Data Tampering Threats and Counter Measures

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Agenda

- General Connectivity Scheme for Data Acquisition for CEMS, EQMS and CAAQMS
- Data Interpretations and Identifying Data Integrity Issues!
- Understanding Data and Data Quality
- Key Focus Areas of Inspection of CEMS, EQMS and CAAQMS

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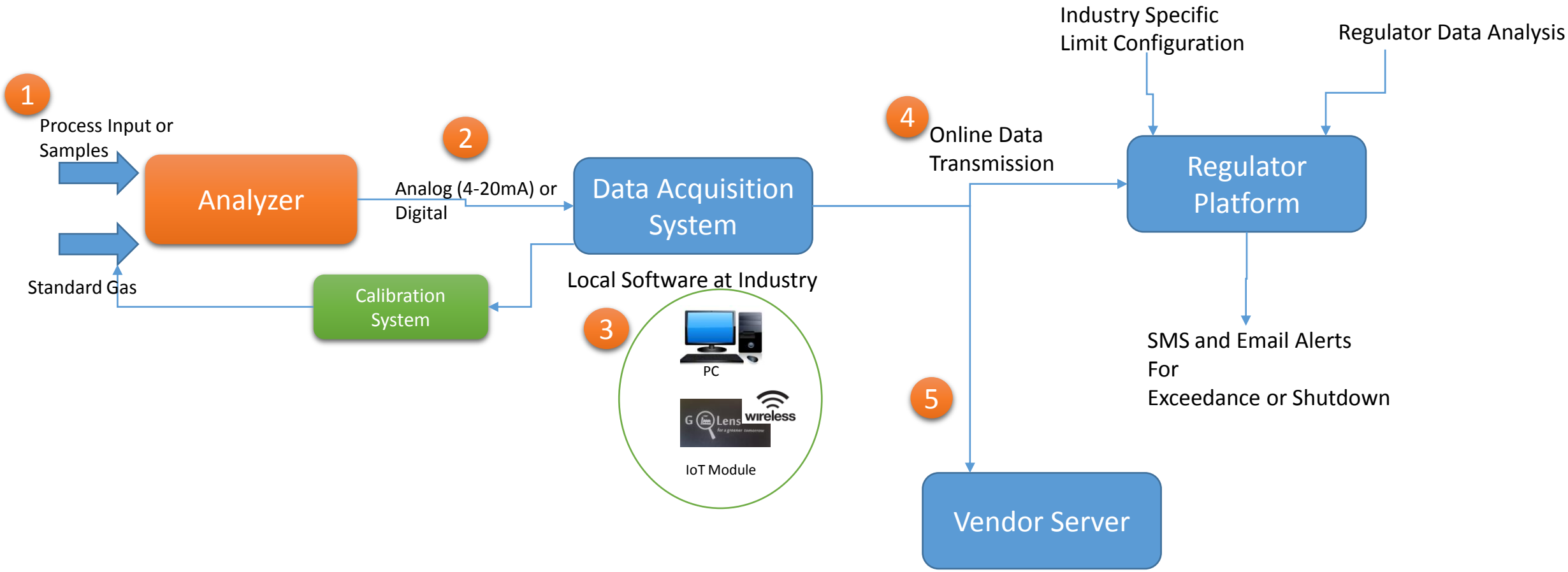
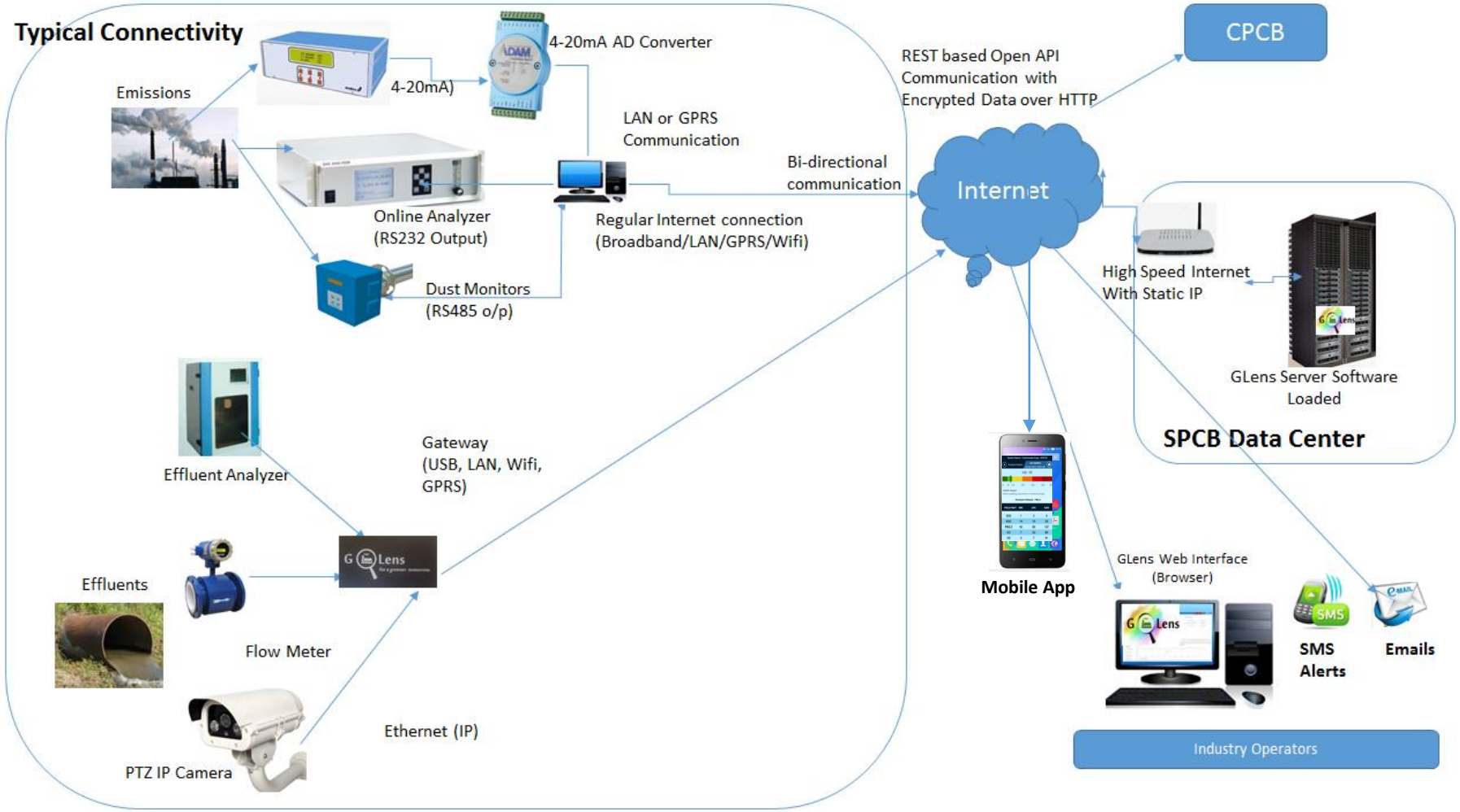
General Schema for Data Transmission and Point to watch for



Connectivity Models



Overview of Direct Connectivity From Analyzer

Ambient Monitoring

DAC Software

Emission Monitoring Systems

Wireless Module

Effluent Monitoring Systems

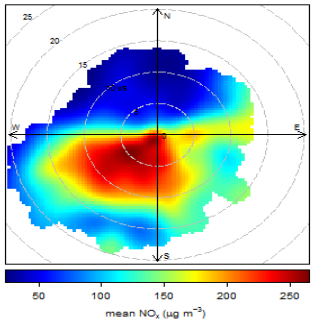
Wireless Module

Internet

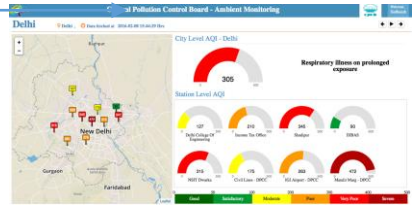
Cloud Server

Internet

GLens Mobile App



Central Software is Web Accessible



Dashboard displayed on TV

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How to Interpret the Online Data from CEMS, EQMS, AAQMS

- Availability of Data /Uptime Report
- Delayed Data
- Data Quality
- Data Gaps
- Exceedances
- Diurnal Analysis
- Matrix Report
- Startup and Shutdown Sequence
- Co-relation charts for Environmental Correlation
- Randomness
- Analyzer Drifts
- Range Shifts
- Calibration Issues
- Comparison across Sectors

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Data Tampering Mechanisms

- Setting Upper Clamp
- Changing Linearization Coefficient
- Changing Analyzer Range
- Data Simulation from Vendor Server
- File Based Data Transfer
- Non-Continuous Data

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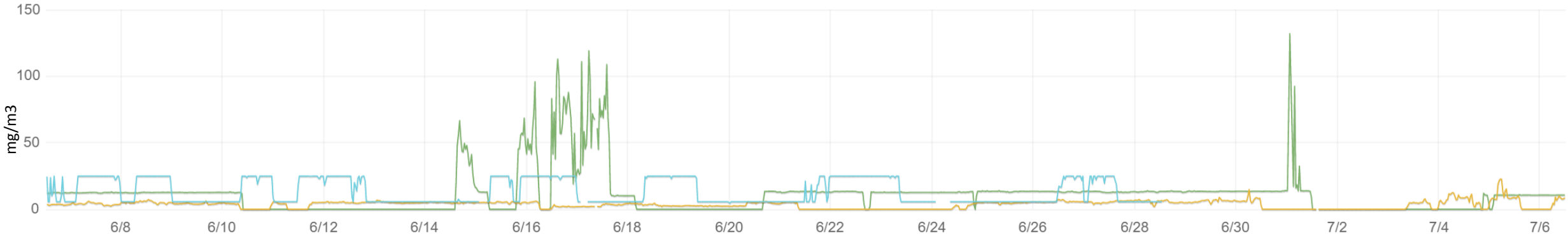
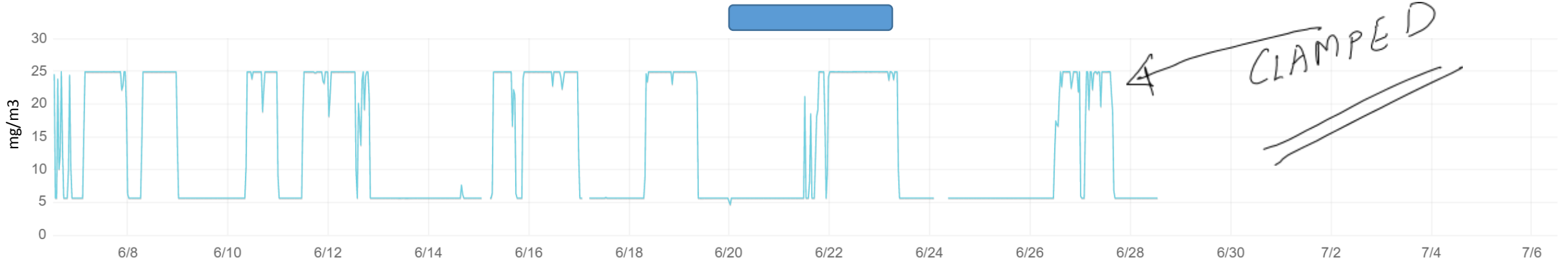
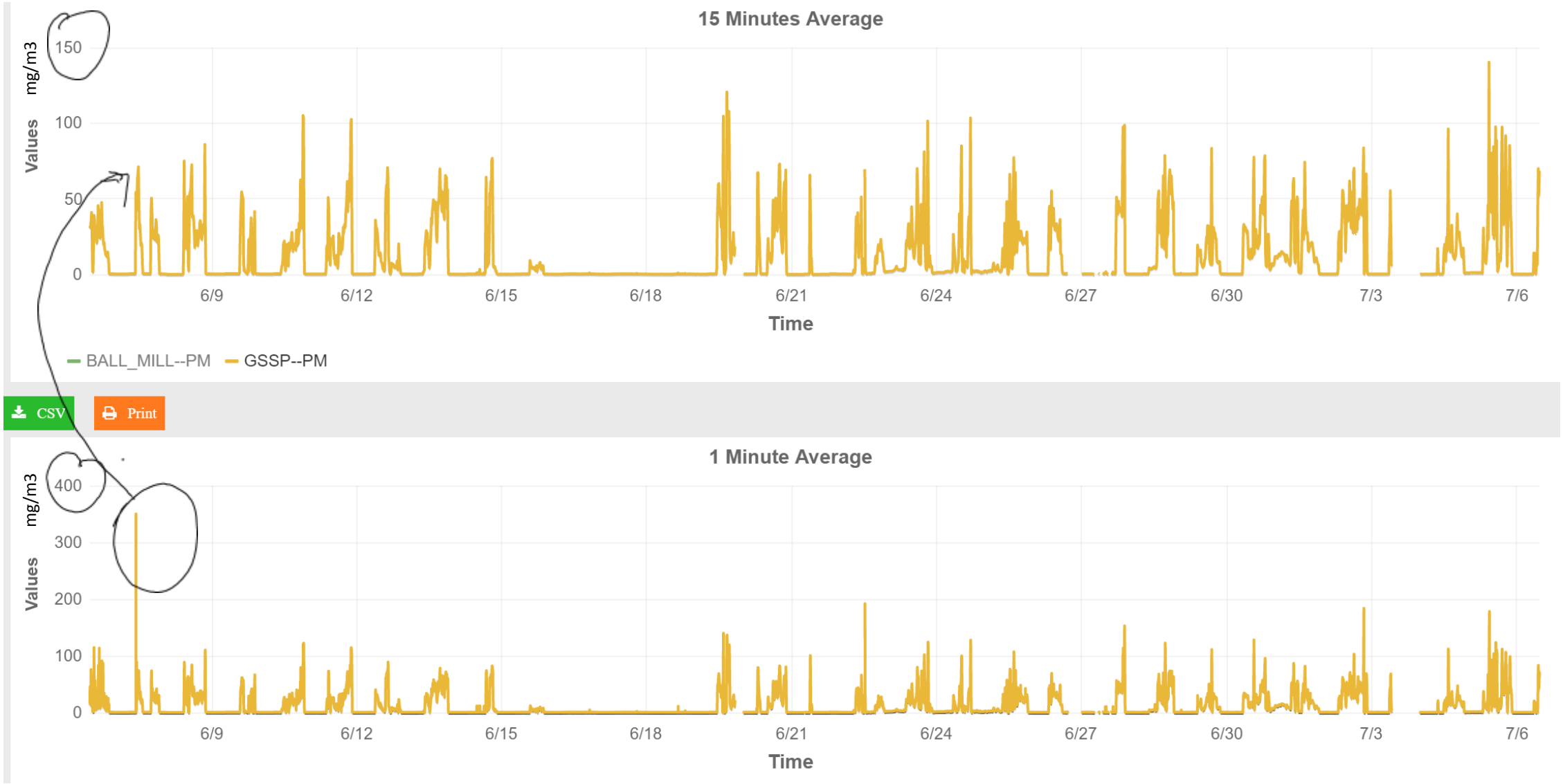
1 Month Data



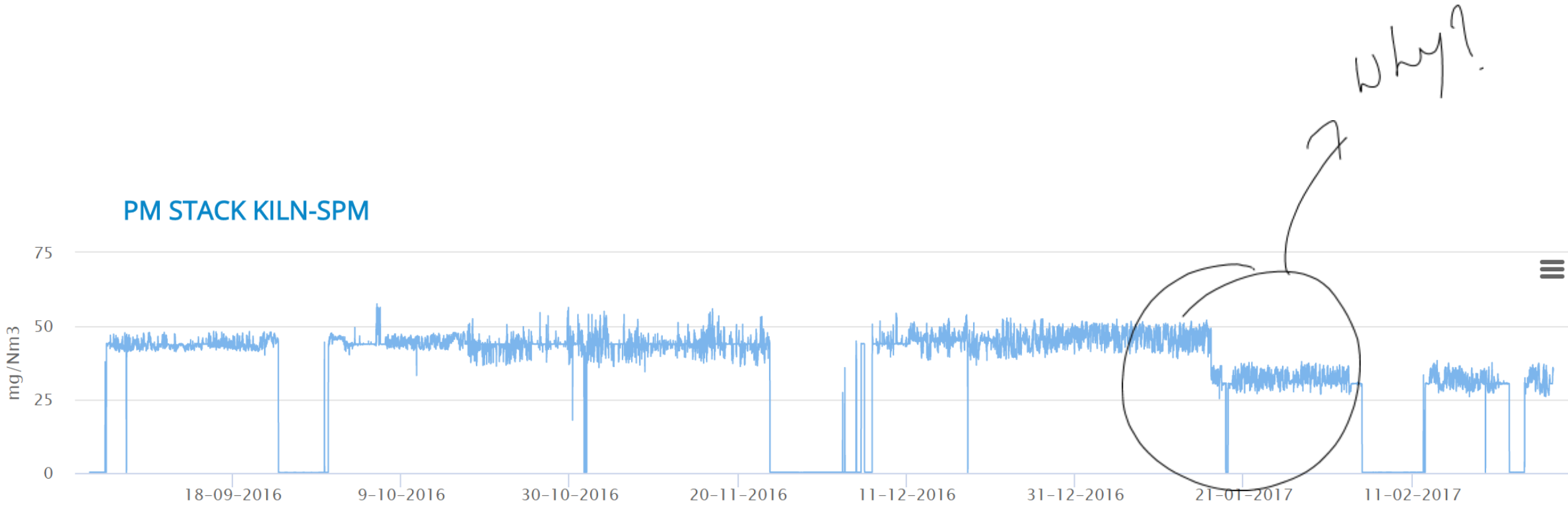


Selected 1 Parameter and You see the issue!!

Understanding 15 Minute Average vs 1 Minute Average



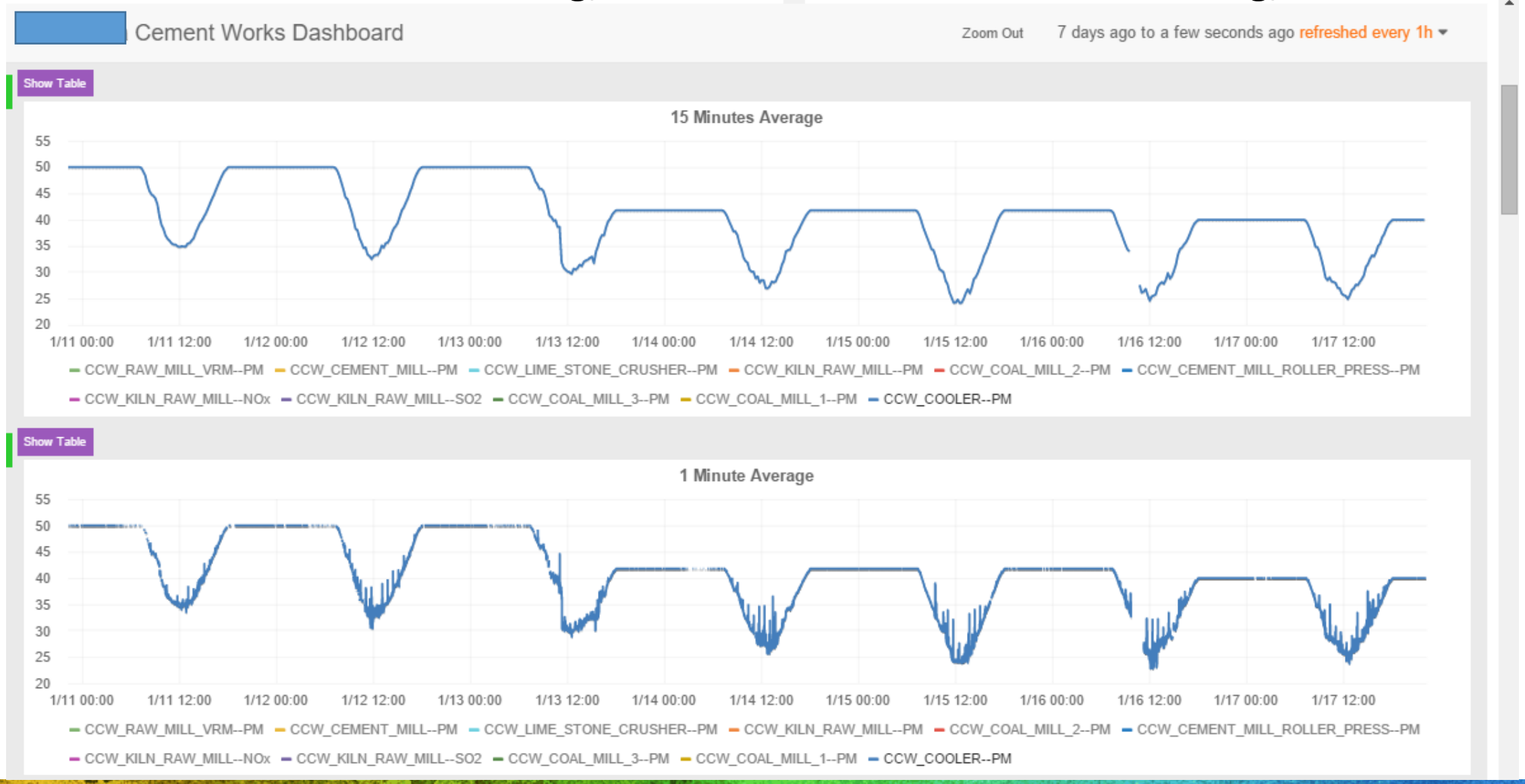
Recalibration or Drift or Tampering?



How to identify Analyzer Drifts!! → Calibration Issue

Upper Limit Threshold - 1

DATA PEAK AT 50 mg/m3. AFTER ALERT DATA PEAK AT 40 mg/m3



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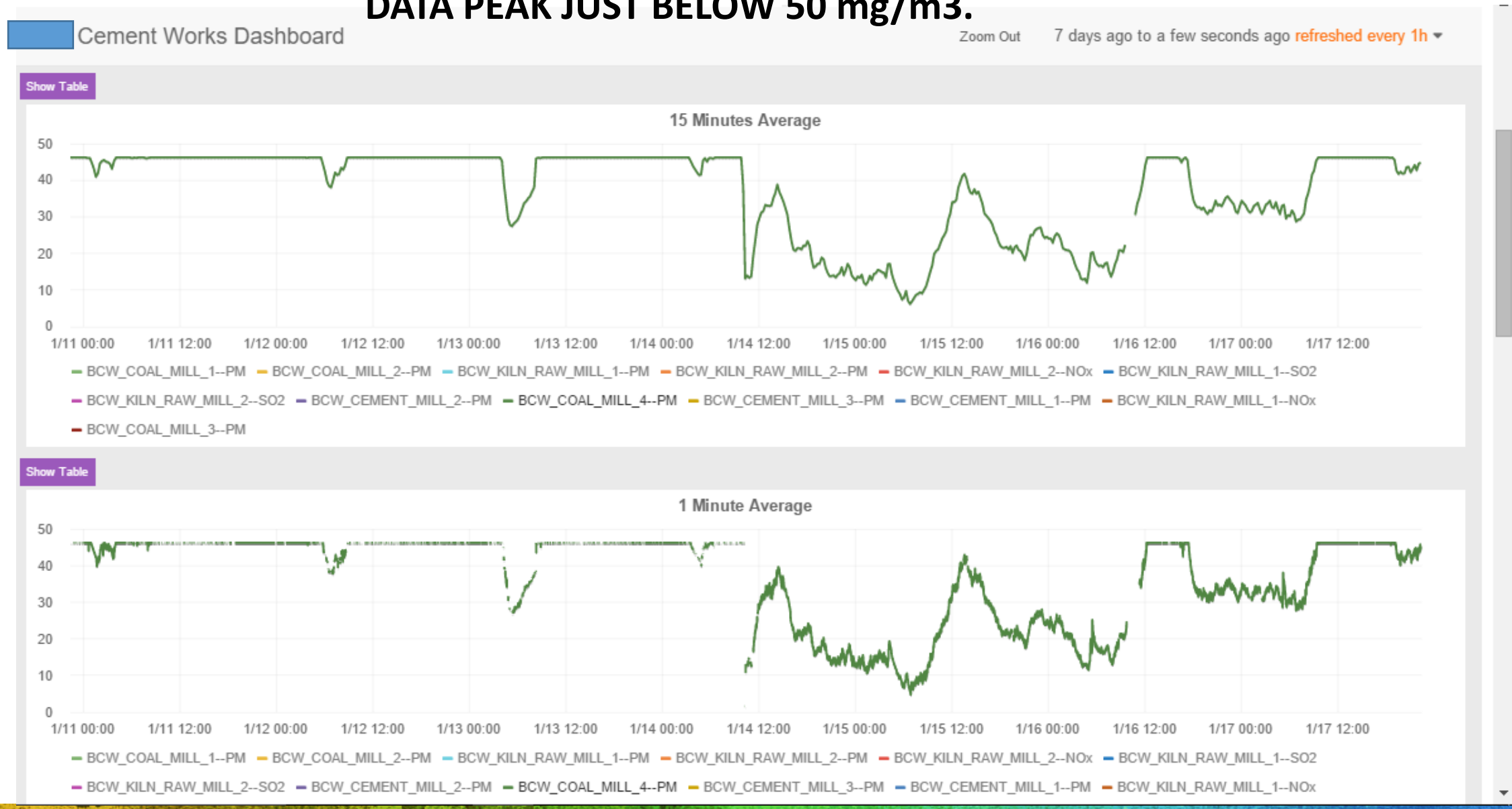
Upper Limit Threshold - 2

DATA PEAK JUST BELOW 50 mg/m3.



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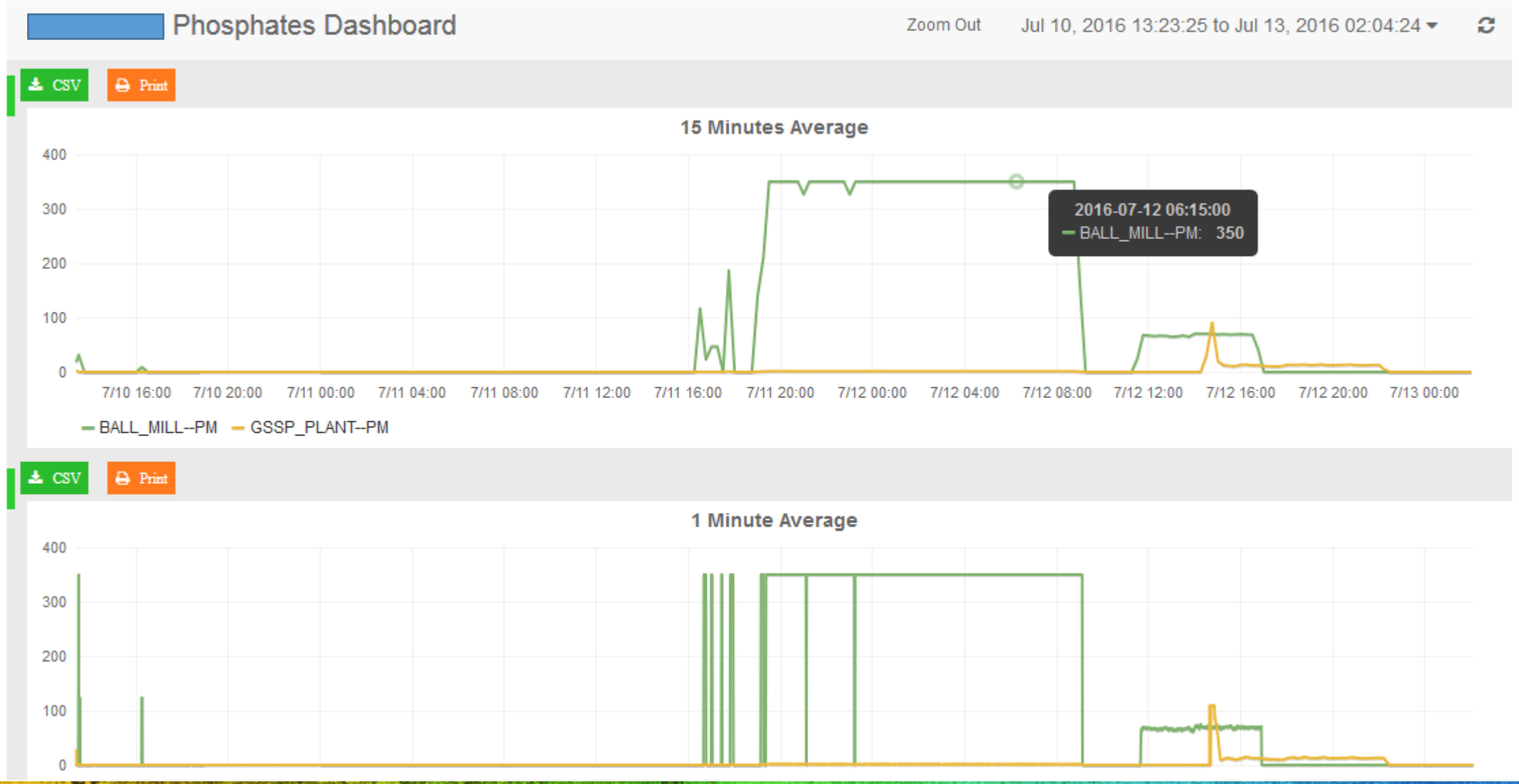
Upper Limit Threshold - 3

DATA PEAK AT 350 mg/m3.



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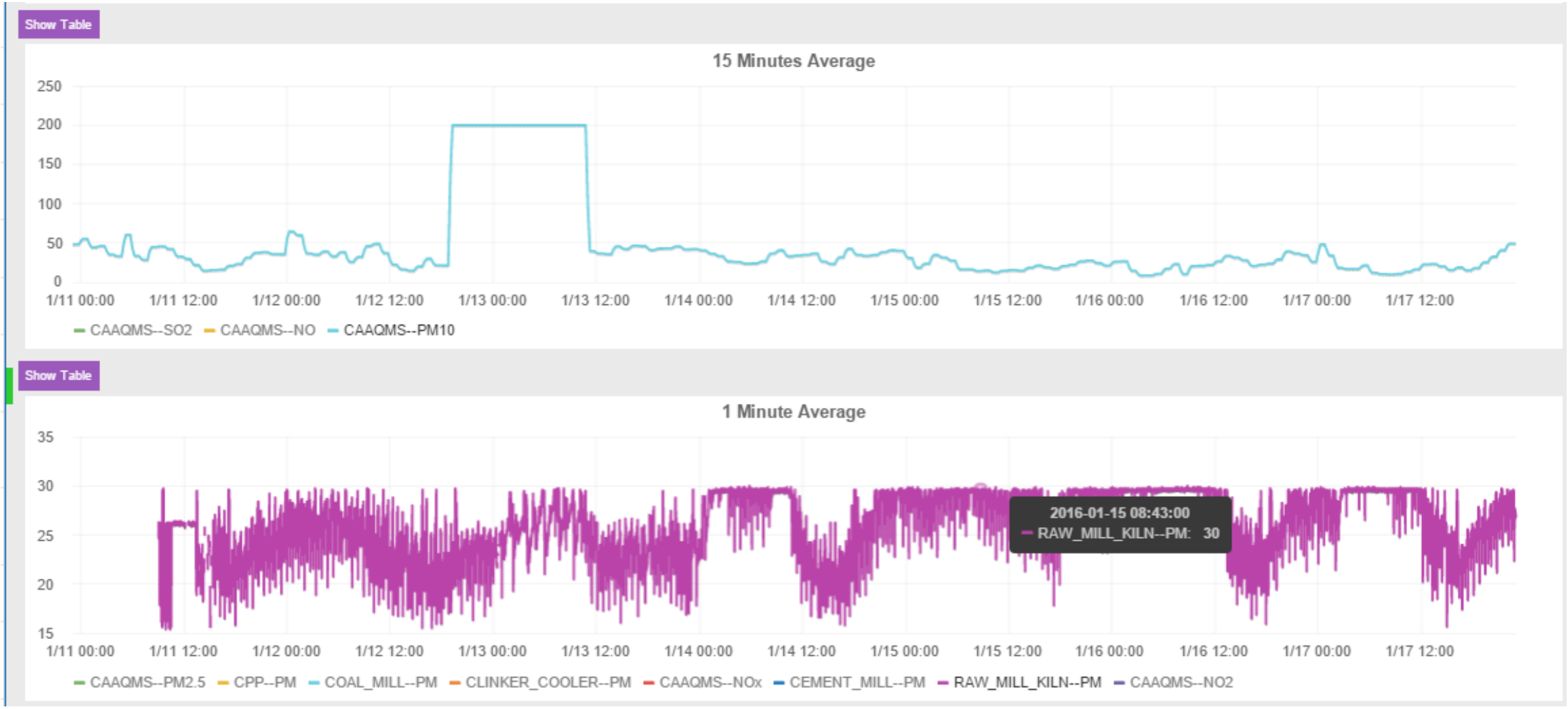
RANDOM DATA SIMULATION WITH DATA PEAK AT 30 mg/m3



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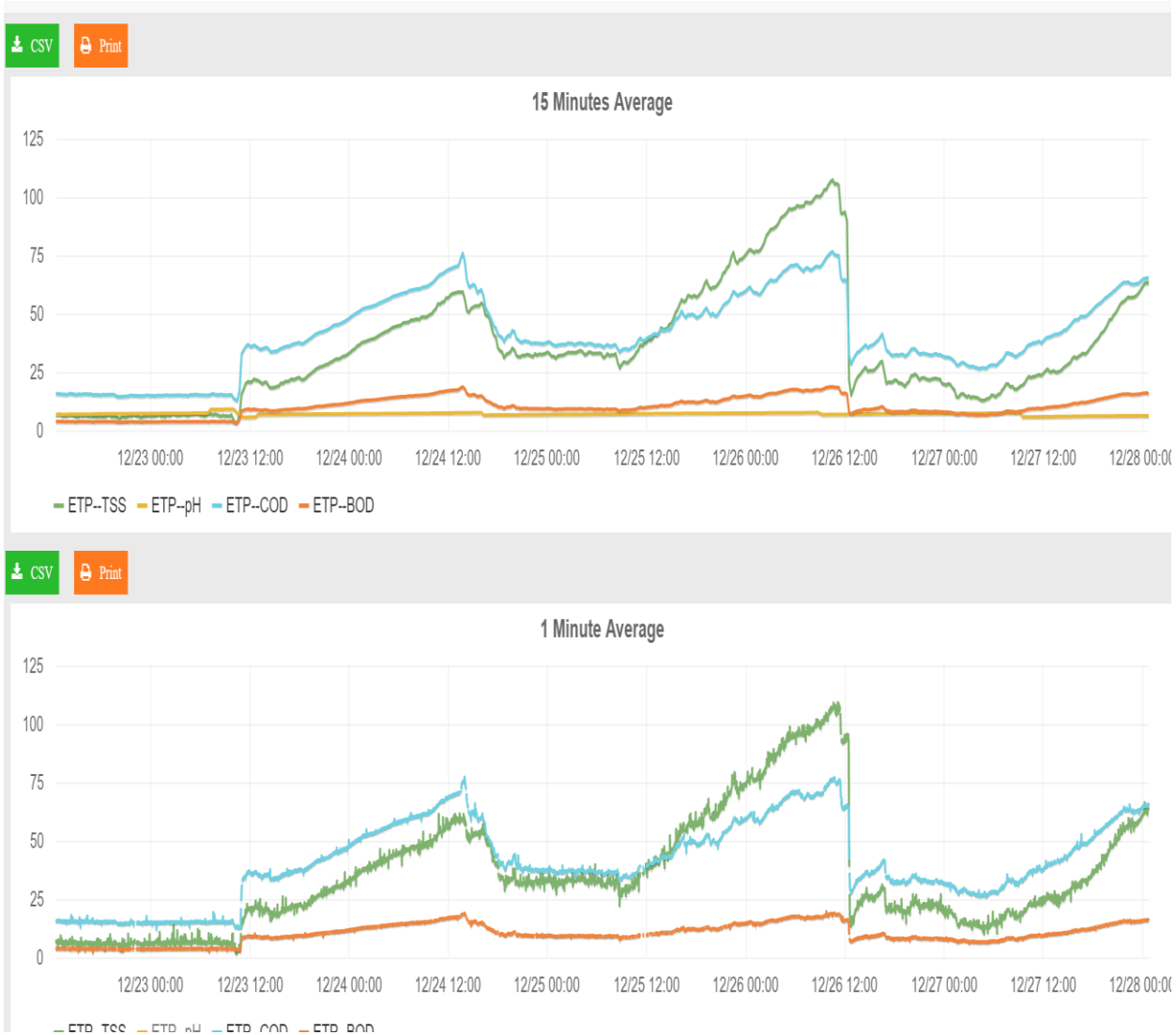
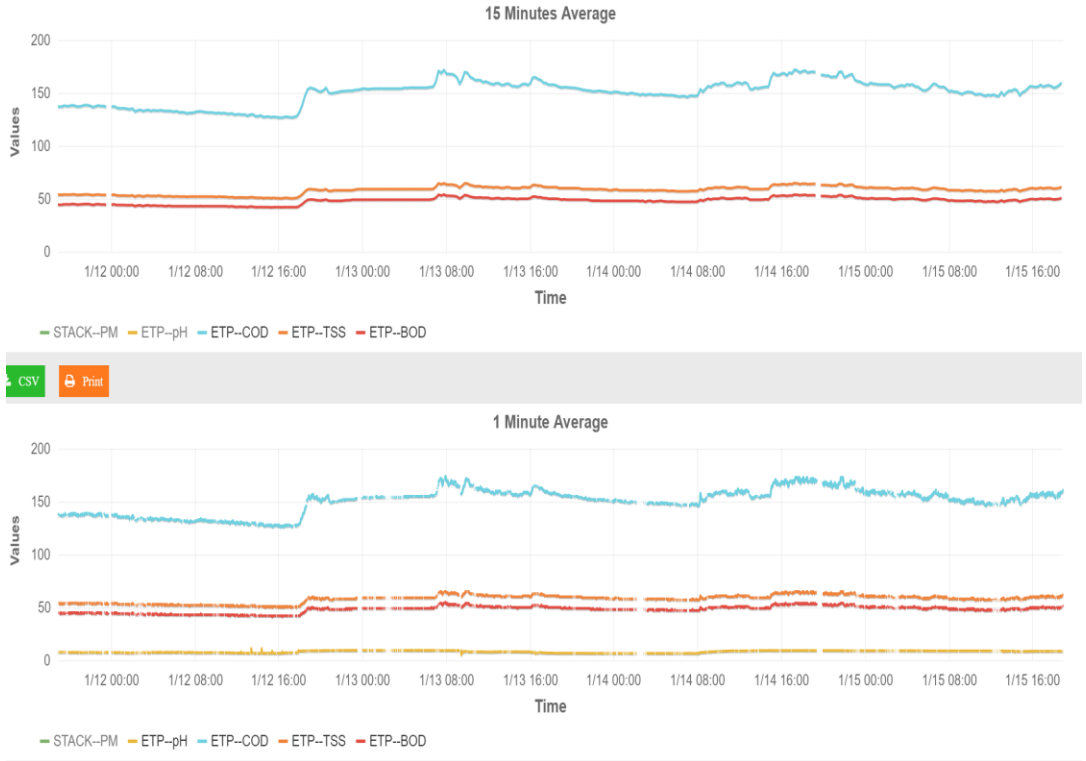
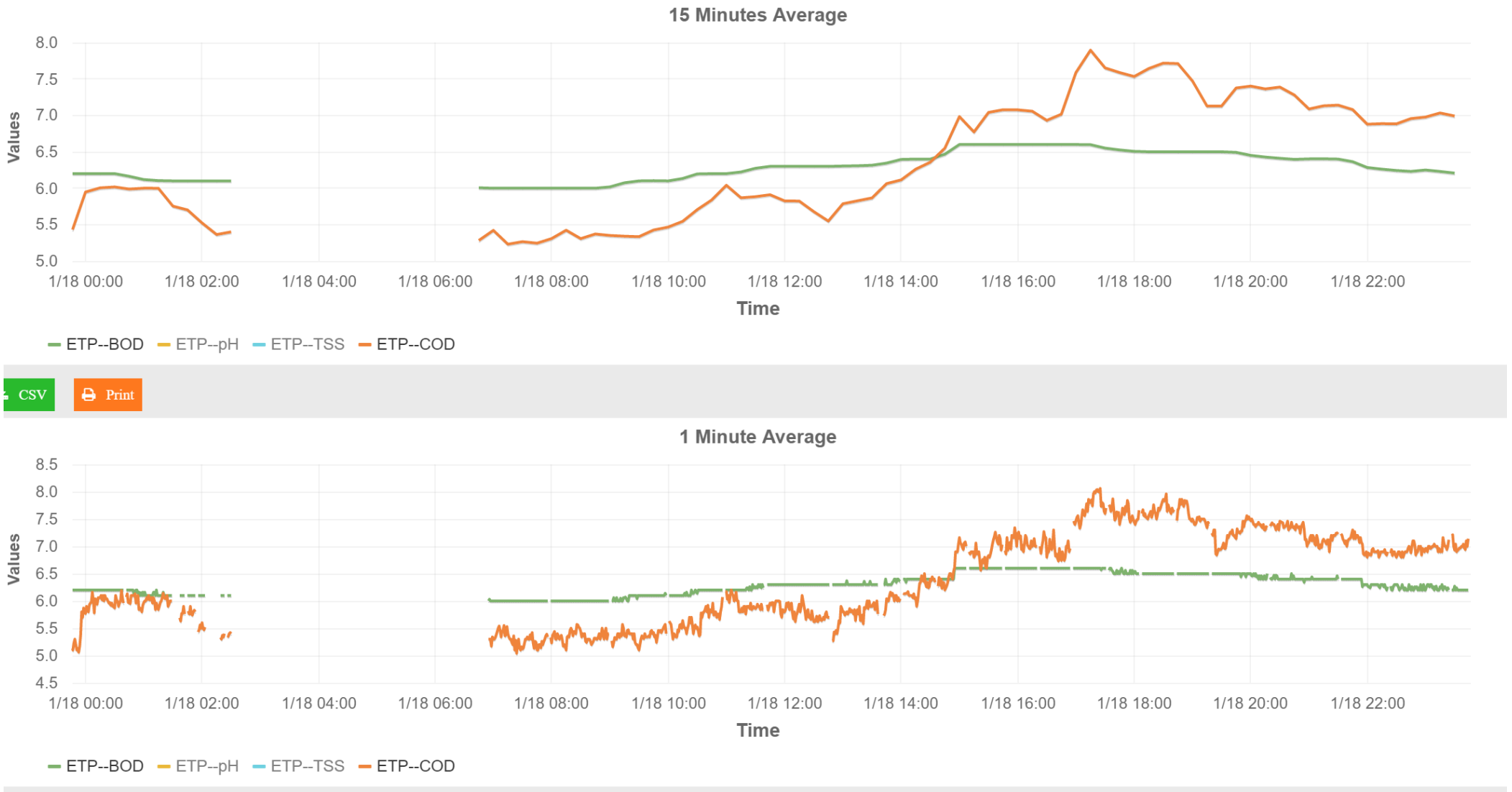
Correlation between COD, BOD, TSS



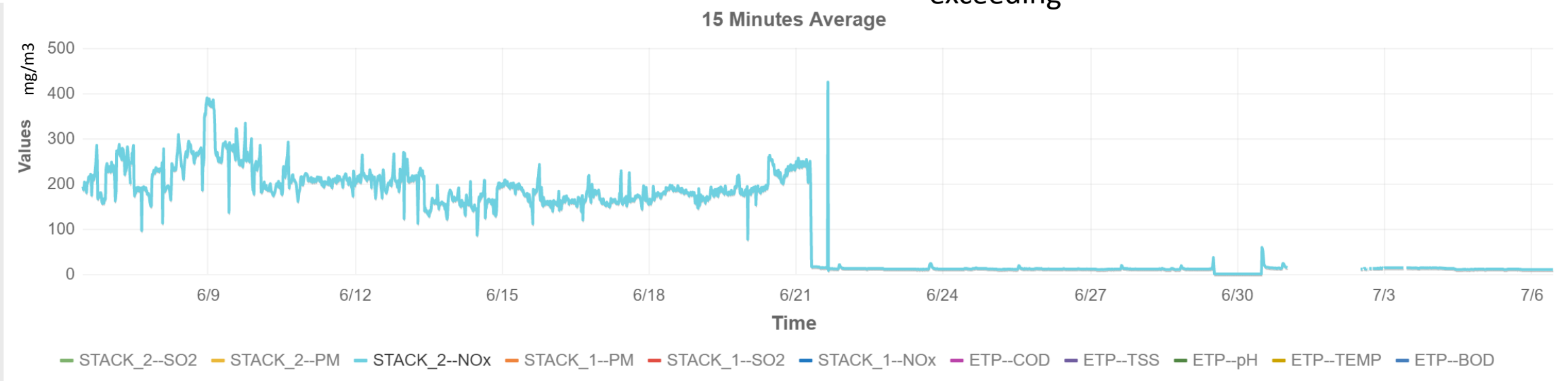


BOD Greater than COD? → Distillery..

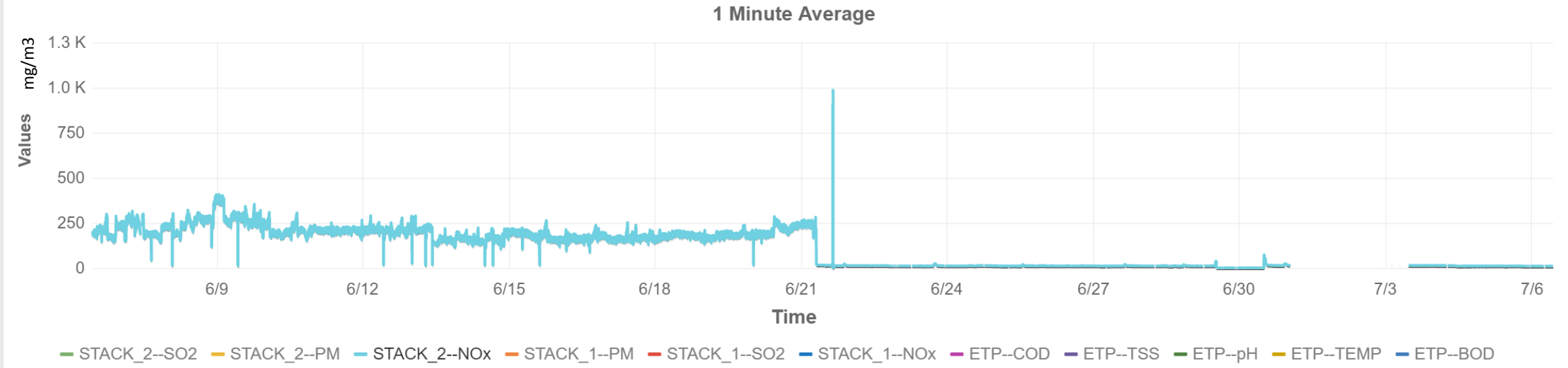


Last 30 days for a Power Plant NOx

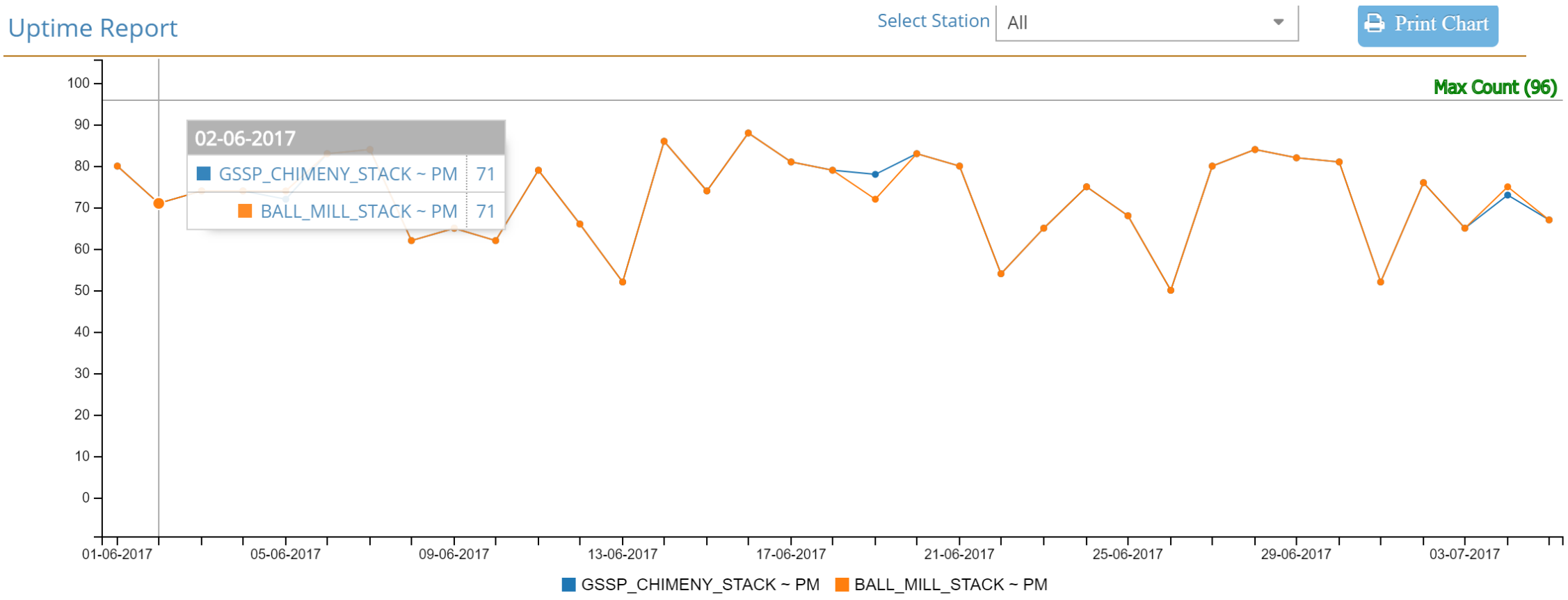
Till this point it was exceeding



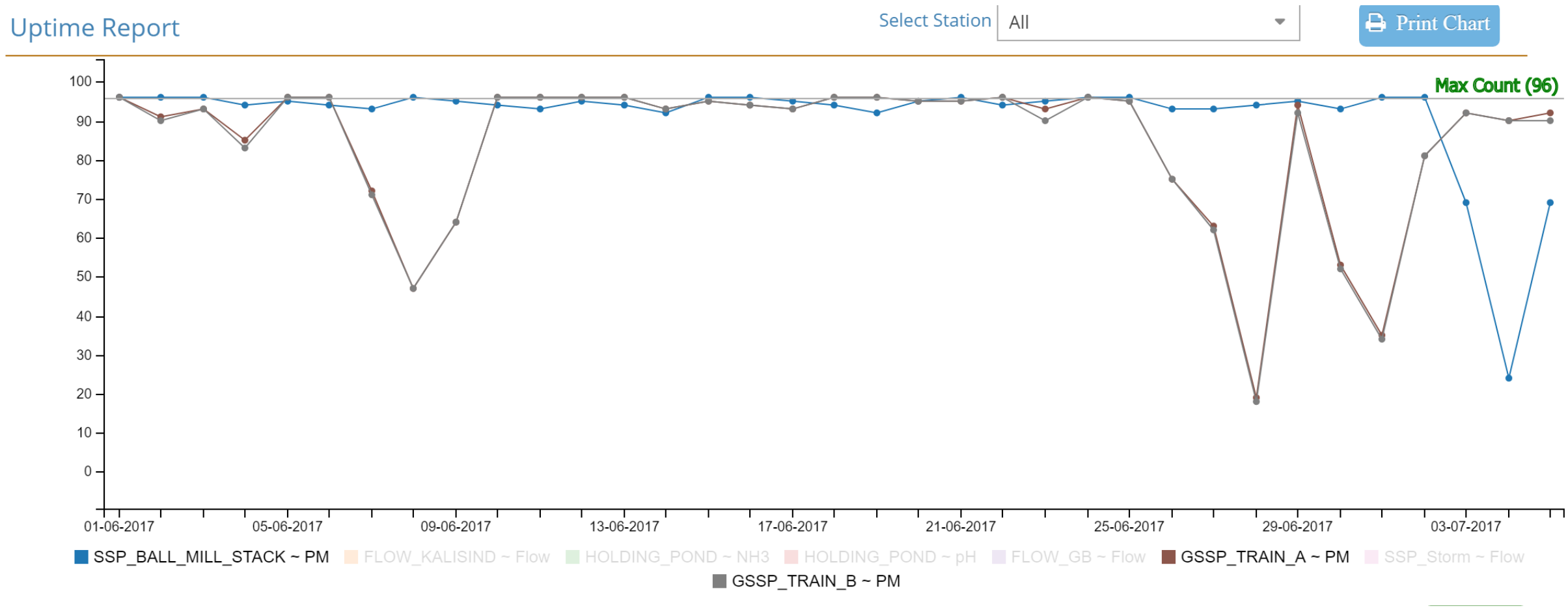
CSV Print



Uptime

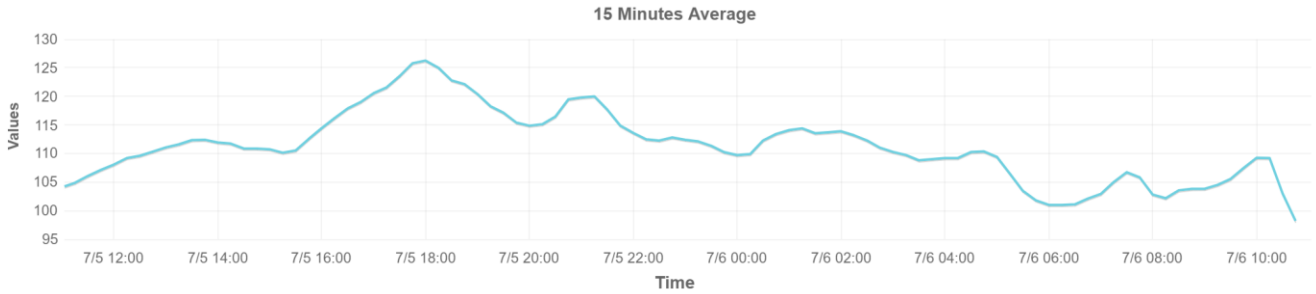

Uptime Report
Select Station
All
Print Chart
Max Count (96)
02-06-2017
GSSP_CHIMENY_STACK ~ PM 71
BALL_MILL_STACK ~ PM 71
100
90
80
70
60
50
40
30
20
10
0
01-06-2017
05-06-2017
09-06-2017
13-06-2017
17-06-2017
21-06-2017
25-06-2017
29-06-2017
03-07-2017
GSSP_CHIMENY_STACK ~ PM
BALL_MILL_STACK ~ PM

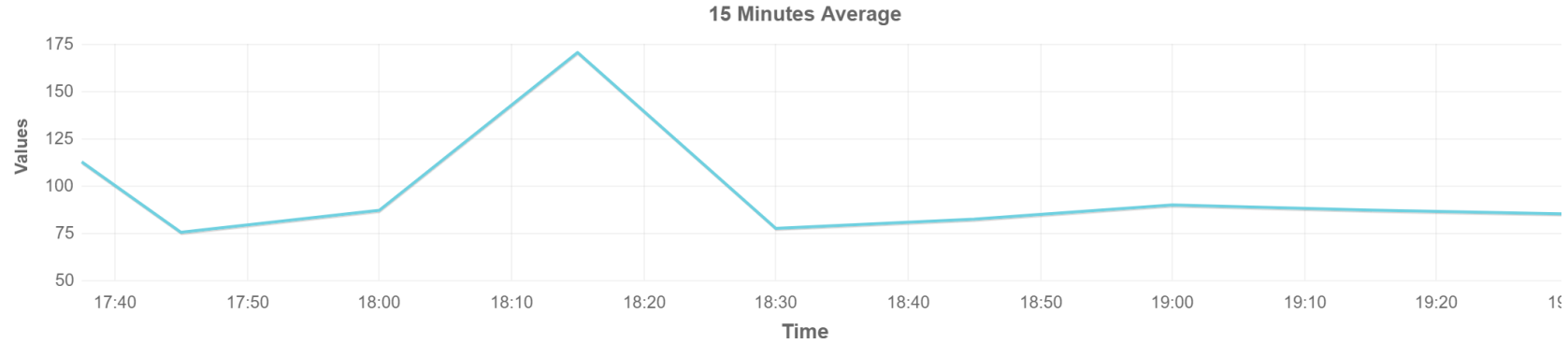
Uptime from Same Industry for different parameter

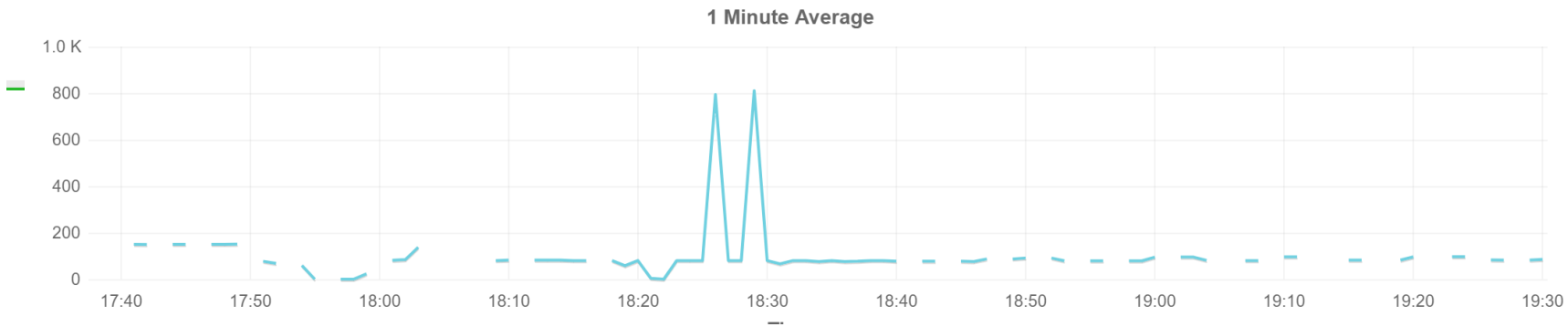


Averaging Effect on Data

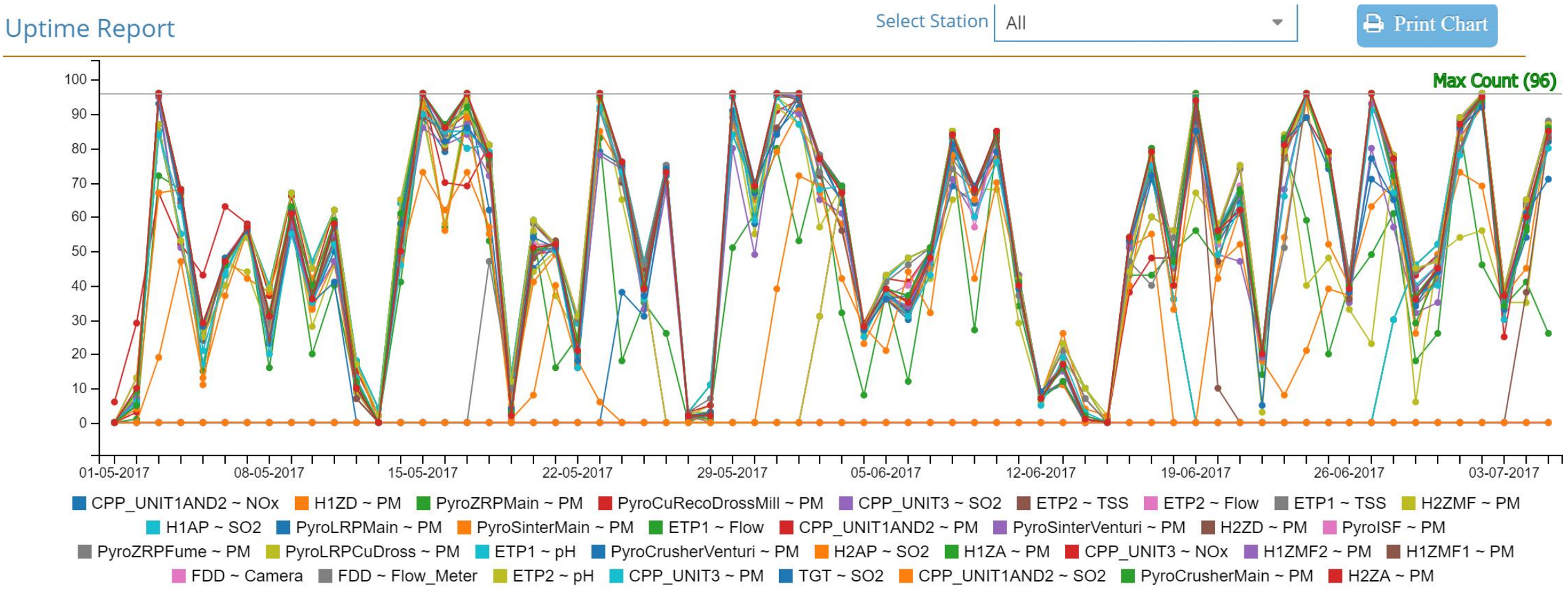
Watch for Discontinuous Data Stream!!



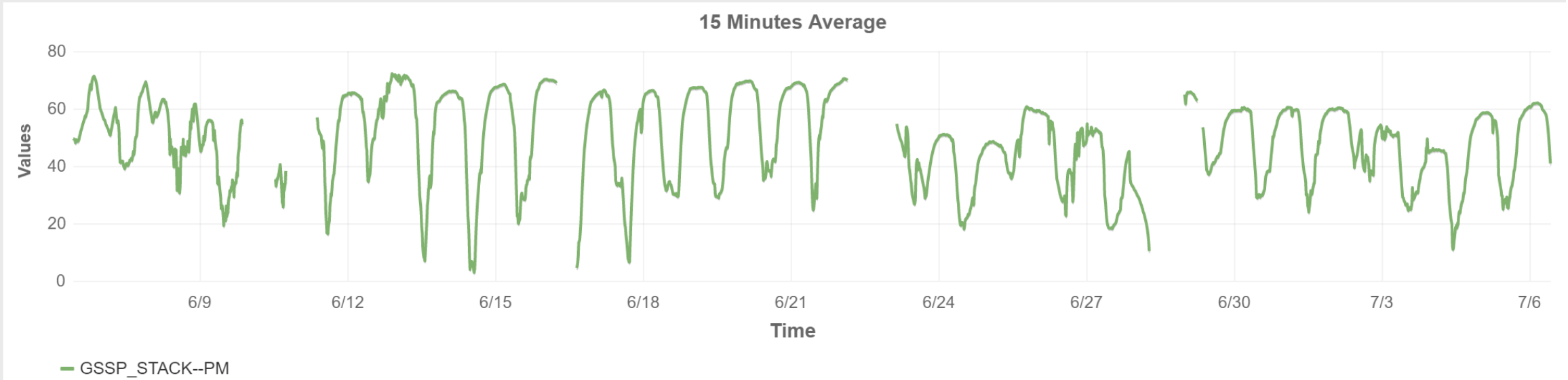




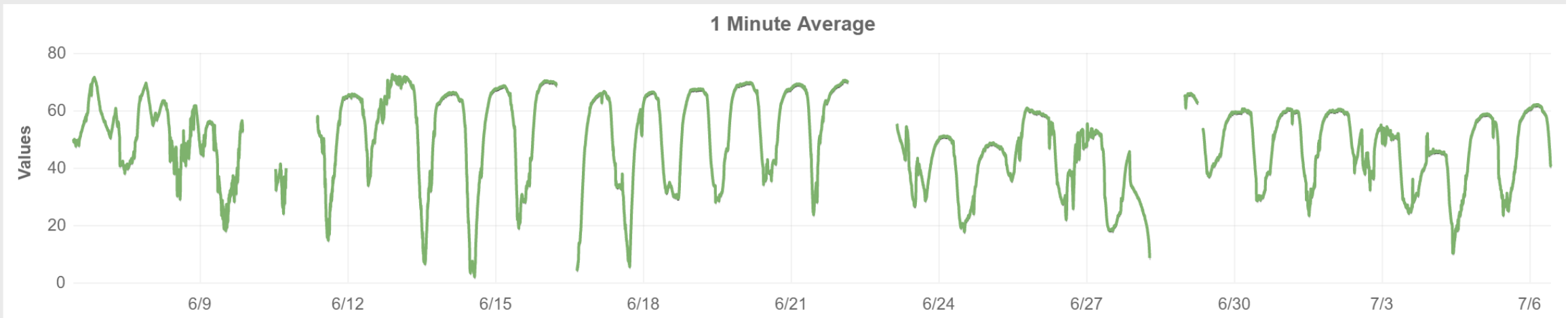
Uptime Analysis for 3 Months!!



CSV Print



CSV Print



Key Focus Area for Regulators during Site Inspection

- Consent to Operate (CTO)
- Location of the Installation
- Technology Choices for different Process
- Range of the Analyzer
- Inspection of the Analyzer
- Connectivity Scheme
- Operation of the Analyser
- Data Transmission
- Comparison with Historical Trends
- Calibration Information
- Factors and Normalization
- Key items to watch
  - File Based Transfer
  - Delayed Data Transfer
  - Switching of Analyzers

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Thank You

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