

Variability of Mercury CEMS vs Sorbent Trap Results

WPCA/KCPL

Coal-fired APC Environmental Seminar

June 5, 2018



Presented By
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But first...
“Precondition
your mind”...
...Its mercury!



Photo courtesy of D. Haynes

“Variability”

var·i·a·bil·i·ty

**lack of consistency or fixed pattern;
liability to vary or change**

“Consistency”

Considerations for Hg CEMS Variability

1. Variability from a different monitoring approach as a basis (PS -12B sorbent trap)
2. Variability between the population of Hg CEMS

Parameters Considered

1. Relative Accuracy (Table A-2, 40 CFR 63, Subpart UUUUU)
 - I. Primary Standard $\leq 20.0\%$ RA *or*
 - II. Alternate Standard $|RM_{avg} - C_{avg}| + |CC| \leq 0.5 \mu\text{g}/\text{scm}$,
if $RM_{avg} < 2.5 \mu\text{g}/\text{scm}$

Parameters Considered

2. Hg Concentration Levels
3. Concentration differences ($|RM_{avg} - C_{avg}|$)
4. Bias
5. Data Availability

The Basis for Comparison

PS 12B Sorbent Trap
Monitoring Systems

VS

EPA Method 30B





The Data Set – PS-12B Hg RATAs

68 RATA Tests

16 facilities

31 EGUs

May 2009 – Feb 2017

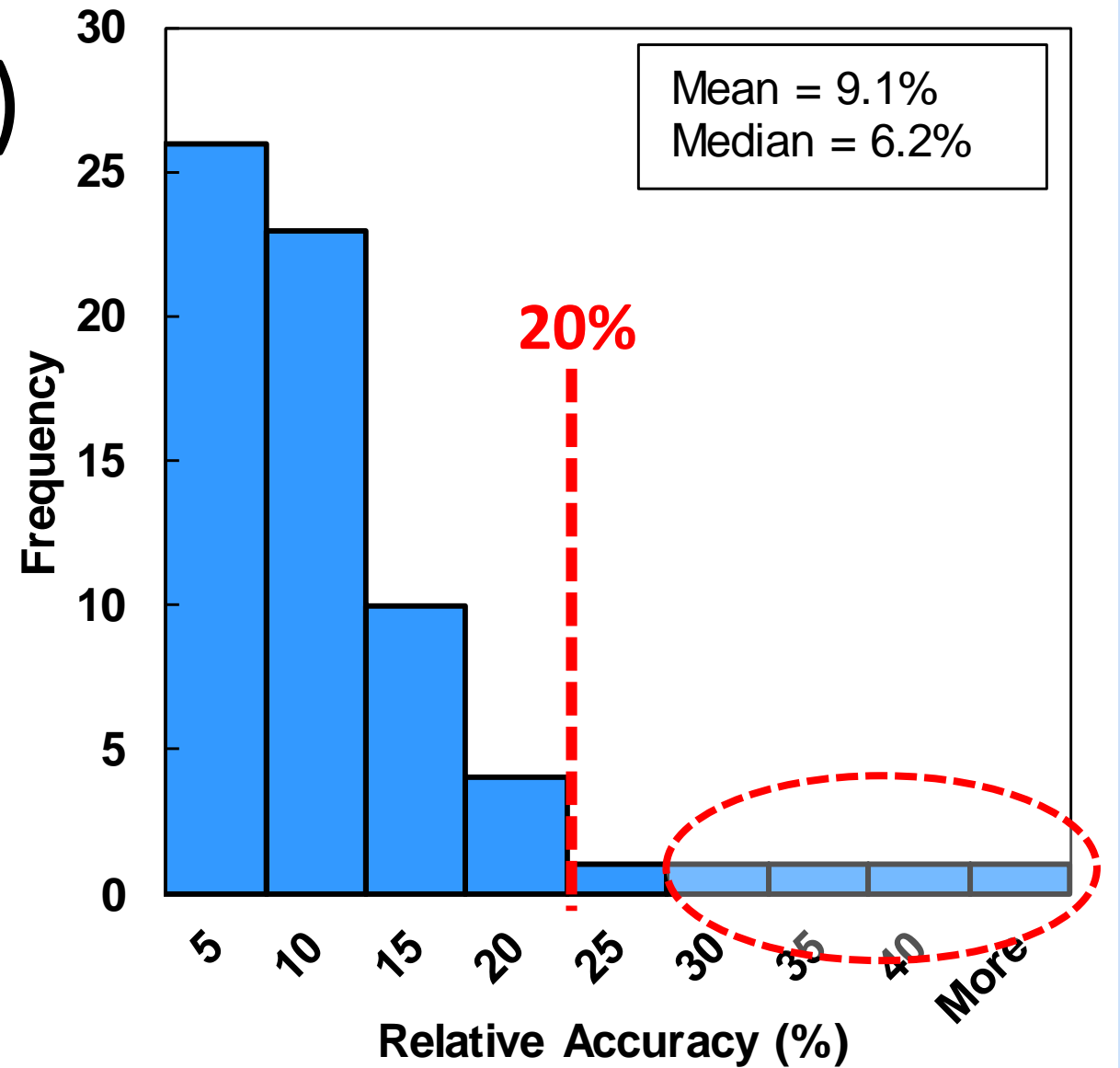
STMS Relative Accuracy (%)

Average RA – 9.1%

Median RA – 6.2%

Best RATA? – 1.59%
(0.550-0.553 $\mu\text{g}/\text{dscm}$)

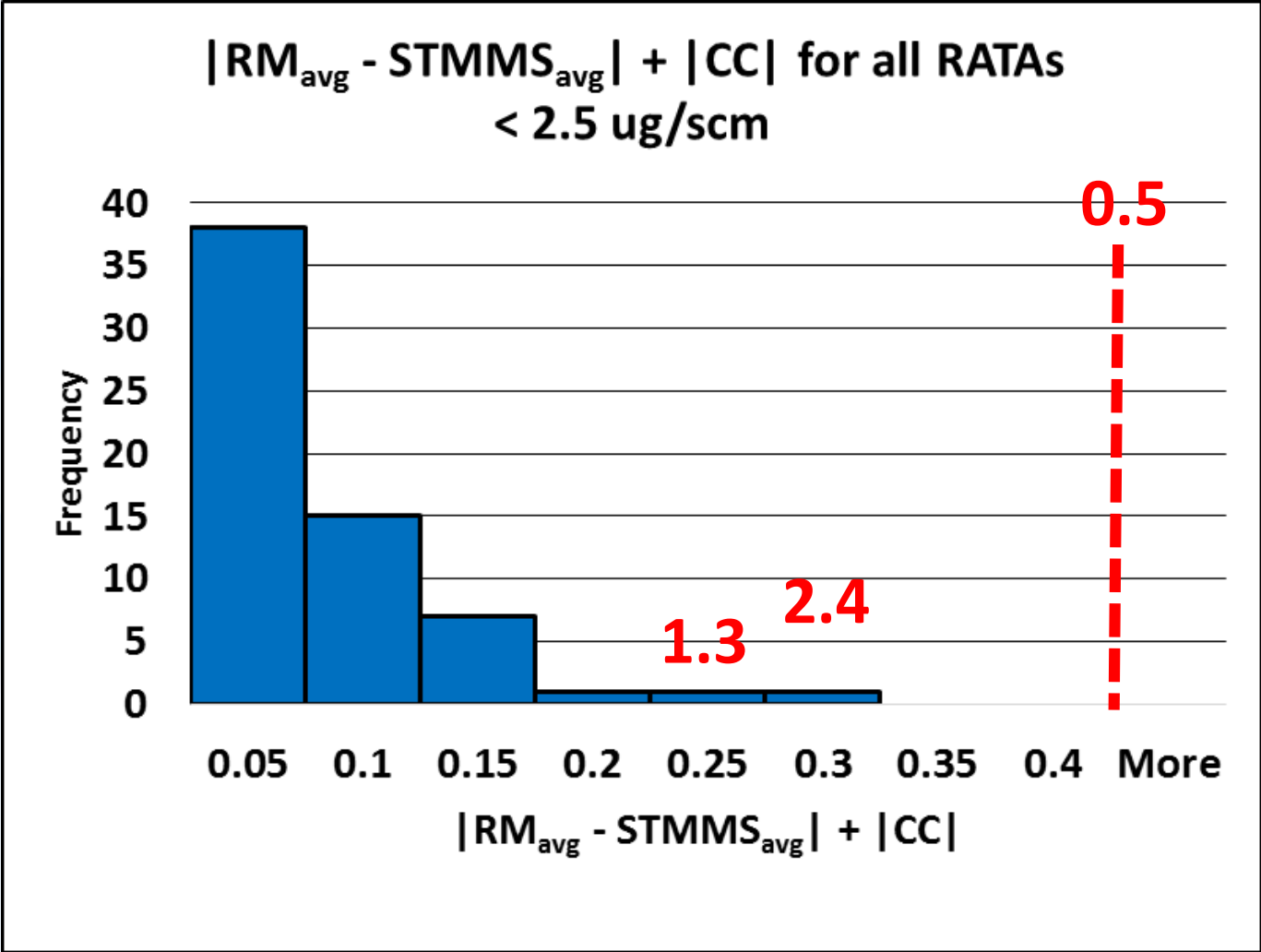
Worst RATA? – 59%
(0.01-0.006 $\mu\text{g}/\text{dscm}$)



STMS Relative Accuracy (Alt)

Average – 0.06%

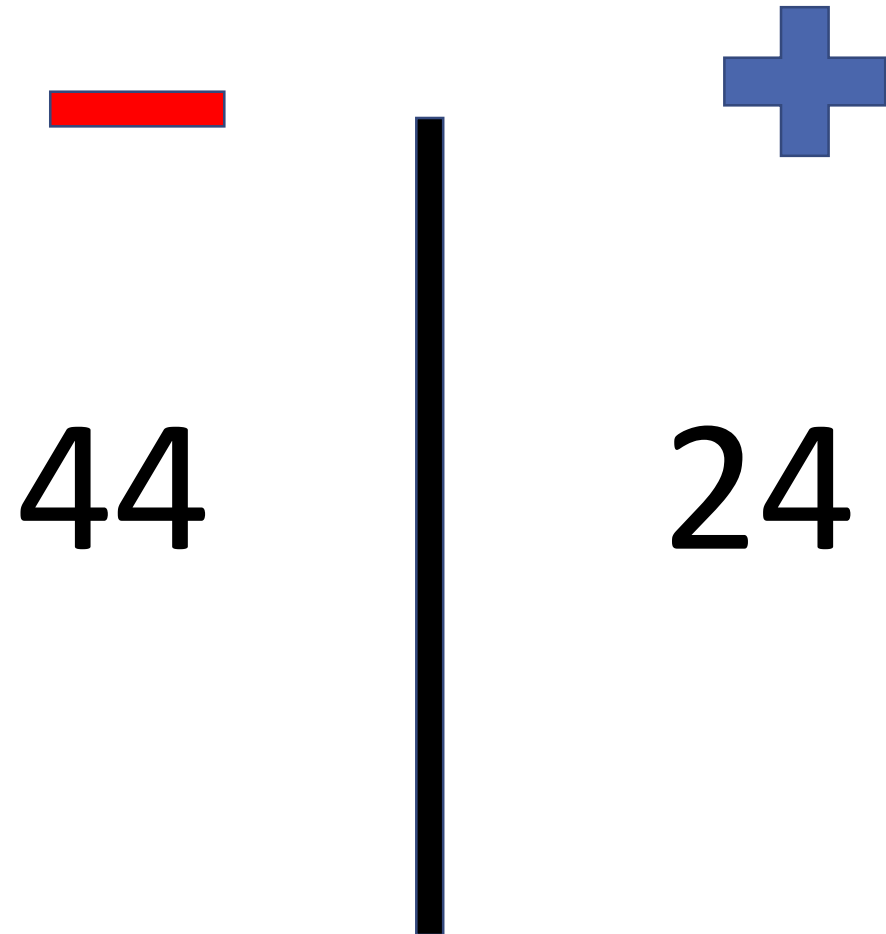
Median RA – 0.04%



BIAS – PS12B to 30B

MeanDiff
-0.01238
0.06998
-0.03636
0.00357
0.00867
-0.05774
-0.26432
-0.13257

$$(RM_{avg} - STMS_{avg})$$





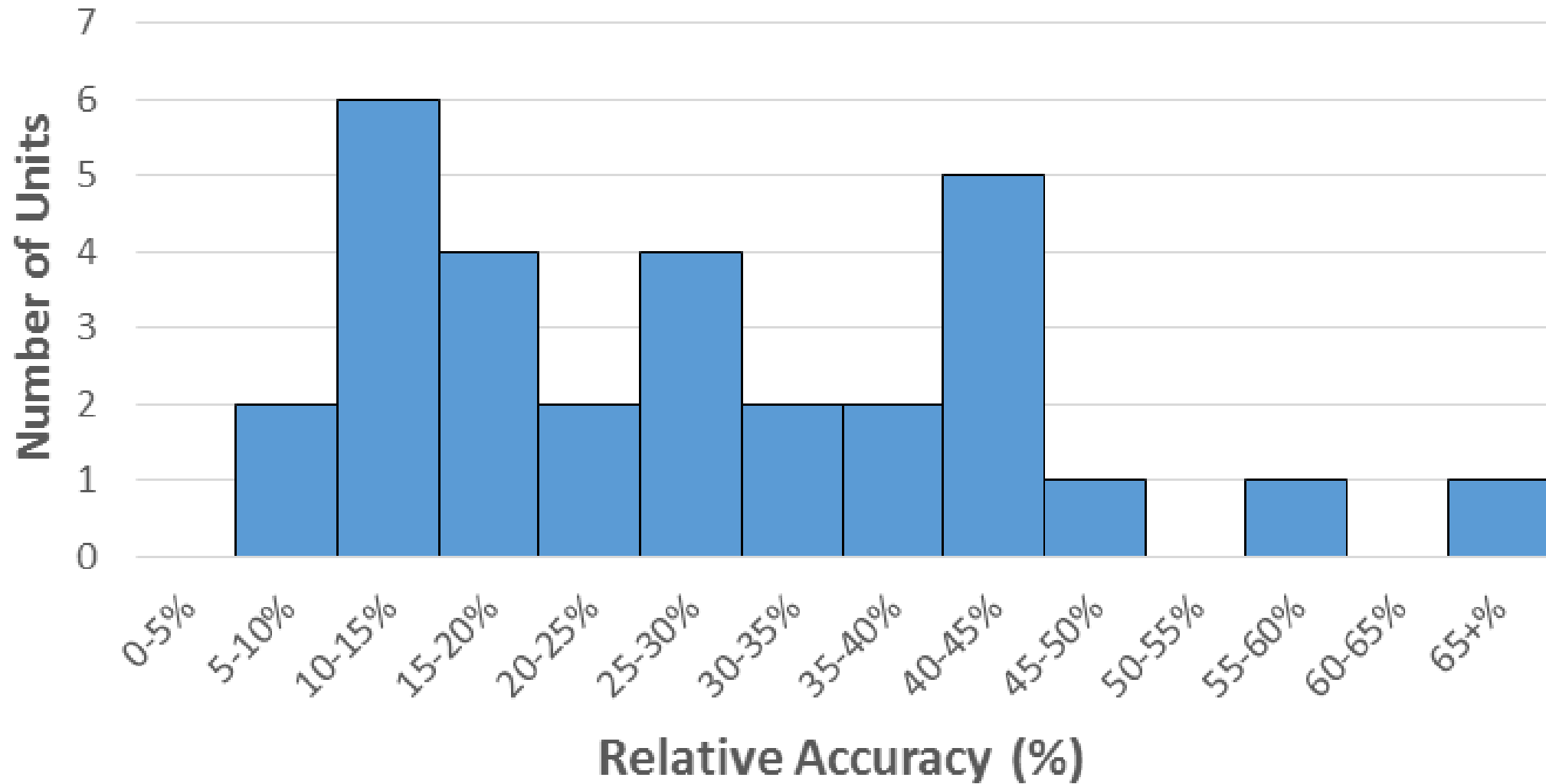
The Data Set – Hg CEMS RATAs

30 Units

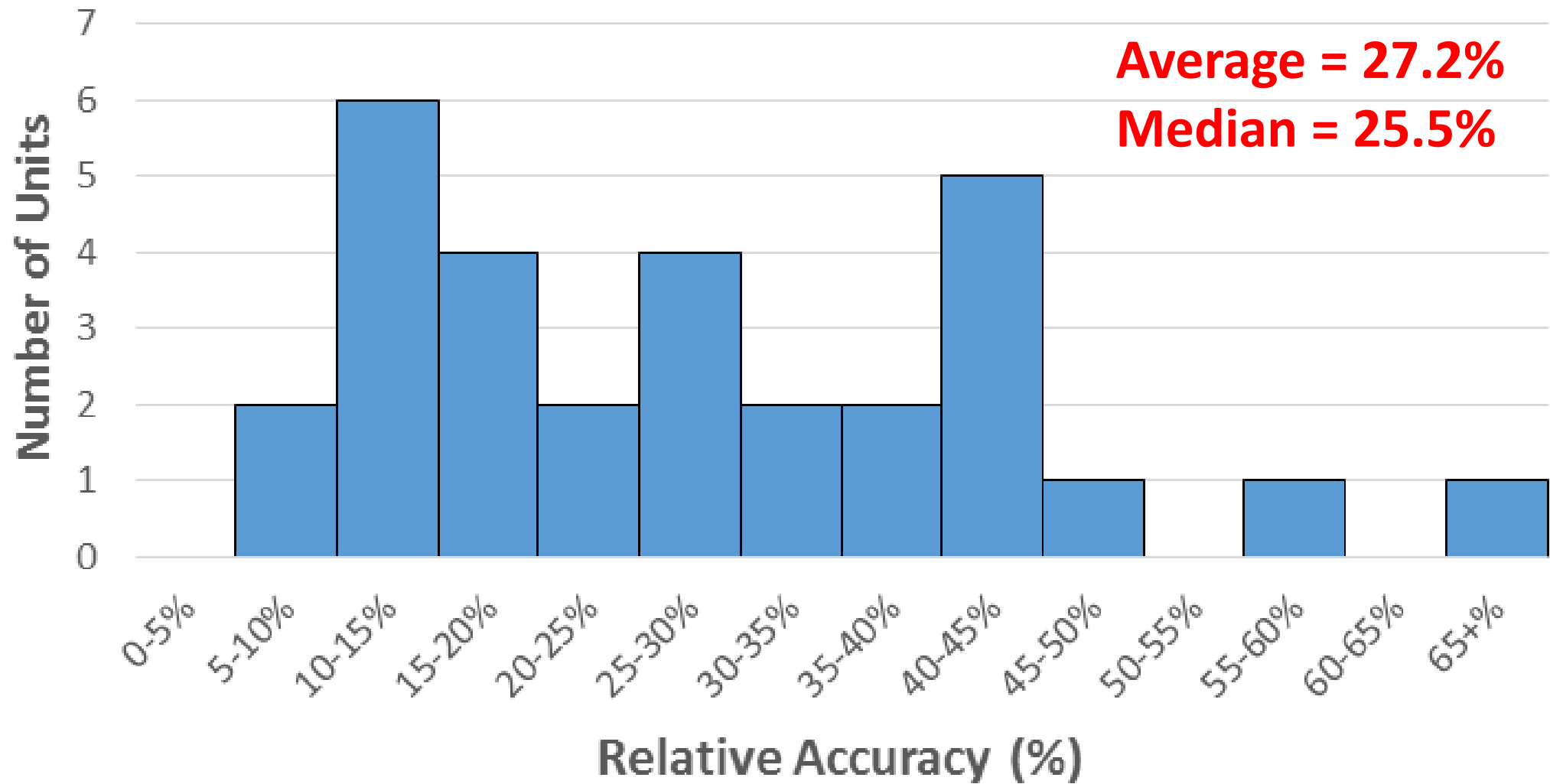
17 facilities (MATS)

2017

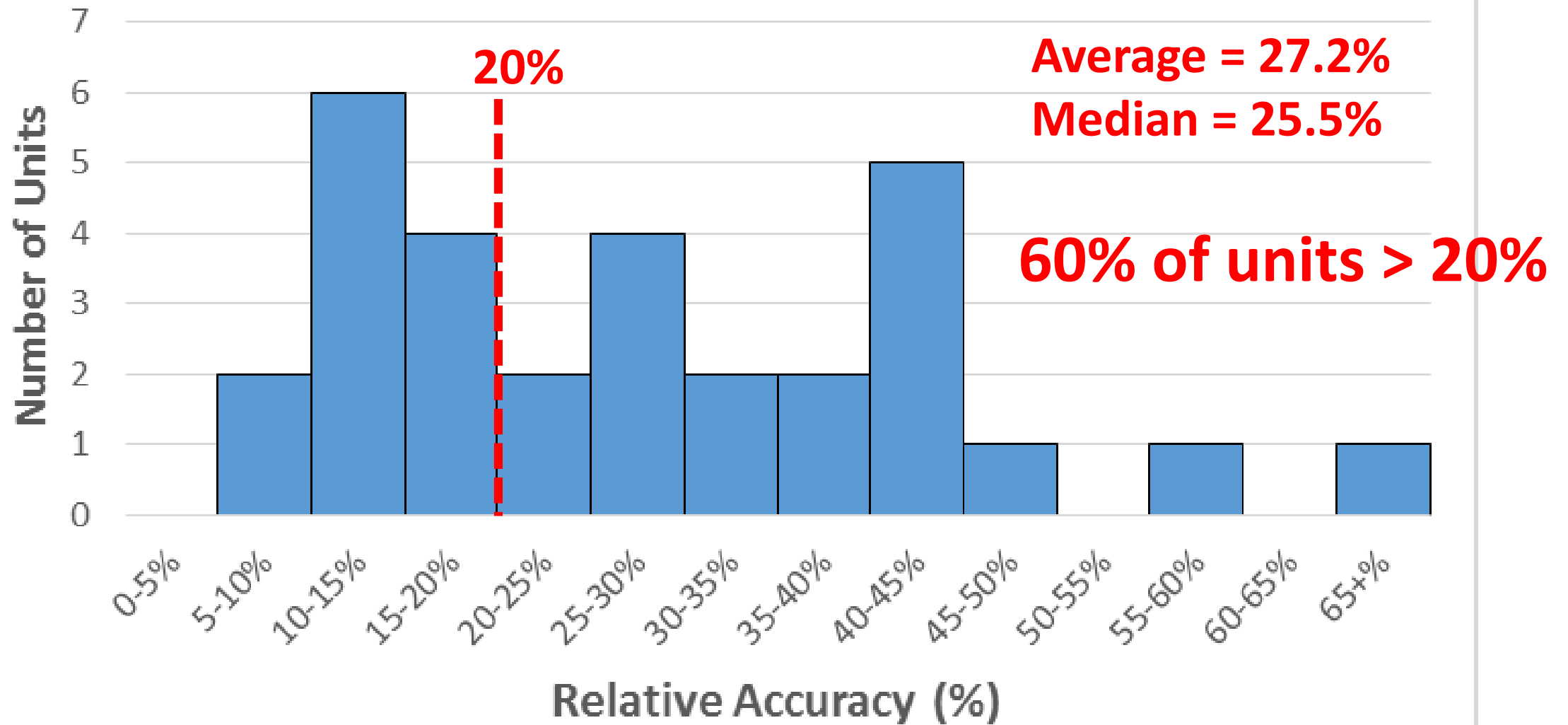
Hg CEMS - 2017 RATA Results - %RA



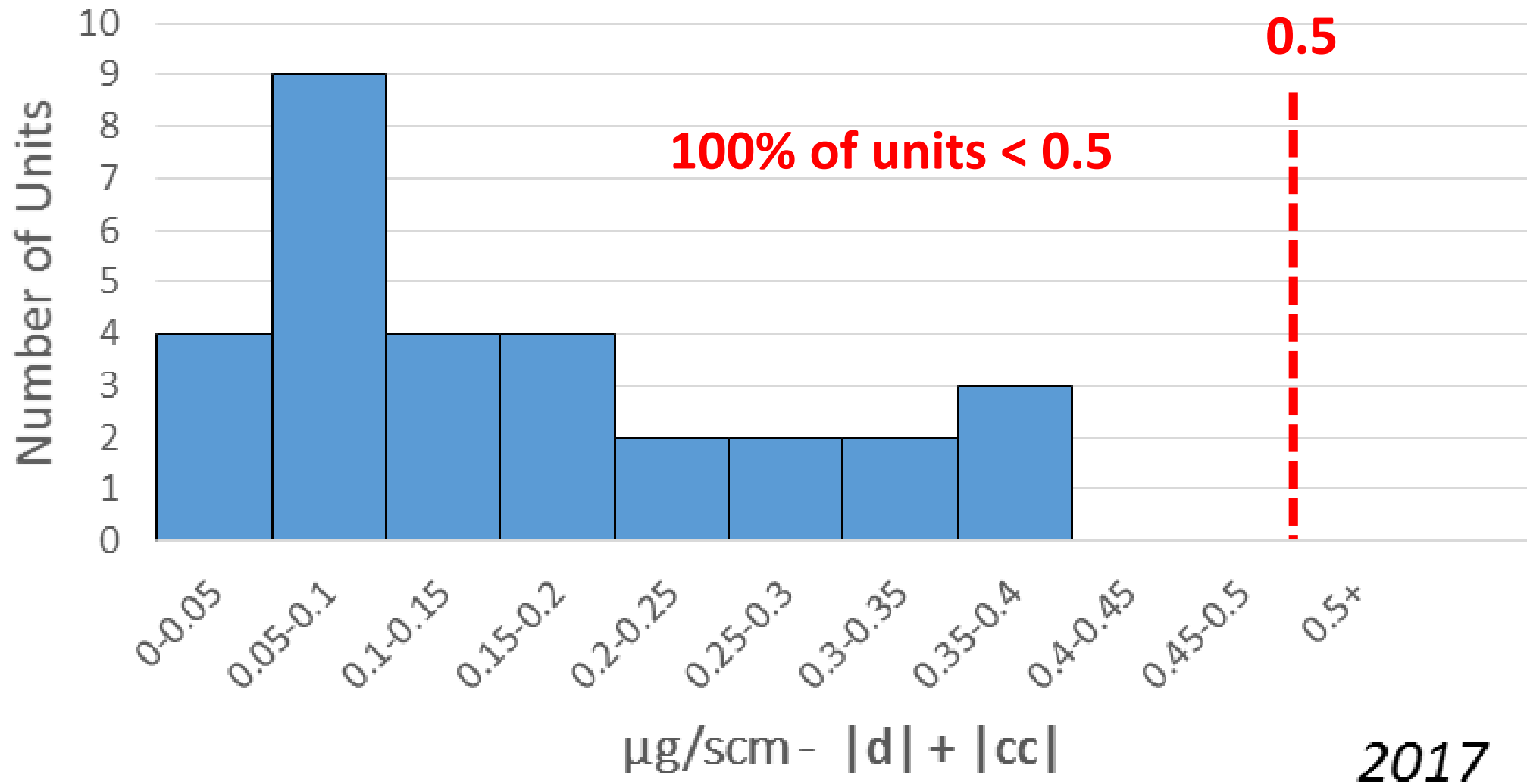
Hg CEMS - 2017 RATA Results - %RA



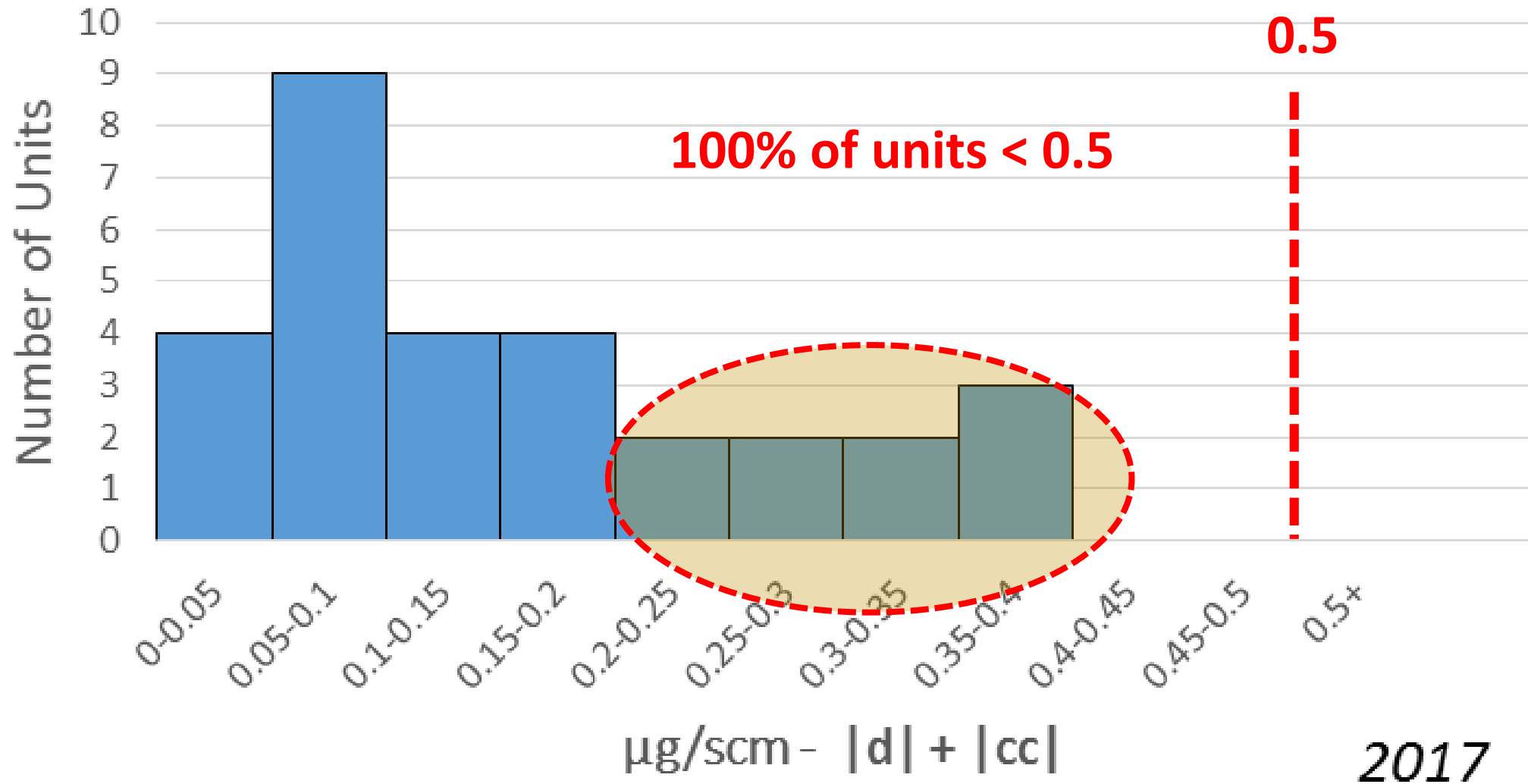
Hg CEMS - 2017 RATA Results - %RA



Hg CEMS - RATA Results - Alternate Specification

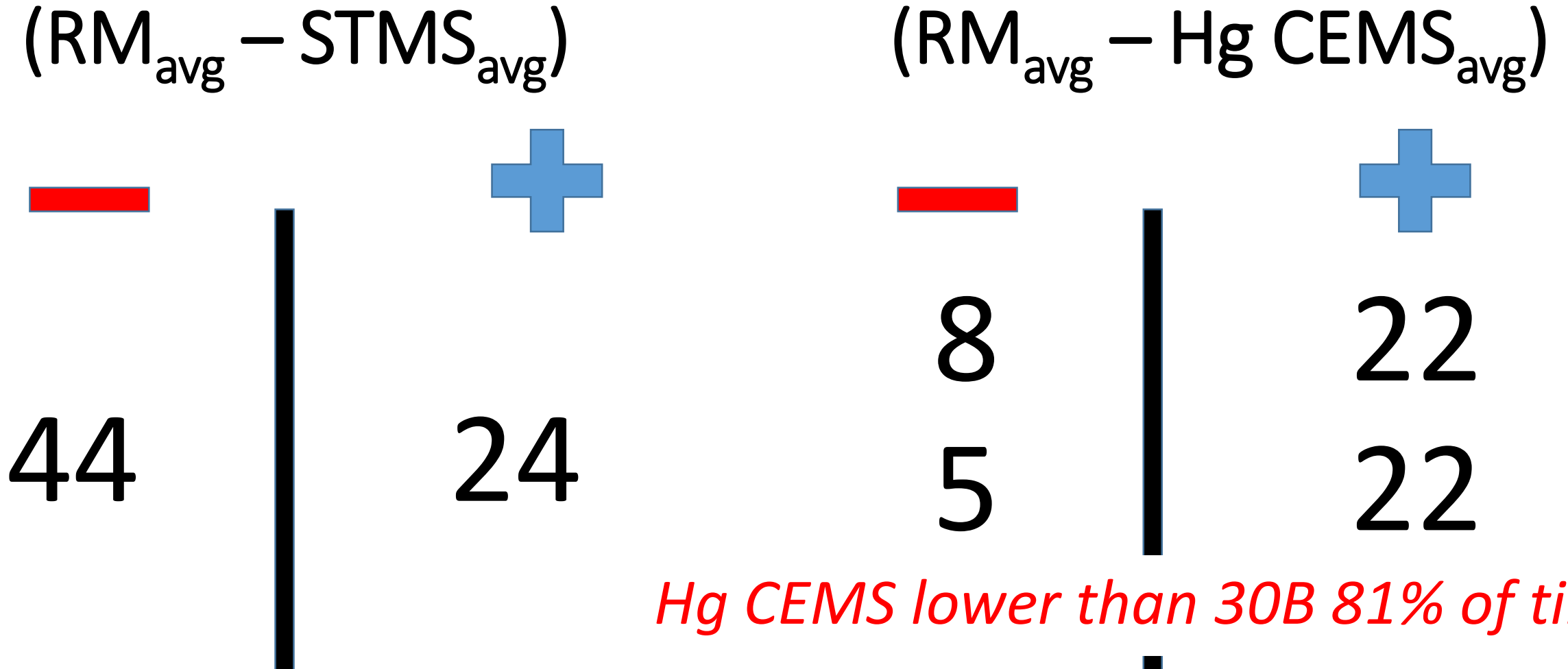


Hg CEMS - RATA Results - Alternate Specification



BIAS (Hg CEMS vs EPA 30B)

BIAS (Hg CEMS vs EPA 30B)



Hg CEMS lower than 30B 81% of time

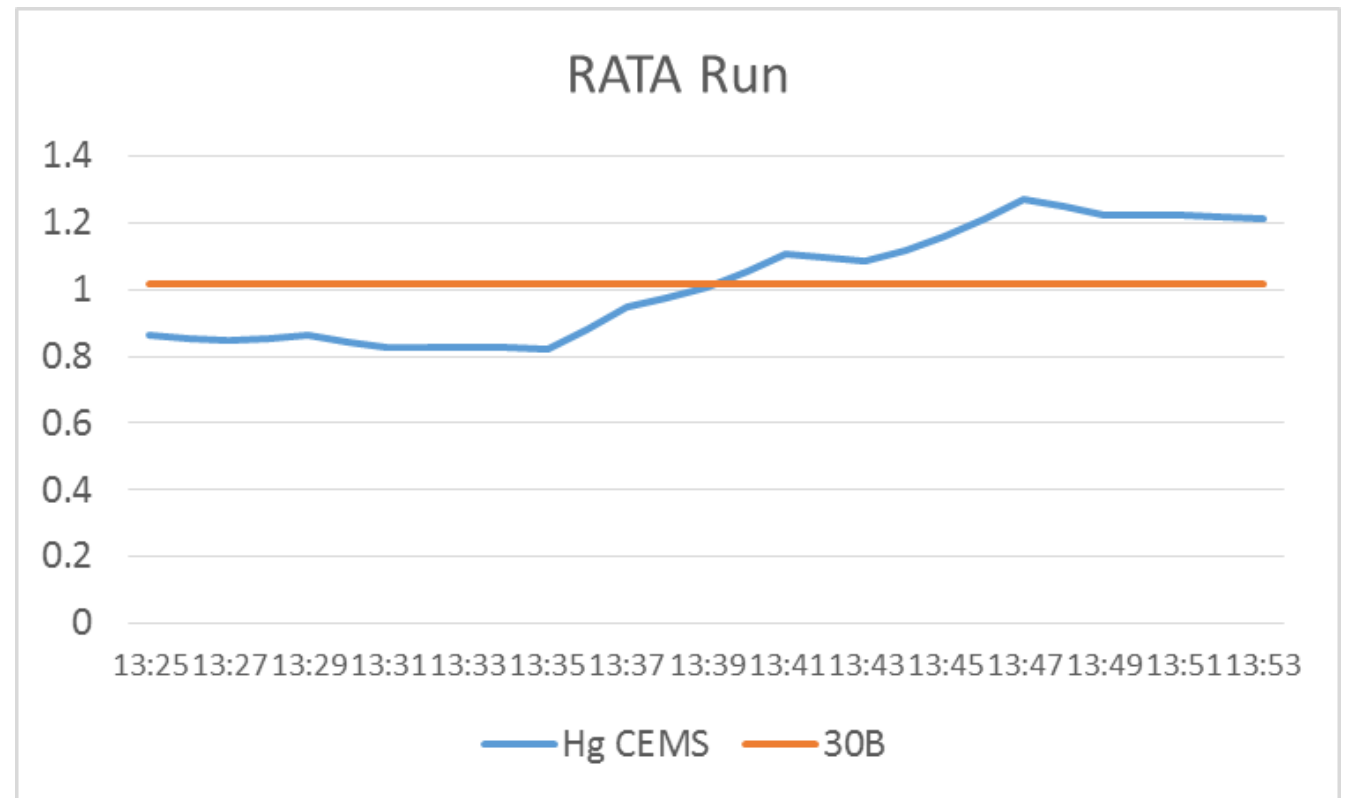
What could cause the difference?



Hg CEMS Concentration Variability during RATA

- Dynamic Hg Concentration during RATA?

Dynamic concentration movement does not seem to have significant impact on difference



Hg CEMS Concentration Difference to 30B

- Calibration Gases and Range - (<10% criteria)

EPRI Conference May 2017

**“Hg CEMS Ongoing QA Data Analysis”
by William Roberson**

Hg CEMS Concentration Difference to 30B

- Hg concentration levels in flue gas correlate to difference in measurements?
 - 0.11 to 2.4 $\mu\text{g}/\text{scm}$

No significant trend in Hg CEMS to 30B concentration difference between 0.3 and 1.2 $\mu\text{g}/\text{scm}$

Effect of Hg Concentration on RA%

- Higher concentrations easier to pass RA%? – *Not necessarily*
 - *No significant passing trend (RA%) between 0.3 and 1.2 $\mu\text{g}/\text{scm}$*
- *Below 0.3 $\mu\text{g}/\text{scm}$ Alt Specification passes*
- *Lignite Fine Line*

Hg CEMS Avg.	30B Avg.	Difference	RA (%) - 20%	Alt Spec. (0.5)
1.57	1.35	-0.22	26.97	0.36
2.18	2.4	0.22	15.58	0.4

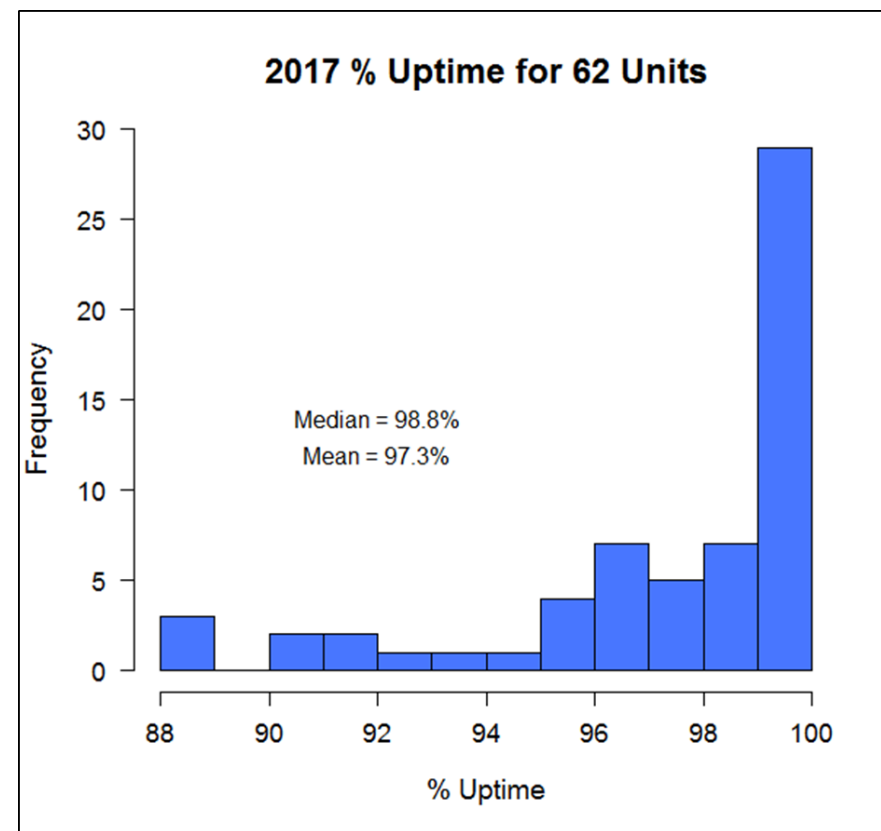
Hg CEMS Data Availability

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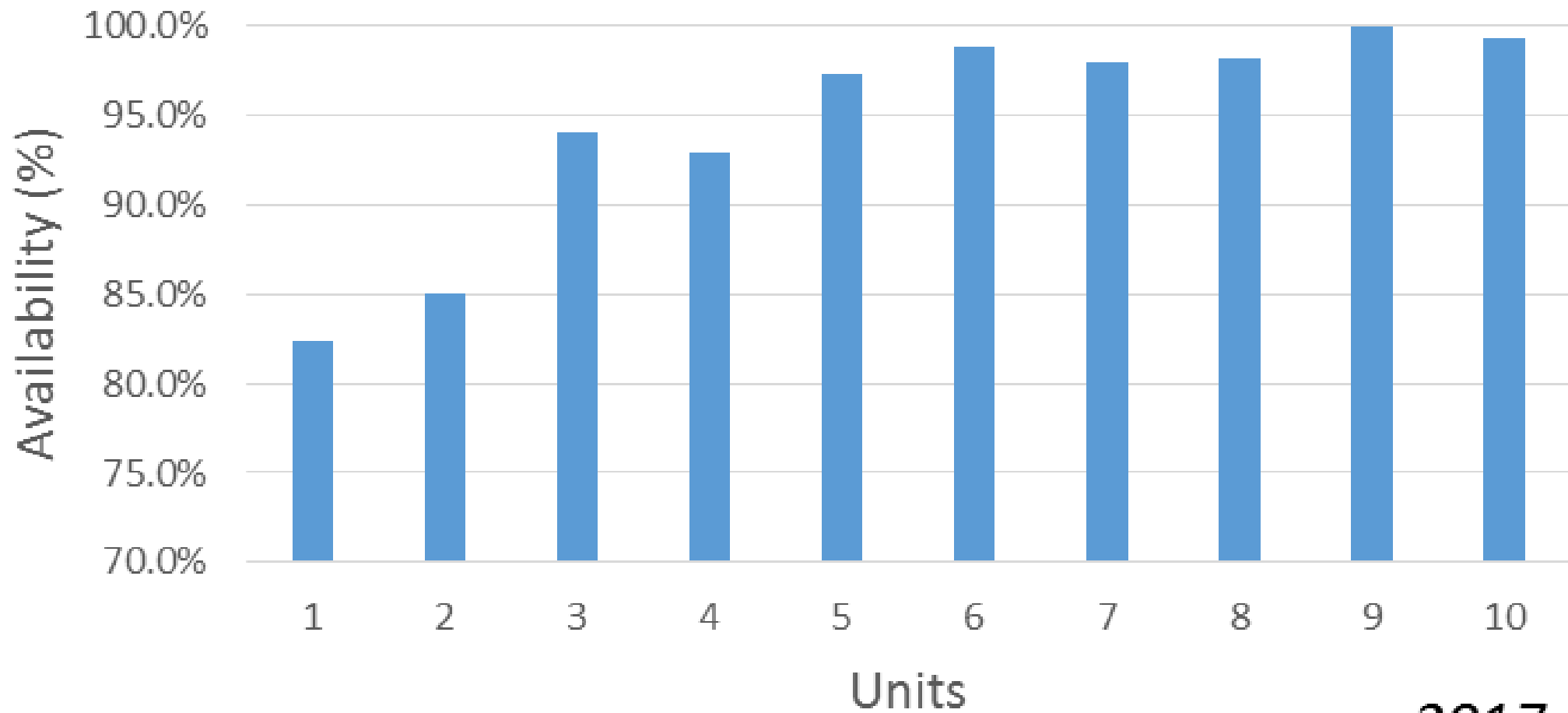
Q4 2017 Reported

- Hg CEMS - 96%
- Industry STMS – 92%
- **CleanAir MET-80 STMS – 97.3%**

*Relation to Hg CEMS RA performance –
Snapshot of Bottom 5 and Top 5*

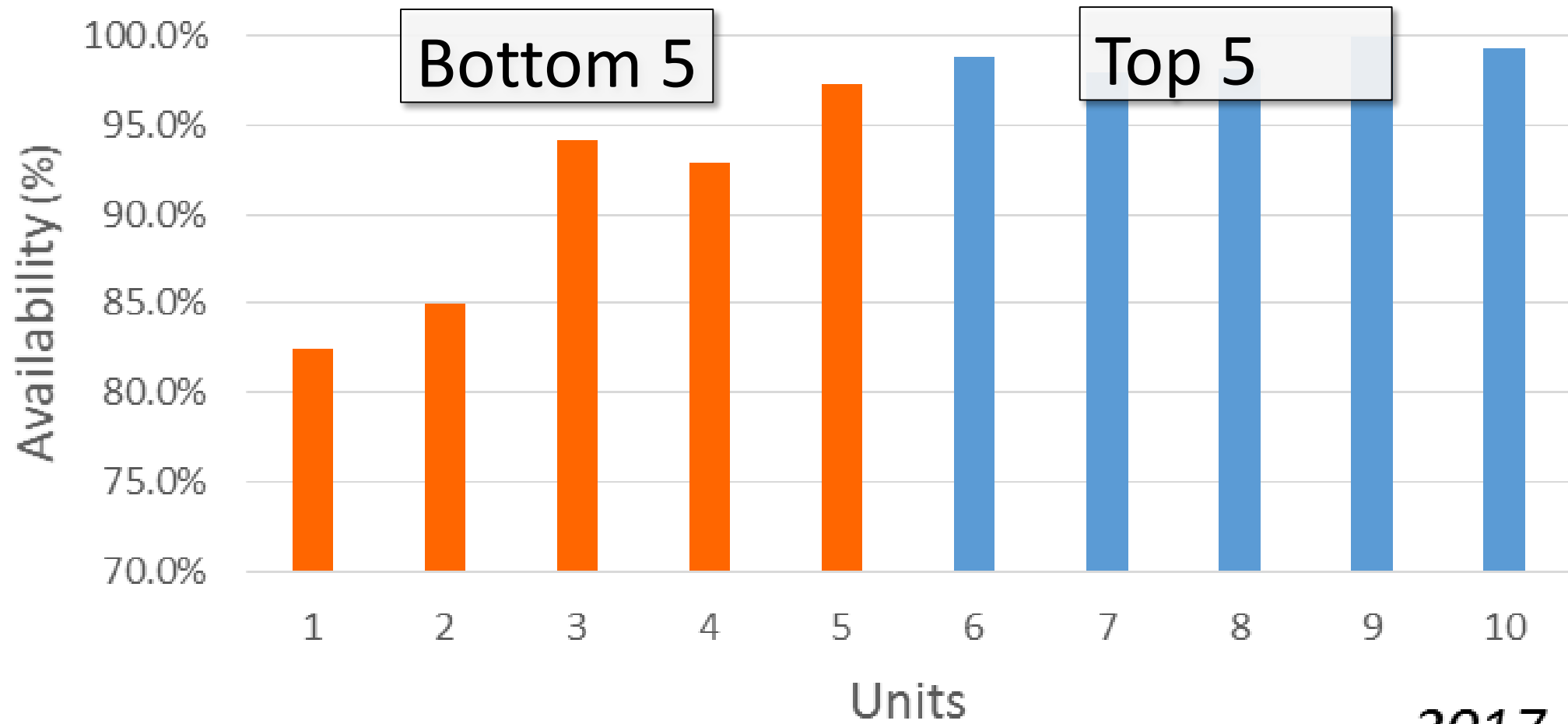


Hg CEMS Availability Top 5 and Bottom 5 RA%



2017

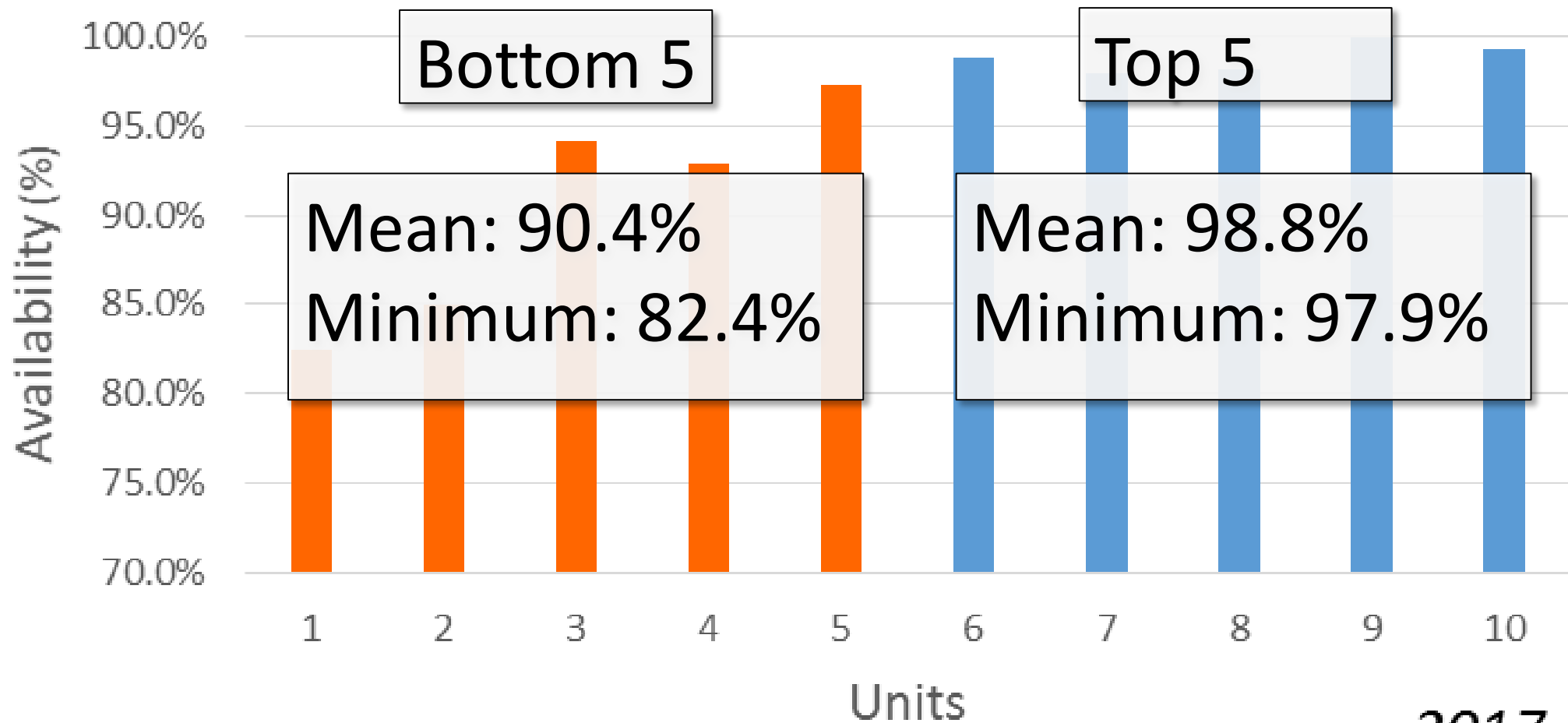
Hg CEMS Availability Top 5 and Bottom 5 RA%



2017

Hg CEMS Availability

Top 5 and Bottom 5 RA%



2017

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