COMMENTS ON SELECTED EPA ASSUMPTIONS REGARDING MERCURY CONTROL COSTS

Submitted by the

Utility Air Regulatory Group

June 3, 2002

KEY ISSUES

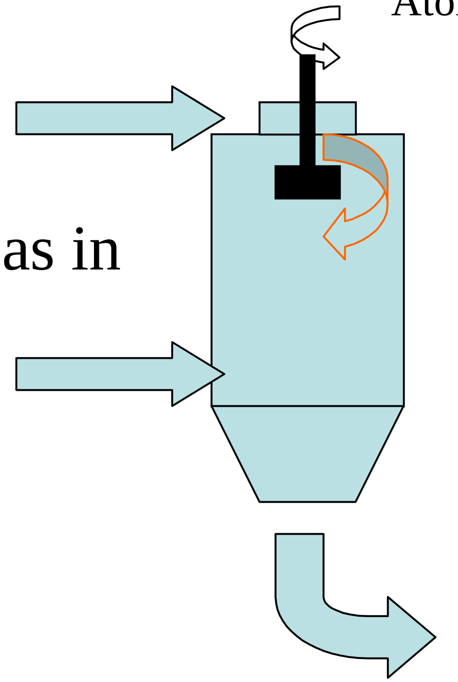
- Feasibility of spray cooling
- Carbon injection/ESPc: feasibility, applicability
- Co-benefits of SNCR, SCR

SPRAY COOLING

- Critical for least-cost Hg reduction, per EPA
- Lower flue gas temperature by 50-100° F improves
  - ESP opacity
  - Carbon use/Hg removal
- Used for non-utility applications w/low sulfur and ash content (steel mills)
- Evaluated but not commercially deployed at:
  - Duke Power/Dan River (1996)
  - Otter Tail Power/Big Stone (1995)
  - SWEPCo/Harrington (1995)
- Pacificorp/Jim Bridger (1996) status not confirmed

SPRAY DRYING, COOLING: NOT THE SAME

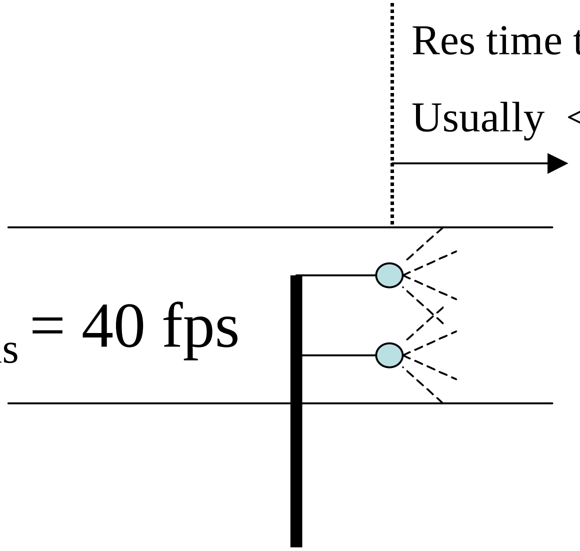
Spray Drying



V_{gas} = 5-8 fps, 3-5 sec residence time

Capital: $75-100/kW

Spray Cooling



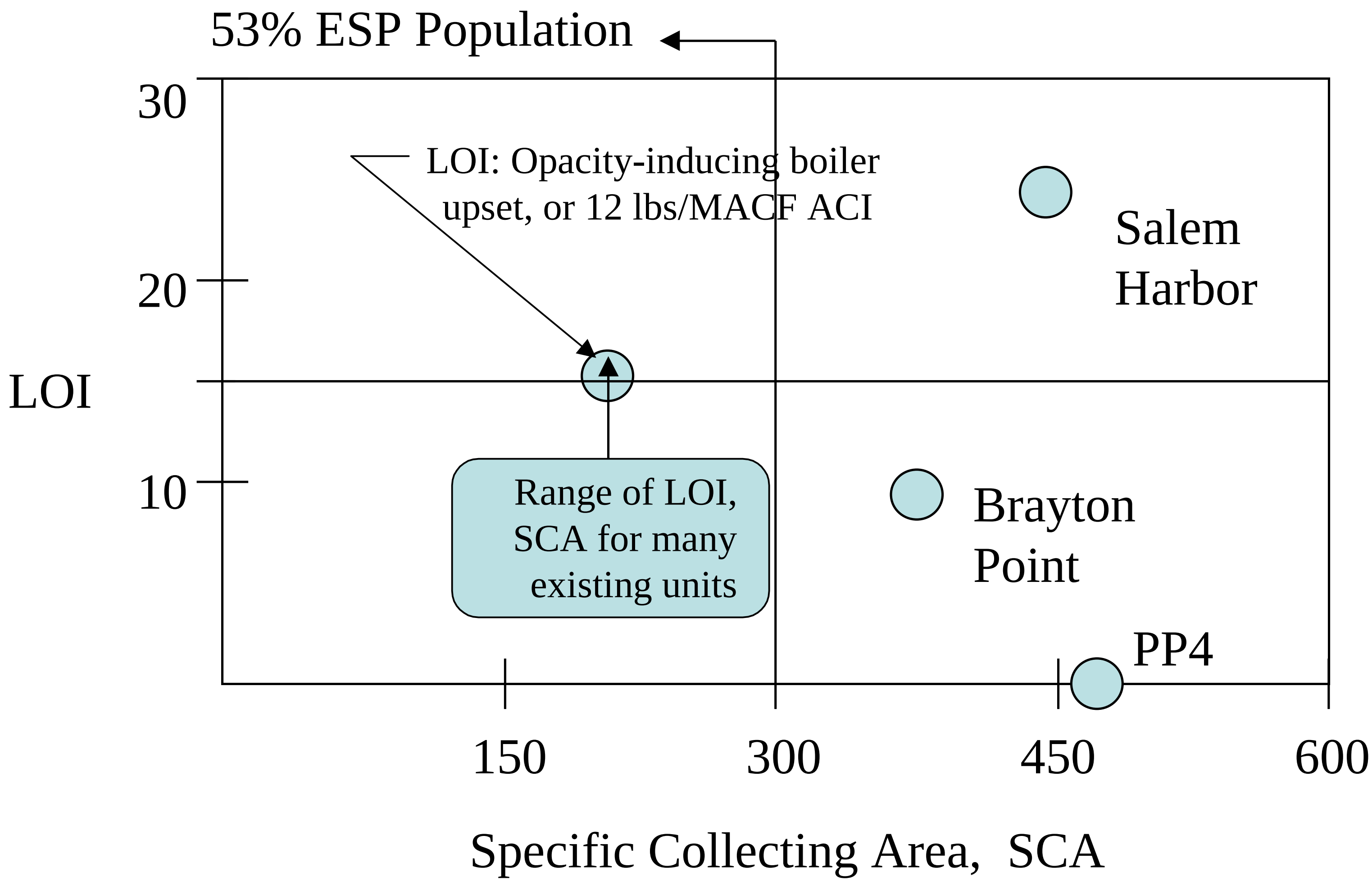
V_{gas} = 40 fps

Capital: $2-3/kW

SPRAY COOLING AT PP4 DEMO (SOLE COMMERCIAL EXPERIENCE)

- Deposits noted via cameras within 1 hr operation
- Key areas of concern (flow vanes, baffles, ESP inlet, etc.) inaccessible to video monitor
- Deposits removable, but after injection terminated
- Significant finding: 50° F temperature drop did not benefit Hg removal, carbon utilization

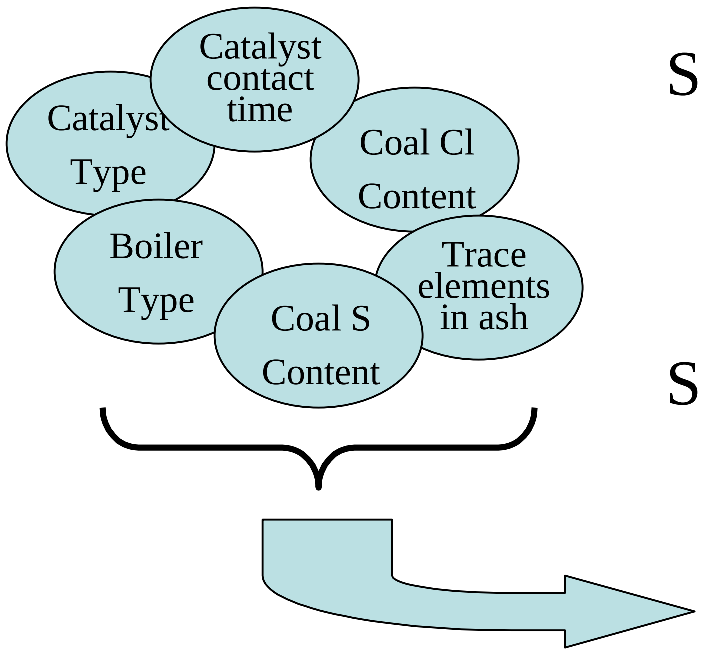
KEY TO THE ESP: CARBON (LOI), SCA (RELATIVE SIZE)



CARBON INJECTION/ ESPc FEASIBILITY

- PP4: one of the most ACI-tolerant ESPs
  - large SCA (465)
  - LOI < 1% (volatile PRB fuel)
- 53% of US ESP inventory
  - SCA <300
  - 5-10% LOI---->10-15 with 12 lbs/MACF
- Units <300 SCA will probably require ESP upgrade to tolerate ACI
  - capital $17-24/kW, not $2-4 /kW per EPA
  - total 2-3 mills/kWh, not <1/kWh per EPA

Hg/NOx "CO-BENEFIT": FACTORS AFFECTING Hg OXIDATION



SNCR: 3 field sites

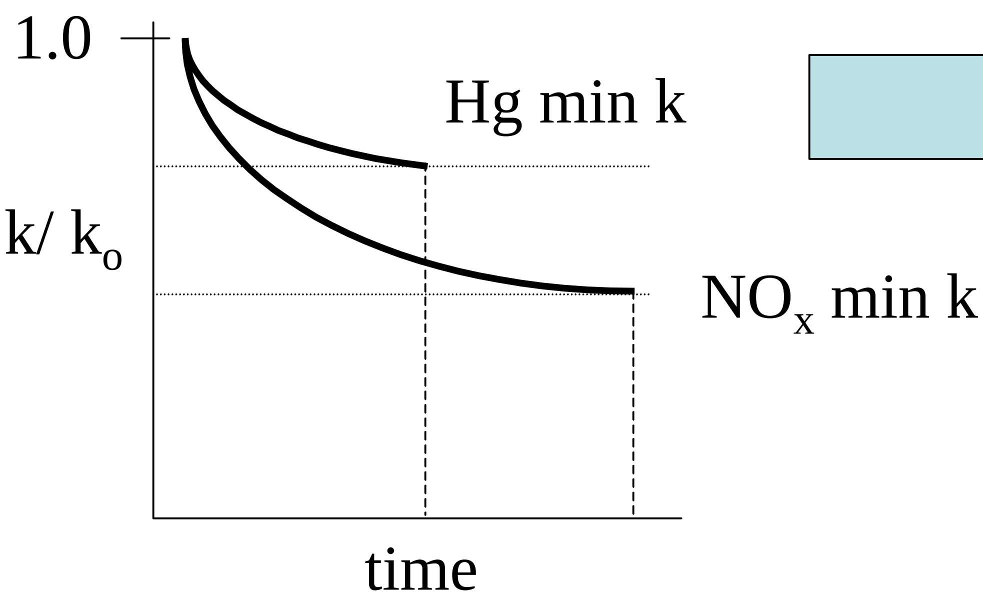
- No clear mechanism
- No evidence from 3 field tests with SNCR, NH3-conditioning

SCR: 2 of 4 sites positive, but "typical"?

- High S coal (2.9, 3.8%)
- Chlorides "not low" (380-1100 ppm)
- Group 2 boilers (cyclone, cell)
- Low "inherent' Hg oxidation (<50%)
- "Excess" catalyst volume (by >50%) than usually deployed for NOx

SCR CO-BENEFITS, EVEN IF REAL, ARE NOT FREE

- Two units "testing positive" featured 50% greater catalyst volume (res time) than typical SCR design
- Catalyst aging may be important



Hg SCR Capital,
<u>Operating Premium</u>

$20-40/kW
0.25 mills/kWh