

# Low-Level Mercury Monitoring

Meeting MATS Monitoring  
Requirements using Sorbent Traps

March 15, 2012

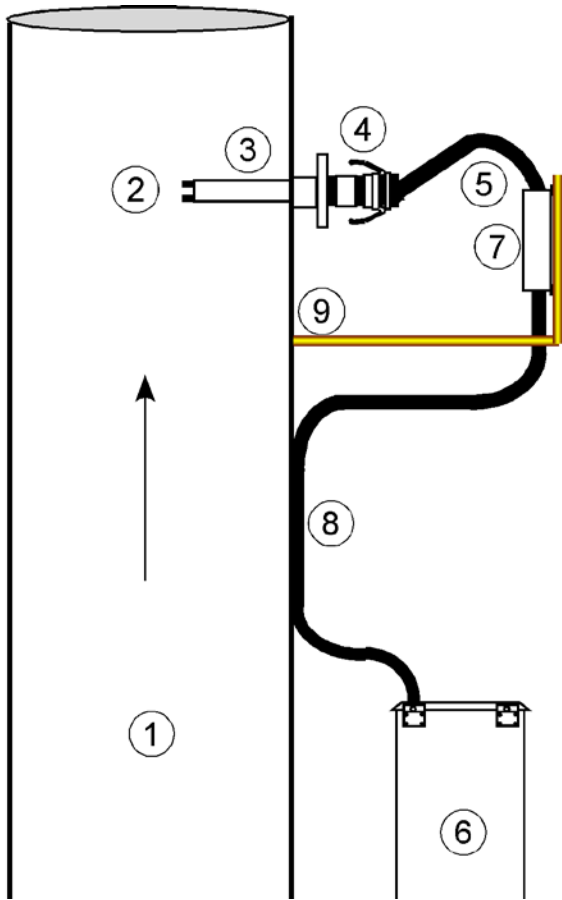
# Overview

- MATS Requirements
- Sorbent Trap Monitoring
- Data



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# MET-80 STMS



# MET-80 Installations



- Dominion Salem Harbor Units 1, 2 and 3
- DP&L J.M. Stuart Station Unit 4 Bypass
- DP&L J.M. Stuart Station Unit 1,2, 4 Scrubber
- DTE – St. Clair Units 1, 2, 3, 4 and 7
- DTE – Monroe Unit 1
- DTE – Belle River Unit 1
- DTE – River Rouge Unit 2
- DTE – Trenton Channel Unit 9
- Dynegy Midwest Generating Baldwin Units 1, 2 and 3
- Dynegy Midwest Generating Hennepin Unit 6
- Dynegy Midwest Generating Vermilion Unit 1/2 (retired)
- Dynegy Midwest Generating Wood River Units 4 and 5
- Dynegy Midwest Generating Havana Unit 6
- Dynegy New England Danskammer Units 3 and 4
- Hoosier Energy Ratts Units 1 and 2 (moved to Merom)
- Nevada Energy Valmy Units 1 and 2
- Nevada Energy Reid Gardner Unit 1
- Wisconsin Public Services Corp. Weston Unit 3
- Wisconsin Public Services Corp. Pulliam Unit 8
- Dominion VCHED, Units 1A, 1B, 2A, 2B
- Prairie State Energy Campus Units 1 and 2
- DTE – Monroe Scrubber Units 3 and 4

# MATS Requirements

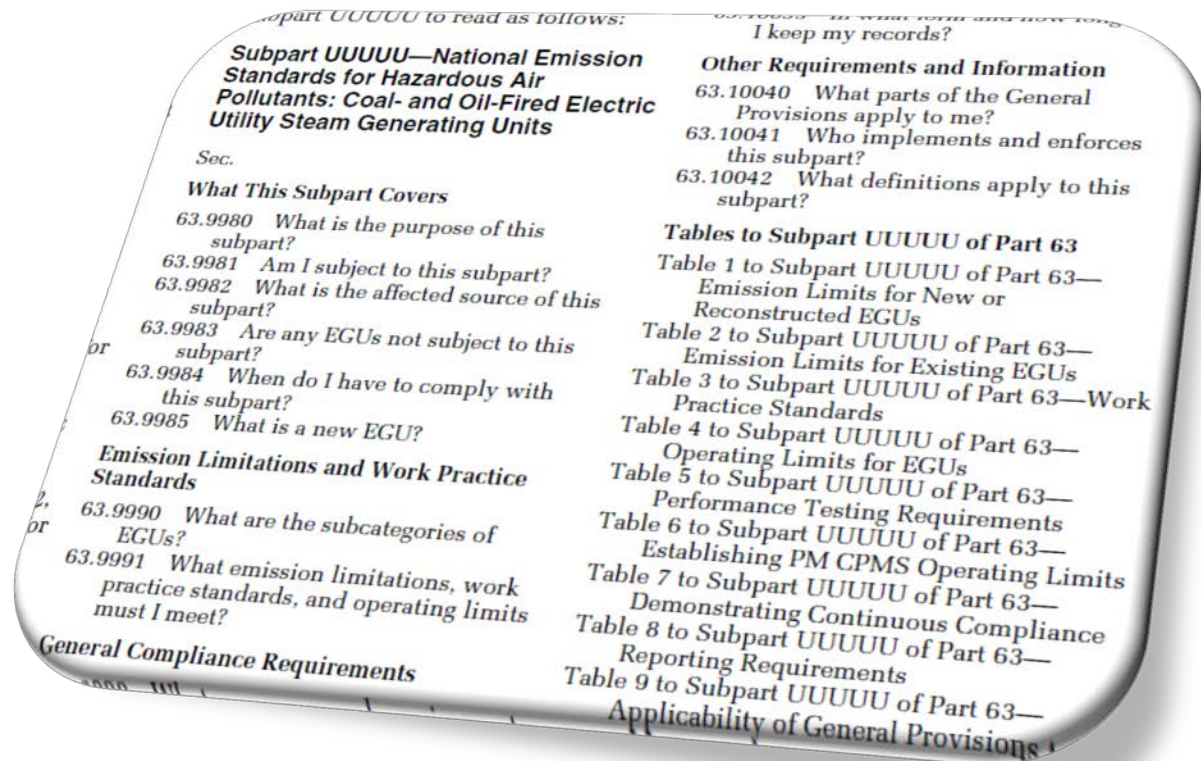
New and existing coal, IGCC and petcoke EGU's will have to monitor mercury

- Measure total vapor-phase Hg
- Report units of standard (lb/TBtu and/or lb/GWh)



# References

- Appendix A of Subpart UUUUU
- Performance Specification 12B



# Nuances

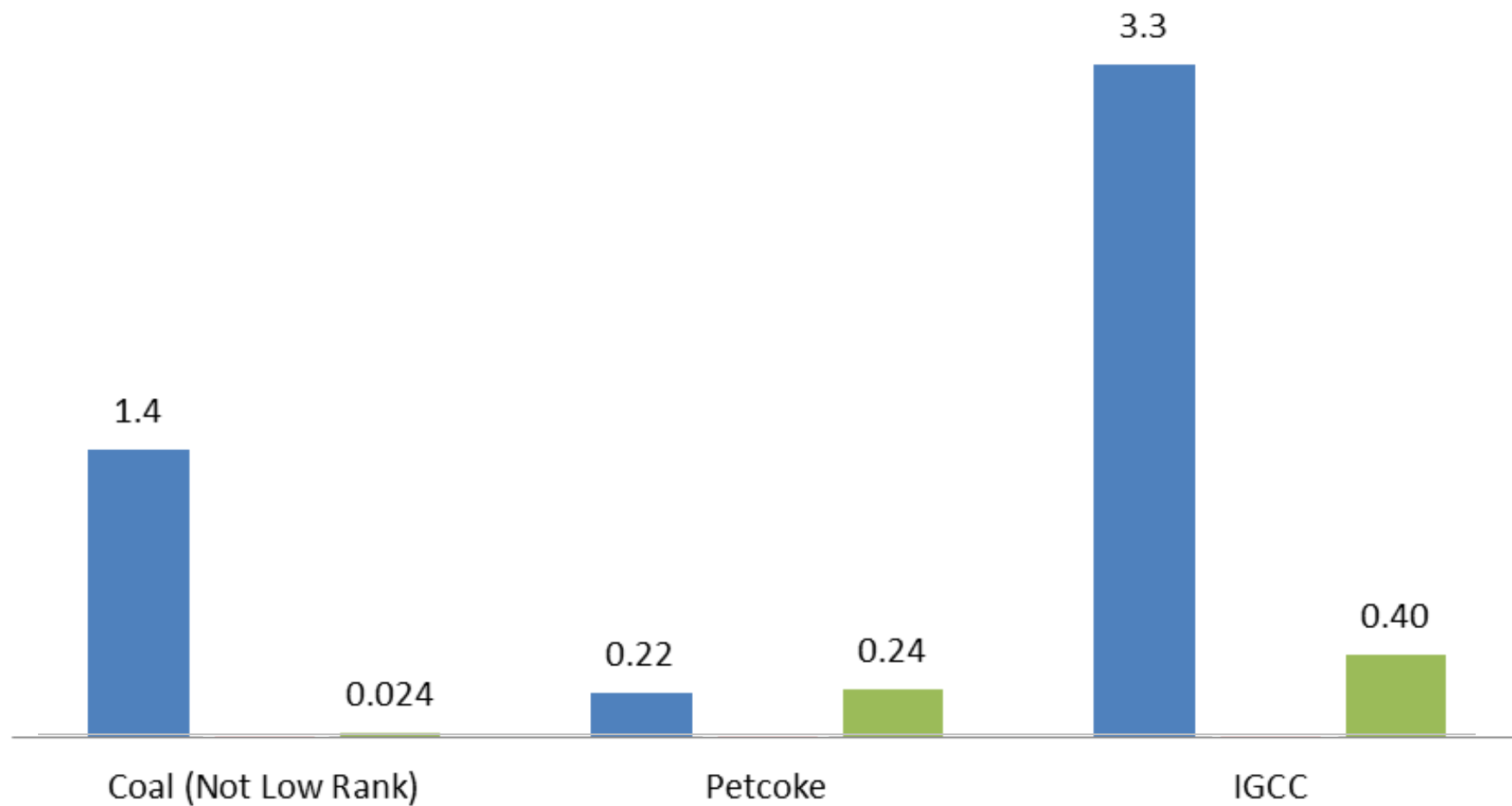
- No missing data procedures
- No bias adjustment factor
  - Startup and Shutdown
    - Possible LEE exemption

# MATS Hg Limits

$\mu\text{g}/\text{scm}$

■ Existing

■ New

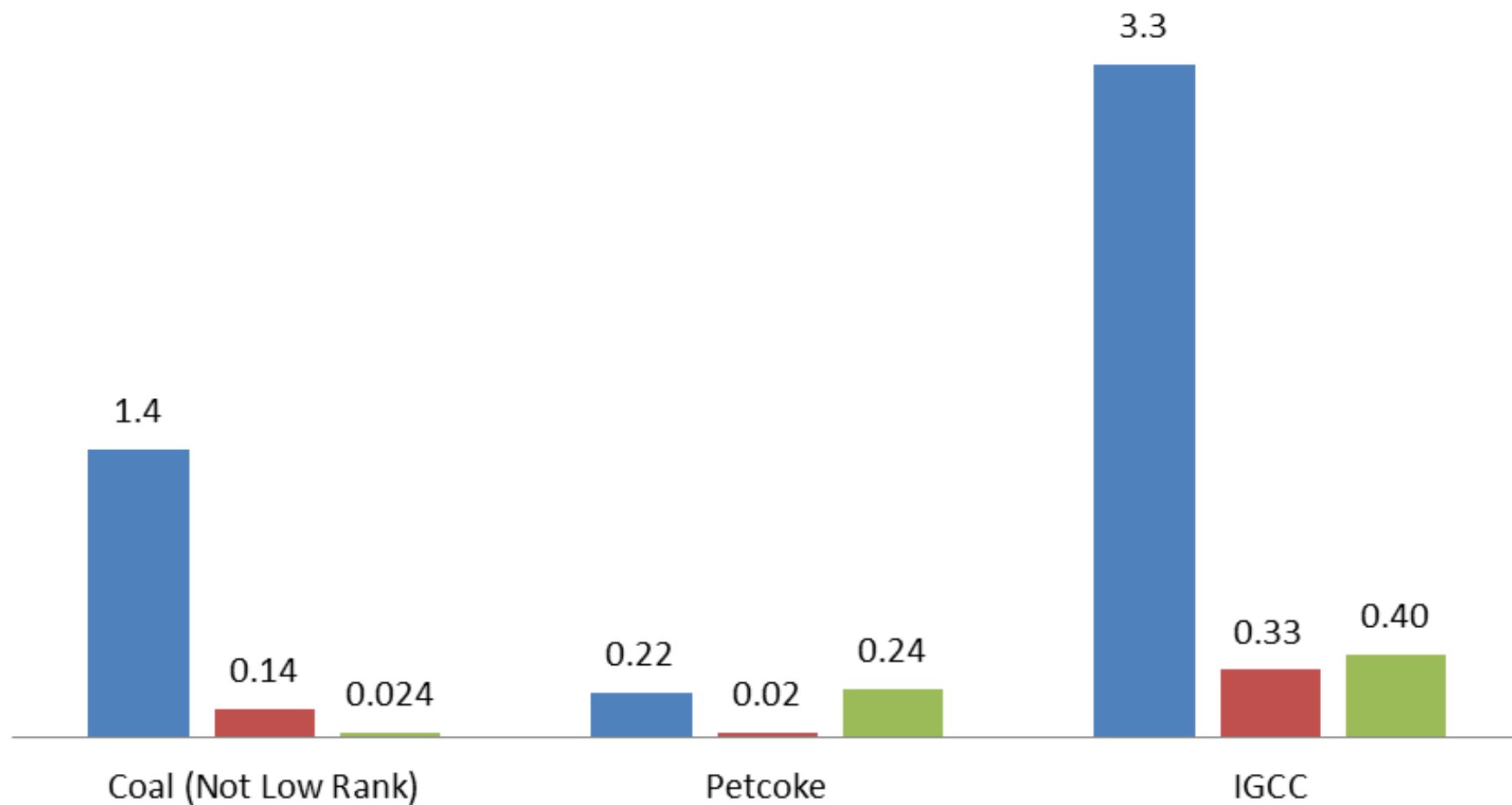




# MATS Hg Limits

$\mu\text{g}/\text{scm}$

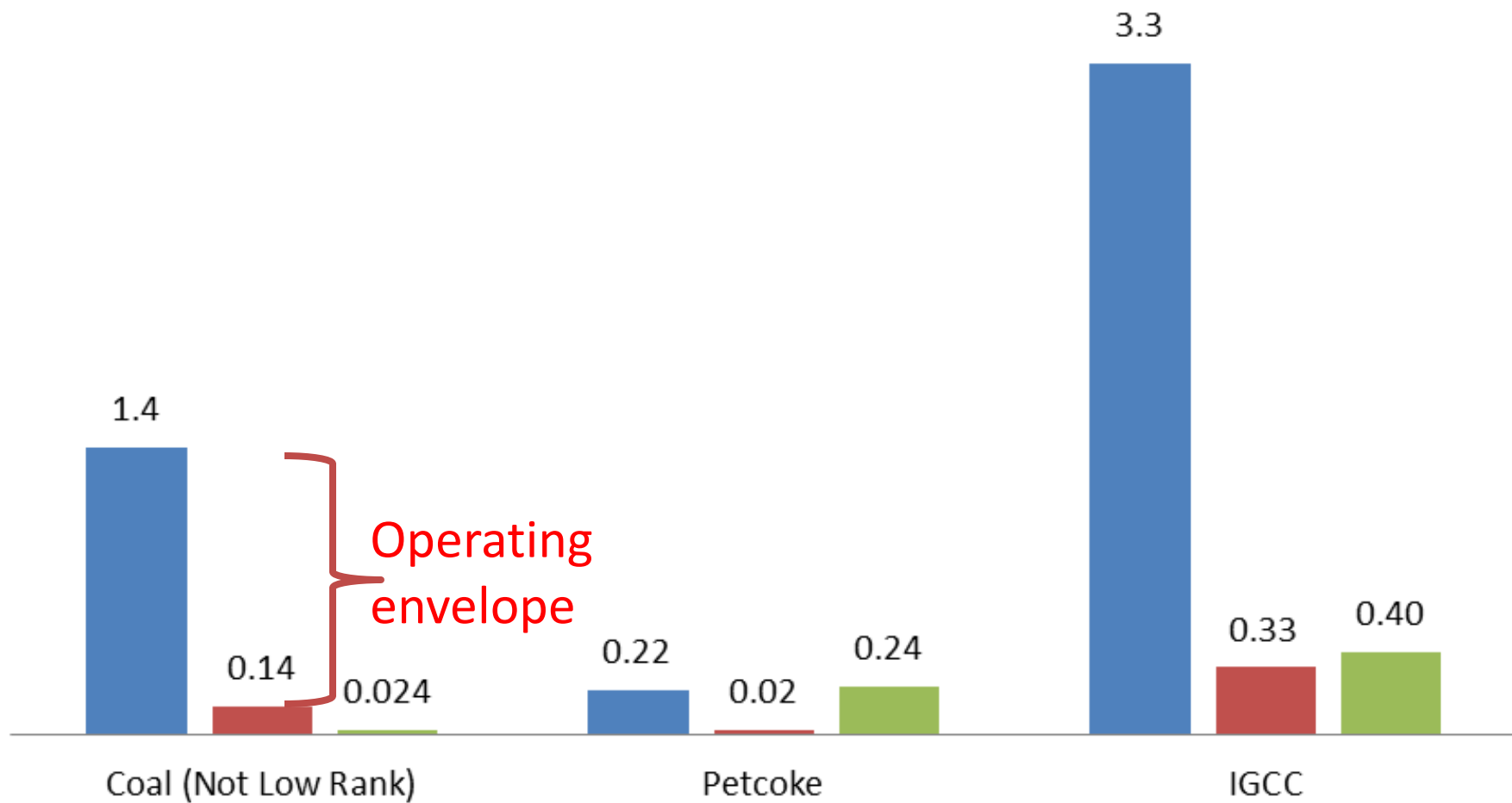
■ Existing ■ LEE ■ New



# MATS Hg Limits

$\mu\text{g}/\text{scm}$

Existing LEE New



# Monitoring Options

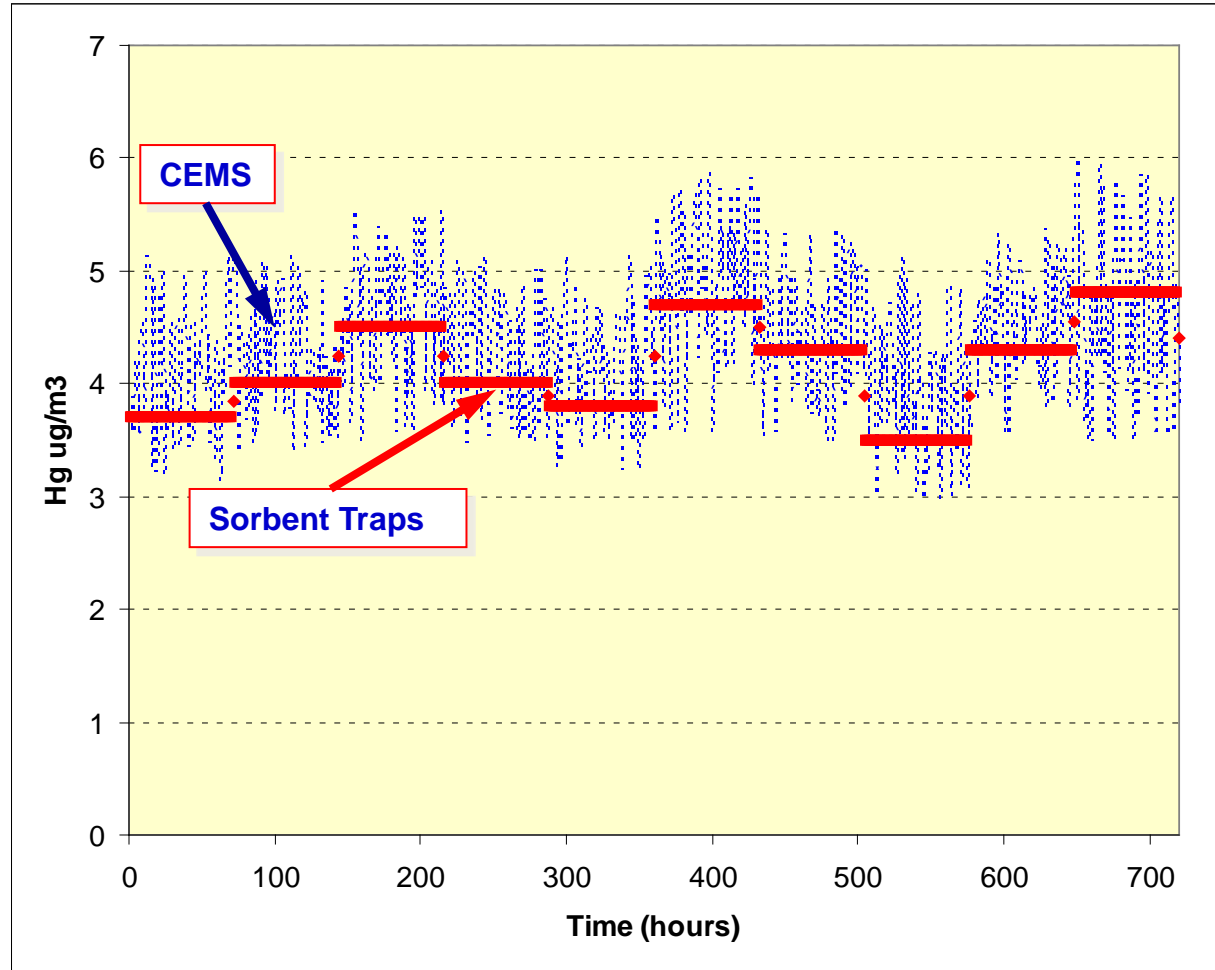
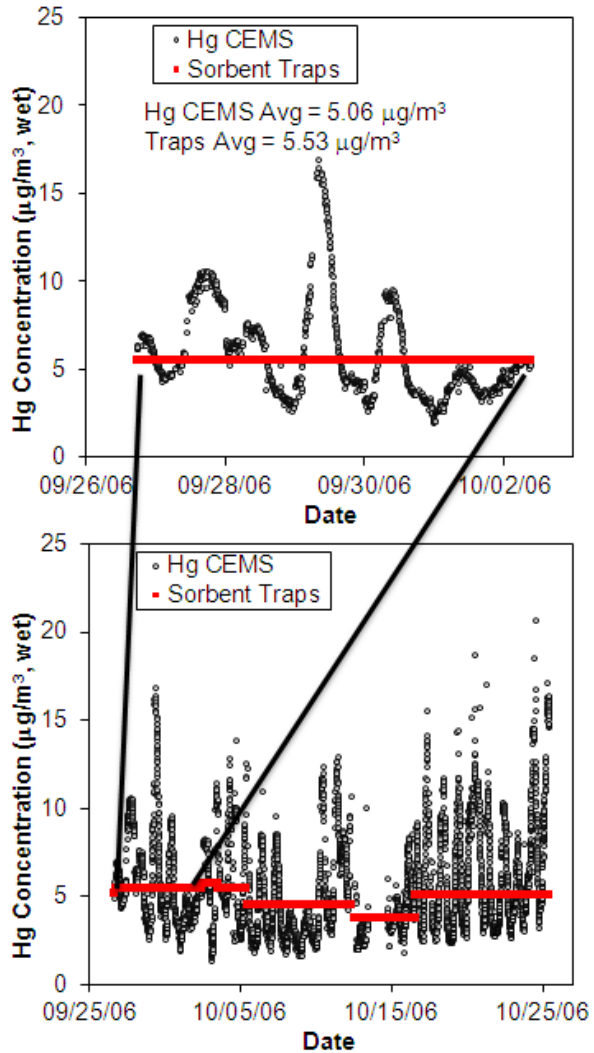
- Hg CEMS
- STMS (PS12B)



CleanAir MET-80 STMS

Tekran Hg CEMS

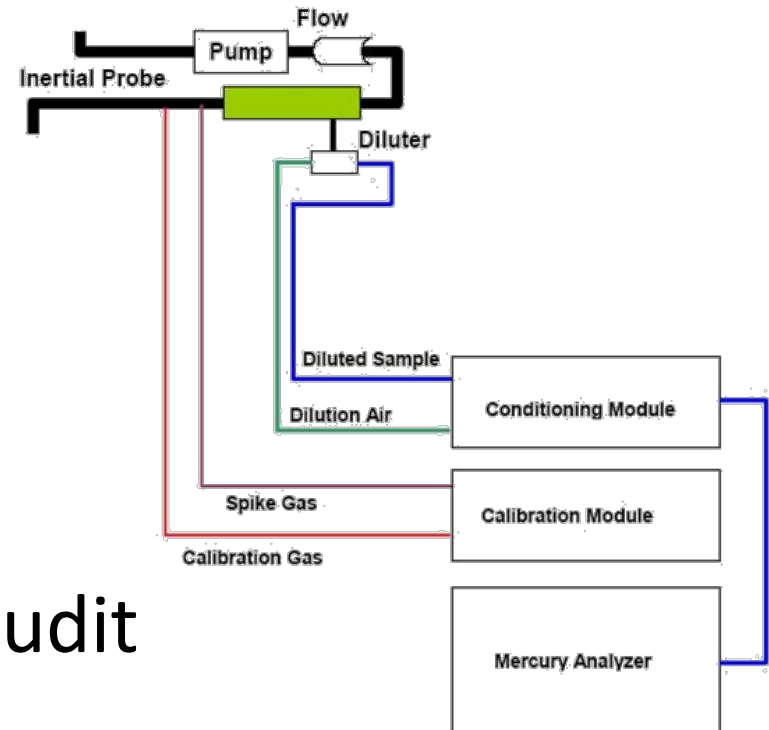
# Monitoring Data



# Initial Certification Requirements

## Mercury CEMS

- 7-Day Cal Error Test
- Linearity Check
- System Integrity Check
- Cycle Time Test
- Relative Accuracy Test Audit



Source: Electric Power Research Institute

# Initial Certification Requirements



## Sorbent Trap MMS

- Calibration of meters & sensors
- Relative Accuracy Test Audit

# Ongoing QA and Data Validation

## Mercury CEMS

- Daily Calibration Error
- Weekly System Integrity Check
- Quarterly Linearity or Integrity Check
- Annual RATA



Model 2537A  
CVAFS Analyzer

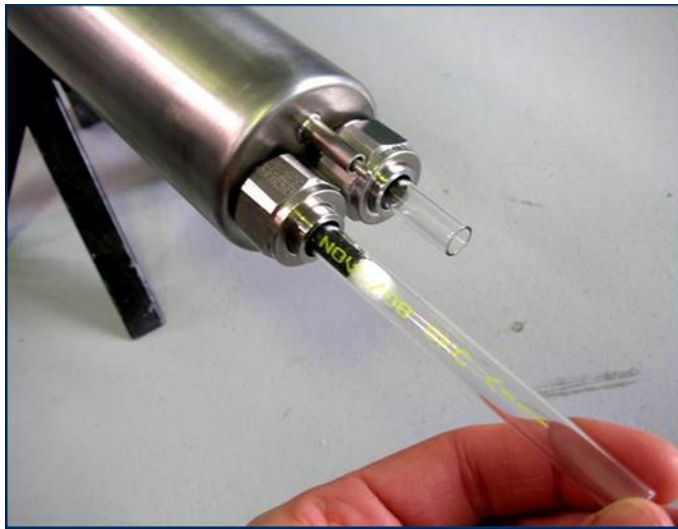
Model 3310 Hg0  
calibrator

Model 3315 HgII  
calibrator

Model 3320  
Sample  
Conditioner

Source: Tekran Instruments, Inc.

# Ongoing QA and Data Validation



## Sorbent Trap MMS

- Trap exchanges (14 days max)
- Laboratory Analysis
- Annual RATA



# Why sorbent trap monitoring?

- Simplicity
- Reliability
- Low levels



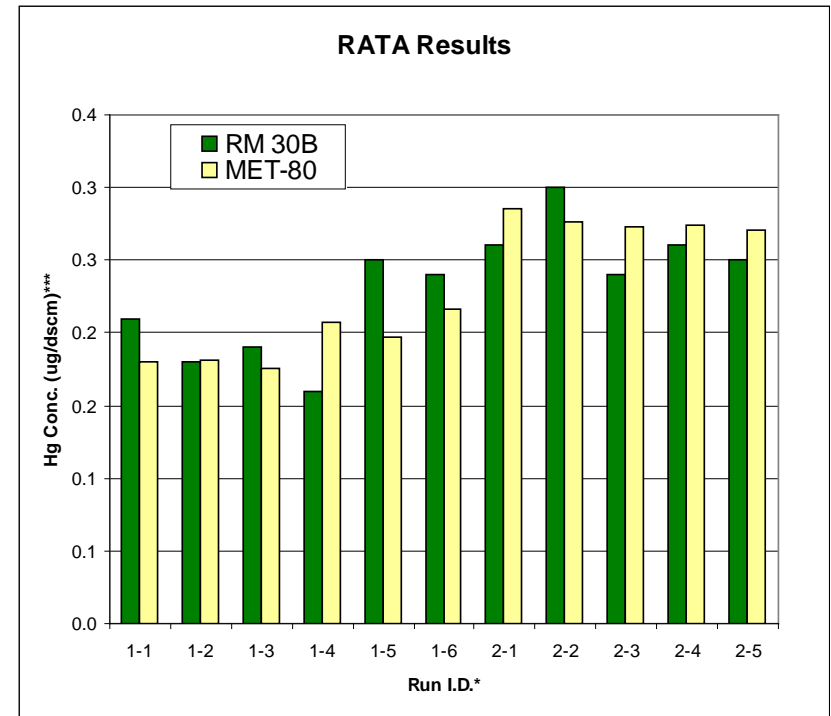
# Why sorbent trap monitoring?

- Simplicity
- Reliability
- Low levels
  - Accurate
  - Reproducible
  - NIST Traceable



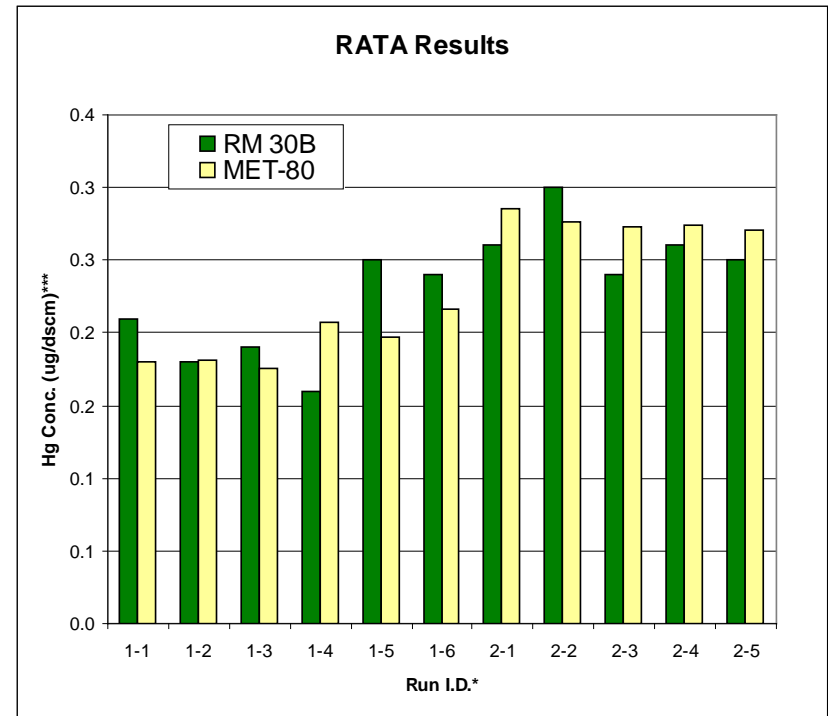
# Accuracy

Run*	Hg conc. ( $\mu\text{g}/\text{dscm}$ )		DIFF	%DIFF
	RM	MET80		
	$C_{RM-Avg}$	$C_{CMMS-AVG}$		
1-1	0.21	0.18	0.03	14.3%
1-2	0.18	0.18	0.00	-0.6%
1-3	0.19	0.18	0.01	7.4%
1-4	0.16	0.21	-0.05	-29.4%
1-5	0.25	0.20	0.05	21.2%
1-6	0.24	0.22	0.02	10.0%
2-1	0.26	0.29	-0.03	-9.6%
2-2	0.30	0.28	0.02	8.0%
2-3	0.24	0.27	-0.03	-13.8%
2-4	0.26	0.27	-0.01	-5.4%
2-5	0.25	0.27	-0.02	-8.4%
<i>All data</i> <i>(n=11)</i>	<b>0.231</b>	<b>0.231</b>	0.0004	9.2%

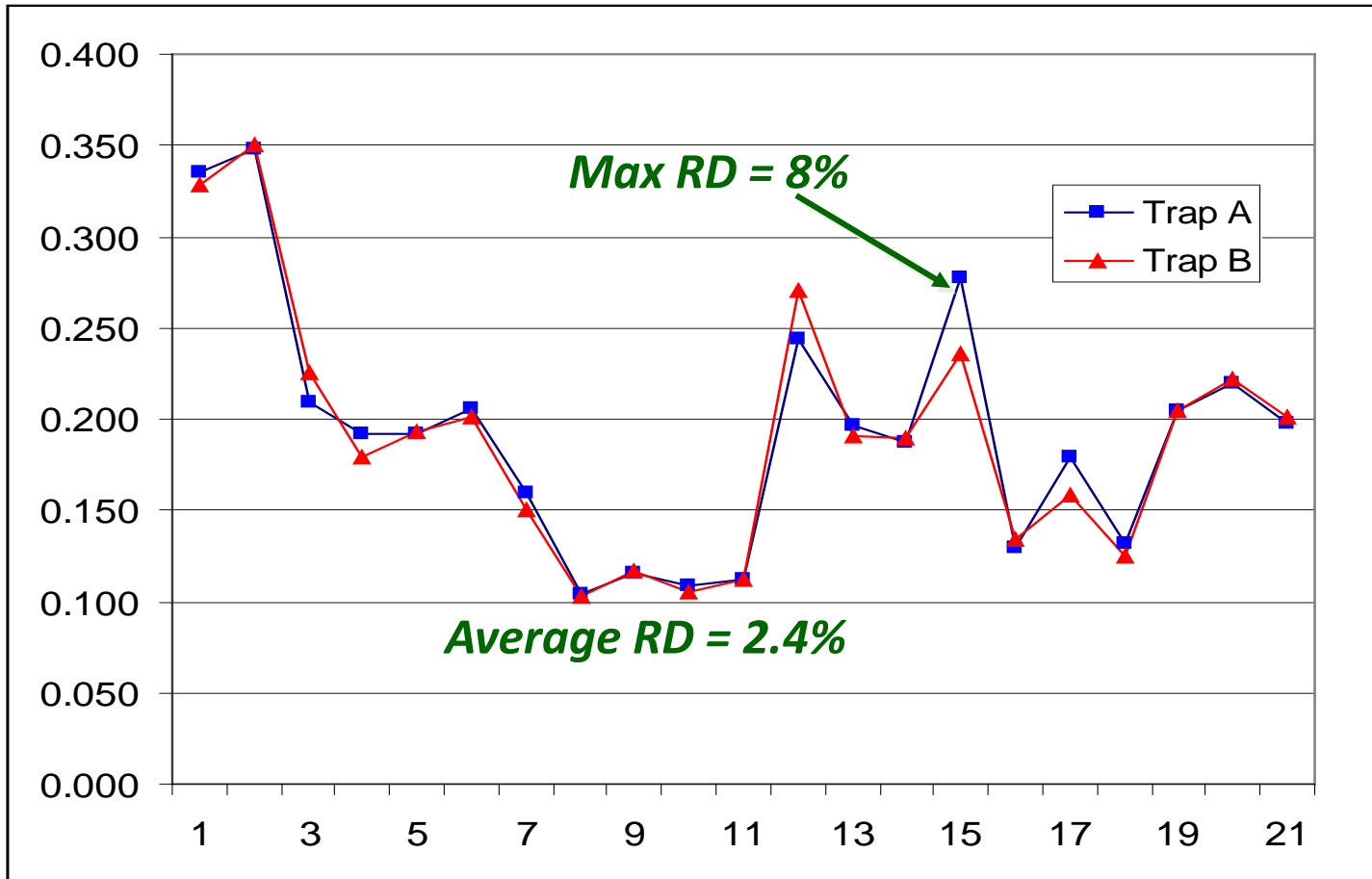


# Accuracy

Run*	Hg conc. ( $\mu\text{g}/\text{dscm}$ )		DIFF	%DIFF
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2-5	0.25	0.27	-0.02	-8.4%
<i>All data</i> <i>(n=11)</i>	<b>0.231</b>	<b>0.231</b>	0.0004	9.2%

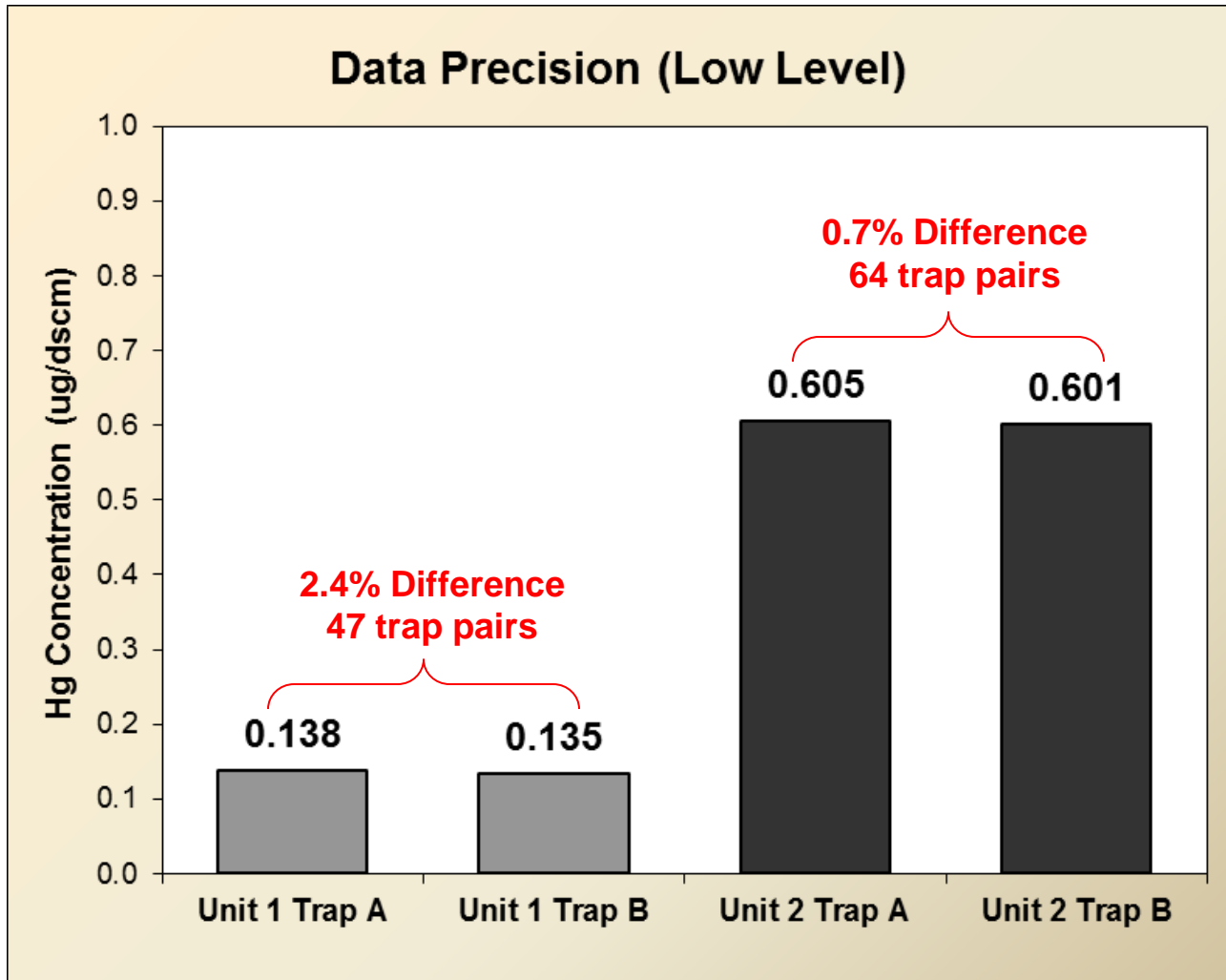


# Reproducibility



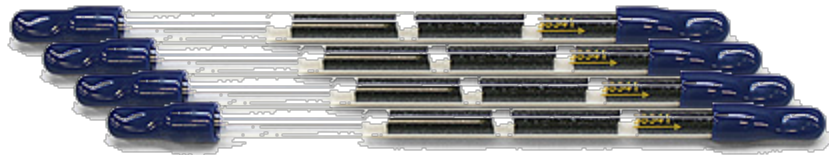
$$RD = \frac{|C_A - C_B|}{(C_A + C_B)} \times 100\%$$

# Reproducibility



# Traceable

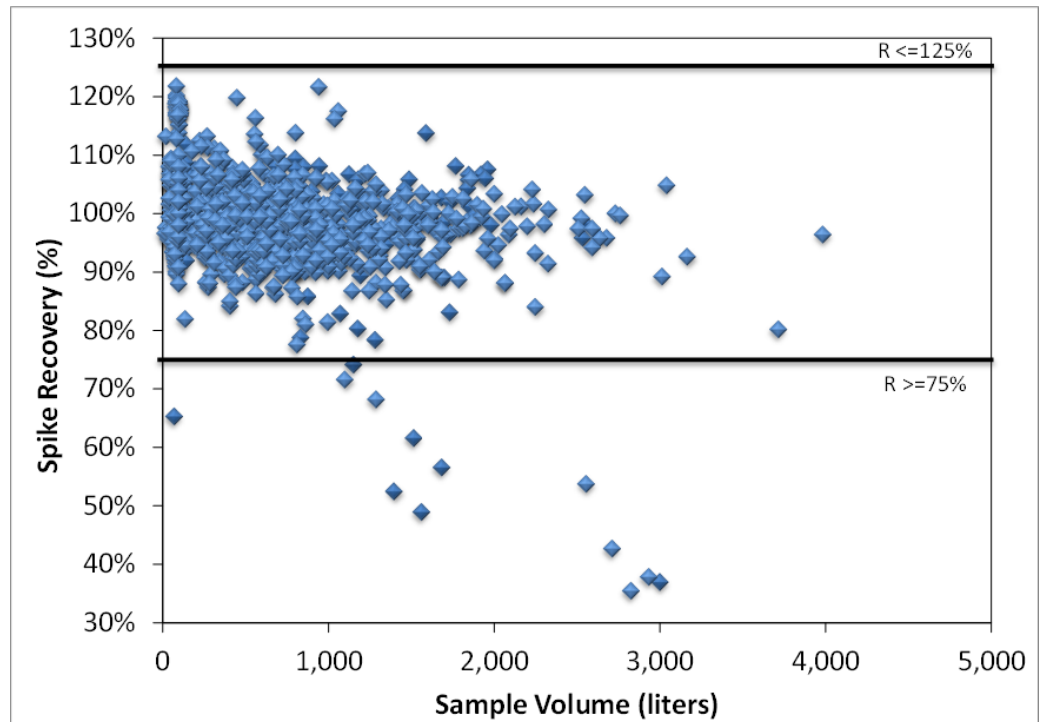
- NIST-traceable standards
- Analyte spiking



# Traceable

- NIST-traceable standards
- Analyte spiking

500 traps  
3 years



Mean spike recovery: 98.5%



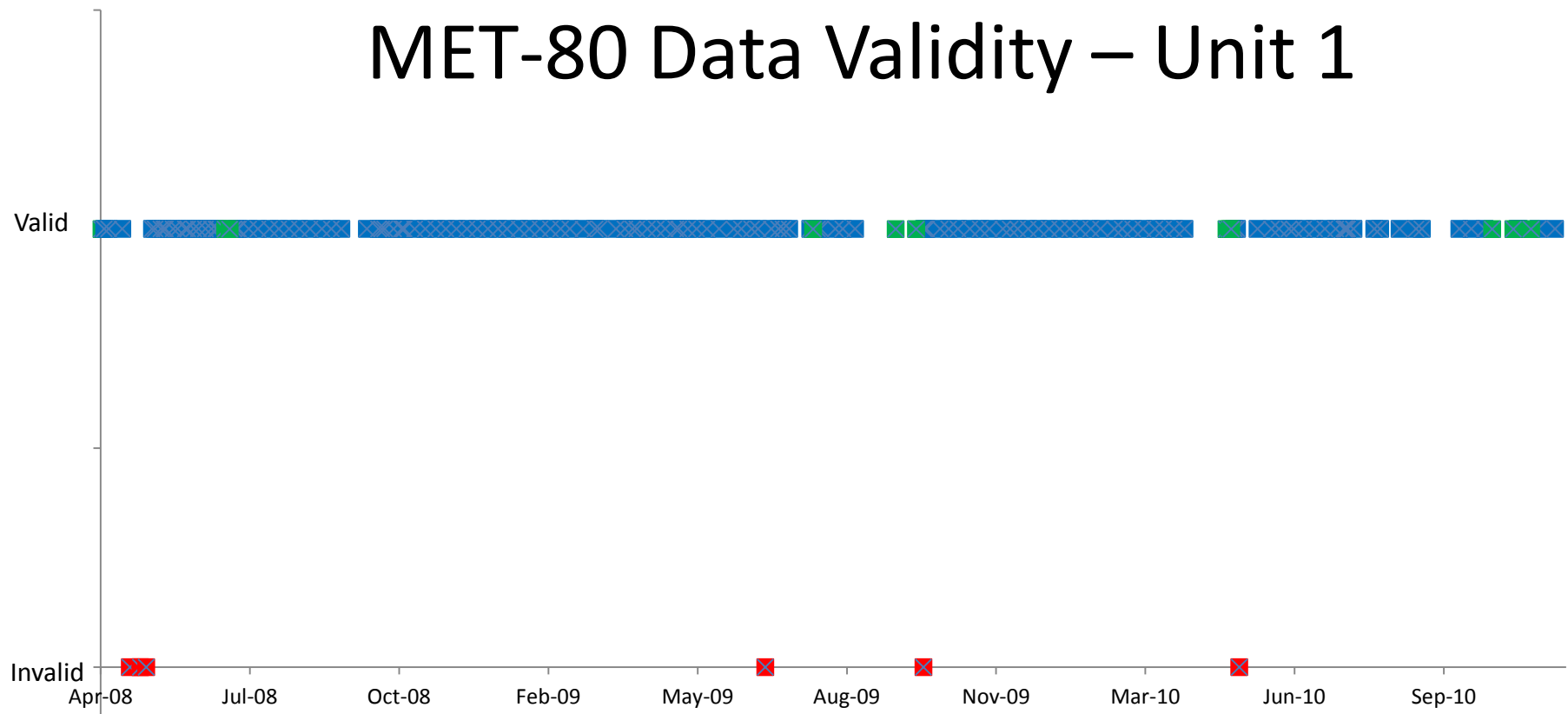
# Reliability

## Case study

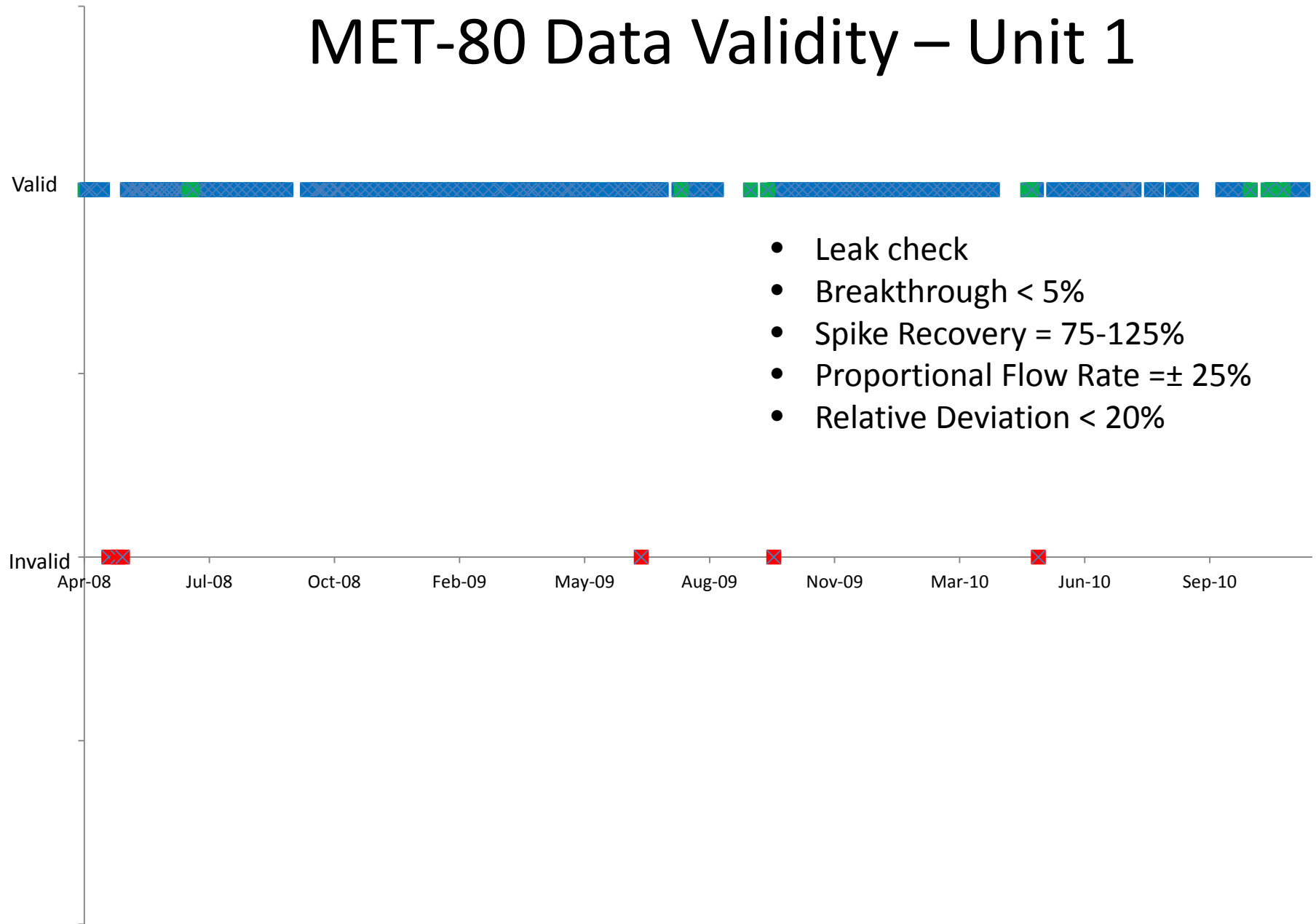
- Dominion Salem Harbor
- Compliance monitoring since 2008
- Three MET-80 systems



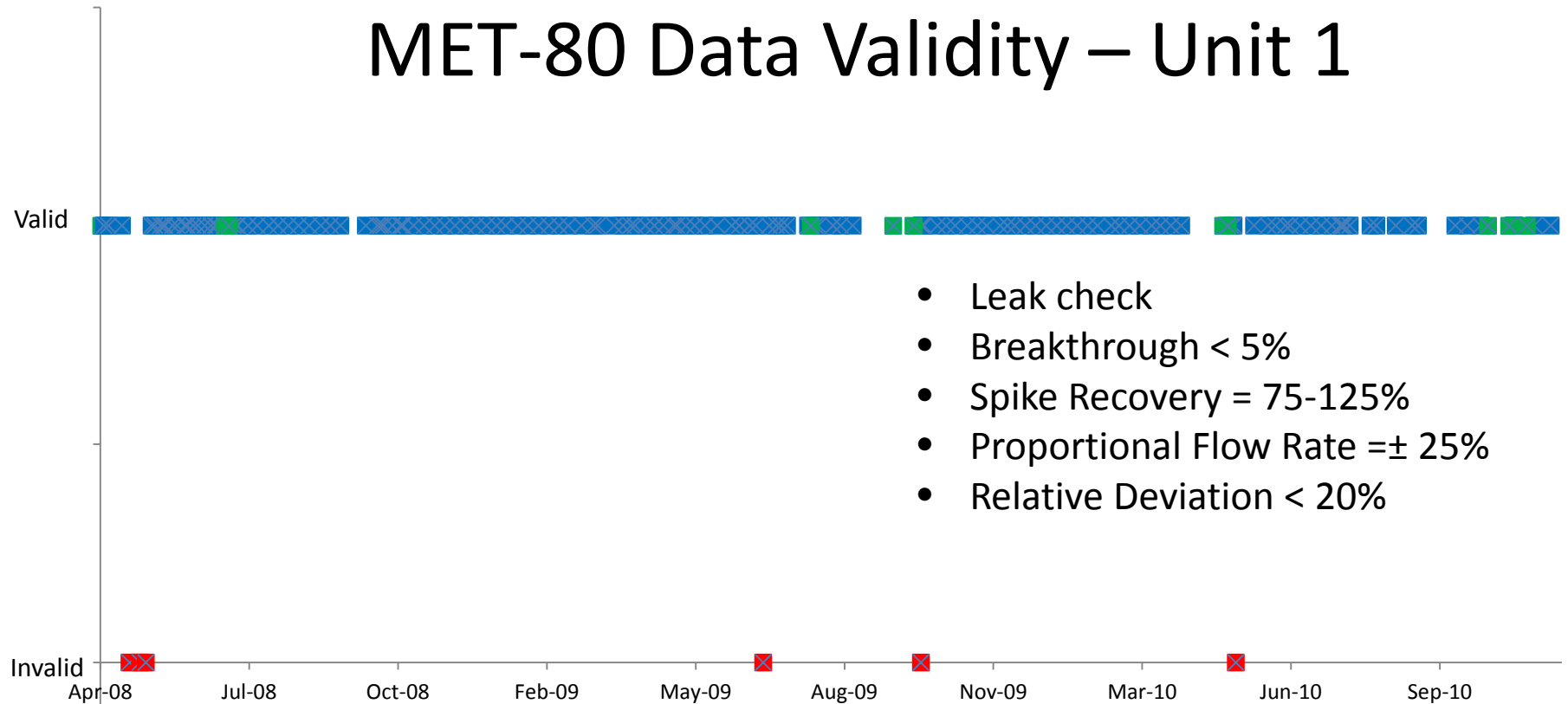
# MET-80 Data Validity – Unit 1



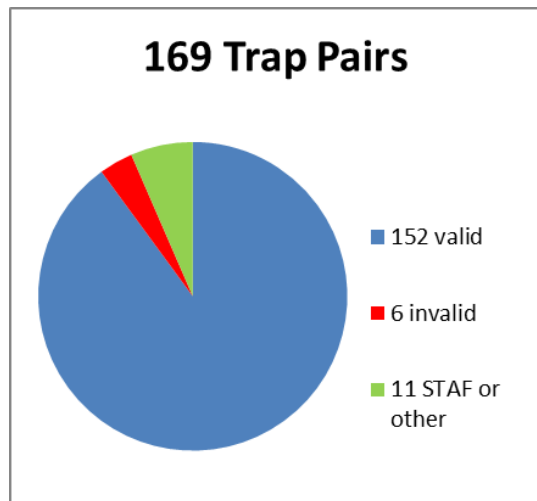
# MET-80 Data Validity – Unit 1



# MET-80 Data Validity – Unit 1

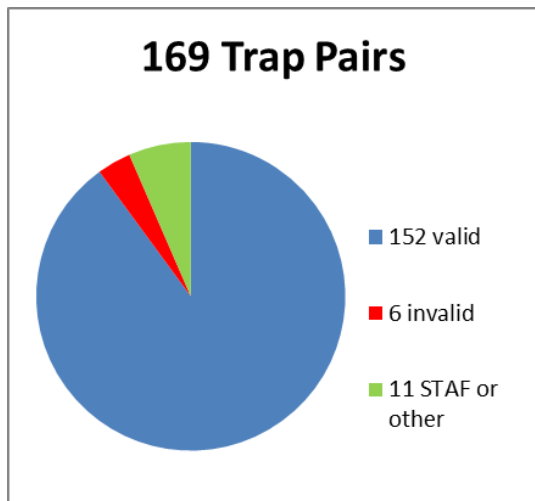
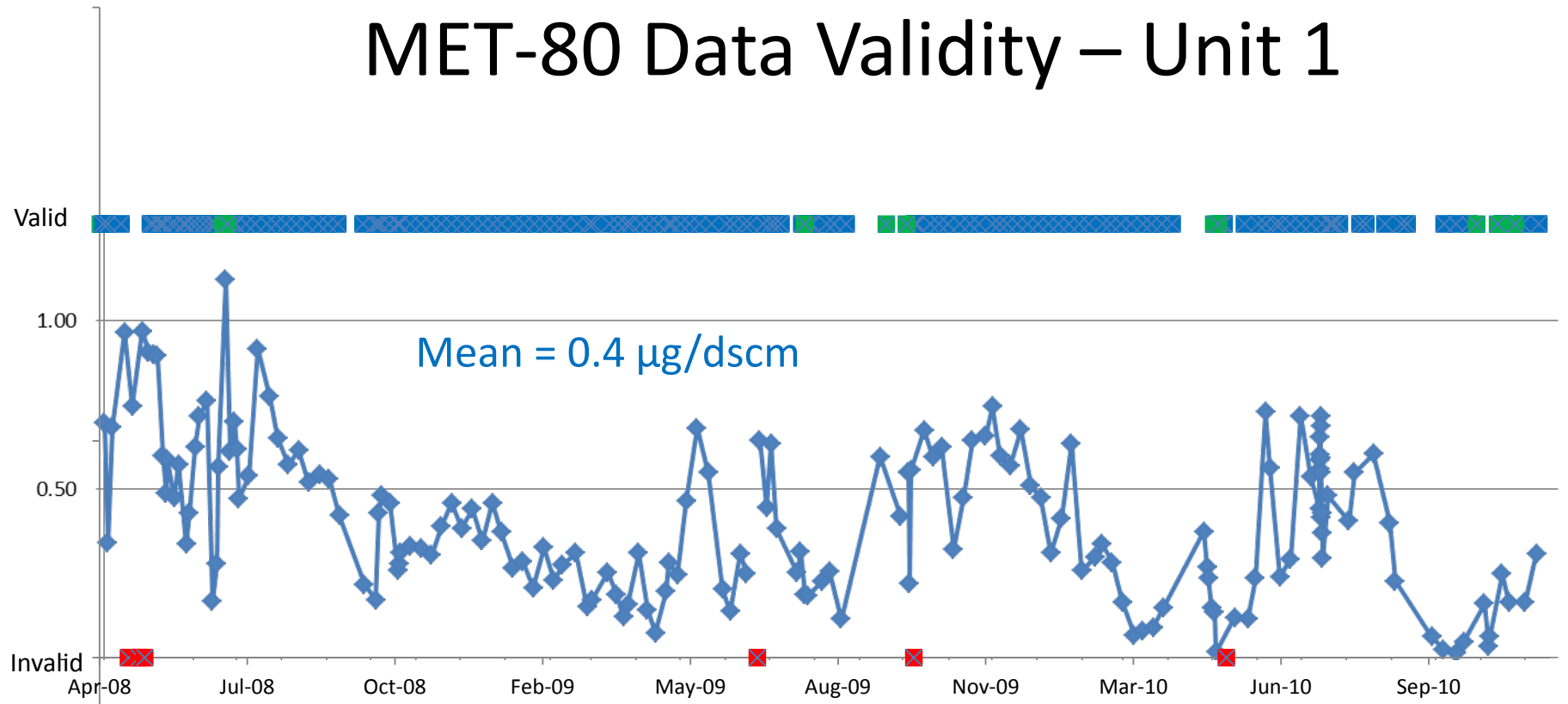


- Leak check
- Breakthrough < 5%
- Spike Recovery = 75-125%
- Proportional Flow Rate = ± 25%
- Relative Deviation < 20%



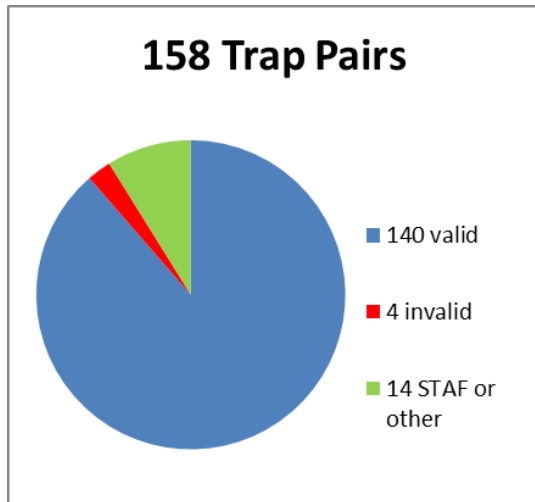
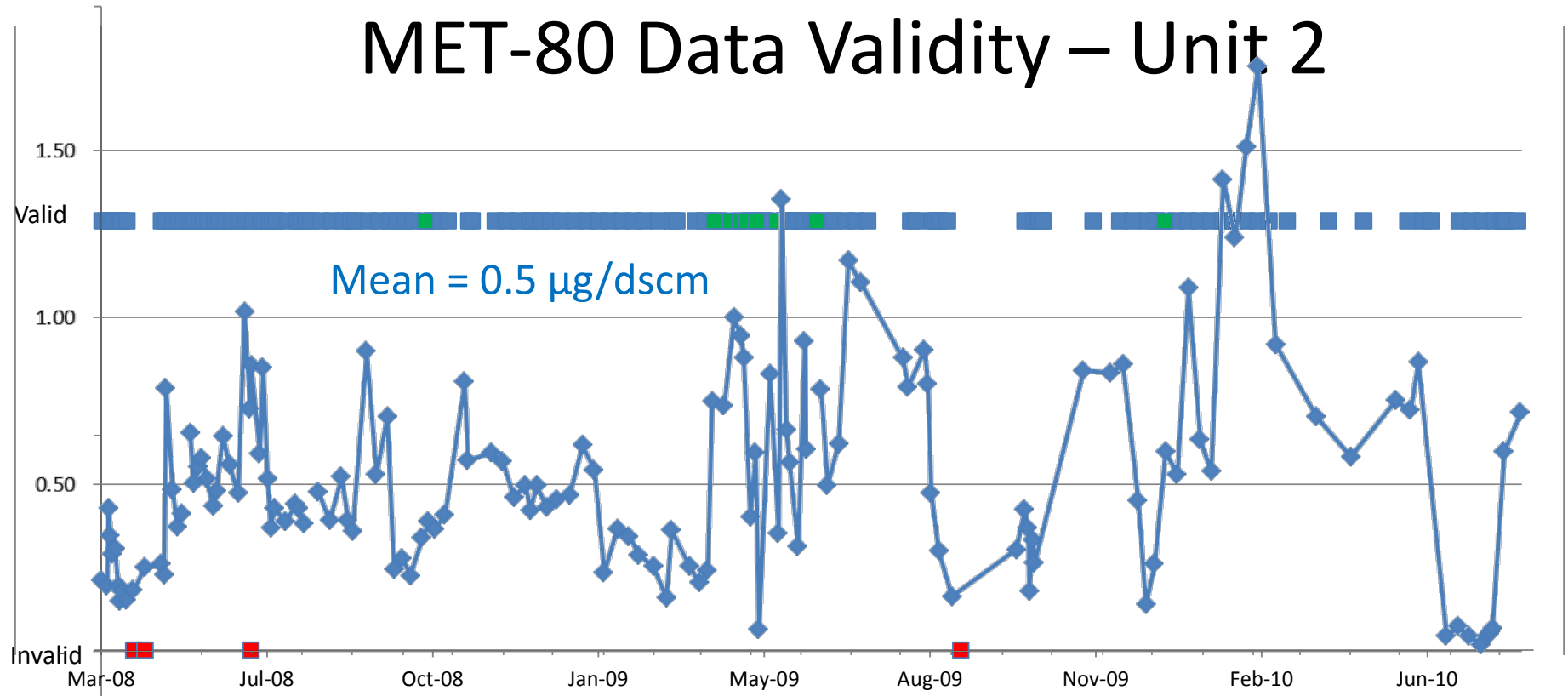
**94%**  
reported  
availability

# MET-80 Data Validity – Unit 1



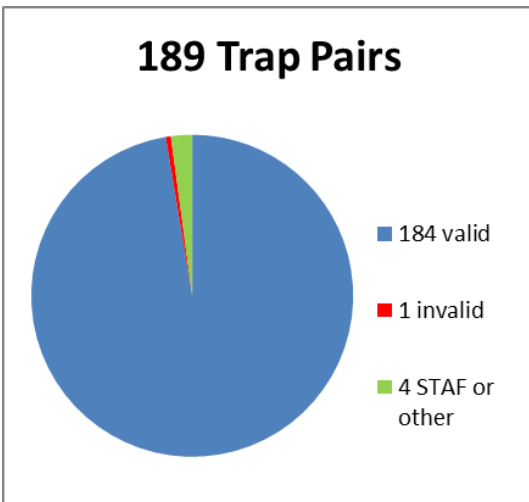
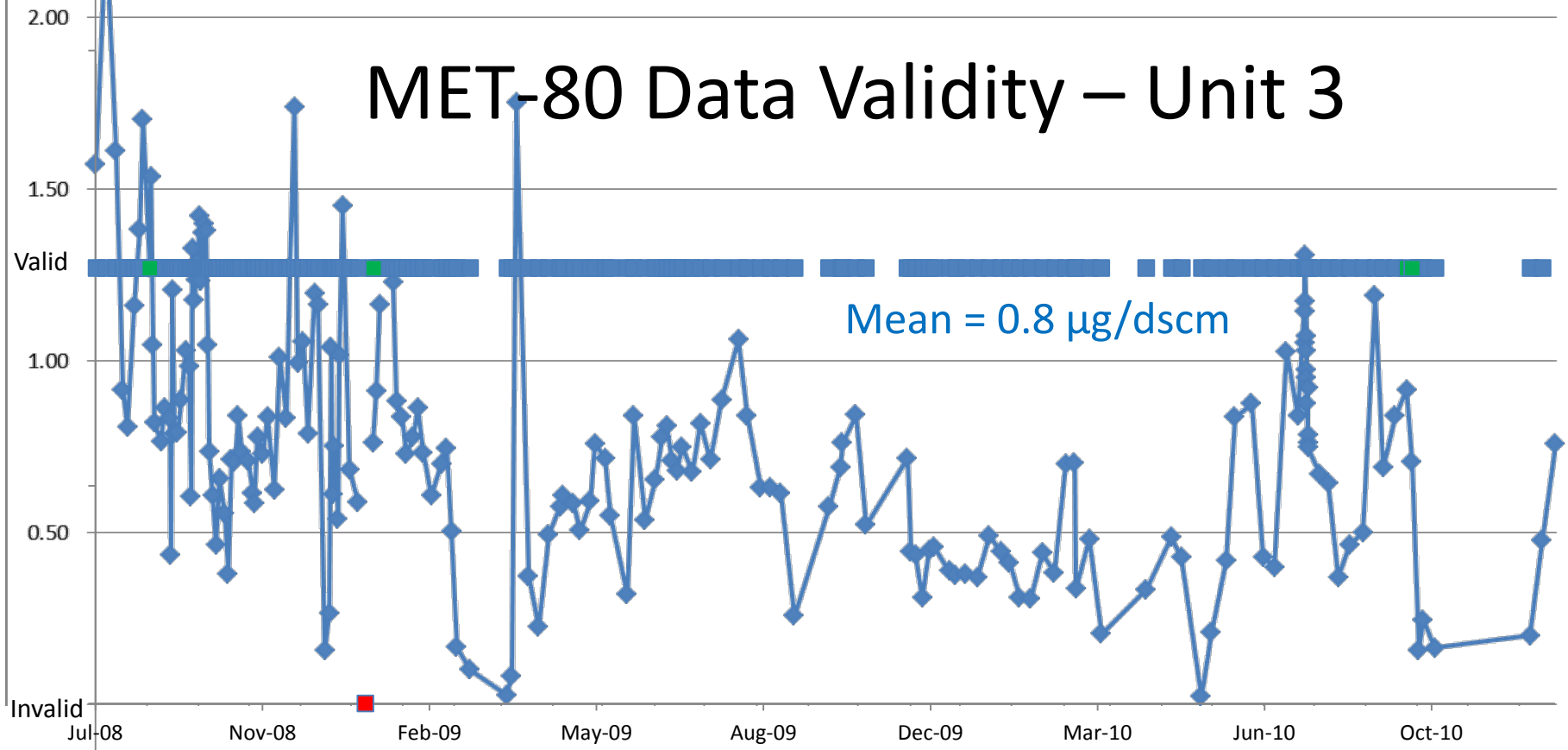
94%  
reported  
availability

# MET-80 Data Validity – Unit 2



91%  
reported  
availability

# MET-80 Data Validity – Unit 3



96%  
reported  
availability

# What about new units?



*Source: Bristol Herald Courier*

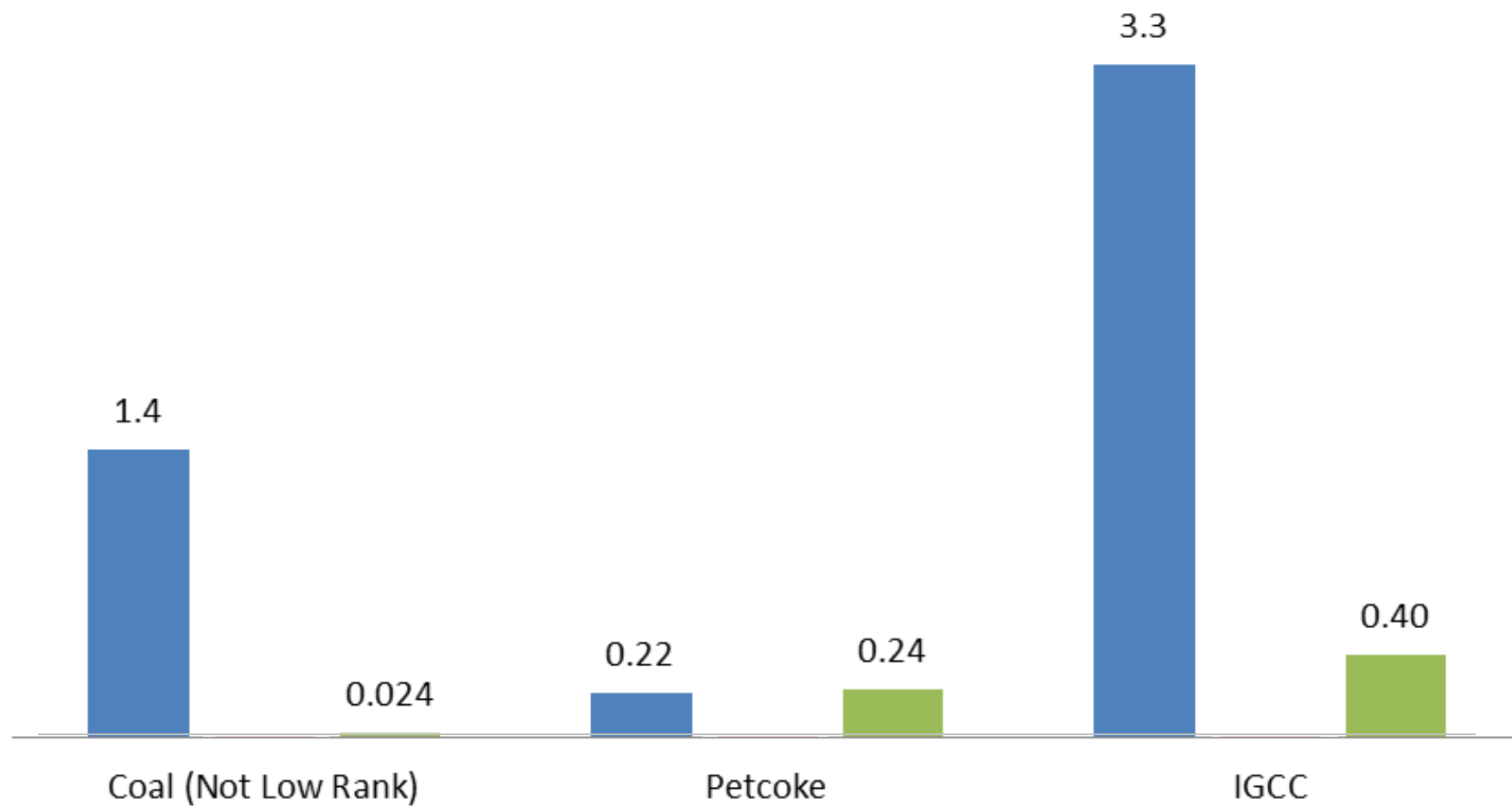


# MATS Hg Limits

$\mu\text{g}/\text{scm}$

■ Existing

■ New

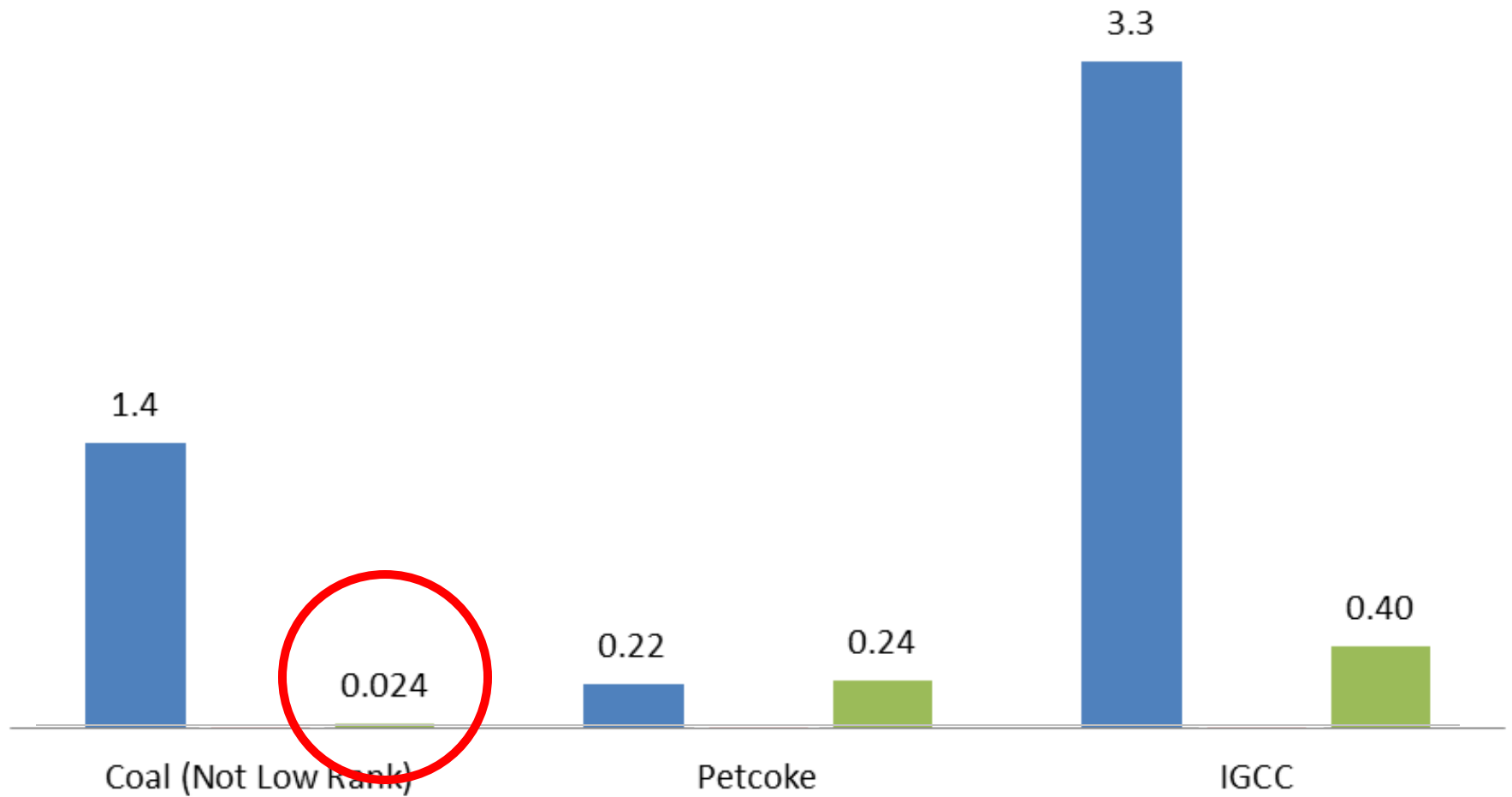


# MATS Hg Limits

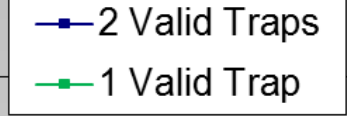
$\mu\text{g}/\text{scm}$

■ Existing

■ New

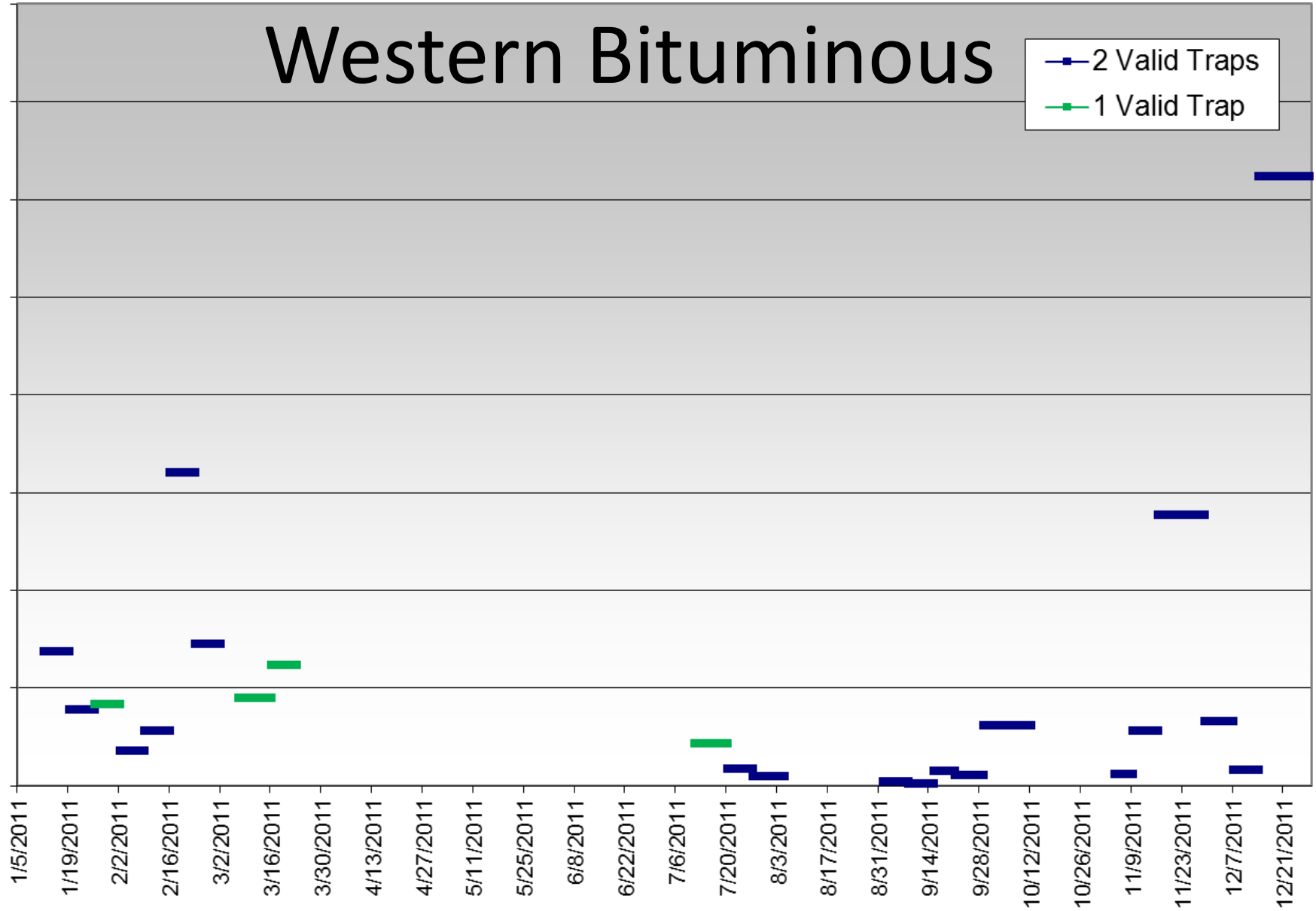


# Western Bituminous

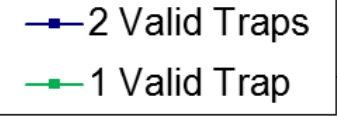


Concentration ( $\mu\text{g}/\text{dscm}$ )

Date



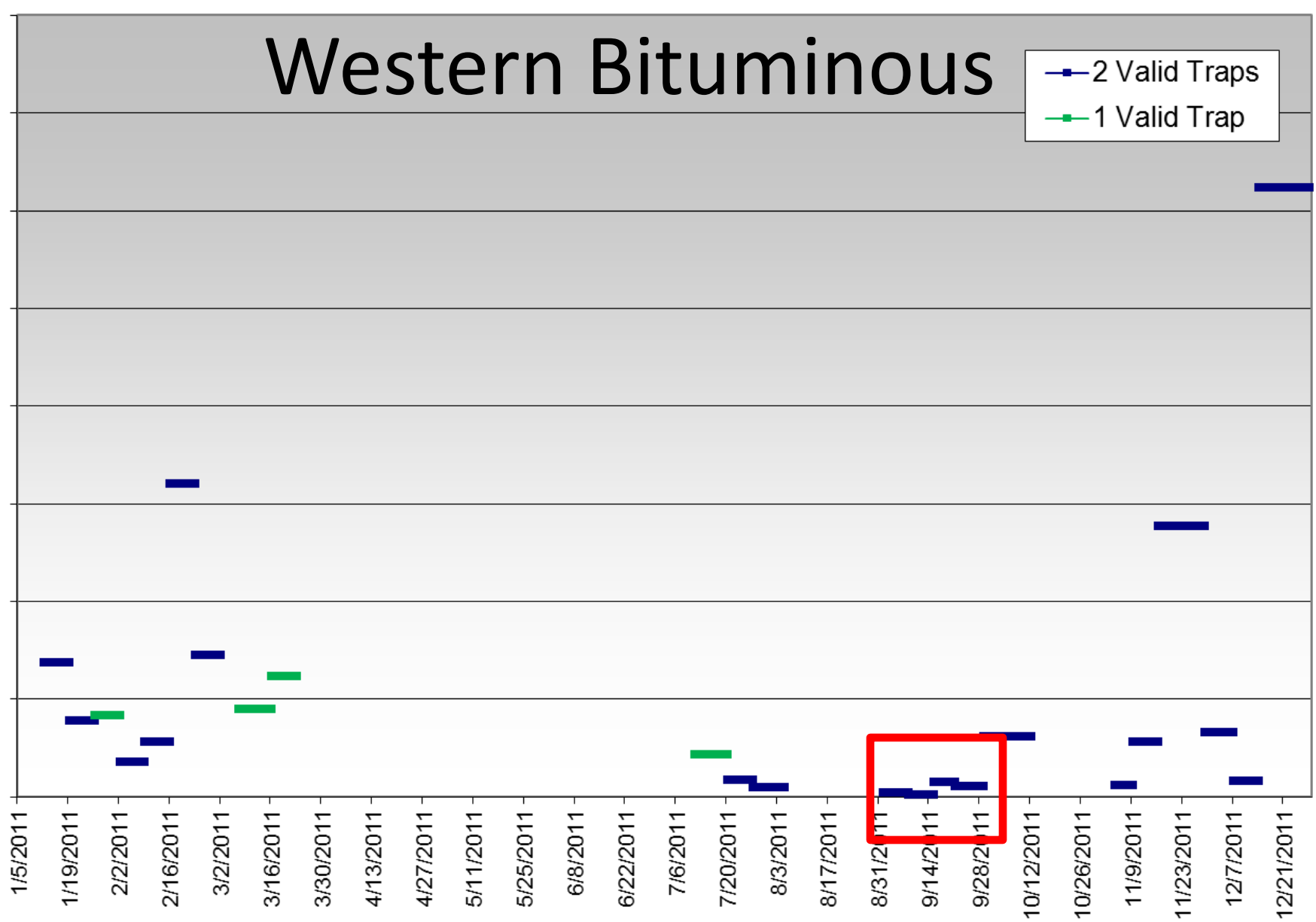
# Western Bituminous



Concentration ( $\mu\text{g}/\text{dscm}$ )

Date

1/5/2011 1/19/2011 2/2/2011 2/16/2011 3/2/2011 3/16/2011 3/30/2011 4/13/2011 4/27/2011 5/11/2011 5/25/2011 6/8/2011 6/22/2011 7/6/2011 7/20/2011 8/3/2011 8/17/2011 8/31/2011 9/14/2011 9/28/2011 10/12/2011 10/26/2011 11/9/2011 11/23/2011 12/7/2011 12/21/2011



0 – 0.025  $\mu\text{g}/\text{scm}$

Concentration ( $\mu\text{g}/\text{dscm}$ )

0.025  
0.020  
0.015  
0.010  
0.005  
0.000

6/22/2011 7/6/2011 7/20/2011 8/3/2011 8/17/2011 8/31/2011 9/14/2011 9/28/2011

Date

0.019

0.0074

0.0026

0.021

# In Summary

- MATS will require mercury measurements well below 1  $\mu\text{g}/\text{scm}$

# In Summary

- MATS will require mercury measurements well below 1  $\mu\text{g}/\text{scm}$
- These levels can be measured

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- Existing units:



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- MATS will require mercury measurements well below 1  $\mu\text{g}/\text{scm}$
- These levels can be measured
- Existing units: **sorbent trap monitoring**
- New units:

# In Summary

- MATS will require mercury measurements well below 1  $\mu\text{g}/\text{scm}$
- These levels can be measured
- Existing units: sorbent trap monitoring
- New units: sorbent trap monitoring

# Questions?

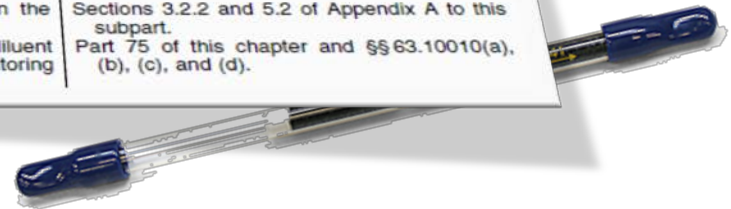
9496

Federal Register / Vol. 77, No. 32 / Thursday, February 16, 2012 / Rules and Regulations

TABLE 5 TO SUBPART UUUUU OF PART 63—PERFORMANCE TESTING REQUIREMENTS—Continued

[As stated in § 63.10007, you must comply with the following requirements for performance testing for existing, new or reconstructed affected sources.]

To conduct a performance test for the following pollutant . . .	Using . . .	You must perform the following activities, as applicable to your input- or output-based emission limit . . .	Using <sup>2</sup> . . .
	OR	<p>f. Convert emissions concentration to lb/TBtu or lb/GWh emission rates.</p> <p>OR</p> <p>Hg CEMS . . . . .</p> <p>a. Install, certify, operate, and maintain the CEMS.</p> <p>b. Install, certify, operate, and maintain the diluent gas, flow rate, and/or moisture monitoring systems.</p> <p>c. Convert hourly emissions concentrations to 30 boiler operating day rolling average lb/TBtu or lb/GWh emissions rates.</p>	<p>Method 19 F-factor methodology at Appendix A-7 to part 60 of this chapter, or calculate using mass emissions rate and electrical output data (see § 63.10007(e)).</p> <p>Sections 3.2.1 and 5.1 of Appendix A of this subpart.</p> <p>Part 75 of this chapter and §§ 63.10010(a), (b), (c), and (d).</p> <p>Section 6 of Appendix A to this subpart.</p>
	OR Sorbent trap monitoring system.	<p>OR</p> <p>a. Install, certify, operate, and maintain the sorbent trap monitoring system.</p> <p>b. Install, operate, and maintain the diluent gas, flow rate, and/or moisture monitoring systems.</p>	<p>Sections 3.2.2 and 5.2 of Appendix A to this subpart.</p> <p>Part 75 of this chapter and §§ 63.10010(a), (b), (c), and (d).</p>



[cleanair.com](http://cleanair.com)

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800-632-1619