ThermoFisher SCIENTIFIC

ADA Advancing Cleaner Energy

Advantages of Using a Process Hg CEMS

An introduction to Hg Process Monitoring and Feedback Control

McIlvaine Mercury Measurement and Capture

Developed jointly by ADA-ES and Thermo Fisher

Presented by Jeremy Whorton on February 26, 2015

Background Info

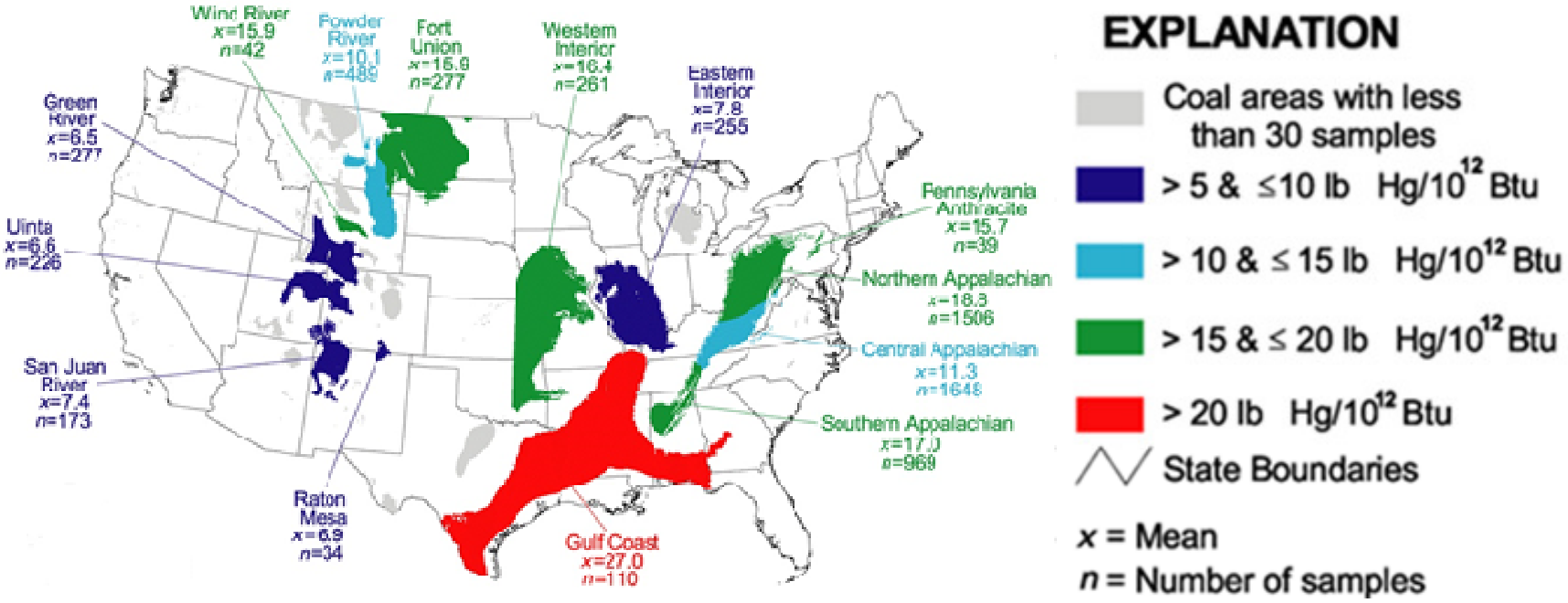
- What are you doing for MATS Compliance (Traps, CEMS)?
- How are you controlling Hg (ACI, CHI)?
- What emission rate will you be controlling to?
- How are you going to handle non-compliance periods?

The Challenge Facing Power Plants

Factors Affecting Hg Emissions

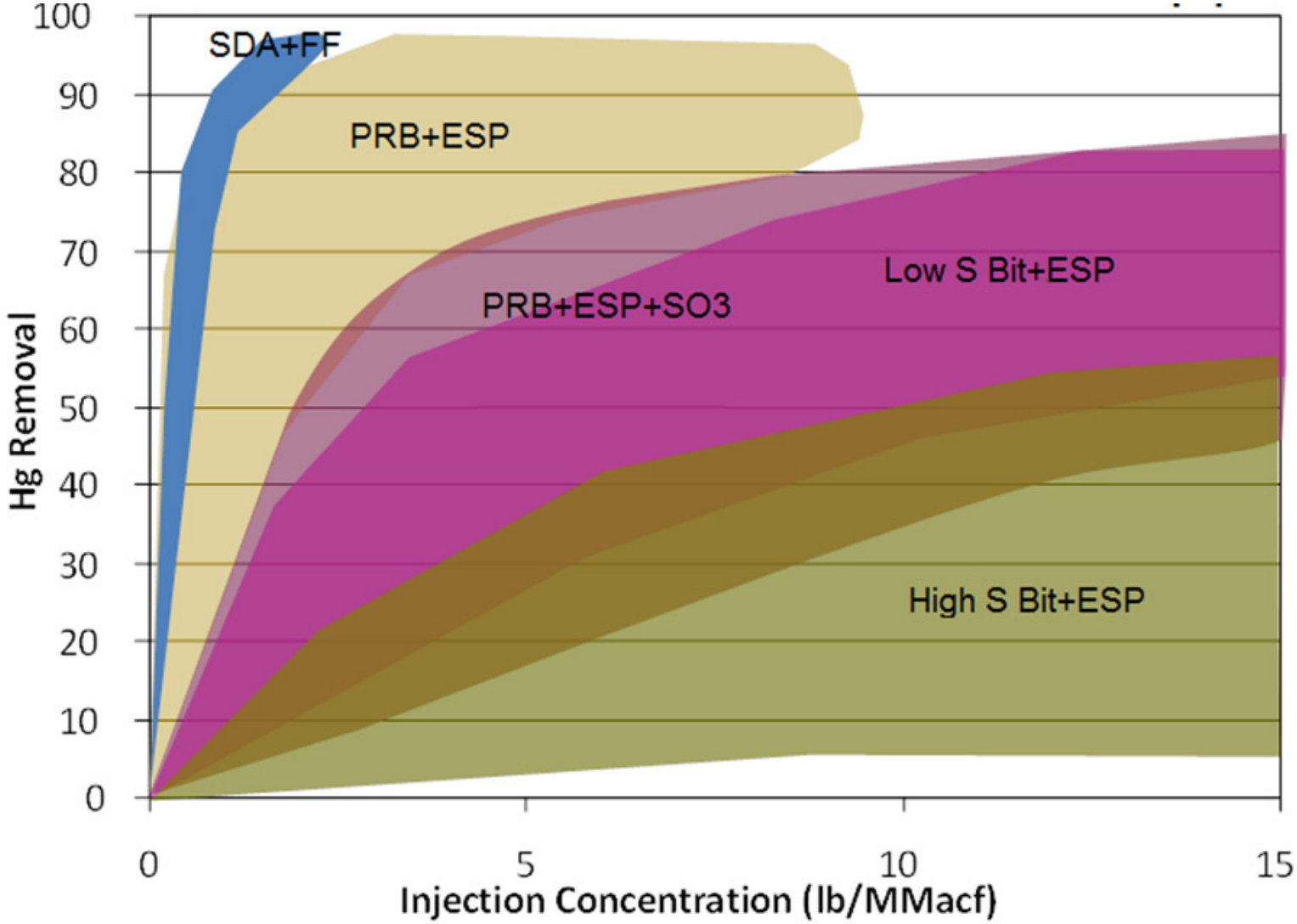
- Coal Hg – Can vary by 5 lb/TBtu across a seam
- Coal Halogen Concentration
- Burner Performance (unburned carbon-LOI)
- SCR Operations - Excess SO_3 and NH_3
- Wet Scrubber Chemistry - Hg Re-emissions
- Boiler Load (temperature and gas flow)
- Add Rate of Mercury Control Agent (PAC, CHI)
- SO_3 Conditioning for ESPs
- Gas Temperature

CoalQUAL Hg Data



- In General, Coal Hg can vary by 5 lb/TBtu across the same seam.
- If you don't have a continuous Hg reading, you have to assume the highest possible Hg value.

Typical Range of ACI Performance



Systems that can Benefit from Feedback Control

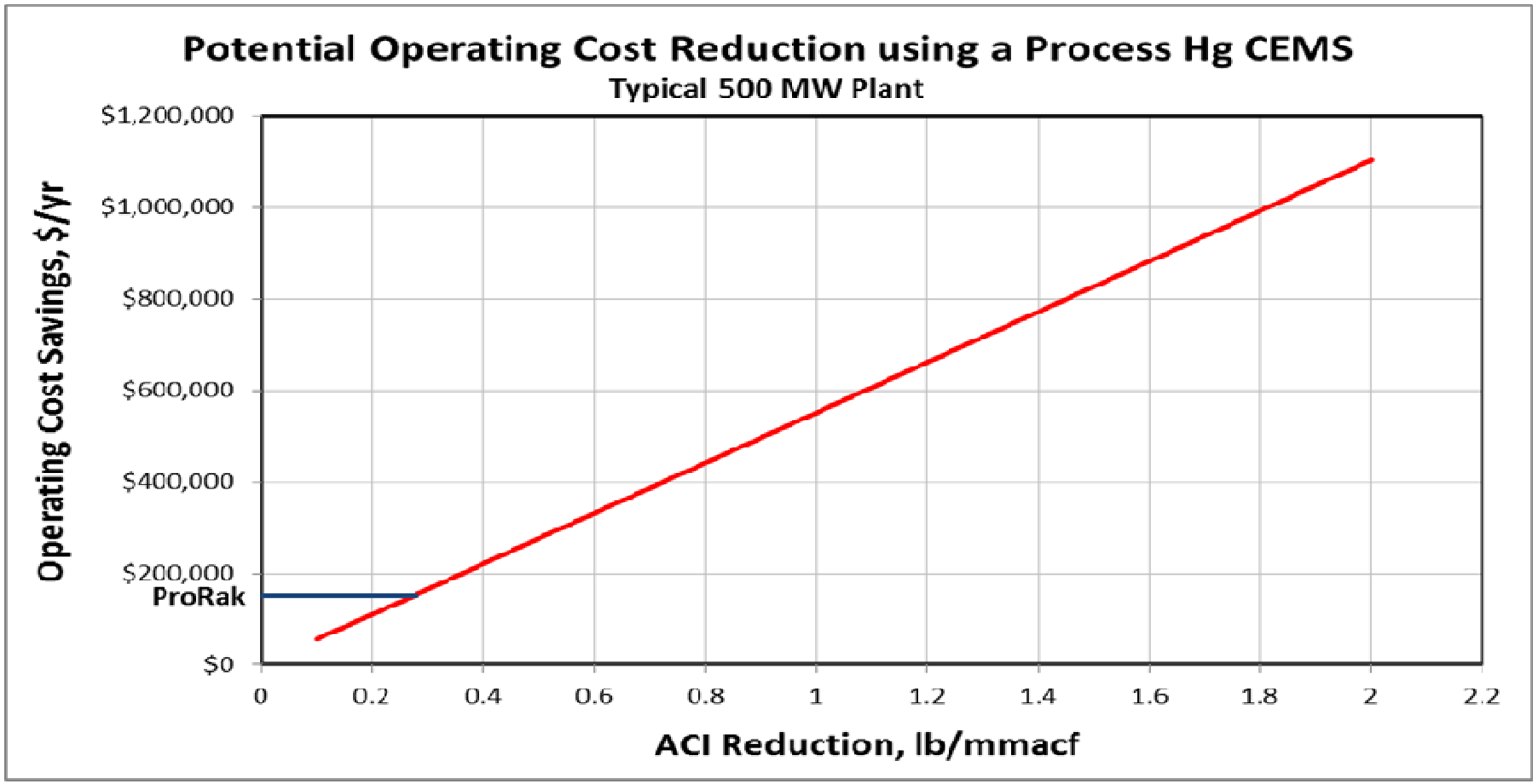
- Activated Carbon Injection (ACI) Systems
- Coal Additive Systems
- Scrubber Additive Systems

Plants Using ACI

Assumptions:

- Typical 500 MW as per B&W's 40th Edition of "Steam".
- PAC cost of $1.00/lb.
- Boiler availability = 70%.
- No significant native Hg capture

Possible ROI for ACI Systems



- An ACI reduction of 0.25 lb/MMacf saves $140,000/yr.

What is a Process Hg CEMS?

A Process Hg CEMS is any Hg CEMS in which the mercury measurement is used in a feedback loop to control a mercury reduction process such as Activated Carbon Injection (ACI), Coal Halogen Injection (CHI), etc.

It can be a compliance system or a CEMS specially designed for process control.

CEMS designed only for process control tend to be simplified versions of compliance systems because they do not have to meet the strict QA/QC requirements.

What is a ProRak™

The ProRak™ is a continuous process mercury analyzer developed jointly by ADA-ES and Thermo Fisher. It is built from genuine Thermo Scientific components in a transportable, climate controlled enclosure.

Why use it?

- Lowers O&M costs of Hg control systems
- Keeps you in MATS compliance
- Compliments sorbent trap monitoring
- Controls Hg Reduction Processes

Features?

- Simple to operate and maintain
- Short Return on Investment
- Installs anywhere in a few hours
- Uses CVAF to eliminate SO_2 Bias vs. AA

ProRak™ Components

- ***ADA® ProRak™ Mercury Analyzer***

- **Consists of Thermo Fisher Components**
  - *80i Analyzer*
  - *82i Probe Controller*
  - *83i Fast Loop Probe (simplified)*
  - *84i Hg Permeation Source*

Ancillary ProRak™ Equipment

- Air Cleaning System – Portable/Modular
  - *Removes particulates, oil, moisture*
  - *Boosts pressure to 90 psi (if needed)*
  - *Produces a nitrogen stream for calibration and dilution*

- Heated Umbilical – 50 feet included

ProRak vs. Compliance CEMS

	ProRak		Compliance CEMS
1)	Measures Hg Total (HgT) Only	→	Speciates Hg (HgT + Hg0)
2)	Not designed for MATS QA/QC	→	Meets all MATS Criteria
	▪ Only needs to pass Daily Cals		
3)	Calibrates with 84i	→	Calibrates with 81i and 84i
4)	Simplified 83i Probe	→	Regular 83i Probe
	▪ No Oxidizer		
	▪ Less solenoid valves		
	▪ Less tubing		
	▪ Hg Total stream only		
5)	Installs anywhere in 2-days	→	Requires costly CEMS Shack
6)	Mobility (anywhere in plant)	→	Stack or CEMS Shack
7)	Less Maintenance/Training	→	More Maintenance/Training
8)	Costs Less (~$150,000)	→	Costs More

Summary of Process Hg CEMS Advantages

- Lower Cost than a Compliance System
- FAST Continuous Readout
- Feedback Control
- Less QA/QC
- Lower O&M
- Short Return on Investment
- Commonality of components for Thermo Scientific Freedom Hg CEMS for MATS Compliance

Questions??

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