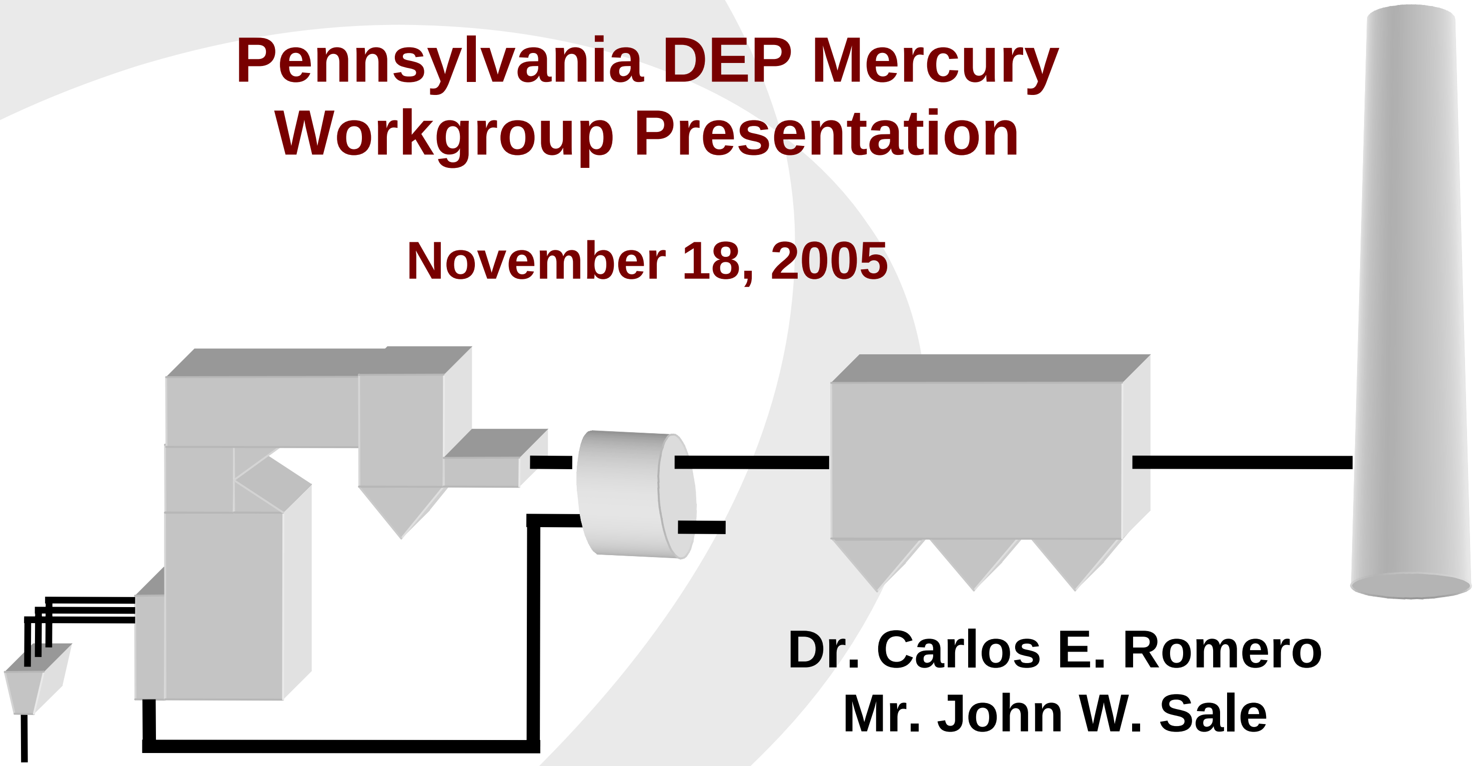
Impact of Modified Boiler Control Settings on Mercury Emissions

Pennsylvania DEP Mercury Workgroup Presentation

November 18, 2005



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IMPACT/IMPORTANCE OF BOILER OPERATING CONDITIONS ON MERCURY

- **The fate of Hg emissions is impacted by the chemical and physical processes occurring in the boiler:**
  - Homogeneous Hg oxidation.
  - Heterogeneous oxidation and adsorption.

- **Link between boiler conditions and Hg emissions:**
  - Time-temperature history - flue gas temperature, APH performance, stack flow.
  - Fly ash characteristics - mill classification, low-NO_x firing system operation, fuel blending.
  - Flue gas conditions – excess O_2 level, reduced NO_x emission level.
  - Other links - operating practices, boiler load profile, sootblowing, etc.

These variables ensure that Hg speciation is site-specific.

- **Importance of getting a handle on the operating conditions impacts:**
  - Interpretation of Hg test data.
  - Development of Hg emissions control options.
  - Reduce the cost of compliance.

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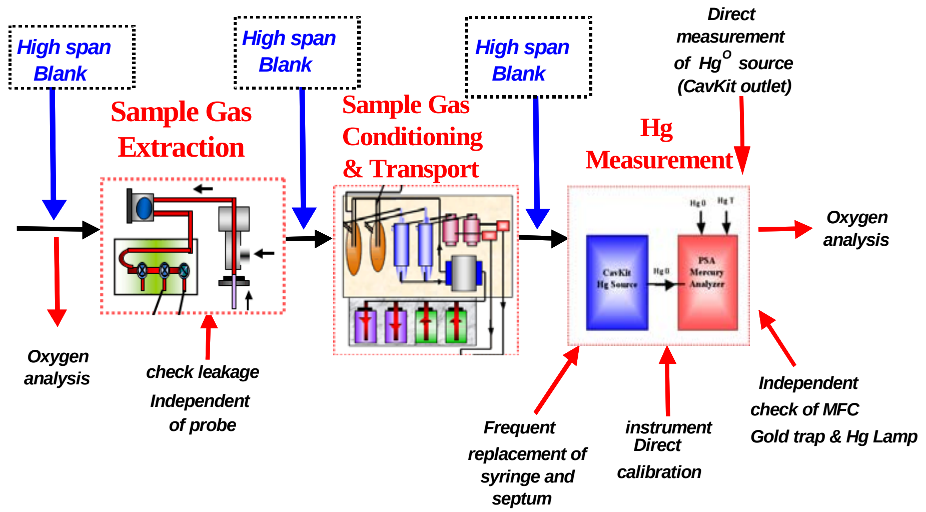
FIELD TESTING

❑ Analytical capabilities:

- ❑ Baldwin, Apogee and PSA filtration probes.
- ❑ Pretreatment/conditioning units.
- ❑ PSA SCEM's for Hg speciation.
- ❑ OHM with EPA Method 17 (performed on-site).
- ❑ Coal, pyrite and fly ash sampling (ultimate, proximate, and Hg, Cl, S, LOI analyses).



❑ Test Program:

- ❑ Boiler optimization - ten-days including baselining, parametric testing, and optimal condition tests.
- ❑ AC injection testing – ten-days including different AC rates under normal and optimal low-Hg operating conditions.

PARAMETERS USED IN BOILER OPTIMIZATION FOR MERCURY EMISSIONS REDUCTION

- Excess air
- Overfire air registers
- Mills
  - Classification
  - Out-of-service configuration and coal biasing
- Back-end temperature – steam coils and bypass dampers
- Electrostatic precipitator – field energization and rapping
- Sootblowing

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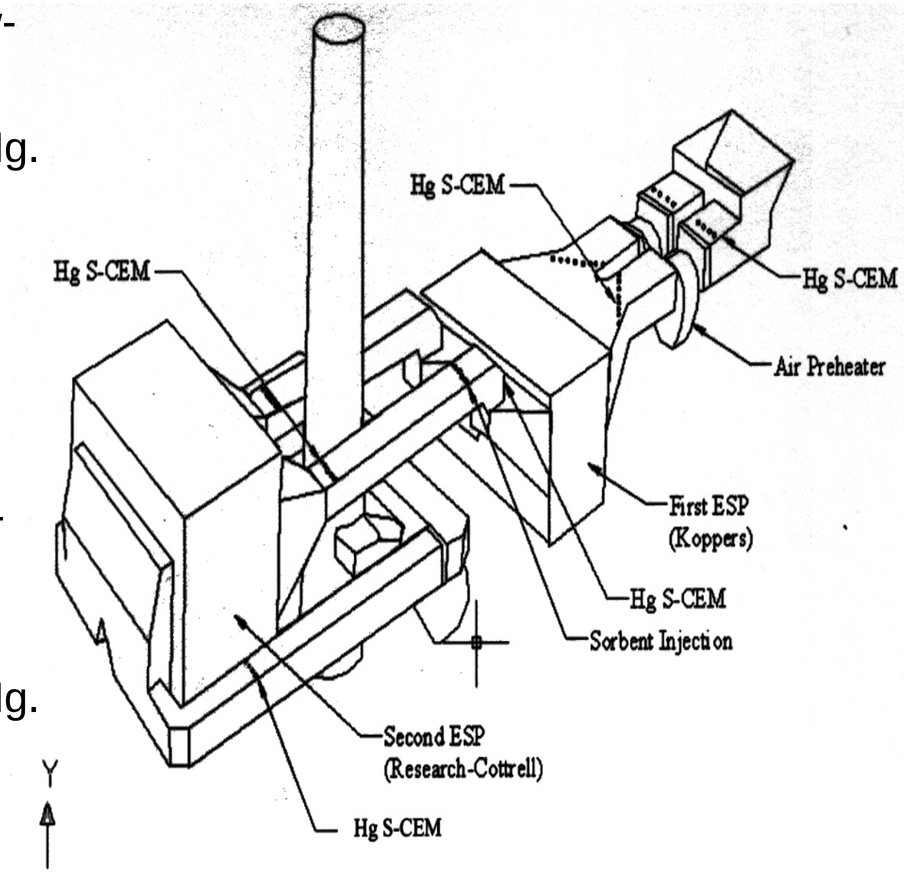
UNIT DESCRIPTIONS

- **Unit A –**
  - 250 MW, CE boiler with a LNCFS-III low-NO_x system.
  - Fires bituminous coals, 0.06 ppm avg. Hg.
  - Ljungstrom APH with on-line rot. speed adjustment.
  - Two ESPs in series, 560 ft^2/1000 acfm.
- **Unit B -**
  - 650 MW B&W boiler with DRB-XCL low-NO_x burners and rotating dynamic classifiers.
  - Fires bituminous coals, 0.06 ppm avg. Hg.
  - Ljungstrom APH with on-line rot. speed adjustment.
  - Two ESPs in series, 660 ft^2/1000 acfm.



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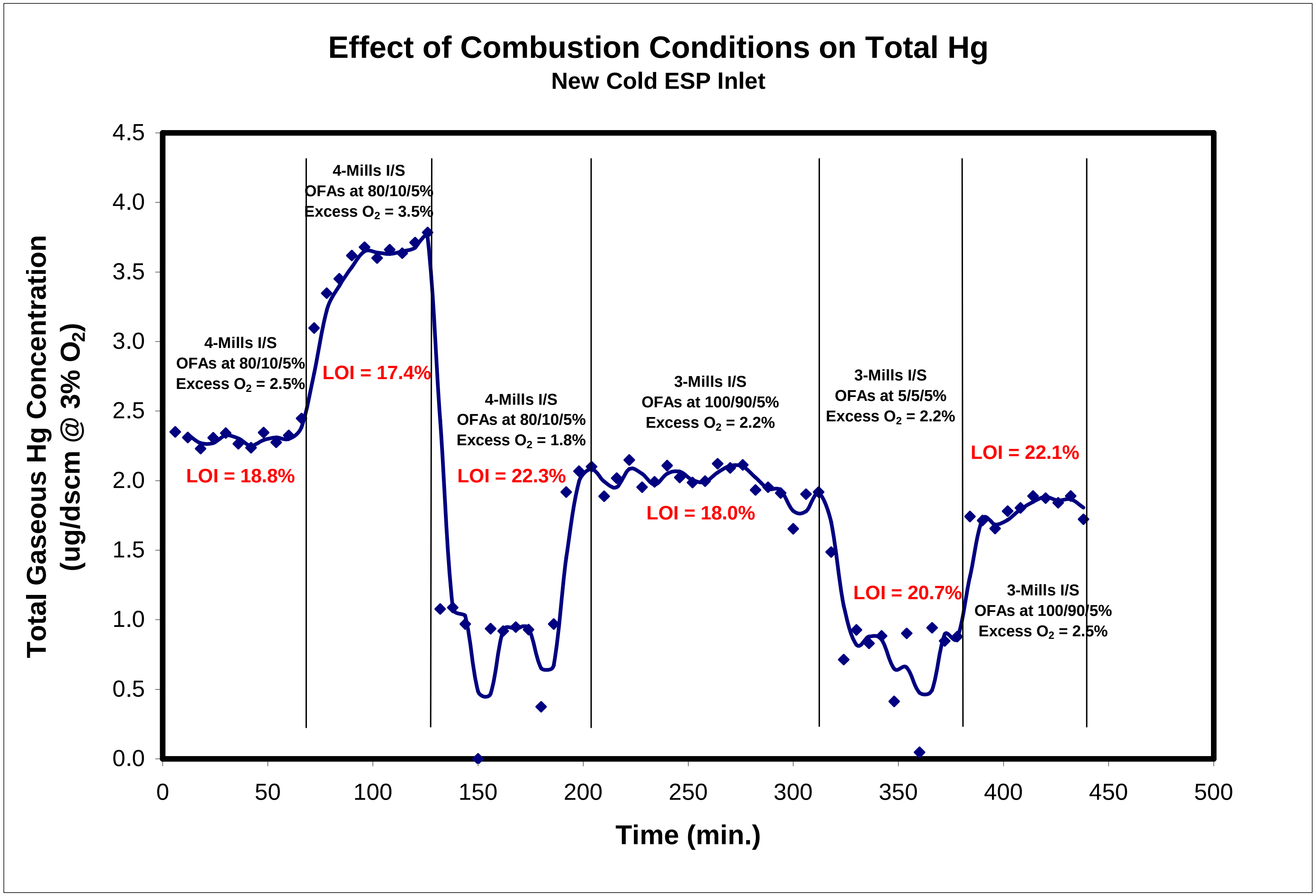
FIELD FEASIBILITY TEST RESULTS – UNIT A



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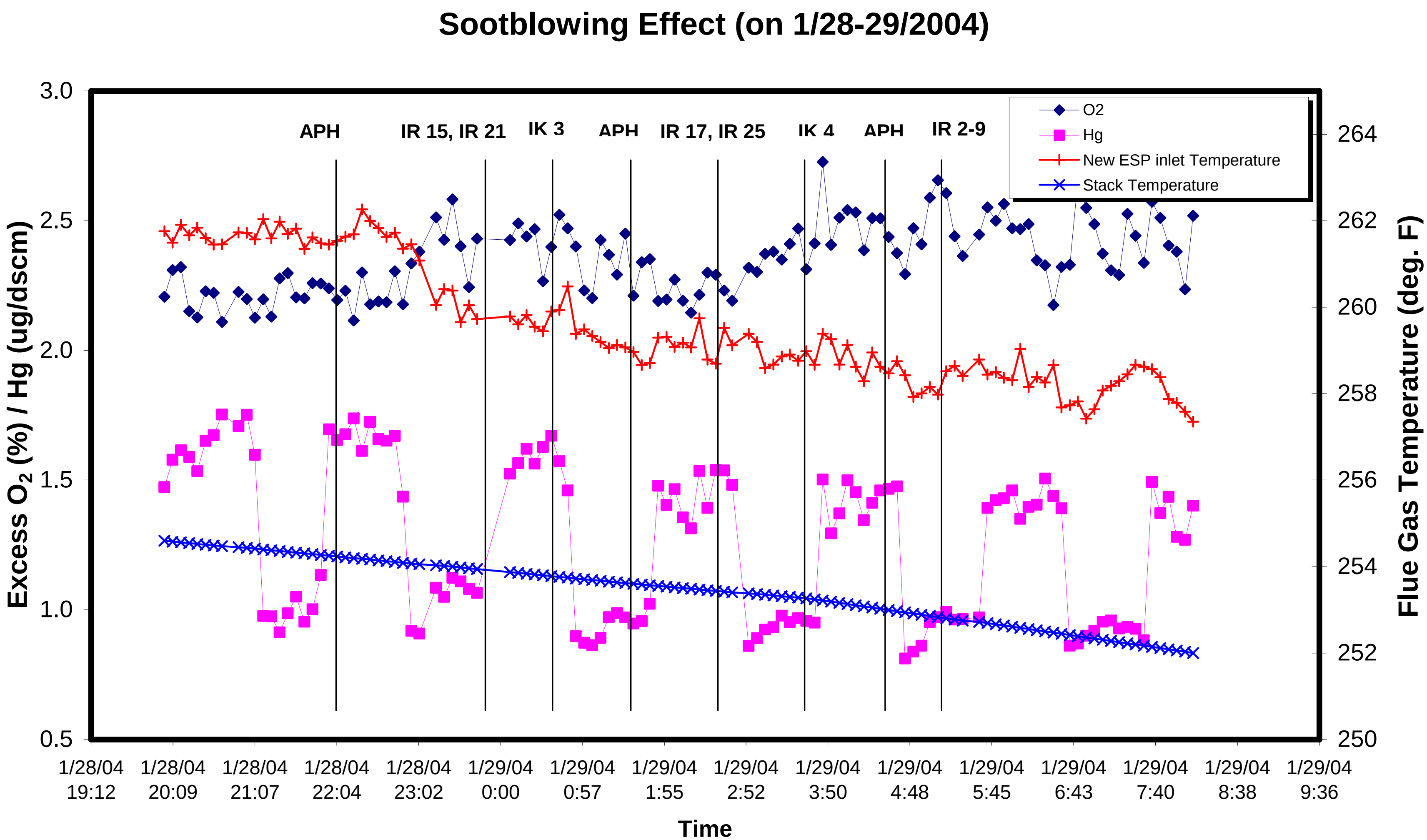

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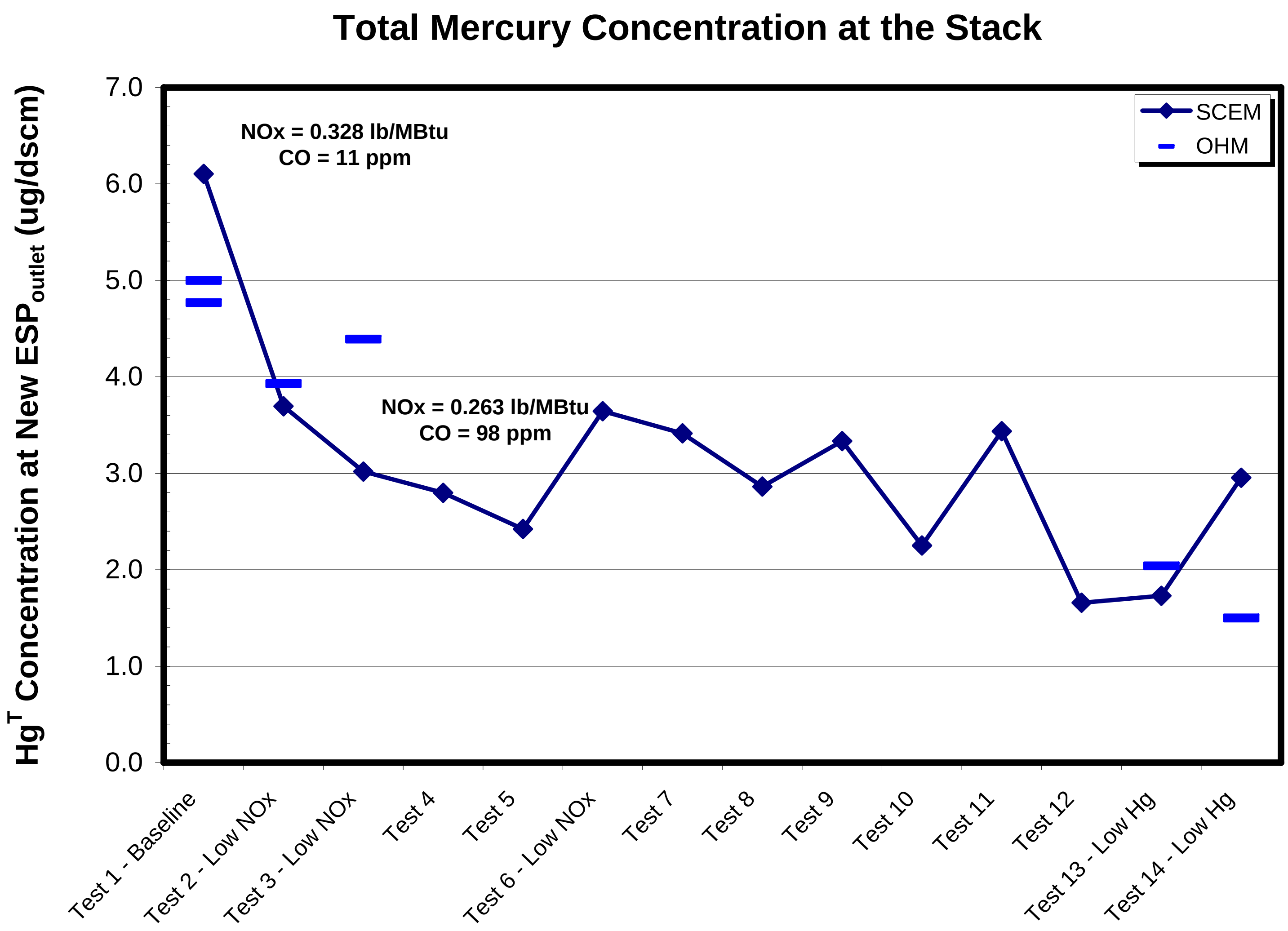
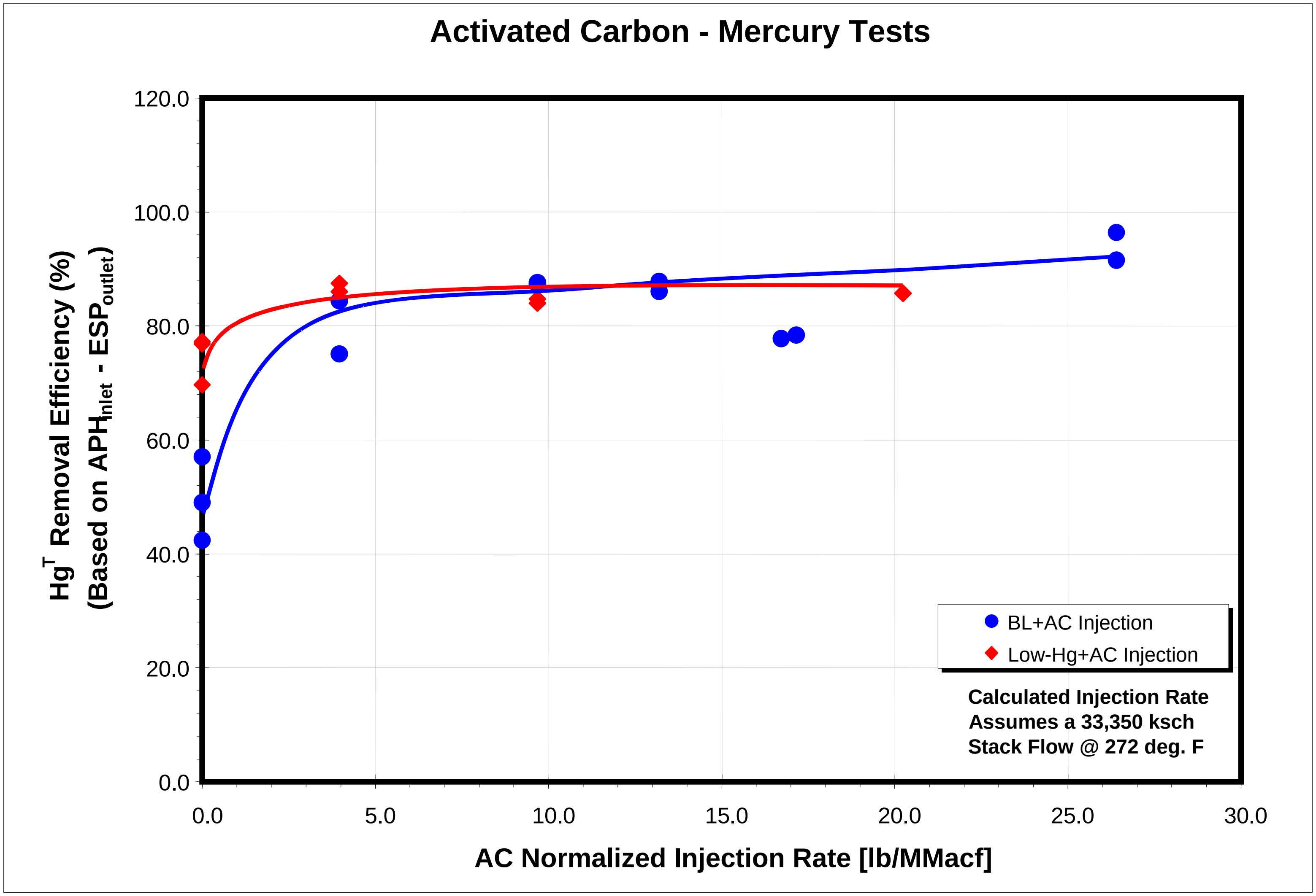
DETAILED HG OPTIMIZATION – UNIT A



AC FIELD TEST RESULTS – UNIT A



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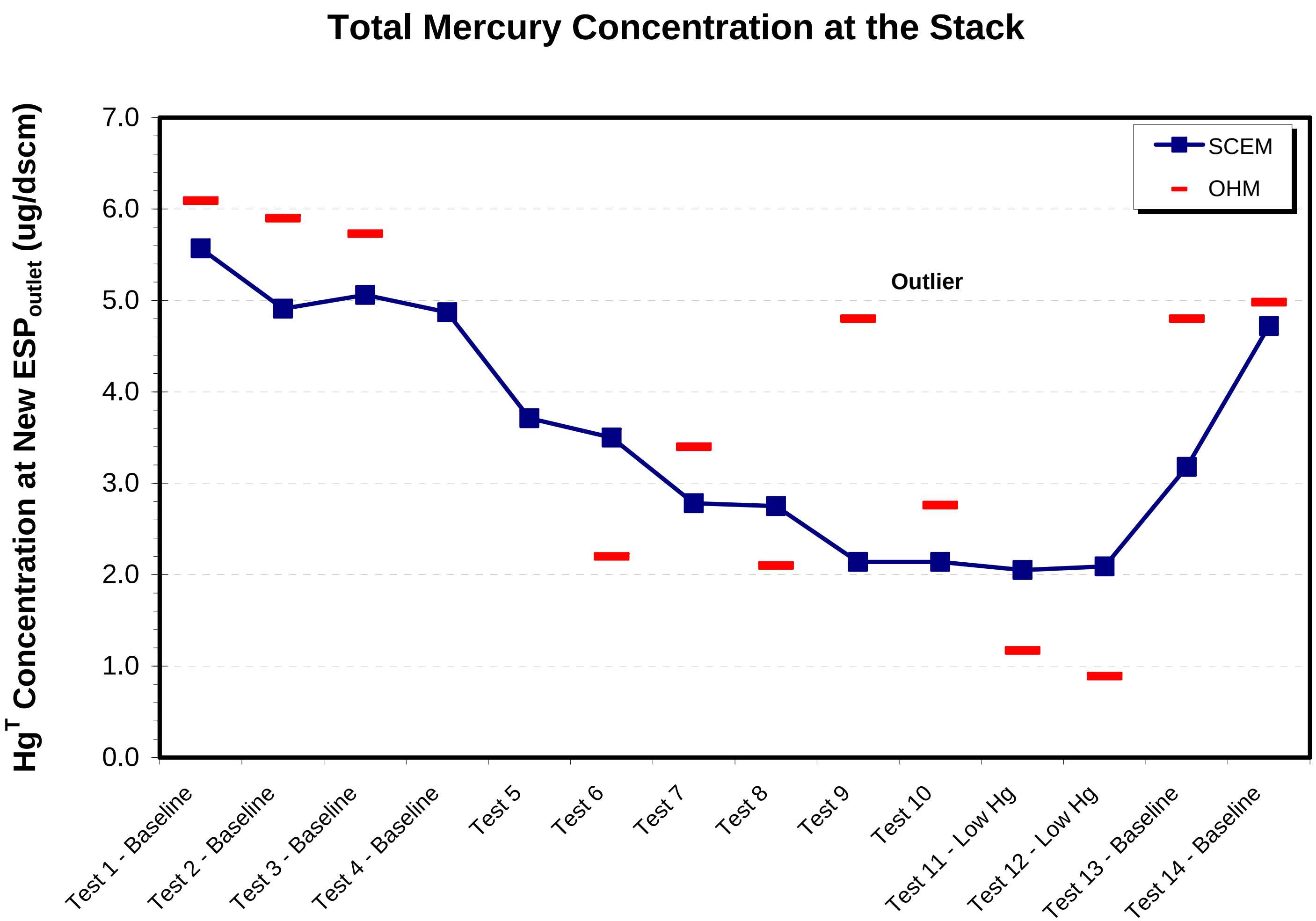
DETAILED HG OPTIMIZATION – UNIT B



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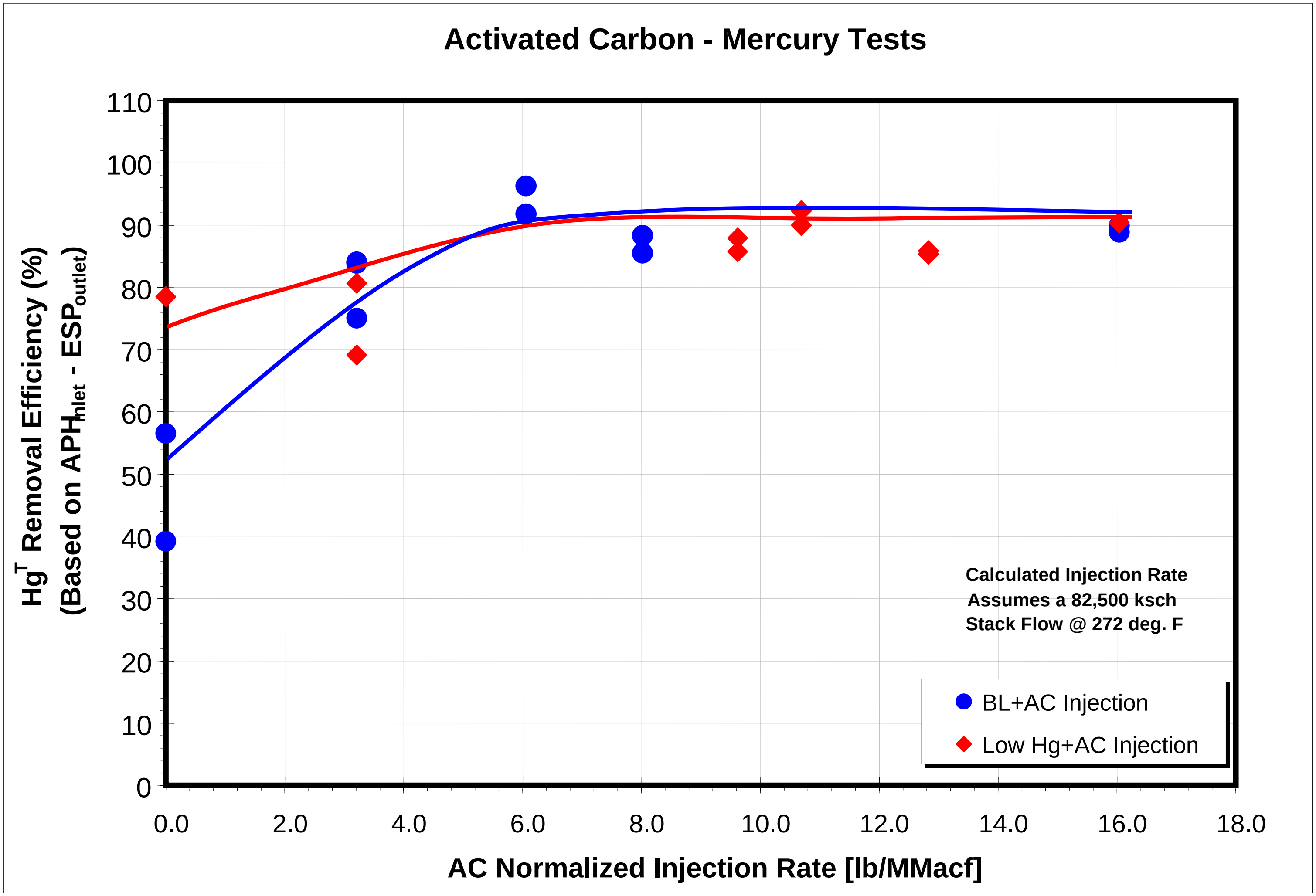
FIELD TEST RESULTS – UNIT B



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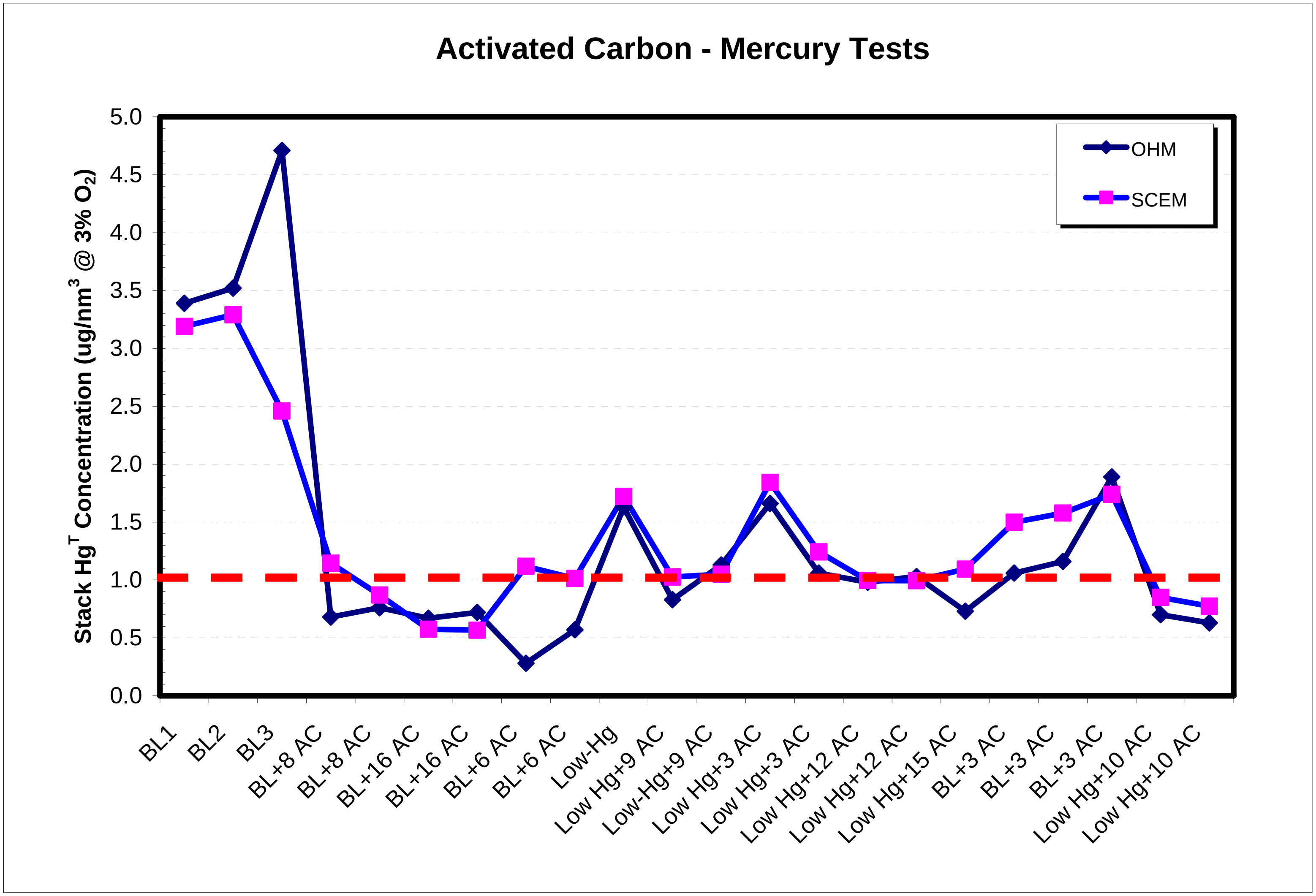
AC FIELD TEST RESULTS – UNIT B



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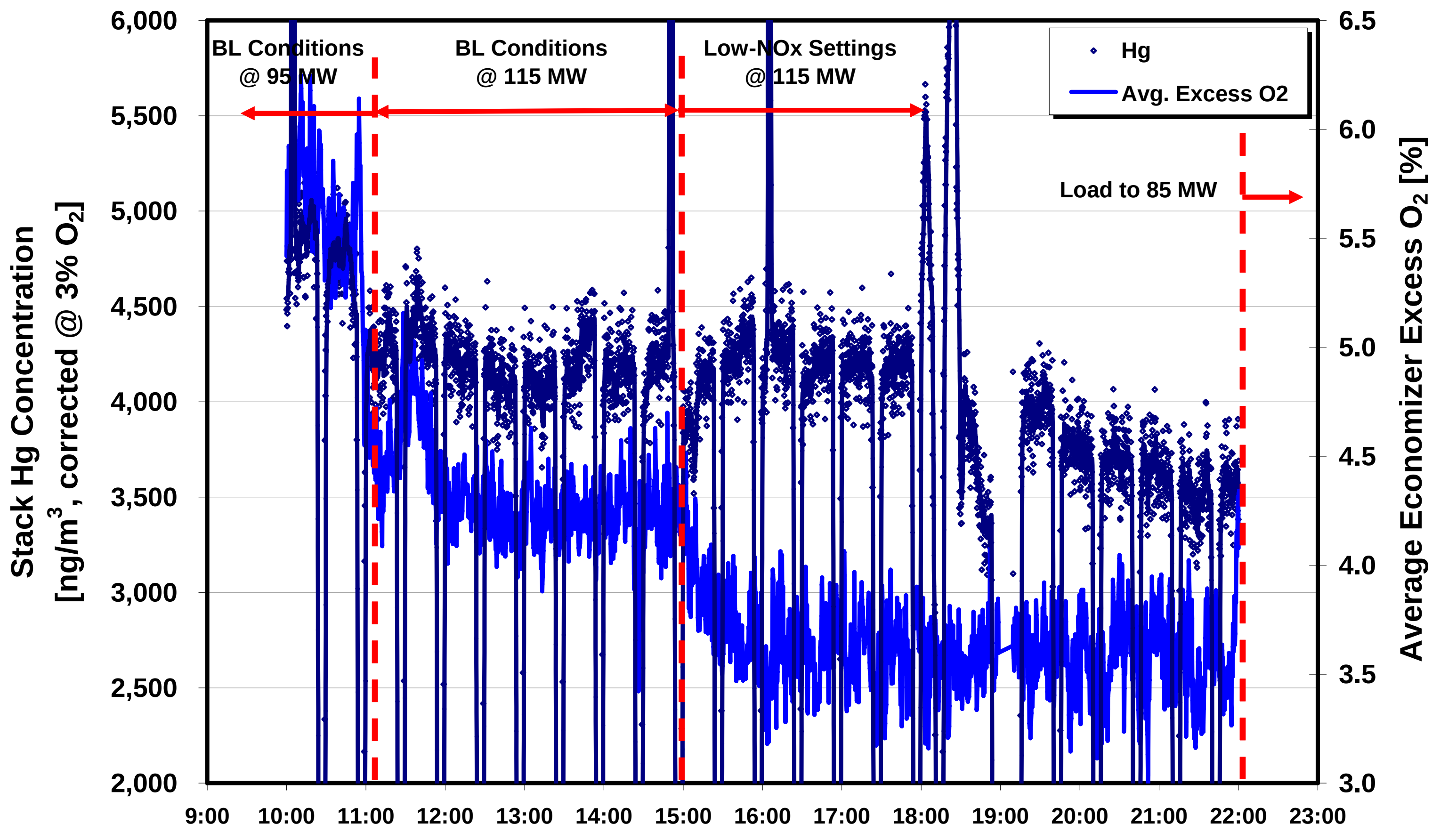
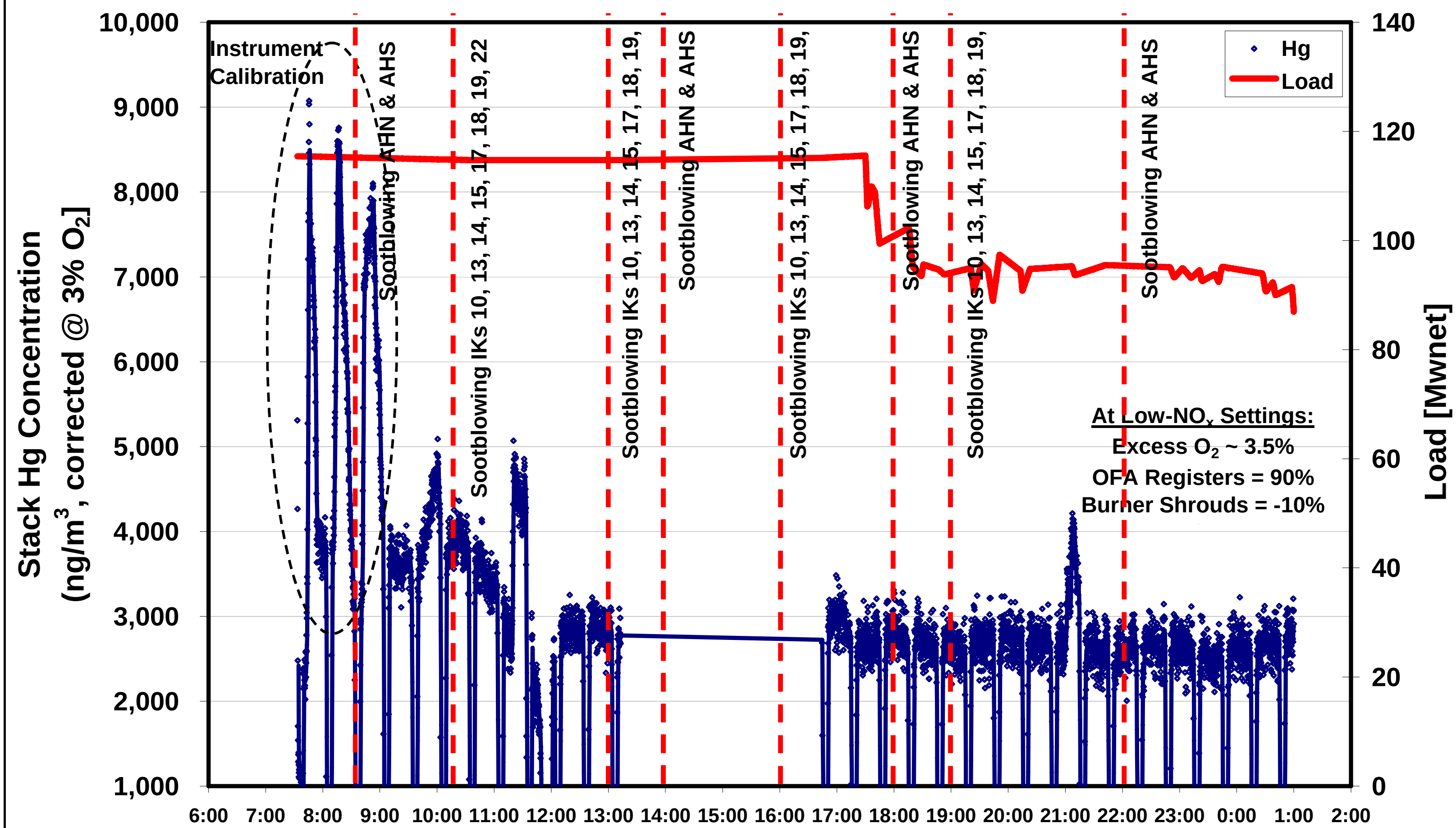
Field Test Results – Unit C



Field Test Results – Unit C



CONCLUSIONS

- Testing performed at four units burning bituminous coals and one unit burning sub-bituminous coals confirmed the merit of optimizing boiler operation through changes to the control settings for mercury emissions reduction.
- The mercury optimization also resulted in a NO_x emissions reductions co-benefit.

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Questions …

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