

CEMS & STATISTICS

What could be worse?

Downs, John

From: Johnson.Travis@epamail.epa.gov
Sent: Wednesday, February 27, 2008 10:23 AM
To: Downs, John
Subject: Sooner, ORIS 6095 - CO2 Evaluation

Attachments: Sooner Probe Leak Notification.doc; Explanation of CO2 Control Chart Evaluation Report.doc; Sooner02112008.pdf



Sooner Probe Leak
Notification...



Explanation of CO2
Control Cha...



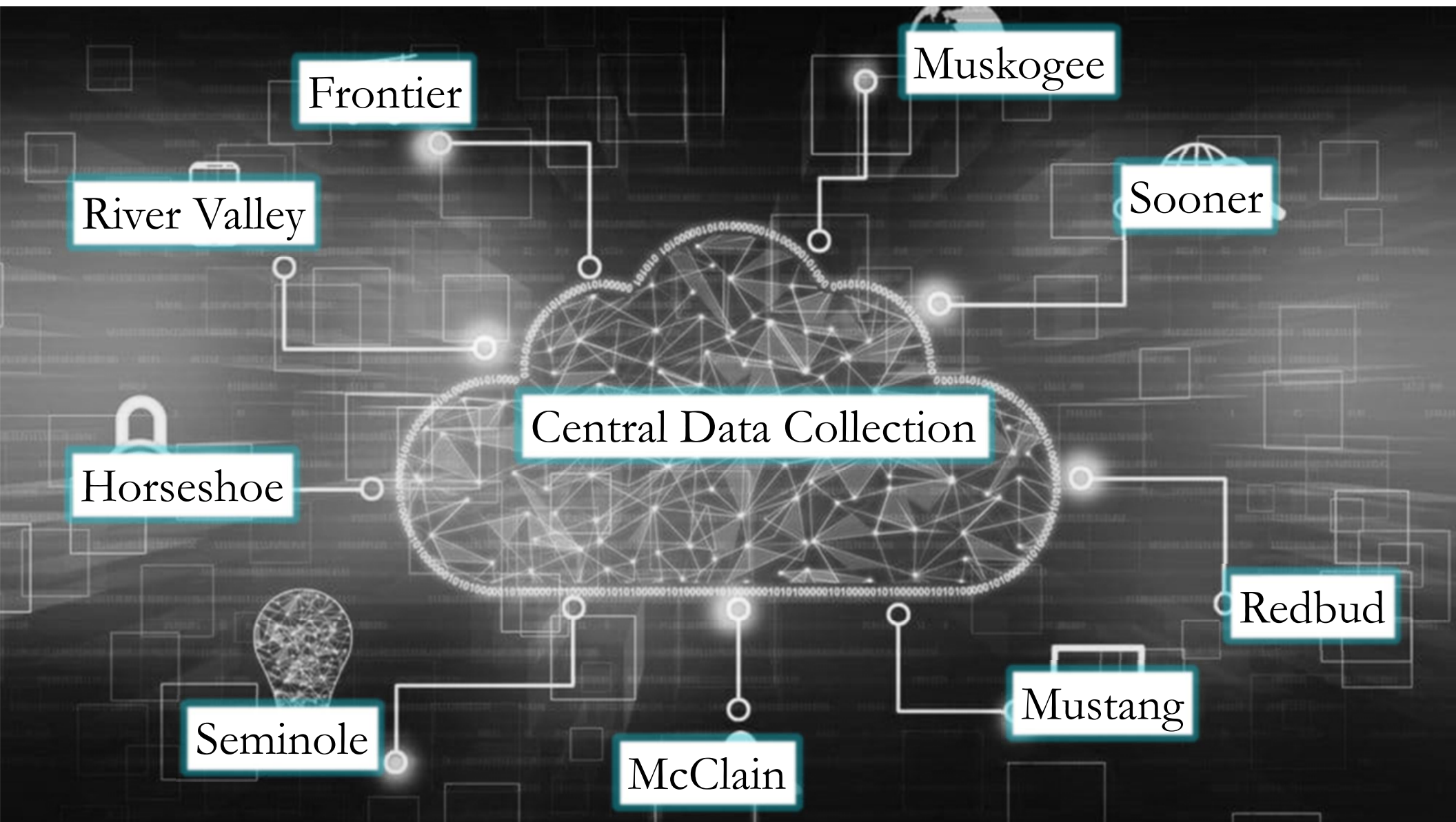
Sooner02112008.p
df (17 KB)

Take

Re: Electronic Audit of 2007 Emissions Data

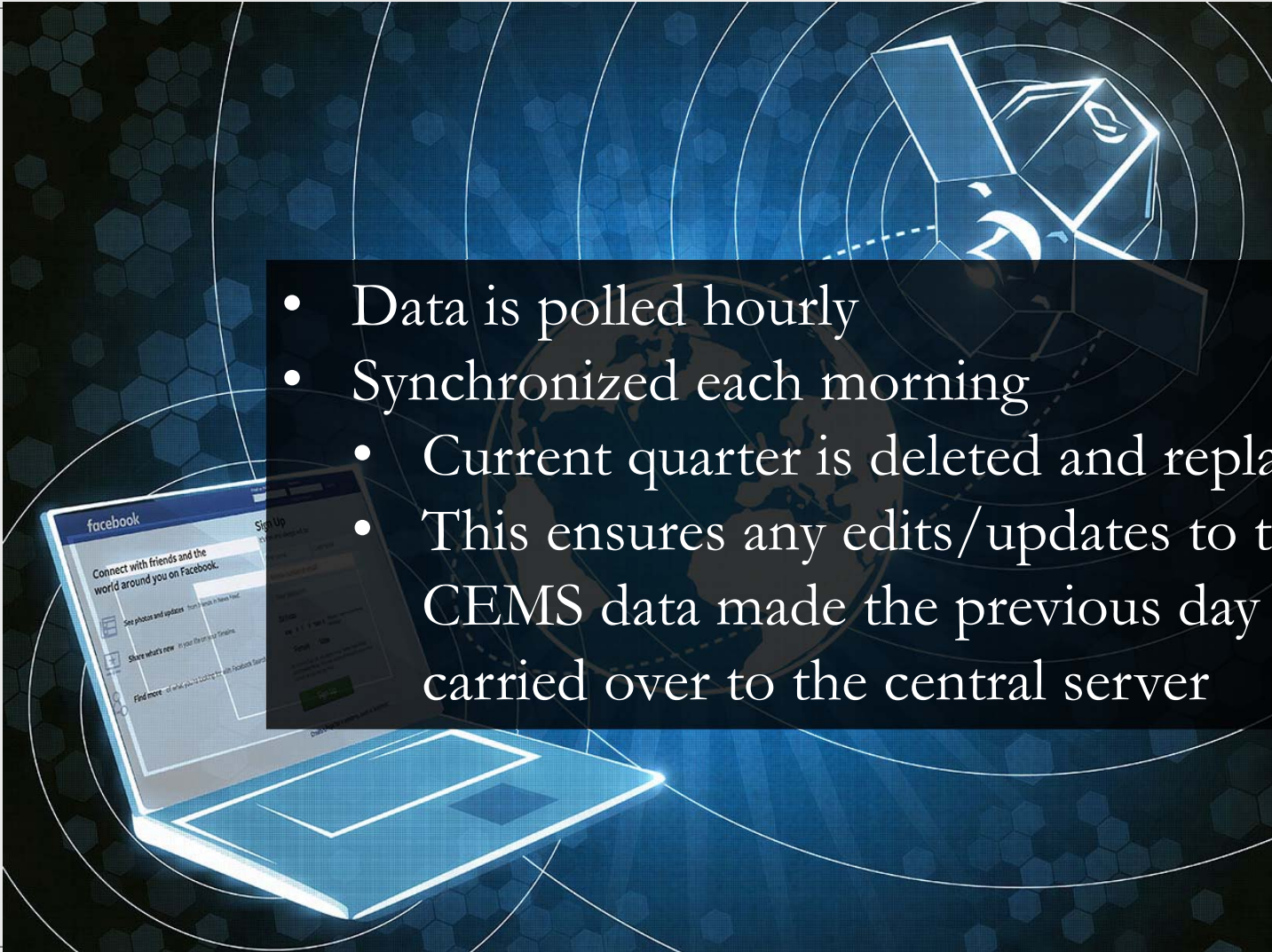
Dear Mr. Wendling:

This is to inform you that on February 27, 2008, the Clean Air Markets Division (CAMD) performed an electronic audit of the 2007 emissions data for Sooner (ORIS 6095), Unit 2, which indicates that the SO₂, NO_x, and CO₂ emissions from this unit or stack may have been under-reported in the 1st quarter 2007 due to a leak in the sample lines or probe of the continuous emission monitoring systems (CEMS).



Benefits of centralization:

- Single logon for all sites
- Standard interface for each vendor
- Ease of use, customization
- Compare across sites easily
- Custom reports as needed by different sites/permits/programs

- 
- Data is polled hourly
 - Synchronized each morning
 - Current quarter is deleted and replaced
 - This ensures any edits/updates to the CEMS data made the previous day is carried over to the central server

TECHNOLOGIES USED:





Reports

View All Site Content

Meeting Workspaces

QAP Documents

- CEMS QAP Manual
- QAP Appendix F
- SOPs
- Troubleshooting Flowchart

Documents

- Reports
- CEMS Forms
- Select a Form
- Monitoring Plans
- Analyzer Manuals
- Parts
- Vendor Repairs
- Training Presentations
- Site Pages

Report & Notification Tracking

- Pending Notifications
- TODO
- Linearities
- RATA (Annual/Semi-Annual)
- RATA (Cert/ReCert)

New Upload Actions Settings

Edit Name Description

Group : 30d Trends (4)

CO 30d Trend	Displays the 30-day Rolling average for each CO system.
Hg 30d Trend	Displays the 30-day Rolling average for each Hg system.
NOx 30d Trend	Displays the 30-day Rolling average for each NOx system.
Regional Haze 30d Trend	Displays the 30-day Rolling average for the selected system.

Group : CE Tests (2)

Daily CE Test Trend	Charts each calibration adjustment and gain adjustment for each CE test.
Drift Deviation Trend	Displays a trend of gain adjustments with each manual calibration.

Group : Data QA (10)

Average Values	Displays an average of NOx and SO2 over the selected time period for the selected units. Only includes hours that have op_time > 0.
Control Chart	This report will build a control chart for selected parameter (O2 %, NOx PPM, Boiler O2 %, Stack Flow, etc).
Day View	
Emissions Rate by Load Bin	Displays a pie chart by load bin of unit operation over a given time period, as well as emission rate for each load bin.
Flow-To-Load Analysis	Performs an aggregated quarterly analysis of Flow-To-Load data to ensure proper follow-up QA testing and reporting is completed.
Minute Trend	Chart selected channels over time on a minute level basis.
Outliers Report	Displays dates and times where pollutants are outside the ranges of known good values as a function of MWH - indicating a possible QA issue.
Recent Events	Compares Logbook and Form entries with QAP App F database to ensure proper follow-up QA testing and reporting is completed.
Review Forms	View the results of the Routine Check Sheets, Quarterly Maintenance, Air Cleanup Package, etc.
Scatter Plot	

Group : Emissions (6)

- SharePoint Document Library:
- SOPs
- Calendars
- SQL Server Reports (SSRS)

Parameters

unit_name

<Select a Value> ▼

Y

CO2 % ▼

Y Min

0

Y Max

0

X

Load (mwh) ▼

X Min

0

X Max

0

begin

6/14/2019 1:00:01 PM

end

9/12/2019 1:00:00 PM

Scatter Plots!

- Select Unit
- Select Y axis
 - Filter Y axis range
- Same for X axis
- Select date range
- Filter by load (if load is not on X or Y)
- Highlight/Overlay plots
- Labels/Outliers

Load Min

0

Load Max

9999

highlight_begin

9/12/2019 9:00:00 AM

highlight_end

9/12/2019 1:00:00 PM

Label Highlighted Points?

☒ True ☐ False

Absolutely

☐ True ☒ False

stdev

-3

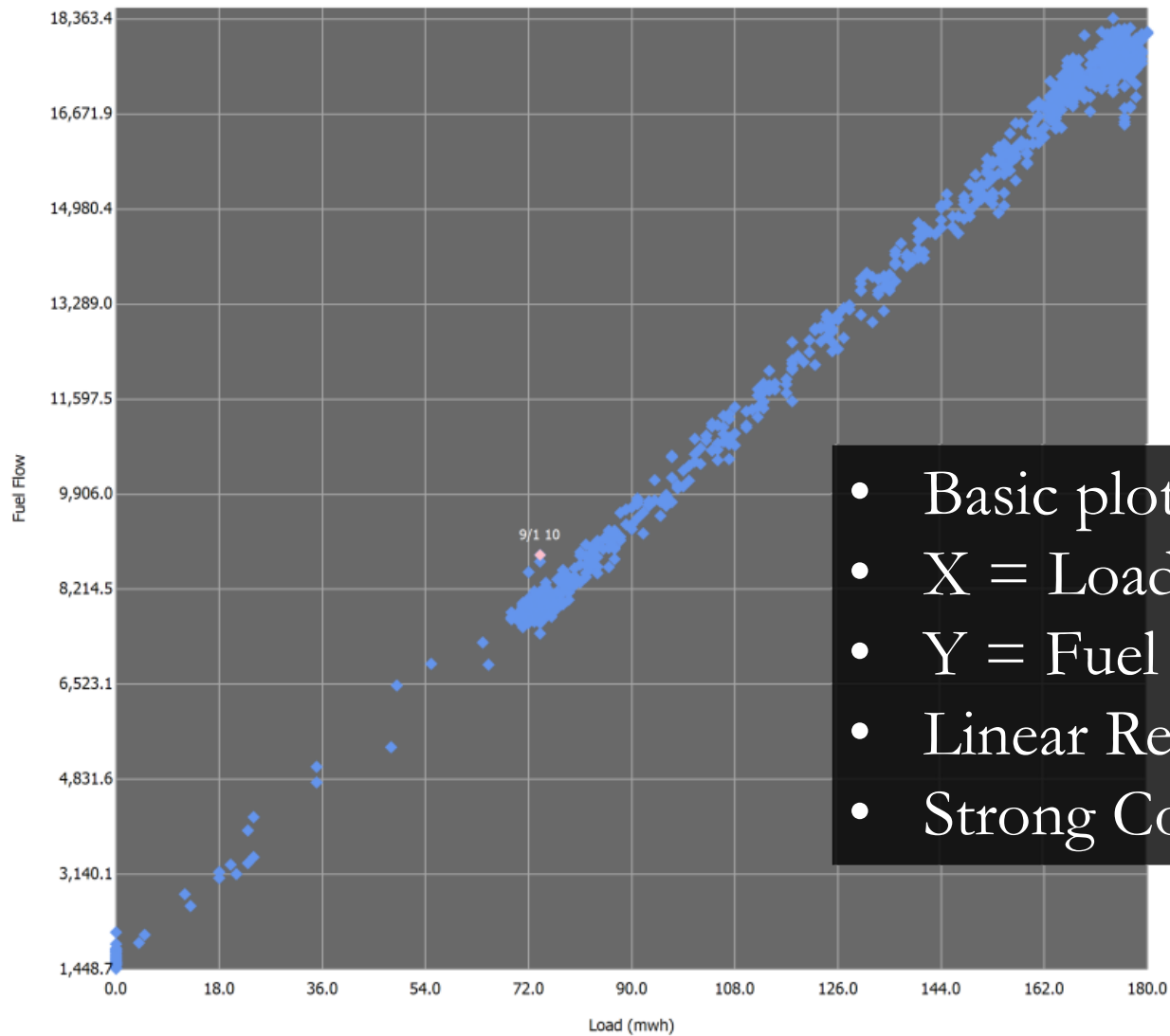
Outliers Sorting

Time ▼

Label Outliers?

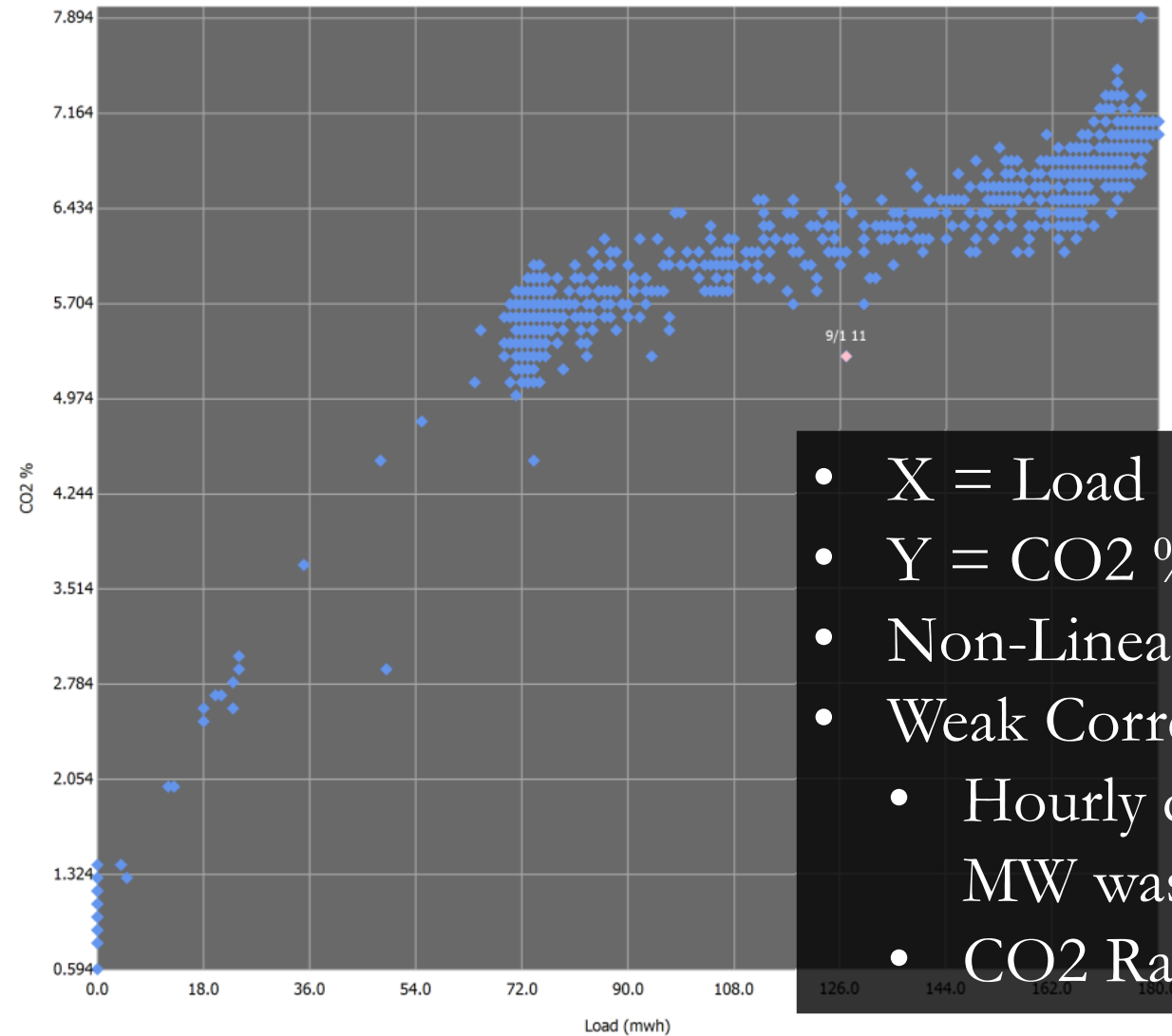
☐ True ☒ False

fuel flow (mwh) vs load (mwh) - 9/11 10

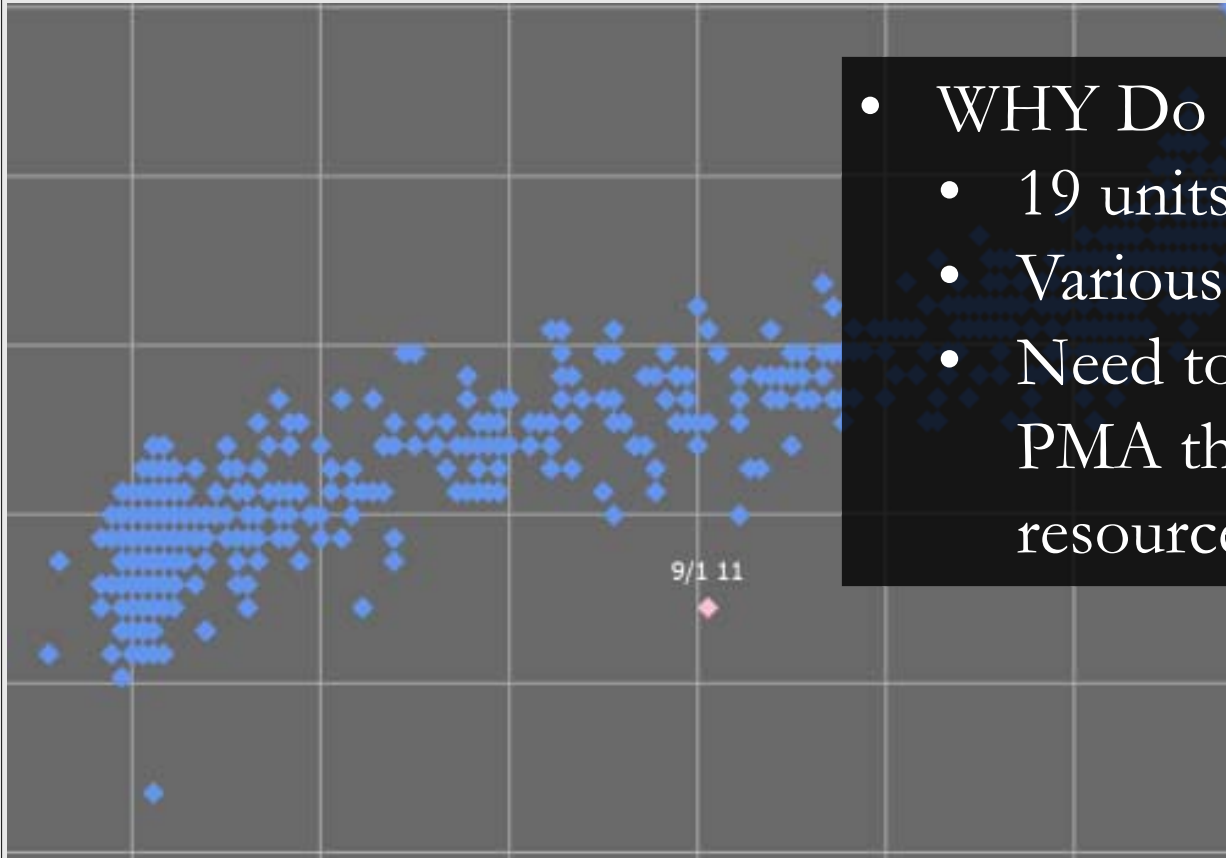


- Basic plot
- $X = \text{Load}$
- $Y = \text{Fuel}$
- Linear Relationship
- Strong Correlation (Expected!)

HL6 CO2 % vs Load (mwh) From 7/1/2019 To 9/1/2019



- $X = \text{Load}$
- $Y = \text{CO2 \%}$
- Non-Linear Relationship
- Weak Correlation – BUT There is one!
 - Hourly data – no valid hours where MW was > 126 and CO2 was < 5.7
 - CO2 Range: 5.7 – 6.3



- WHY Do all this?
 - 19 units
 - Various operating characteristics
 - Need to be able to maintain high PMA through appropriate use of resources

Why Automate?

- Server is able to evaluate, every hour, each combination of pollutant parameter and independent variable
- Alert to investigate as needed

Nox
O2
CO2
CO
SO2
Hg

X

lbs
ppm
%
Lbs/mmbtu
etc

X

MW
Fuel Flow (Gas Units)
Stack Flow (Coal Units)
Heat Input

X

29 Units!!

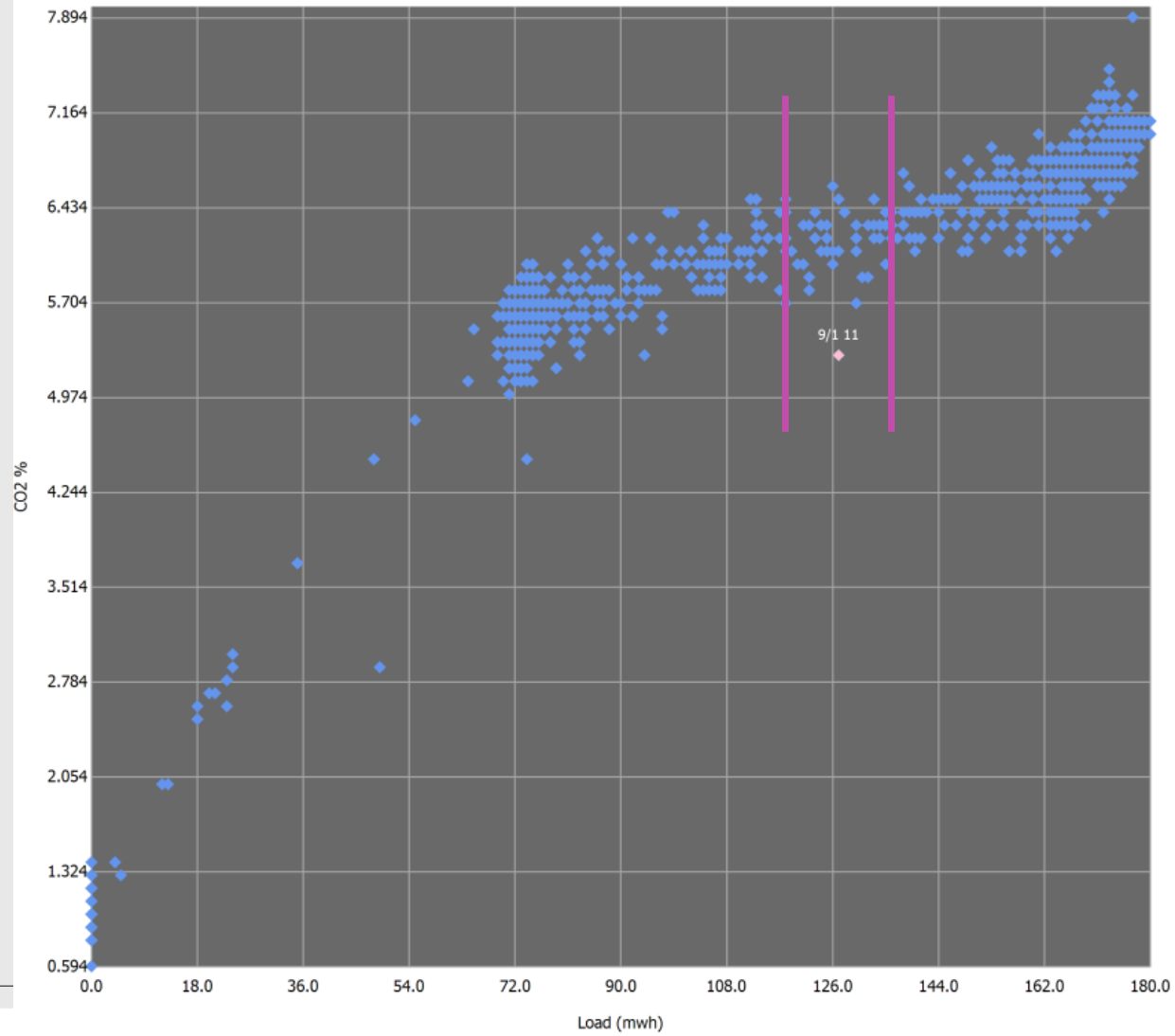
```

] select @sql = '
declare @unit_id int
select @unit_id = id from unit where unit_name = @unit_name
select
    u.unit_name, a.timestamp,
    case
        when a.load_range > hb.load_range then '/'
        when a.load_range < hb.load_range then '\'
        when a.load_range = hb.load_range then '-' end +
    case
        when a.load_range > ha.load_range then '\'
        when a.load_range < ha.load_range then '/'
        when a.load_range = ha.load_range then '-'
        when ha.load_range is null then '' end [load],
    ''+@y+ ' vs. '+@x+'' [chart], ''+@x+'' [x], ''+@y+'' [y],
    case when stdev = 0 then 0 when stdev is null then 0 else
        (a.'+@y+ '-avg)/stdev
        /*(a.'+@y+ ' - [avg]) / Sqrt((Square(1) / 1) + (Square([stdev]) / [count]))*/ end as [a.'+@y+ '_sd]
    , [avg], [stdev]
from
    actuals a inner join unit u on u.id = a.unit_id inner join
    (select      b.unit_id, b.timestamp,
                avg(c.'+@y+') avg, count(c.'+@y+') [count],
                stdev(c.'+@y+') stdev
    from        actuals b, actuals c
    where       c.unit_id = @unit_id and b.unit_id = @unit_id
    and c.timestamp between dateadd(d, -180, @begindate) and @enddate /*and c.'+@x+' != 0 */
]
-
    ' + /*case when @x_min > 0 then      ' and c.'+@x+' >= ' + convert(varchar, @x_min) else '' end + '
    ' + case when @x_max > 0 then      ' and c.'+@x+' <= ' + convert(varchar, @x_max) else '' end + */ '
    ' + case when @y_min > 0 then      ' and c.'+@y+' >= ' + convert(varchar, @y_min) else '' end + '
    ' + case when @y_max > 0 then      ' and c.'+@y+' <= ' + convert(varchar, @y_max) else '' end + '
    and b.timestamp between @begindate and @enddate and b.'+@x+' != 0
    and b.'+@x+'      between c.'+@x+' - (c.'+@x+' / 25) and c.'+@x+' + (c.'+@x+' / 25)

    ' + case      when substring(@y, 1, 3) in ('so2', 'co2', 'nox', 'stk', 'hea', 'co_', 'hg_')
                then 'and c.'+substring(@y, 1, case when @y in ('stk_flo', 'heat') then len(@y) when :
    ' + case      when substring(@x, 1, 3) in ('so2', 'co2', 'nox', 'stk', 'hea', 'co_', 'hg_')
                then 'and c.'+substring(@x, 1, case when @x in ('stk_flo', 'heat') then len(@x) when s

```

HL6 CO2 % vs Load (mwh) From 7/1/2019 To 9/1/2019



hl6 outliers report sep X All Mailboxes

Results By Date ↑

▼ Last Week

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Mon 9/2

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Mon 9/2

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Mon 9/2

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Sun 9/1

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Sun 9/1

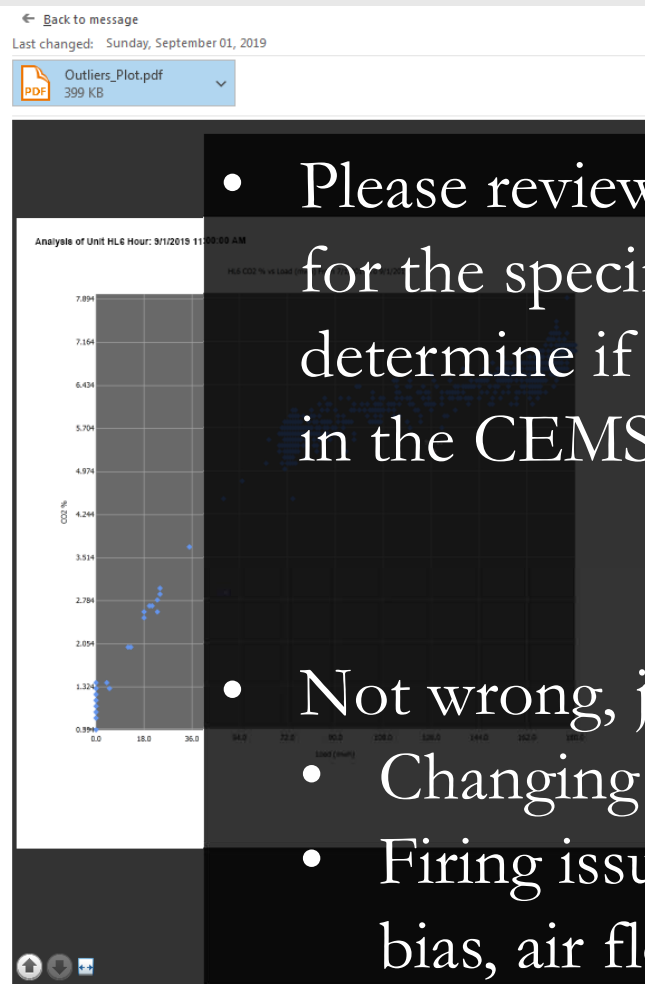
cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Sun 9/1

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Sun 9/1

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Sun 9/1

cemsserver@oge.com
Outliers Report for Unit HL6: Se...
Please review the attached deviation report(s) for the
Sun 9/1

Older



- Please review the attached deviation report(s) for the specified unit and timeframe to determine if a system problem has occurred in the CEMS.
- Not wrong, just different
 - Changing load
 - Firing issues, operating parameters (O2 bias, air flow, coal quality)

HL6 Log Book

9/1/2019 19:56 James Doyle	Corrective Action - 346		
	Corrective Action	pulled probe inspected and cleaned critical orifice placed back in service ran two manual followed by hands off calibrations.	
	Maintenance Beginning	9/1/2019 4:20:00 PM	
	Maintenance Ending	9/1/2019 6:56:00 PM	
	Symptoms	Co2 readings looked .8% low	
9/2/2019 07:49 James Doyle	Corrective Action - 346		
	Corrective Action	changed the critical orifice linearity needed	
	Maintenance Beginning	9/2/2019 5:40:00 AM	
	Maintenance Ending	9/2/2019 6:45:00 AM	
	Symptoms	NOx Range Overflow co2 range over flow the orifice has systems of leaking call by operations @ 05:00	
9/3/2019 17:27 Ronald Madron	LK Install		
	LK Install Date & Time	9/3/2019 5:27:00 PM	T12066-M
9/3/2019 17:30 Ronald Madron	Boyd Jones - performing linearity after the orifice had been replaced in the probe on 9-2-19. The CO2 linearity failed the second run and did not pass the average and failed linearity. We cleaned the cell and the reading did not improve. We did not have a new cell liner at HL and could not find the spare CO2 analyzer. We traveled to Shawnee Service Center and retrieved the CO2 like kind and installed followed with a hands off calibration.		
9/3/2019 18:07 Ronald Madron	Test Report		
	0.) Report Author	MadronRG	
	1.) Test Type	Linearity	
	2.) Test Report Number	hlpt1840	
	3.) Notes	Arrived to performdiagnosticlinearity after orifice change Flowed gases and adjusted regulators from 1050 hours to 1102 hours. Run 1 began at 1113 hours and finished run 3 at 1218 hours. NOx passed but CO2 did not. Went to	

RB1
4/1/2019 - 6/30/2019 11:00:00 PM

	PMA		
	Apr 2019	May 2019	Jun 2019
O2	99.7	99.7	99.7
NOxHI	99.5	99.4	99.3

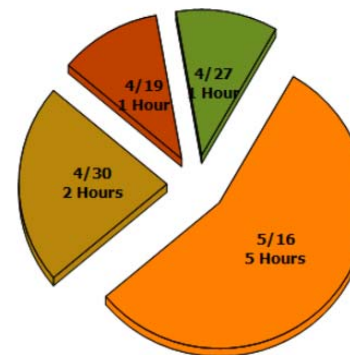
Linearity Dates			
COHI	COLO	NOxHI	O2
5/16/2019	5/16/2019	5/16/2019	5/16/2019

	Maintenance				
	NOx	Probe - 355	Pump - 381	CO	Peristaltic
1/4ly	6/18/2019	not required	not required	4/29/2019	not required
Annual	2/6/2019	4/29/2019	2/6/2019	not required	4/16/2019

RB1 Availability
 Operating Hours: 1481 hours
 0.61 % Lost



RB1 Lost Hours Breakdown



MT12
4/1/2019 - 6/30/2019 11:00:00 PM

	Apr 2019	May 2019	Jun 2019
O2	99.1	99.2	99.3
NOx_L	99.1	99.2	99.2
NOx_H	99.1	99.2	99.2

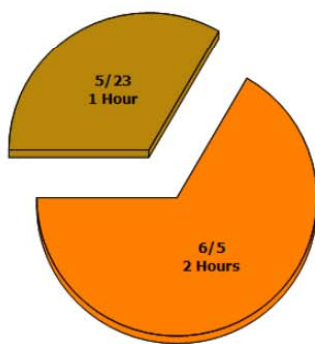
Linearity Dates			
NOx_H	NOx_L	O2	
4/4/2019	4/4/2019	4/4/2019	

	Probe - 355	Alarms	NOx	Peristaltic
Annual	PAST DUE	11/20/2018	PAST DUE	PAST DUE
1/4ly	not required	not required	5/2/2019	not required

MT12 Availability
Operating Hours: 1284 hours
0.23 % Lost



MT12 Lost Hours Breakdown



Parameters

unit
MT12

begin
4/1/2019

end
6/30/2019 11:00:00 PM