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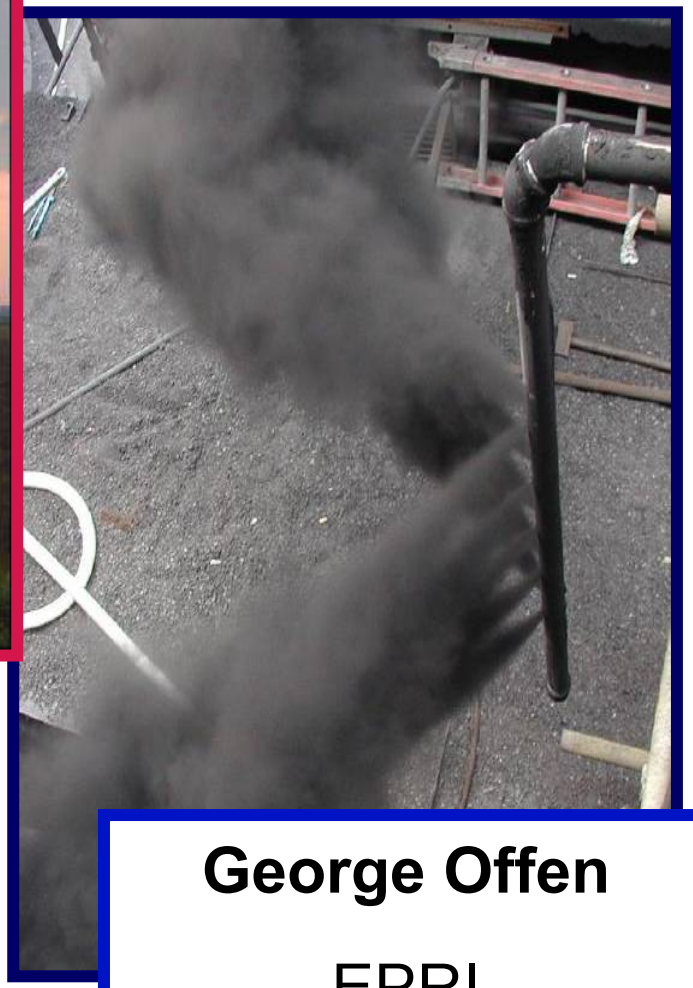
EPRI's Perspectives on Mercury Controls for Power Plants

DOE/NETL's 2007 Mercury Control Technology Conference

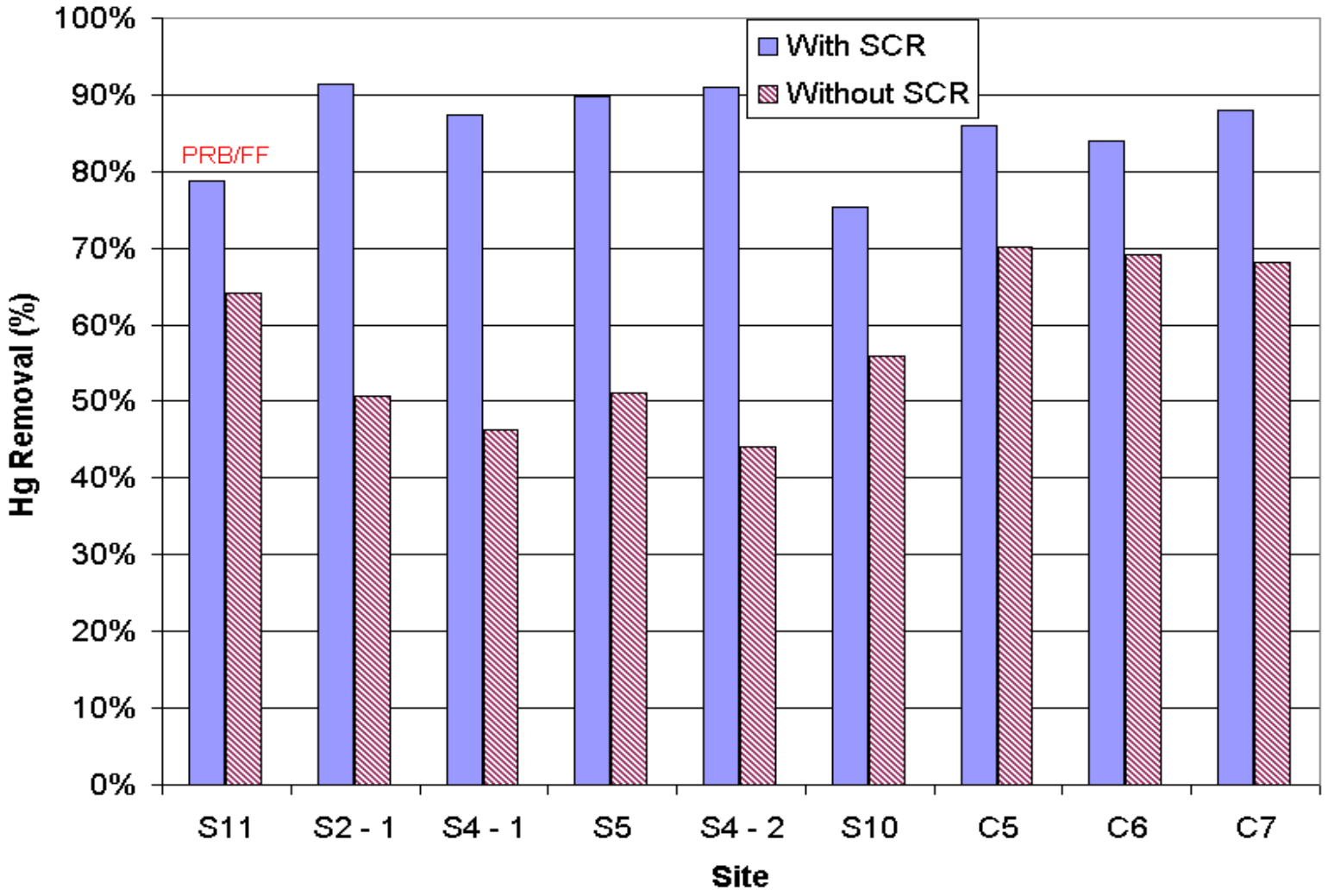
December 11, 2007



George Offen

EPRI

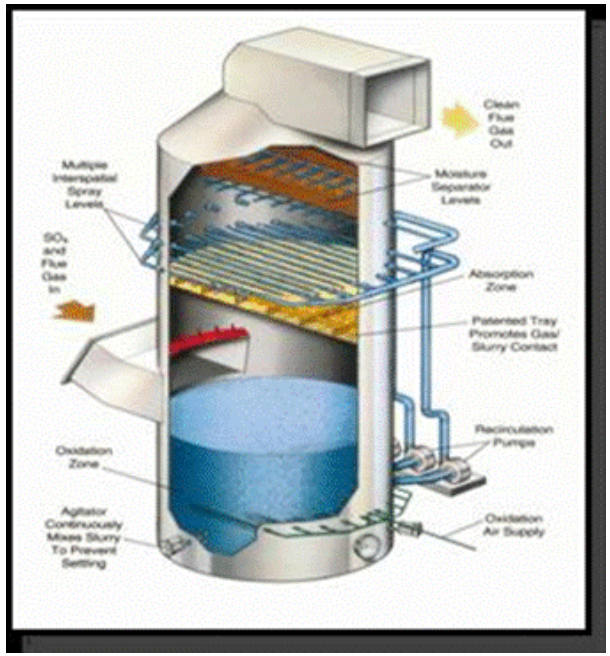
Co-benefits Offer Substantial Hg Reductions, Not Always at Same High Level



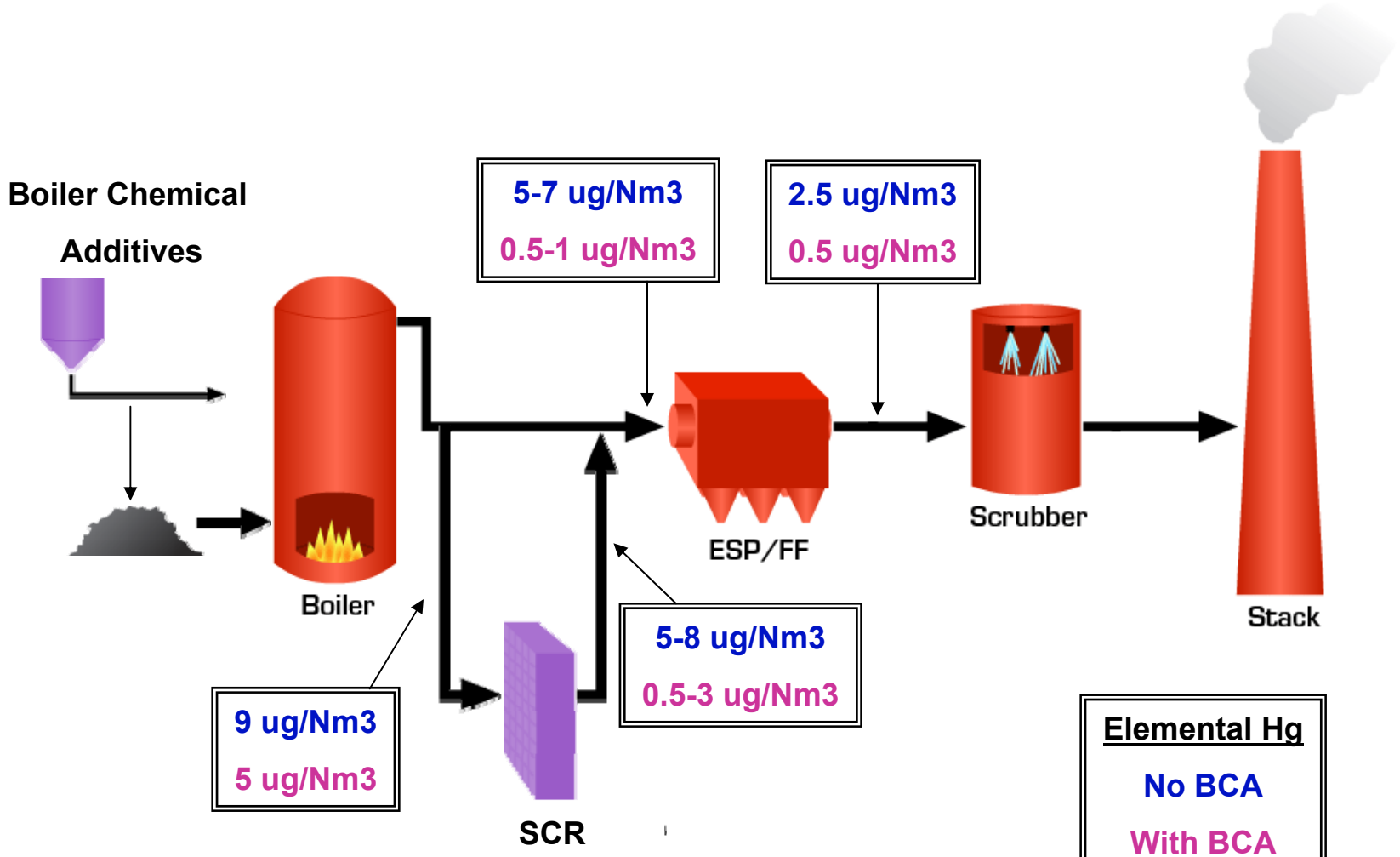
Co-benefits – What Do We/Don't We Know?

- **Capture rates high, but 90% ΔHg not routinely achieved**
  - **90% (some state targets) compliance requires >90% operation**
  - **Only 4 of 20 measurements >90%**
  - **One site as example**
    - **95% Hg^{2+} at FGD inlet**
    - **96% Hg^{2+} "removal"**

    Ideally ➔ 91.2% Hg removal, but
    - **0.4 μg/m^3 re-emissions ➔ 86% removal**
- **Research plans**
  - **Continue fundamental chemistry work**
    - **Why re-emissions? How stop?**
    - **How direct Hg to desired discharge stream?**
  - **Seek patterns from data for SCR/FGD sites with <90% removal**
  - **Evaluate options to enhance removal**



One Potential Solution – Boiler Chemical Additives (BCA) to Promote Hg Oxidation



Any unintended consequences?

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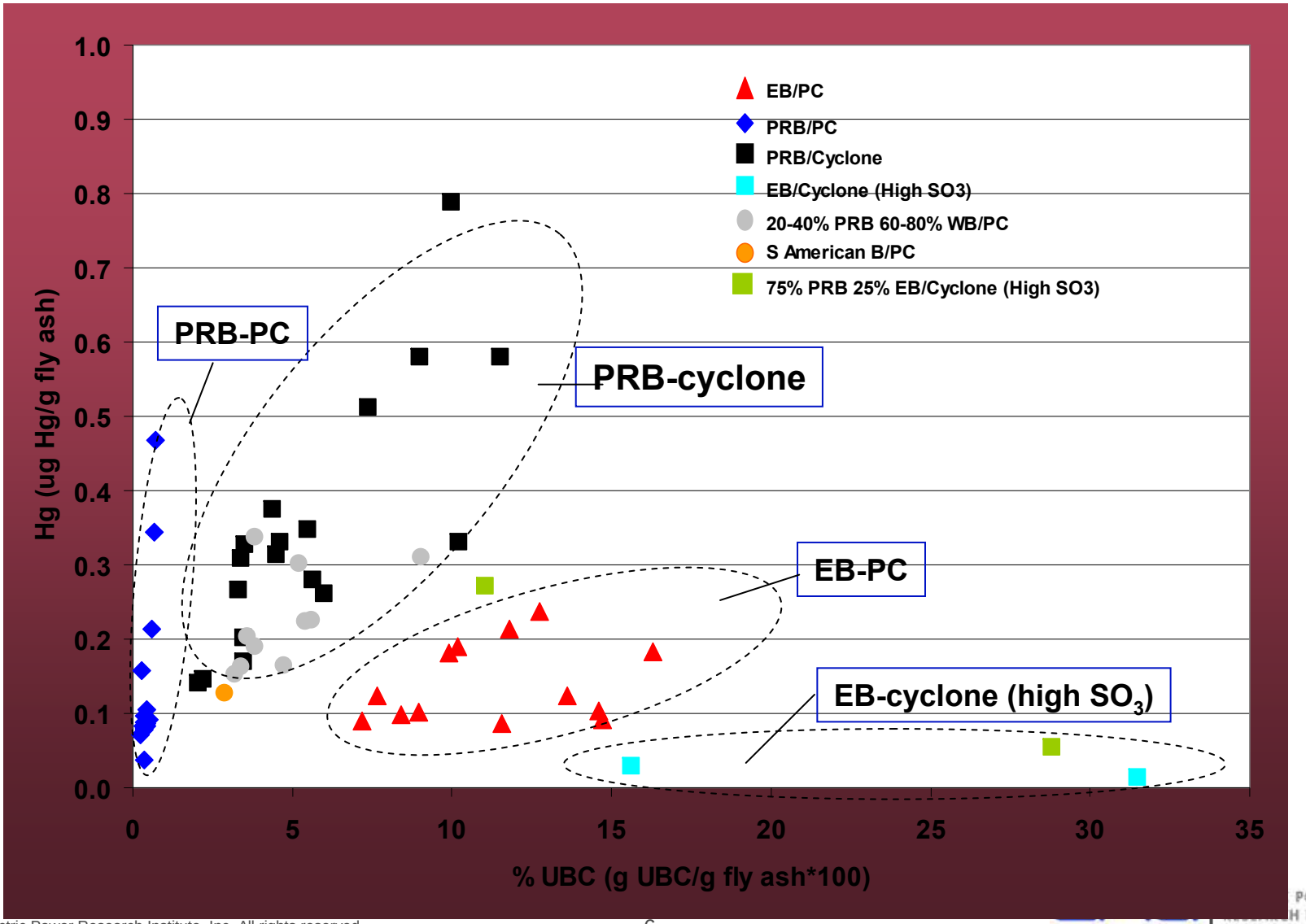
Re-emission Inhibitors for Enhanced Mercury Control

- 2004 options = B&W's NaHS and DeGussa's TMT-15
- B&W additive tested by DOE-NETL ➔ mixed results, so EPRI investigated TMT-15
- Pilot-scale inconclusive, full-scale (2 sites) not effective, complex behavior
  - Periods of low and periods of high re-emissions
  - Complex behavior with Ca, Mg in FGD liquid
- Now testing other additives – e.g., Nalco, PRAVO, other
- Expect related chemistry for (a) re-emissions and (b) Hg partitioning to liquid vs solid discharge streams
- Need also determine any impact on discharges/products

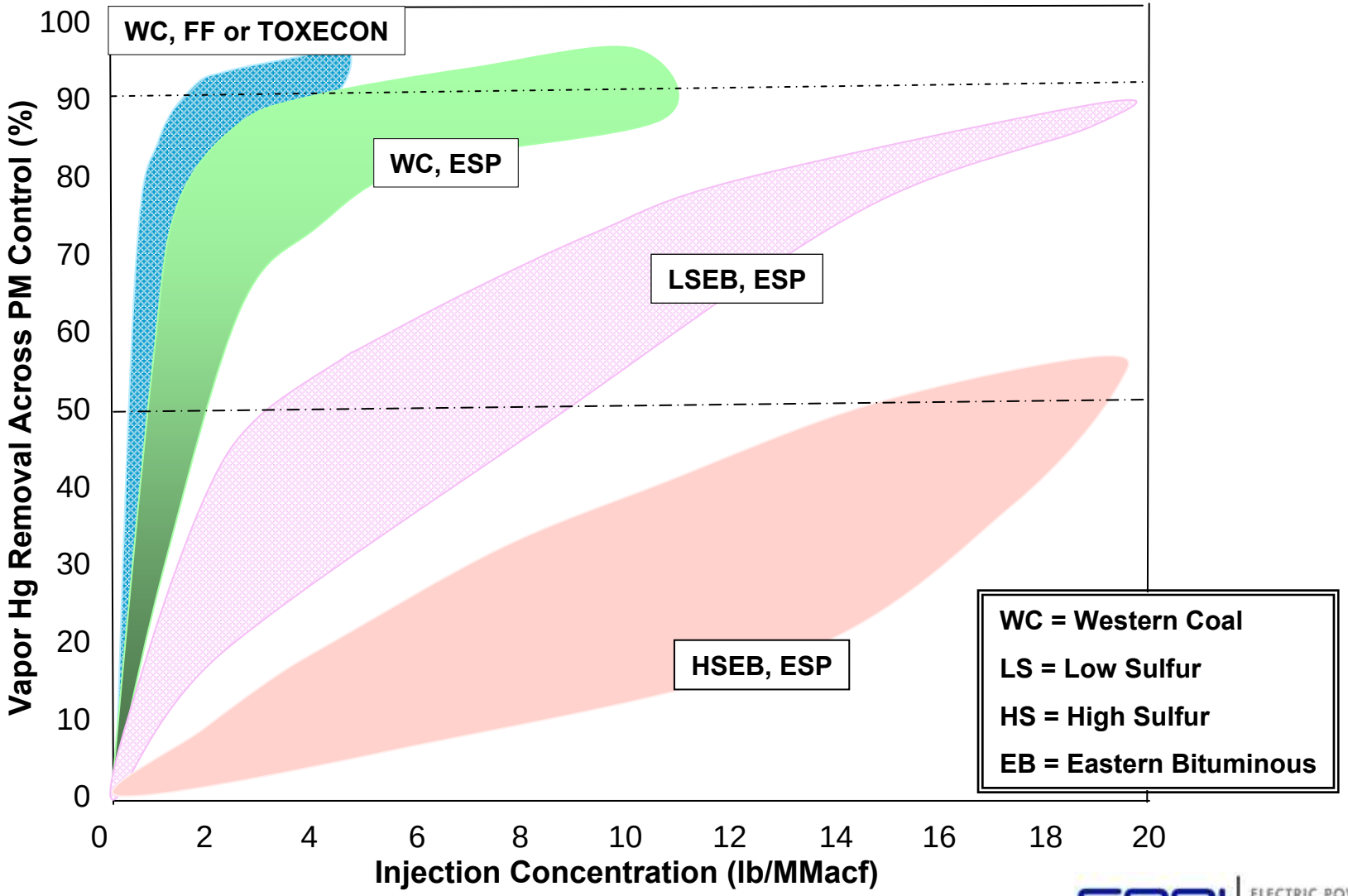
Coal and Firing Type More-or-Less Uniquely Determine Hg Capture by Fly Ash

(Most data from tests <1 month)



Similar Patterns Found to Hold for Hg Capture by Activated Carbon

(Most data from tests <1 month)



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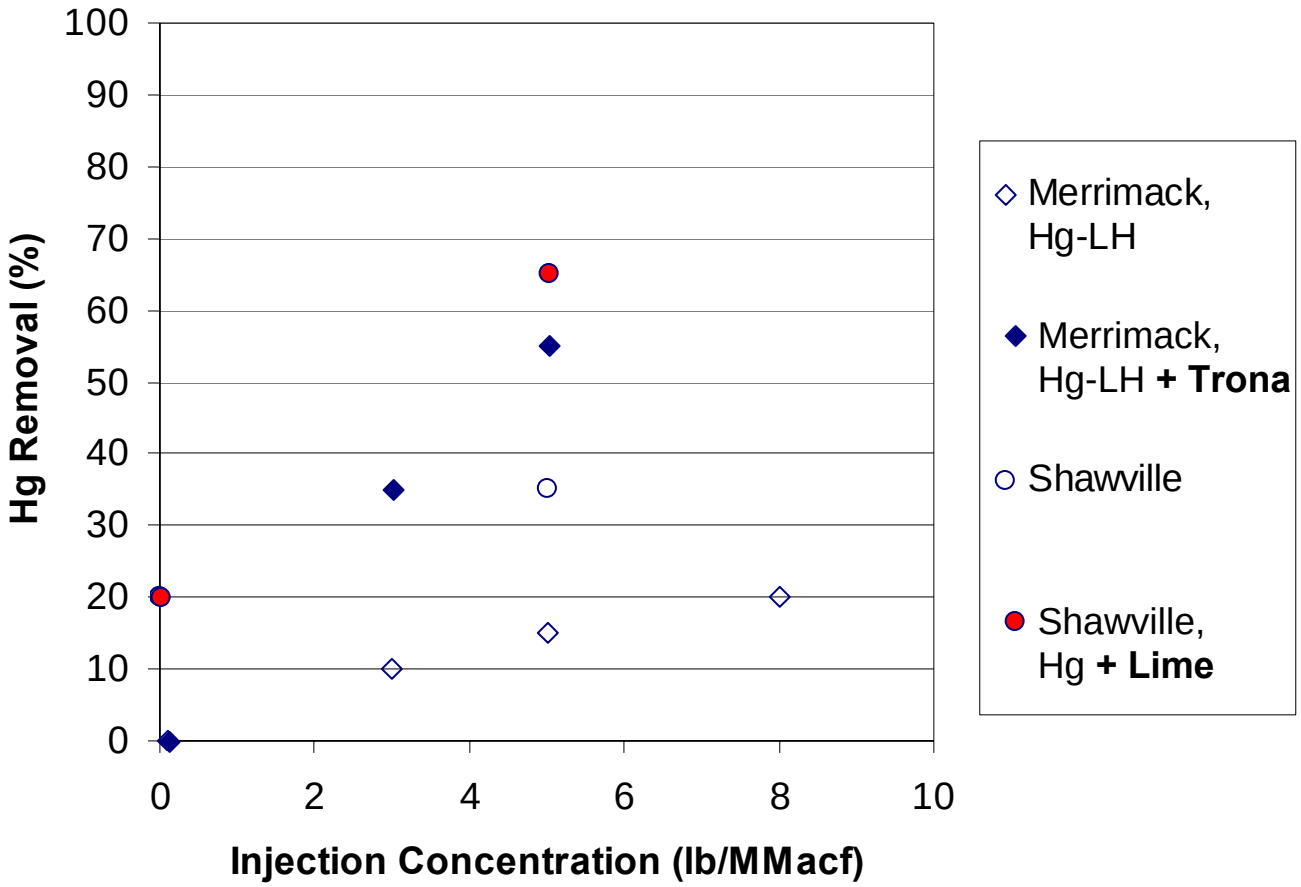
Co-Injection with Alkaline Sorbents – One Approach to Reduce Impact of SO_3



Slide courtesy of ADAES

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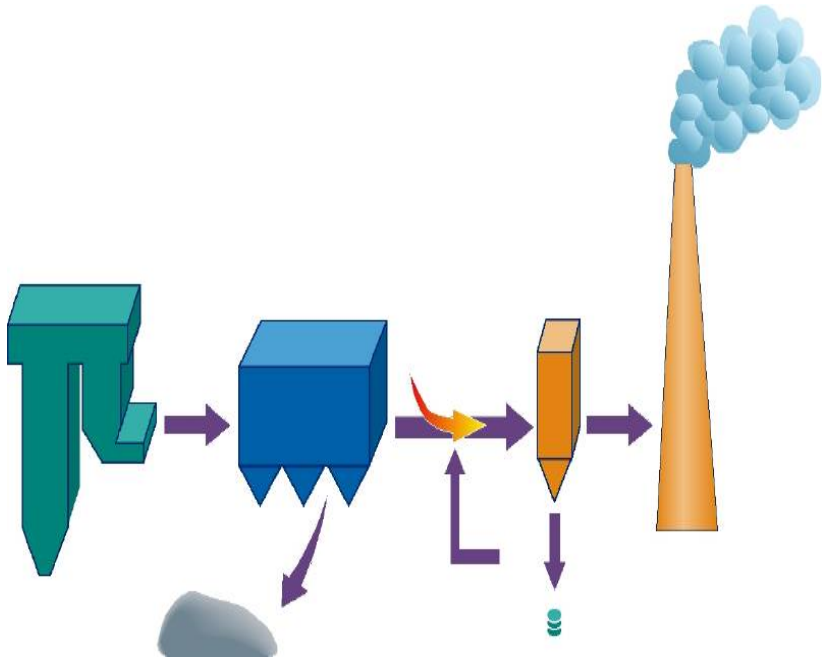
TOXECON™: Good Performance Observed at Presque Isle

TOXECON™ -- injection between ESP and baghouse

- ✓ >90% removals (PRB)
- ➢ Very limited experience on E. Bit (only low-S)
- ✓ Much less sorbent than injection ahead of ESP
- ✓ No ash impacts
- ✓ Minimizes particulate emissions
- • Operating surprises being addressed
- ➢ Requires baghouse retrofit @ $80 to >$150/kW



Focus of EPRI Research
(w/DOE, EPA, Members, Contractor/Supplier Partners)

- **Address issues**
  - **SO_3, hot-side ESP, injector performance**
  - **Cost-acceptable options for 90% compliance**
  - **PM emission increases (NSR?)**
  - **Potential bromine impacts – boiler, FGD, products**
  - **Other metals – As, Se, ….**
  - **Confidence in technology – expand experience base & validate models**
- **Improve process, reduce impacts, lower costs**
  - **Prevent re-emissions and control fate of Hg in FGD**
  - **Improve sorbent technology/understanding**
    - **Injection limits for ash use in concrete**
    - **Novel – for high T or high SO_3; with low ash impact or easily separable from ash; better ΔHg**
    - **Lower cost**
  - **Novel technologies**

User Challenges for Commercial, Compliant Application

- Limits set at level of best performers
  - Data show range of performance
  - Reasons for site-to-site differences often not understood or predictable
- Are guarantees comparable to other APCDs?
  - If site-specific, not consistent with uniform limit
  - Are they comprehensive?
    - If ACI, more than ΔHg vs ACI rate?
    - If co-benefits, at what SV, ΔNOx, L/G, ΔP, etc.
- High ΔHg requirements → very low Hg emissions. Can we measure accurately?
- Mercury compliance measurement still WIP
- The unexpected?

Questions?