
AVEVAWORLD

Advanced Emissions Monitoring and Reporting
Marathon Petroleum Corporation - Environmental

April 9, 2025

Speakers

- Serge Ibarra
  - Marathon Petroleum Corporation
  - Corporate Environmental Engineer

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  - EXELE Information Systems, Inc.
  - Director

MPC Transitions Environmental Personnel to Modern Tools

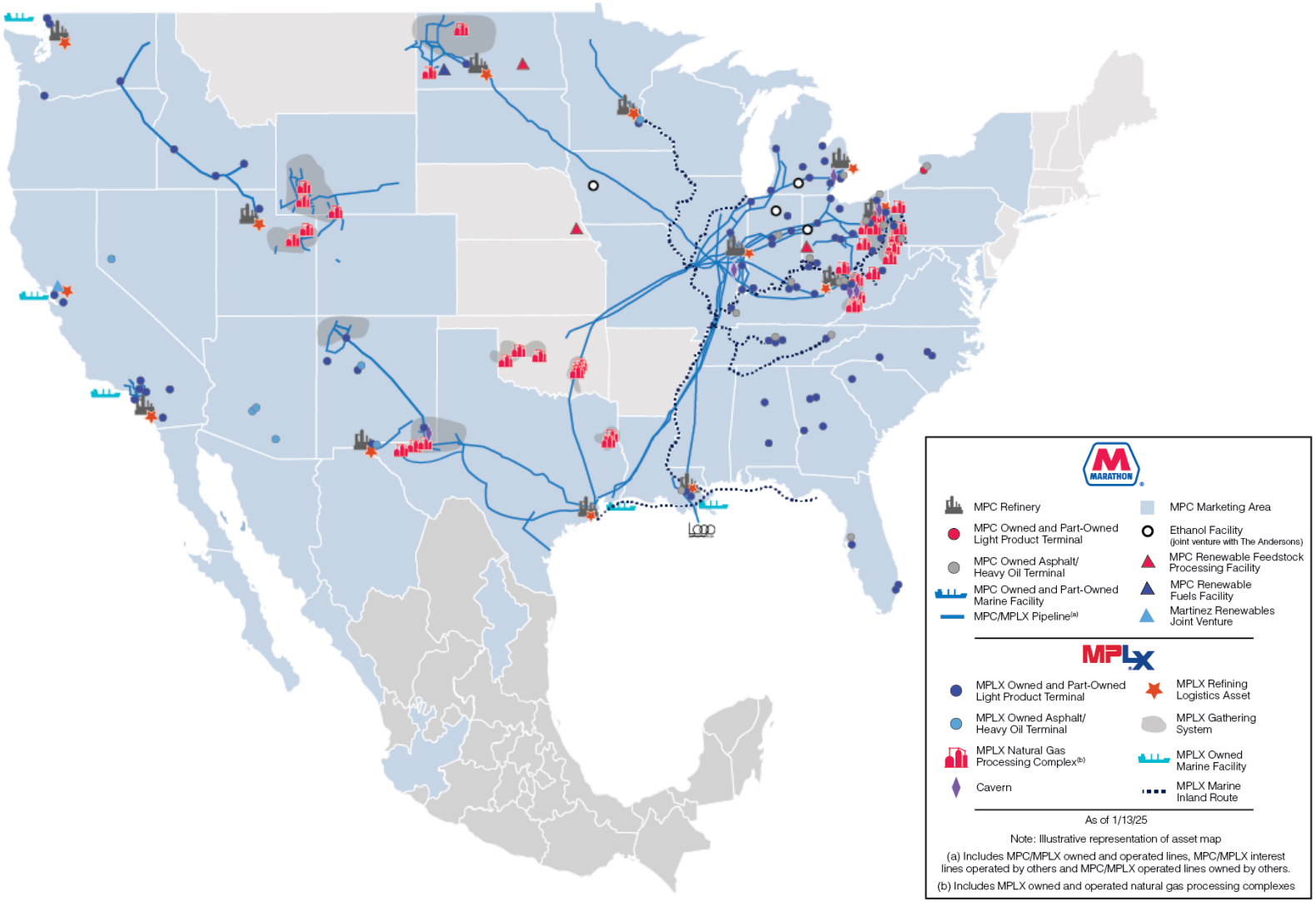
- **Challenge**
  - Manual reporting processes lead to a difficulty providing visibility into compliance behavior resulting in inefficient operational improvement
  - Largely based on a complex web of Excel spreadsheets and manual entry/manipulation
  - Data collection, sharing and analysis were highly time consuming
- **Solution**
  - Deployed AVEVA™ PI System™ as the backbone of an overall compliance workflow solution to streamline data collection, calculations, access, analysis and reporting with strong governance and enterprise consistency
  - Developed system to manage, analyze and present large sets of compliance data, helping to streamline Environmental workflows and overall compliance program effectiveness
- **Results**
  - Ongoing multi-phased project taking steps toward significant improvement in the level of effort, consistency, manageability and transparency to a portfolio of stakeholders leading to more reliable and efficient operation of assets
  - Aligned with our overarching business strategy on sustainability

MPC at-a-Glance

Largest US Refiner with ~3MMBPD Capacity

- **Marathon Petroleum Corporation (MPC) is a leading, integrated, downstream energy company headquartered in Findlay,** Ohio. The company operates the nation's largest refining system. MPC also owns the general partner and majority limited partner interest in MPLX LP, a midstream company that owns and operates gathering, processing, and fractionation assets, as well as crude oil and light product transportation and logistics infrastructure.

- **MPC is undergoing a workflow modernization effort for the Environmental workforces at the Refining Assets**. A centralized project has been initiated with the goal of migrating Environmental personnel away from older tools and introduce an update to compliance management.



EXELE at-a-Glance

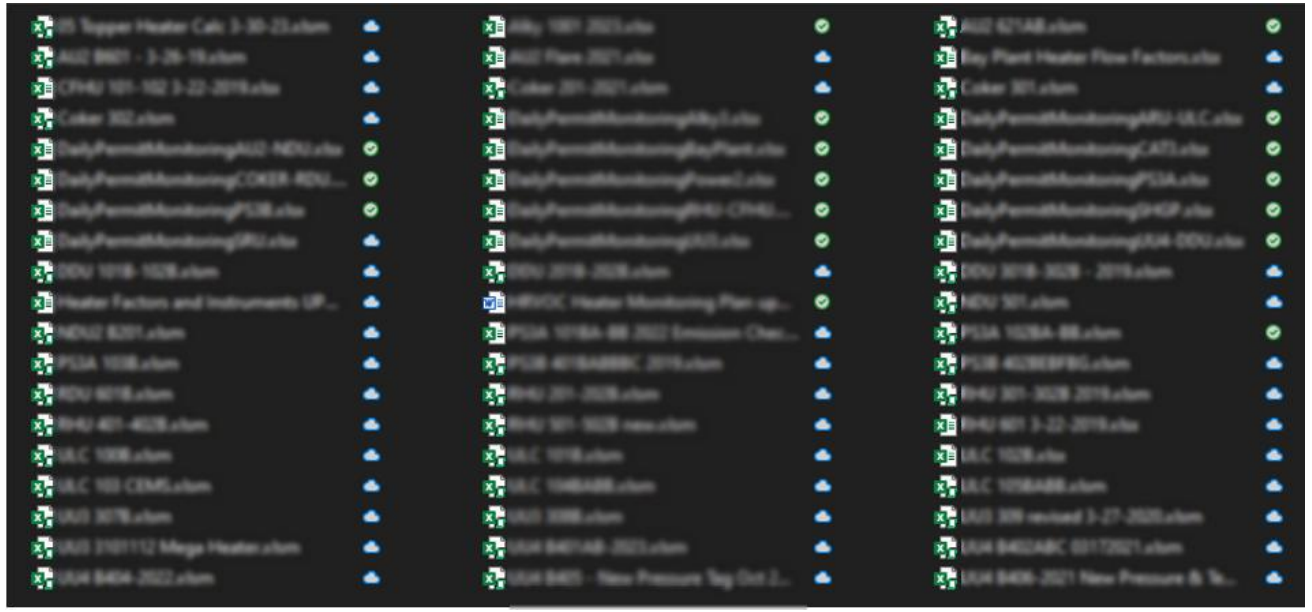
- EXELE has been commissioned to execute and help develop the technical aspects of the MPC Corporate Environmental Group's project to digitally enhance our compliance efforts.

Existing Tools for Environmental Compliance

Dozens of Compliance Requirements Managed with These Tools

- MPC Environmental predominantly leverages spreadsheets for compliance tracking, with minimal utilization of PI features integrated into solutions.

- Where PI AF has been used, there is not a robust AF-driven visualization approach implemented, and PI Vision displays are generated using rudimentary skills.



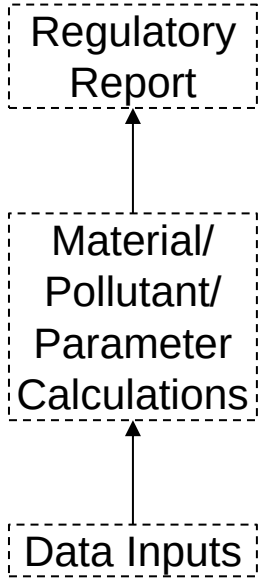
- 40 CFR 60 Subpart Ja
- 40 CFR 63 Subpart CC
- 40 CFR 63 Subpart UUU
- 40 CFR 75
- 40 CFR 98
- Total Site Emissions
- 40 CFR 355

Current Use of AVEVA PI System

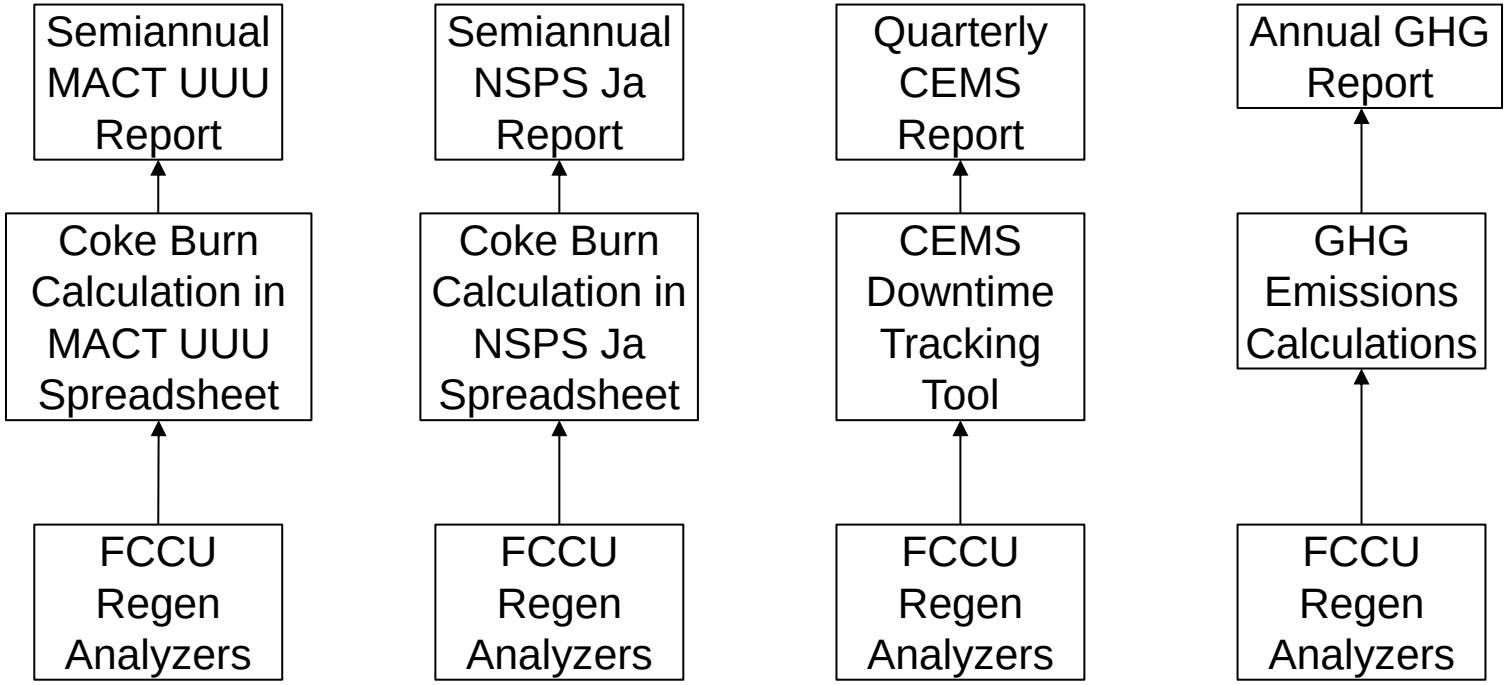
Reactive Environmental Workforce Uses Tools to Meet Immediate Needs

- No planned architecture in existing builds/logic to offset spreadsheets. Cannot be further leveraged for other purposes.

Typical Report Workflow



Example Workflow as Generally Applied at Sites



In this example, there are four parallel reporting paths, each requiring data review

What are the Issues and Challenges with the Current State of PI System Usage that Prompted the Project?

- Parallel data flows

- Inflexible tooling created by Environmental workgroups
  - Cannot build standard dashboards
    - Still using PI ProcessBook-minded approach for data visualization
  - Inefficient processes to maintain system
  - Primary spreadsheet tools require active refreshes

- Our compliance demonstration tools are cumbersome to maintain or not set up for ease of use

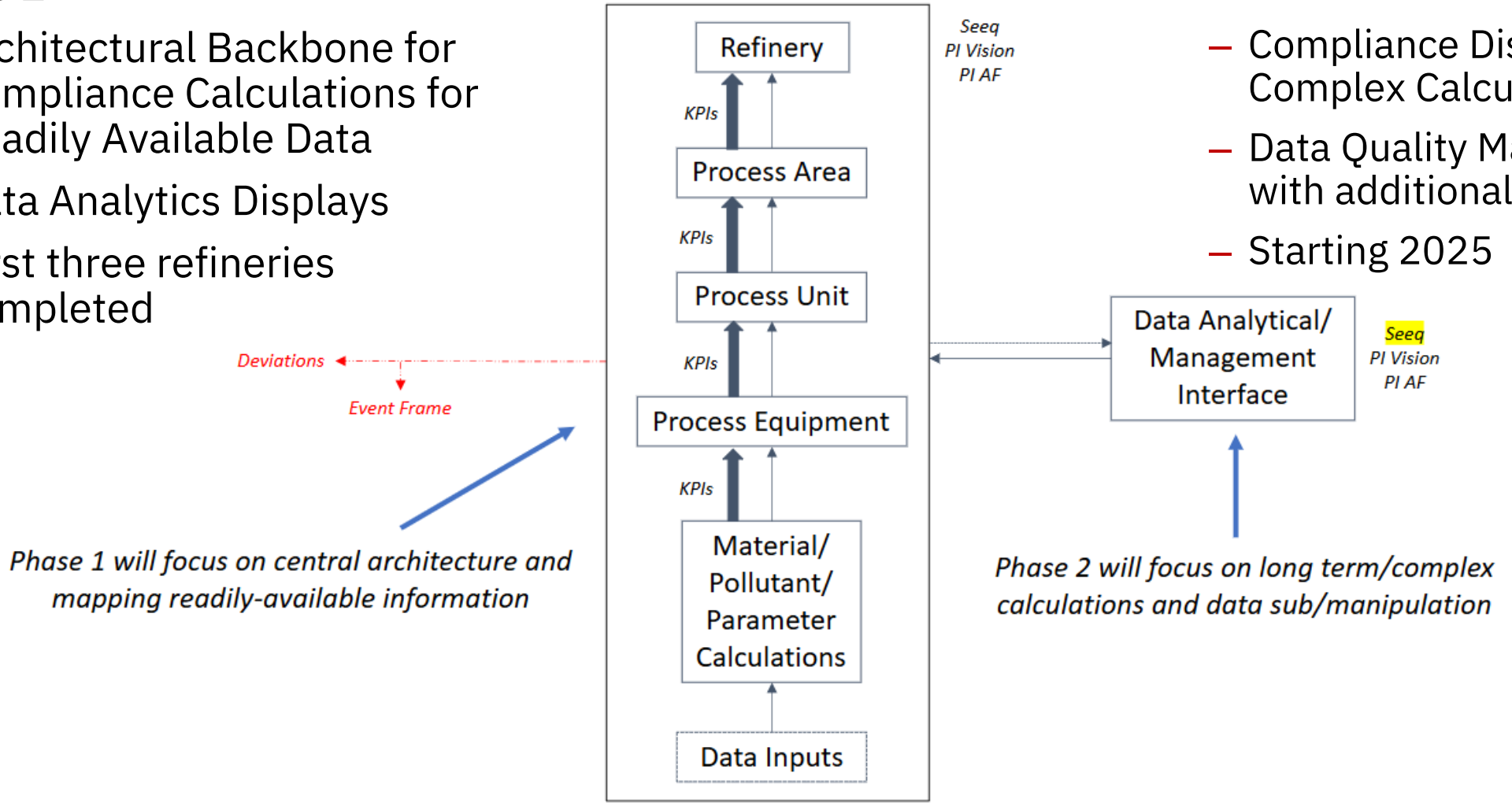
Goals and Desired Benefits

- Leverage enterprise software licenses to provide modern and more centralized, efficient workflows for Environmental personnel
- Automated calculations for Short-Term and Long-Term compliance limits
- Improve transparency of Short-Term and Long-Term compliance limits for internal stakeholders and third parties
- Consolidated data flows
- “Don’t use spreadsheets” is not a goal – we converted it into an auxiliary benefit by providing them new tools to minimize compliance risk

Environmental Project Phased Approach

Build to the refinery, not to the compliance requirement

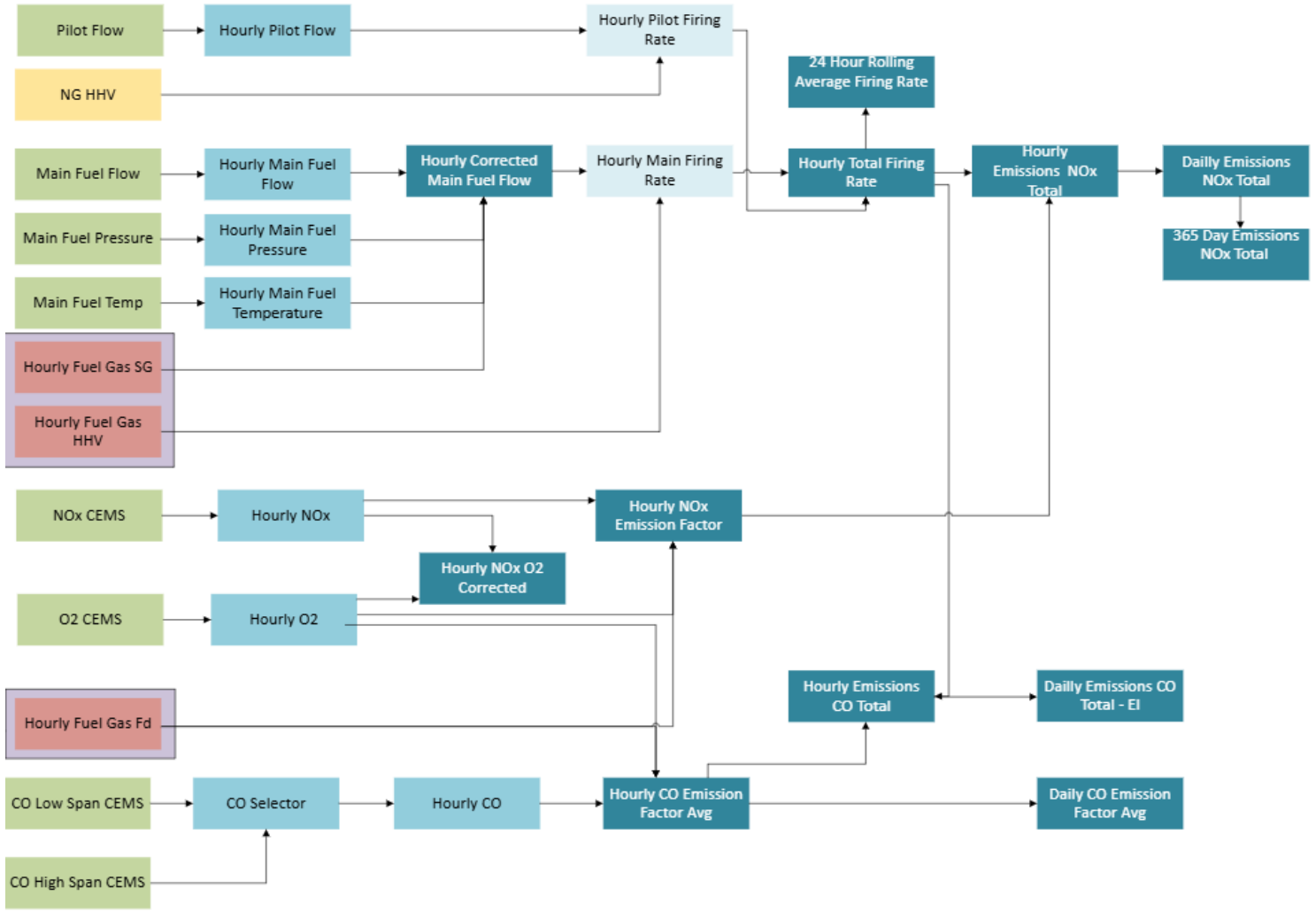
- **Phase 1**
  - Architectural Backbone for Compliance Calculations for Readily Available Data
  - Data Analytics Displays
  - First three refineries completed



- **Phase 2**
  - Compliance Displays for Complex Calculations
  - Data Quality Management with additional tools
  - Starting 2025

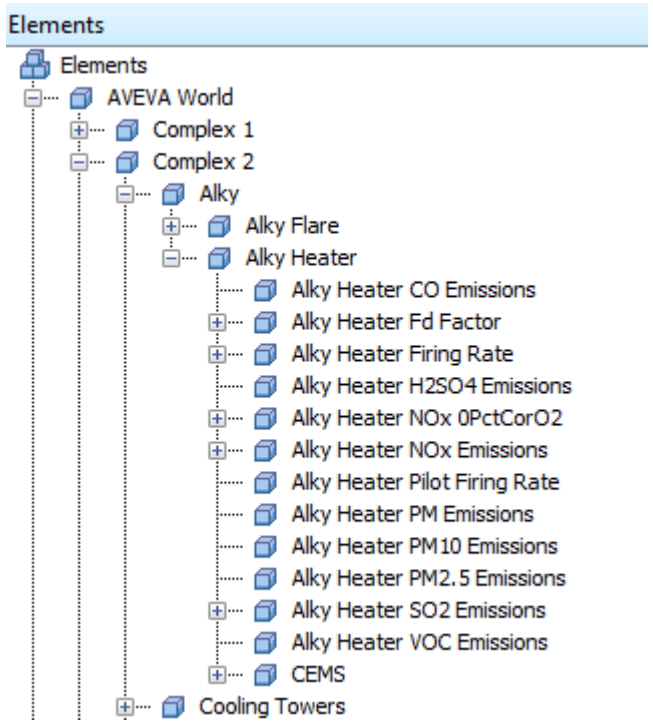
Many Variations of Calculations To Model in PI Asset Framework

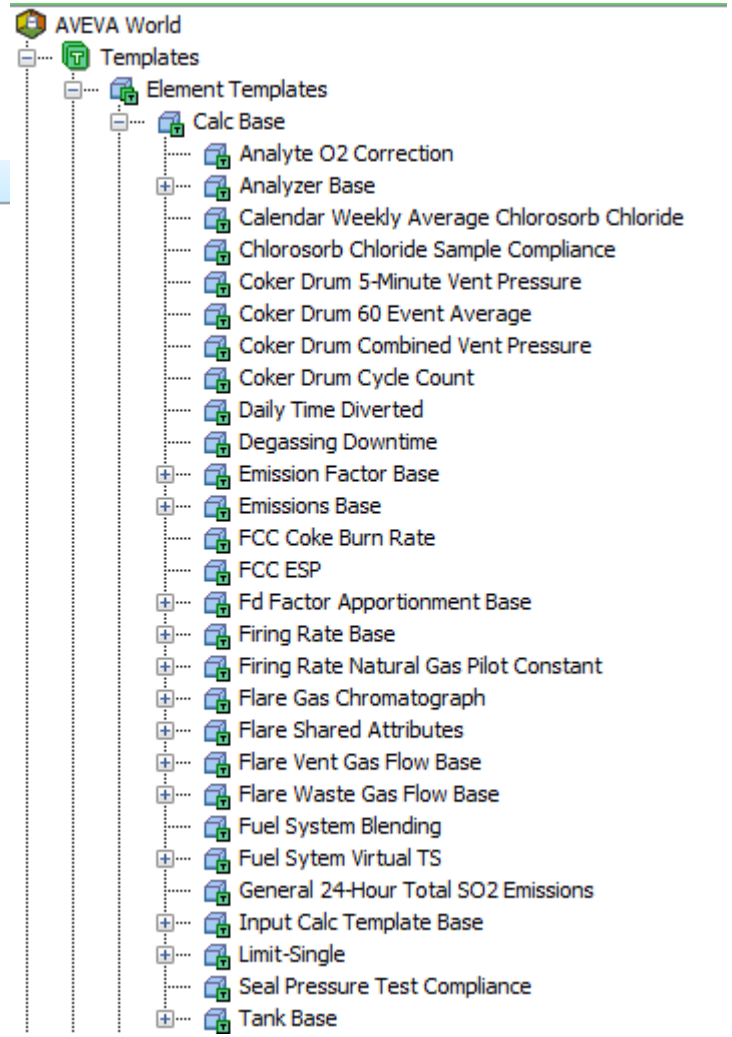
- **Emissions calculations vary based on the physical setup and the compliance requirements**
  - Multiple fuel flows
  - Shared stacks
  - Emission factor calculation vs calculated emissions from CEMS (analyzers)
  - Various reporting durations and O2 correction amounts
- **Different permits for each equipment type and at various level of the calculation**
  - Heaters/Boilers, Tanks, Flares, FCCs, Water Treatment ,Thermal Oxidizers, Coke Drums and etc.
- **Many shared inputs among calculations**



PI Asset Framework Philosophy

- **Templates**
  - Minimize functions within each template – “Keep elements small and focused”
  - Creating elements from templates should “feel like playing with Legos”
  - Minimize periodic analyses and force as many event-driven as possible
- **PI Analysis Data reference (On Demand Analyses)**
  - Reduces recalculation dependencies
- **Single Data Sources**
  - References to output analyses and avoid mapping same tag in multiple places
- **Calculation Rollups and Reference Hierarchies**
  - Summary data flows up through hierarchies and calculated data flows down the hierarchy
- **Use uniform naming patterns to automatically name elements and tags**





Environmental Home Page

Transparency Through Templated Intelligent Compliance Displays

- Compliance limits can be summarized in a standard dashboard for ease of identification
  - Context switching used for users to review between process areas and units
- PI Event Frames dashboards are used for incident identification

Complex 1 | Complex 2 | Complex 3 | Complex 4 | Complex 6

AVEVA World Demo Short Term Limits by Complex

Parameter	Operating	Calculation	Value	Limit Type	Limit	% of Limit
Firing Rate	True	1 Hour Block Average	155.36 mmbtu/hr	<	300	51.79 %
NG FG Flow	True	1 Hour Block Average	145.56 mscfh	<	300	48.52 %
NOx EF	True	24 Hour Rolling Average	0.069823 lb/mmbtu	<	0.2049	34.08 %
SO2 Emissions	True	24 Hour Rolling Total	19.05 lb	<	500	3.81 %
Firing Rate	True	1 Hour Block Average	54.836 mmbtu/hr	<	210	26.11 %
Natural Gas Flow	True	1 Hour Block Average	51.732 mscfh	<	219	23.62 %
SO2 Emissions	True	24 Hour Rolling Total	0.89409 lb	<	500	0.18 %
Firing Rate	True	Daily Block Average	130.33 mmbtu/hr	<	138	94.44 %
Firing Rate	True	Midnight to Now Average	126.39 mmbtu/hr	<	138	91.59 %
SO2 Emissions	True	24 Hour Rolling Total	13.79 lb	<	500	2.76 %
Firing Rate	True	Daily Block Average	117.47 mmbtu/hr	<	138	85.13 %
Firing Rate	True	Midnight to Now Average	113.23 mmbtu/hr	<	138	82.05 %
SO2 Emissions	True	24 Hour Rolling Total	12.421 lb	<	500	2.48 %

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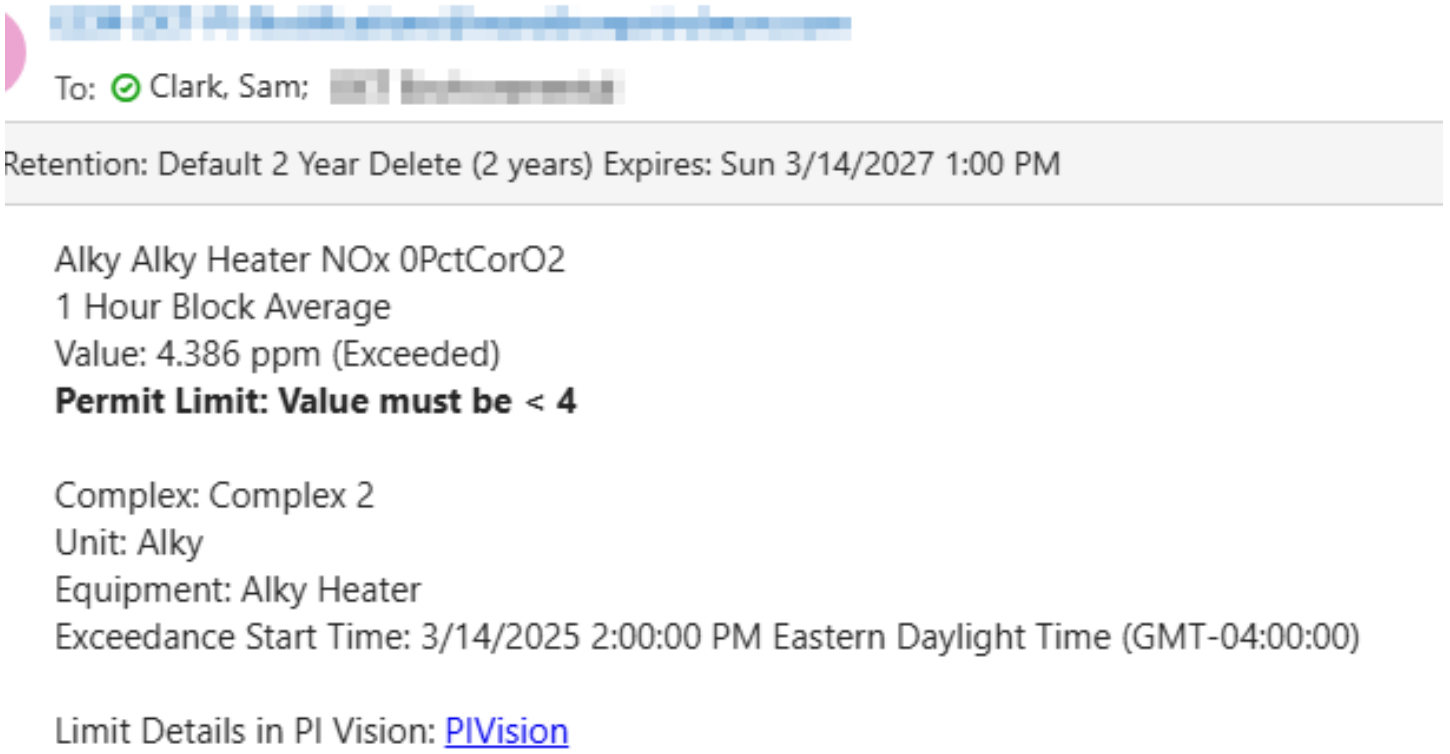
Focus on Limits

- PI Notifications alert recipients of potential exceedances that require further review



To: Clark, Sam; [redacted]

Retention: Default 2 Year Delete (2 years) Expires: Sun 3/14/2027 1:00 PM

Alky Alky Heater NOx 0PctCorO2
1 Hour Block Average
Value: 4.386 ppm (Exceeded)
Permit Limit: Value must be < 4

Complex: Complex 2
Unit: Alky
Equipment: Alky Heater
Exceedance Start Time: 3/14/2025 2:00:00 PM Eastern Daylight Time (GMT-04:00:00)

Limit Details in PI Vision: PIVision

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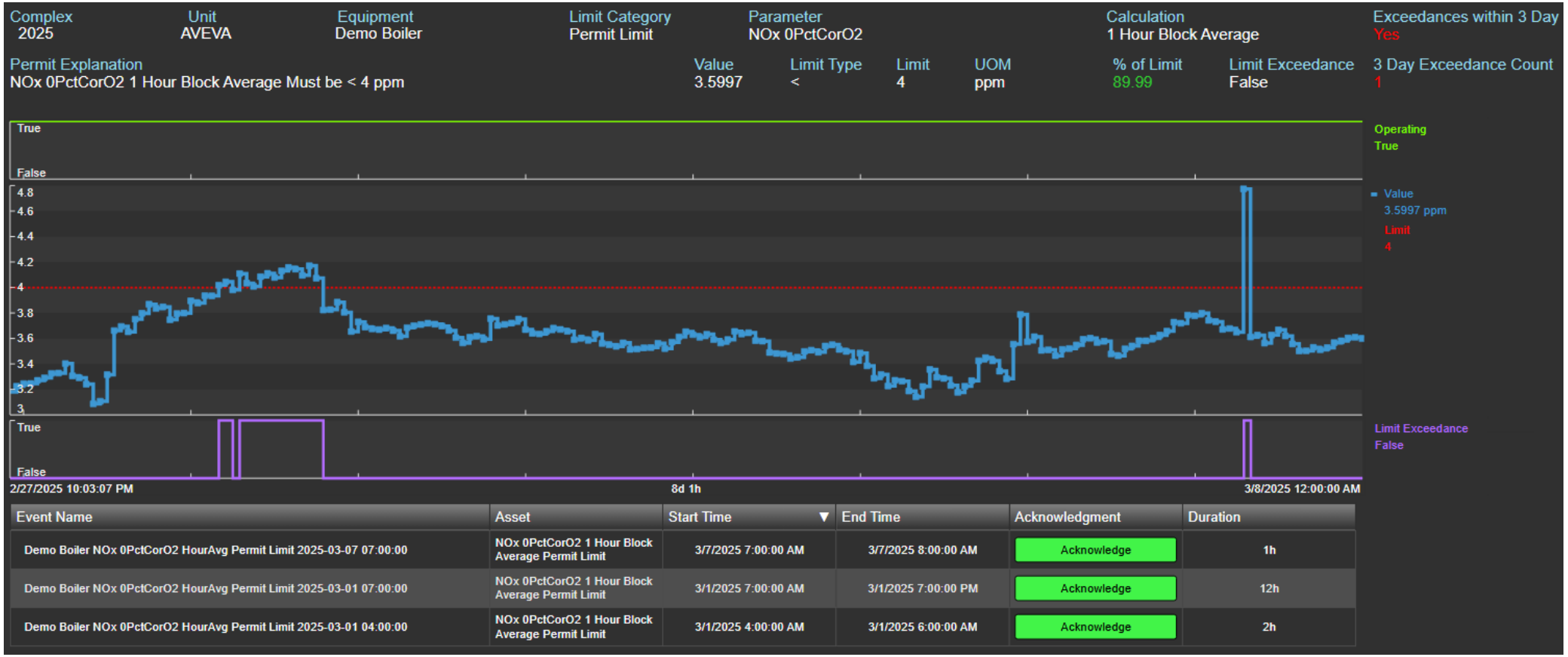
Simplified View of the Compliance Status

- Navigation links from PI Vision screens and PI Notifications enable rapid investigation



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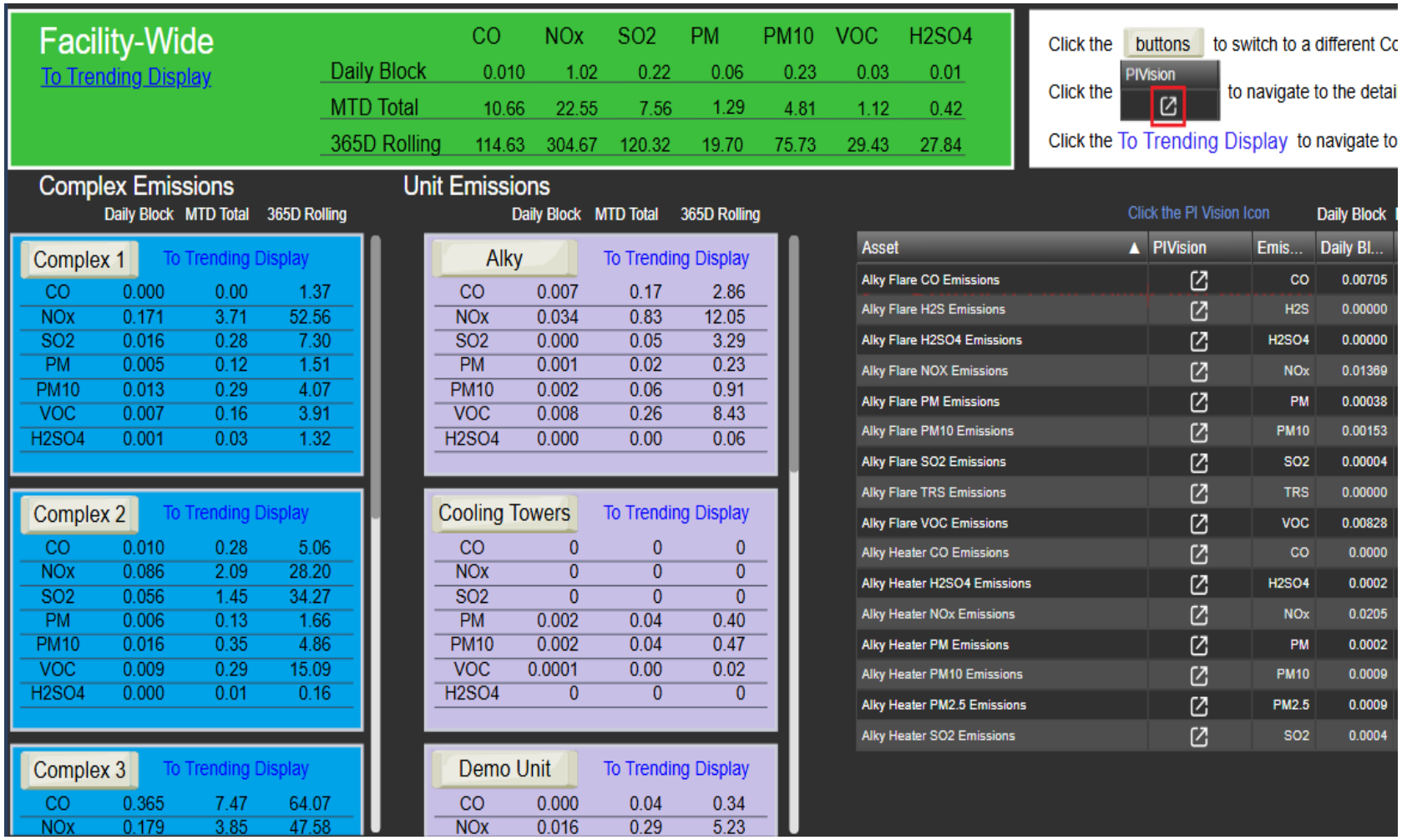
Content Through Context

- Contextual switching functionality leveraged to create interactive displays
- Navigation to more detailed pages applied to each level of the hierarchy
- PI Vision URL Builder to jump to equipment specific views



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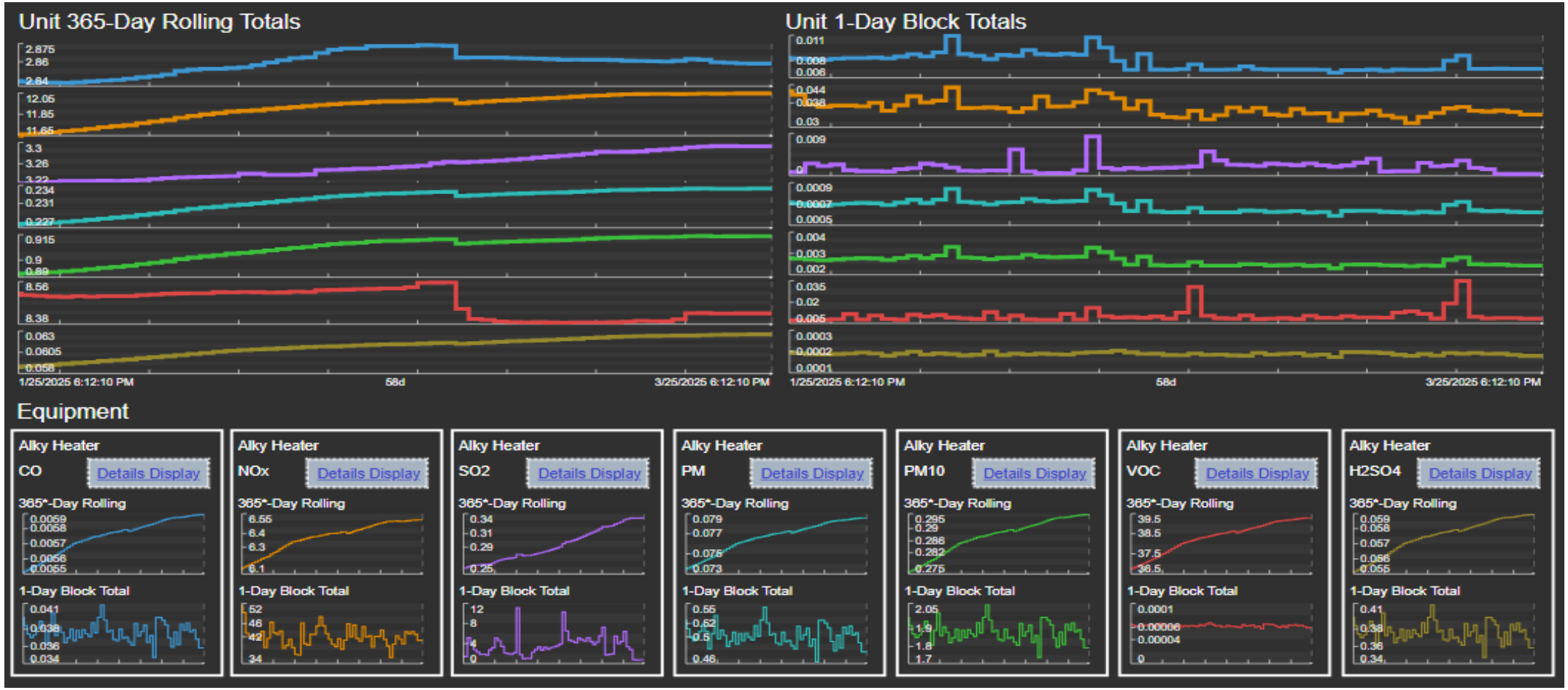
Layered Data

- Context driven displays show all relevant inputs. Users drill down to the desired level of detail.



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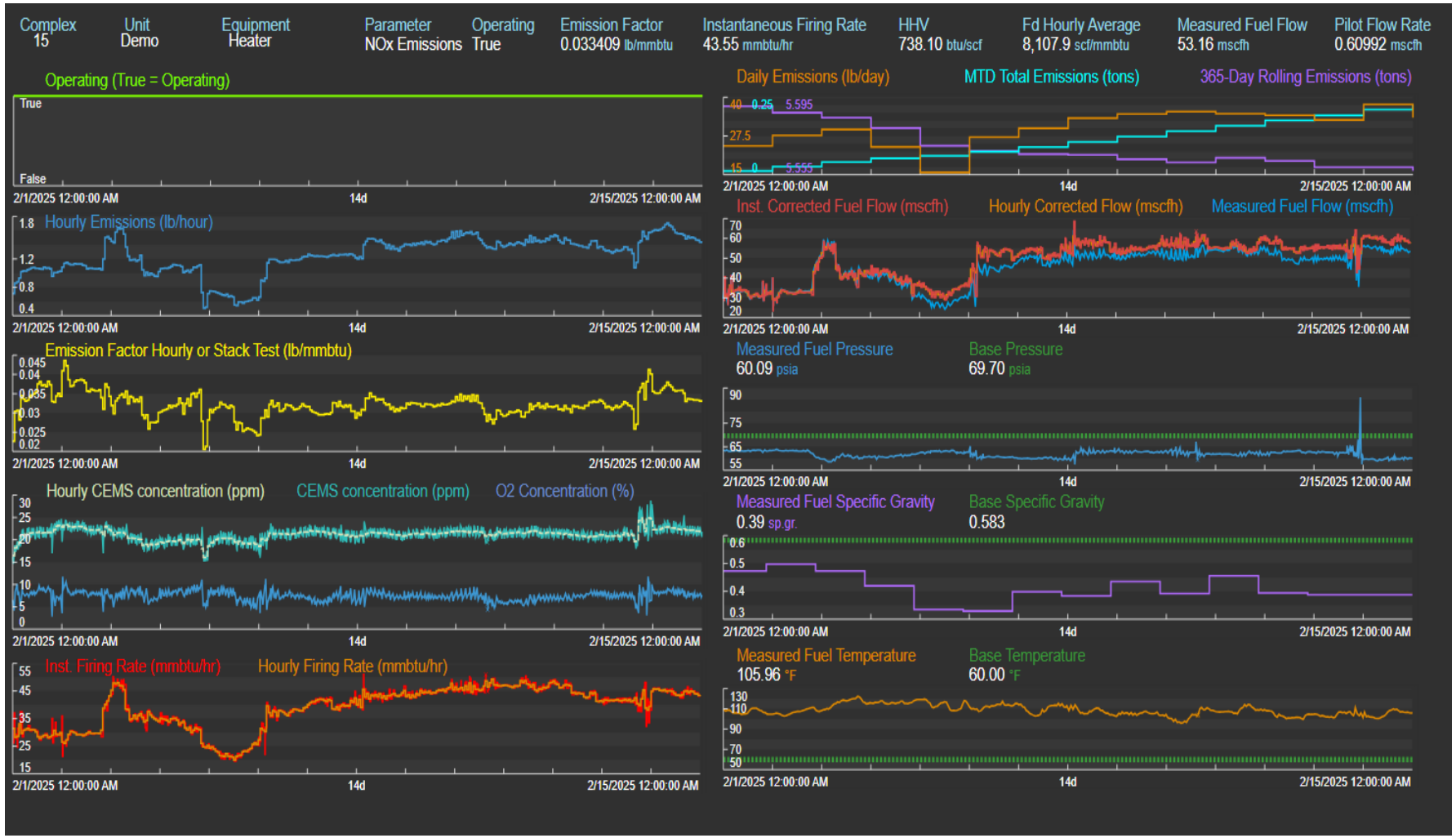
New Environmental Views

Equipment Specific Views To Show Contribution of Inputs

- Regimented structure across facilities allows for standard visualization approach at each site
- Detailed view into heater emissions that was not available in existing compliance tools
- Replicated in Seeq for advanced analysis



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Results

Centralized PI Infrastructure to Improve Enterprise Compliance Efficiency

- **PI Asset Framework**
  - Consolidated PI Data framework to meet compliance needs
    - Approximately 3,000 environmental limits added to PI AF and all viewable in PI Vision
    - Live and up-to-date compliance calculations

- **PI Vision**
  - Organized visualizations by process area, optionally filter by unit and then down through hierarchy for general compliance calculation inputs
  - Organized dashboards of compliance statuses for stakeholders to review
    - Operation and Engineering workforces have visibility into updated status – no need for routine spreadsheet reports

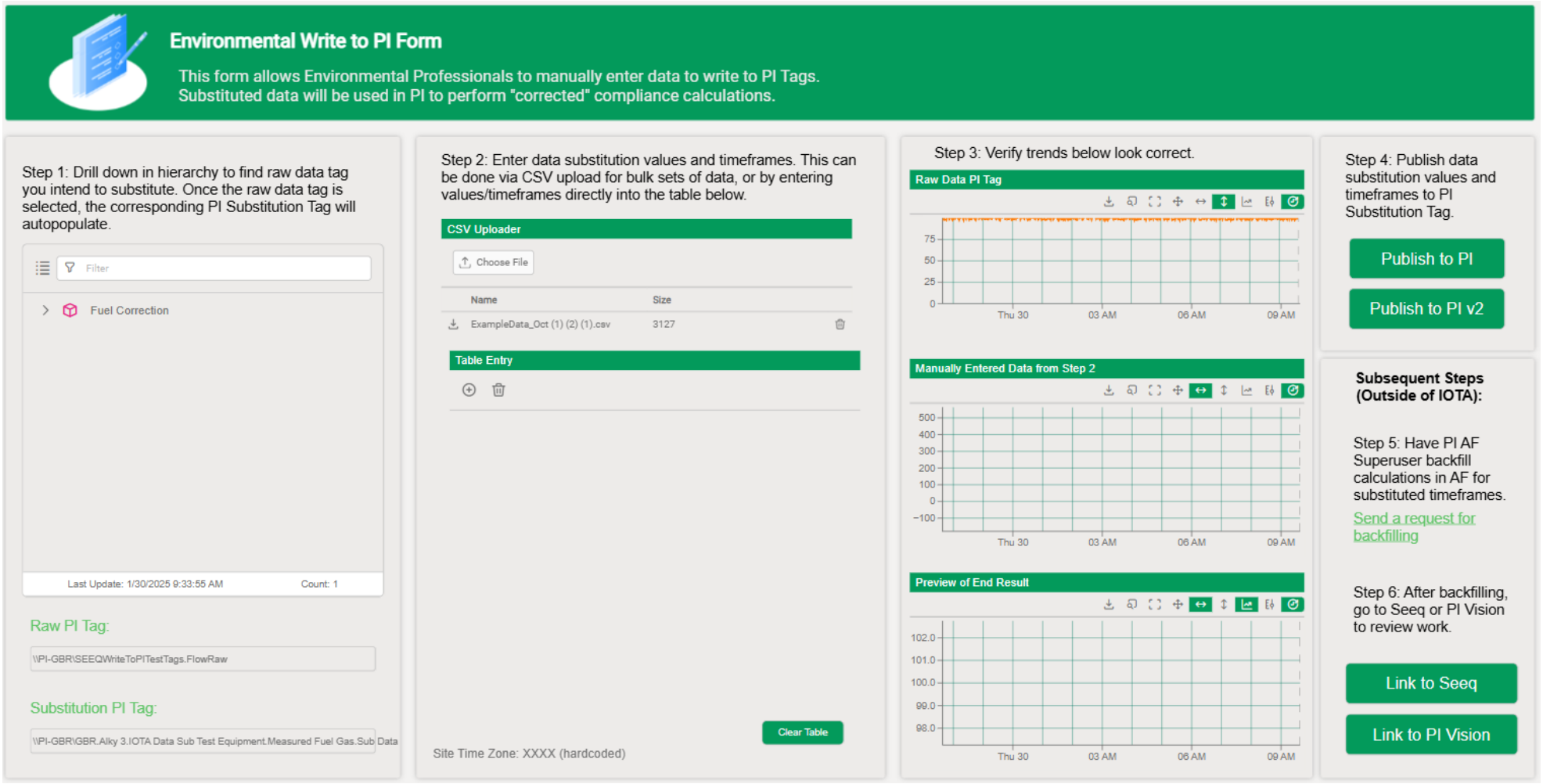
Path Forward

Phase 2

- **Project Status**
  - Three Phase 1 sites completed
  - In 2025 – Starting first Phase 2 site, fourth Phase 1 site
  - Phase 2 – Annotations in Seeq Vantage for incident context

- **Data Substitution work in progress**
  - There are cases where process unit status must be overwritten, or auxiliary data will be used for compliance demonstration
    - Substitution tags will be leveraged to historize additional data to be incorporated into existing calculations (driven through *IOTA Vue*)

Data Substitution in Phase 2



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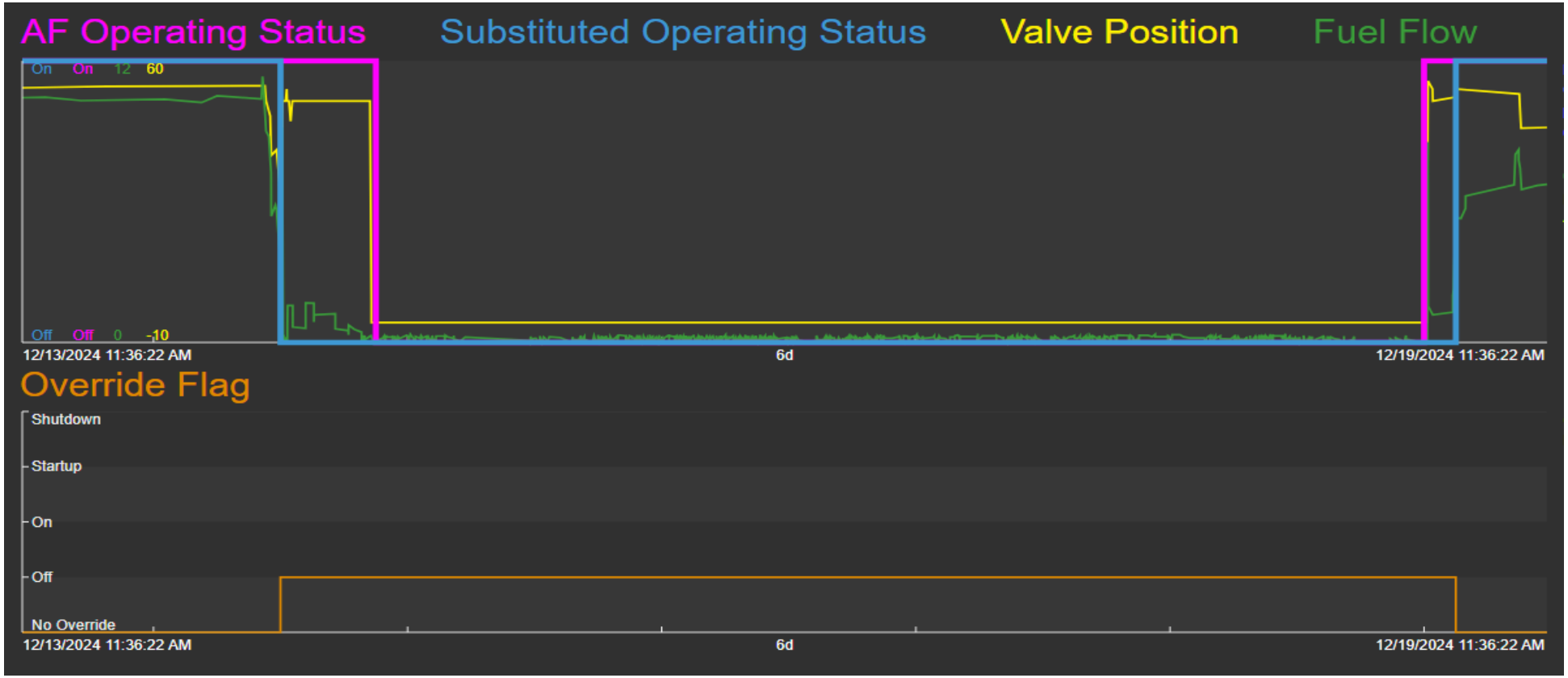
Sneak Peak: Equipment Operation Override

- Example: Force Equipment into "Off" state to extend maintenance window. Fuel flow dropped to zero many hours before the valve closed



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Acknowledgements

- MPC Staff
  - Sam LaRose
  - Breanna Stevens
  - Dennis Lawless
  - Brian Wagoner
  - Damon Crawley
  - Meaghan LaBarre
  - Tim Sandford
  - Mitch Tauzin
  - Tracy Hoang
  - Troy Gilbert
  - Sandy Perry
  - Zac Cramer
  - Chad Ernst
  - Mike Kingsmill
  - Ruth Cade
  - Tim Peterkoski
  - Todd Dixon
- EXELE Staff
  - Dan Fishman
  - Sam Clark
  - Randy Giguere
  - Crystal Beffa
  - Julie Fuchs
- Phase 2 Personnel
  - Sasha Jones, et al (IOTA)
  - Patrick Weber, et al (Seeq)

MPC Transitions Environmental Personnel to Modern Tools

- **Challenge**
  - Lack of visibility into compliance behavior preventing operational improvement
  - Manual reporting processes led to bottlenecks compromising agility on action
  - Largely based on a complex web of Excel spreadsheets and manual entry/manipulation
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Questions?


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