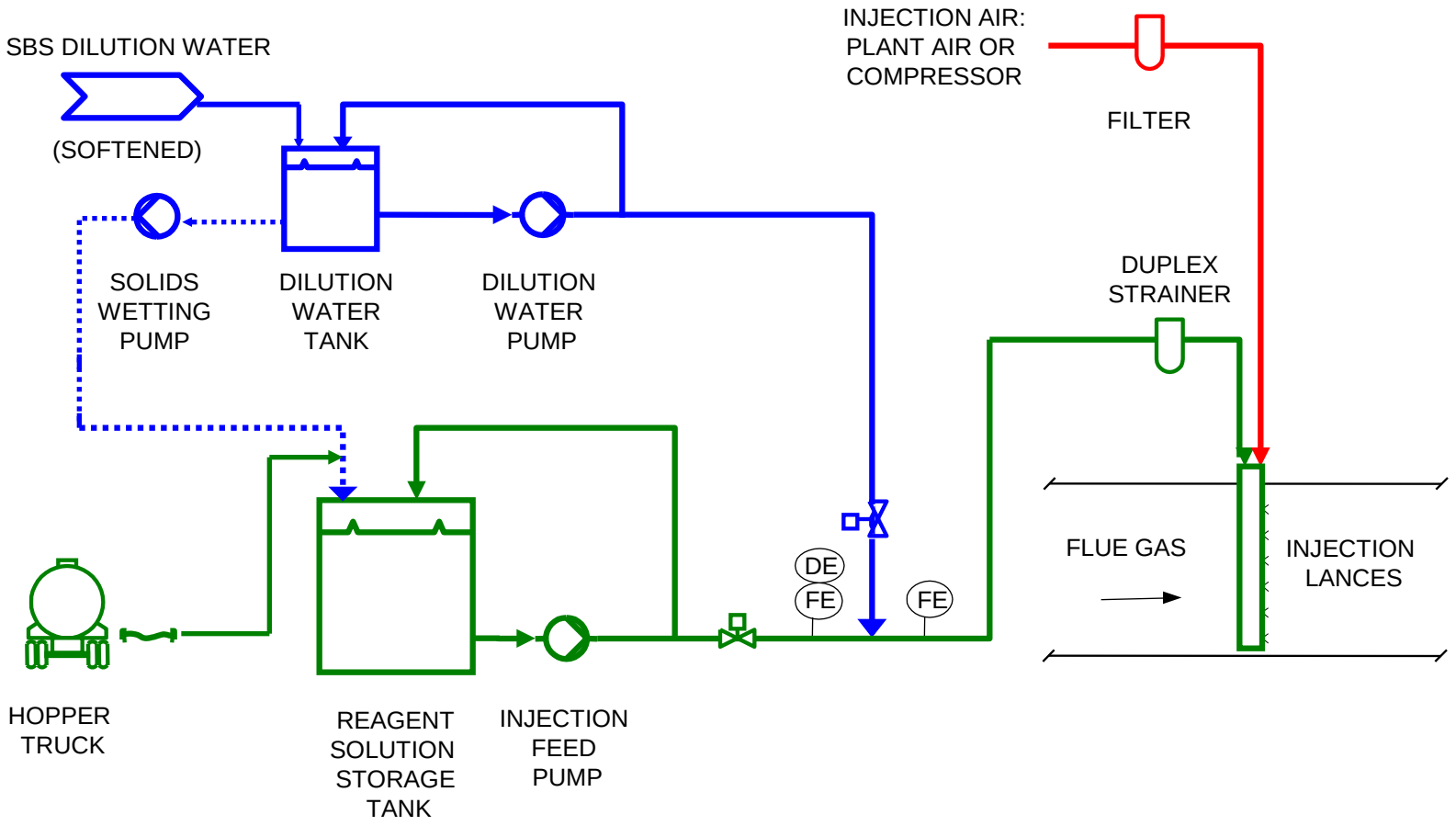
- Patented Technology
- Simple Solution Injection
- Sodium-Based Reagent
- Dual-Fluid Atomization
- Selective Reactions
- High SO_3 Removal
- Low Injection Rate
- Product Collected with Ash

Benefits

- Opacity Elimination
- Corrosion Reduction
- ESP Enhancement
- HCl and Se Removal
- Potential Heat Recovery
- SCR/SNCR Flexibility
- Hg Capture Enhancement
- CO_2 Reduction

Maximum Benefits with "Upstream" Injection

Simplified SBS Flow Diagram



SBS Injection Installations

- Installation List
  - 24 Boilers
  - 11 Plants
  - 15,000 MW
- Since 2005…
  - All “upstream” of APH
  - Some “downstream” systems relocated
- “Pre-SCR” Injection
  - 4 Plants
  - 5100 MW
  - 3 yrs Op experience

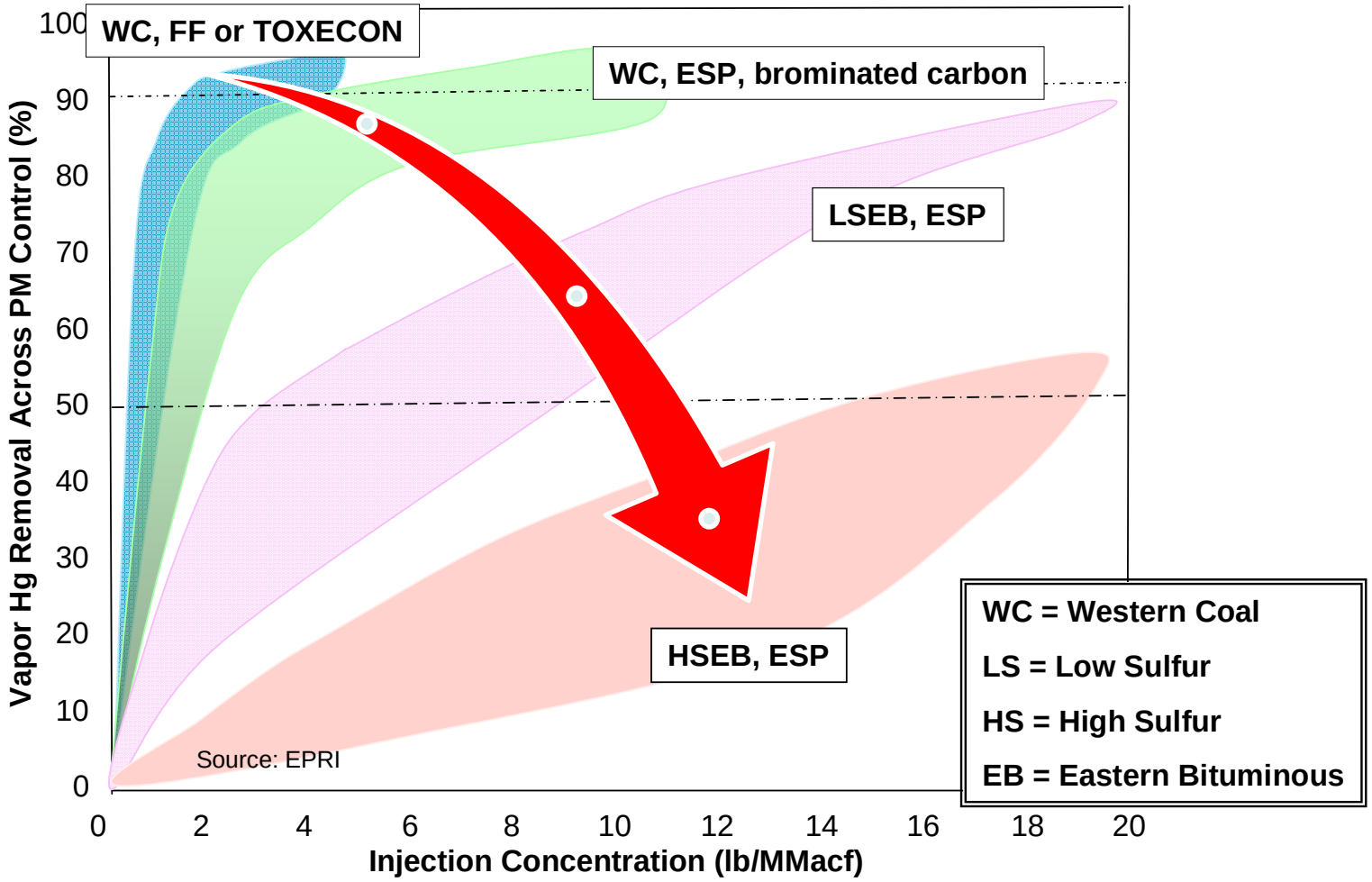
Utility	Plant	State	MW	Design SO_3	Injection Location	Reagent	Startup Date
FirstEnergy	Mansfield 1-3	PA	3 x 860	80	Air Heater Inlet	Sodium Sulfite	2003
TVA	Widows Creek 7	AL	550	54	Air Heater Inlet	Sodium Sulfite	2003
NIPSCO	Bailly 8	IN	365	59	Air Heater Outlet	Sodium Carbonate	2004
Vectren	Culley 3	IN	287	48	SCR Outlet	Sodium Carbonate	2004
PPL	Montour 1-2	PA	2 x 765	42	Air Heater Outlet	Sodium Carbonate	2004
Duke Energy	Gibson 1-5	IN	5 x 650	110	Air Heater Outlet	Sodium Carbonate	2005
DP&L	Killen 2	OH	635	34 / 36	Econ Outlet / SCR Outlet	Sodium Carbonate	2007
IP&L	Harding St 7	IN	465	58	SCR Outlet	Sodium Carbonate	2007
NIPSCO	Bailly 7	IN	180	59	SCR Outlet	Sodium Carbonate	2008
DP&L	Stuart 1-4	OH	4 x 620	90	SCR Inlet	Sodium Carbonate	2008
Duke Energy	Gibson 1-3, 5	IN	4 x 650	110	SCR Inlet	Sodium Carbonate	2009-2011
Allegheny Energy	Pleasants 1-2	WV	2 x 700	74	SCR Outlet	Sodium Carbonate	2012
Hoosier Energy	Merom 1-2	IN	2 x 540	100	SCR Inlet	Sodium Carbonate	2012

Sulfuric Acid Emission Results

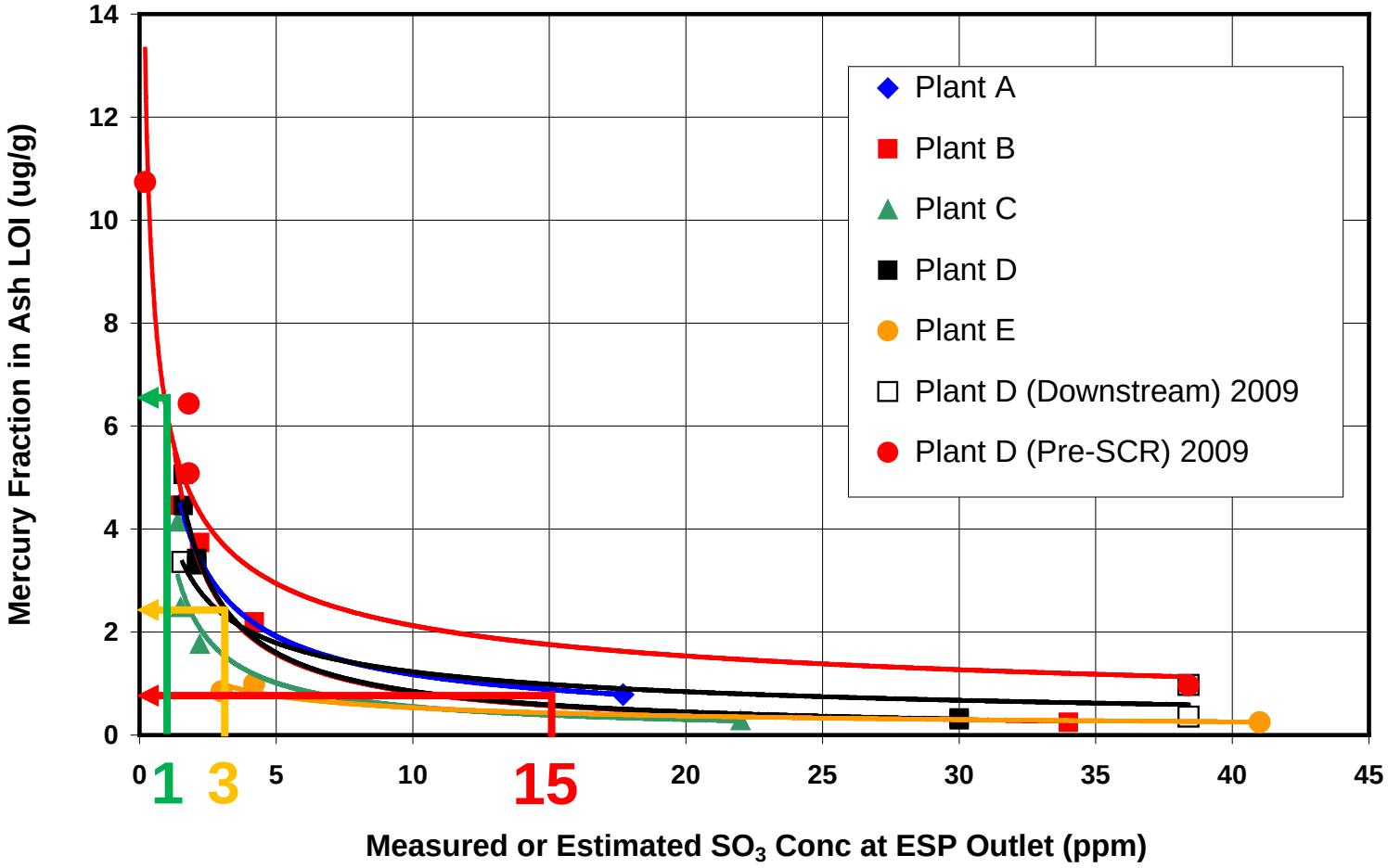
Plant	Inlet SO_3 (ppmvd - 3% O_2)	Stack SO_3 (ppmvd - 3% O_2)	SO_3 Removal (%)	H_2SO_4 Emissions (lb/MMBtu)	Particulate Control Device	SO_2 Control Device
A	32	1.3	95.9%	0.0038	ESP	WFGD
B	65	1.6	97.5%	0.0046	Venturi Scrubber	WFGD
C	36	1.3	96.4%	0.0038	ESP	None
D	66	1.2	98.2%	0.0035	ESP	WFGD
E	45	0.2	99.6%	0.0006	ESP	WFGD
F	15	0.6	96.0%	0.0017	ESP	WFGD
G	44	0.5	98.9%	0.0015	ESP	WFGD

Recent installations demonstrate <1 ppm SO_3 and <0.003 lb/MMBtu SAM

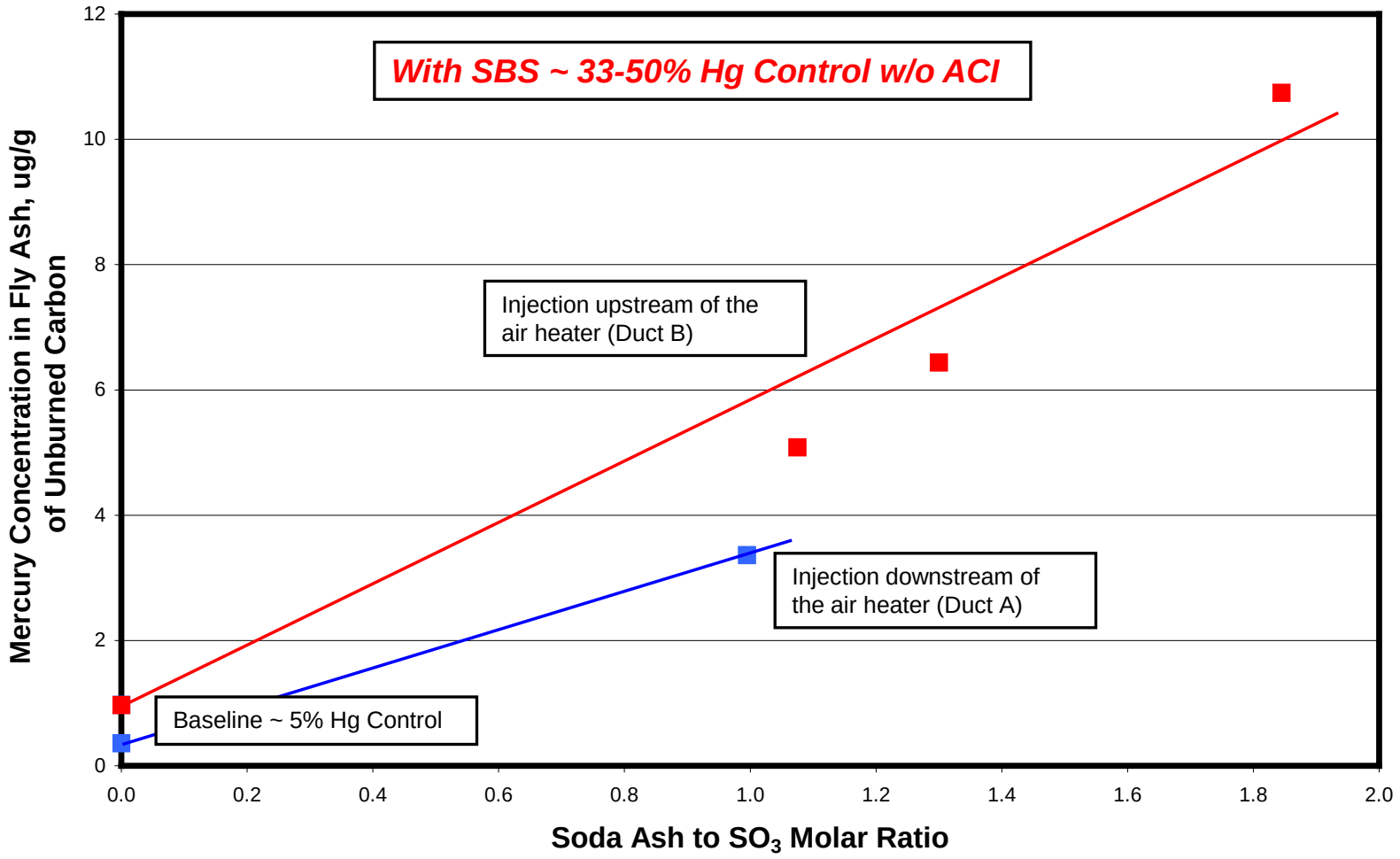
Impact of SO_3 on ACI Performance



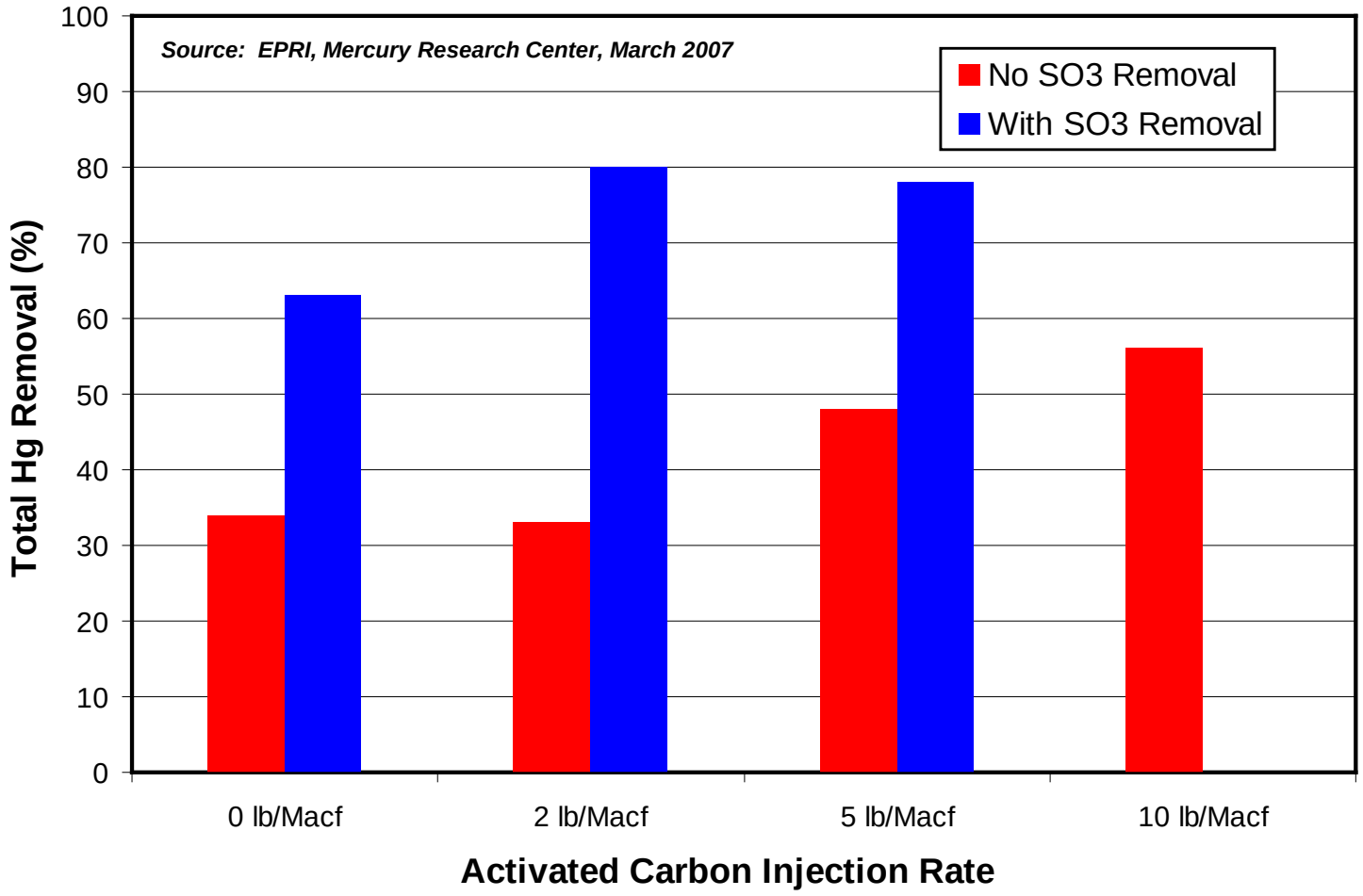
SO_3 Impact on Ash Hg Capture



Mercury Co-Removal Results



Impact on Hg Removal with ACI



Summary

- SO_3 can adversely affect plant reliability, efficiency, and performance of emissions control systems – including mercury controls
- Recent regulations and rules will require significant reductions in mercury emissions as well as increasing control of sulfuric acid mist
- SBS Injection can significantly reduce SO_3 levels prior to the APH - and reduce stack SO_3 emissions to < 1 ppm (<0.003 lb/MMBtu SAM)
- Mercury capture rates of 50-90% are achievable with high-efficiency SO_3 control - and little to no carbon injection

Questions?

Contact Info:

Sterling Gray
512-633-4975
sterling.gray@urs.com