OCTOBER 25, 2023

Prescription for Success: PI System Health Monitoring

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Agenda

- Intros
- History of the growth of PI within VELCO
- Value of PI to VELCO
- Health of a PI System
- Tools and Technologies
- AF Templates
- AF Structure
- Notifications Alerts
- PI Vision Displays
- Best Practices for Effective Monitoring
- Conclusion

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Intros

- VELCO was formed in 1956 when Vermont's local utilities joined together to establish the nation's first statewide, "transmission only" company to create and maintain an interconnected electric transmission grid
- Owned by Vermont's 17 distribution utilities
- VELCO manages
  - 738 miles of transmission lines
  - 13,000 acres of rights-of-way
  - 55 substations, switching stations and terminal facilities
  - Equipment that enables interconnected operations with Hydro-Québec
  - Fiber optic communication networks that monitor and control the electric system and serve as a key link for Vermonters' high-speed data internet access

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Intros

DLL SOLUTIONS
THE PROCESS INFORMATION SPECIALISTS

- DLL Solutions has been providing expert PI Integration services since 1998
- Specializing in expertly integrating AVEVA products
- Helping customers to optimize operations, drive growth and empower businesses to make data-driven decisions.

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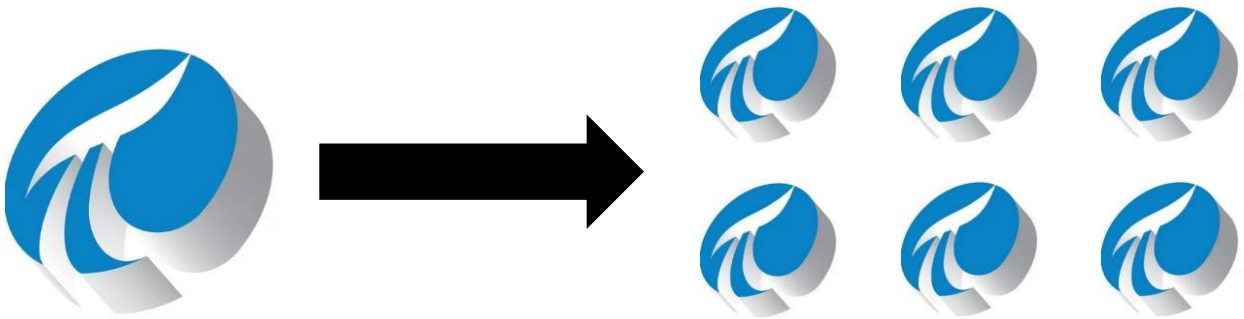
History of the growth of PI within VELCO

- VELCO has used PI for 23 years
- Starting from one PI Server growing to a PI Community Agreement customer
- Large infrastructure to provide solution with systems on-prem and in the cloud
- Need to monitor entire infrastructure
- This was discussed in the “VELCO Community Agreement” presentation in AVEVA World 2021



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Power and Utilities | Vermont, United States of America

Power Accounting Efficiencies and Customer Service

Challenge

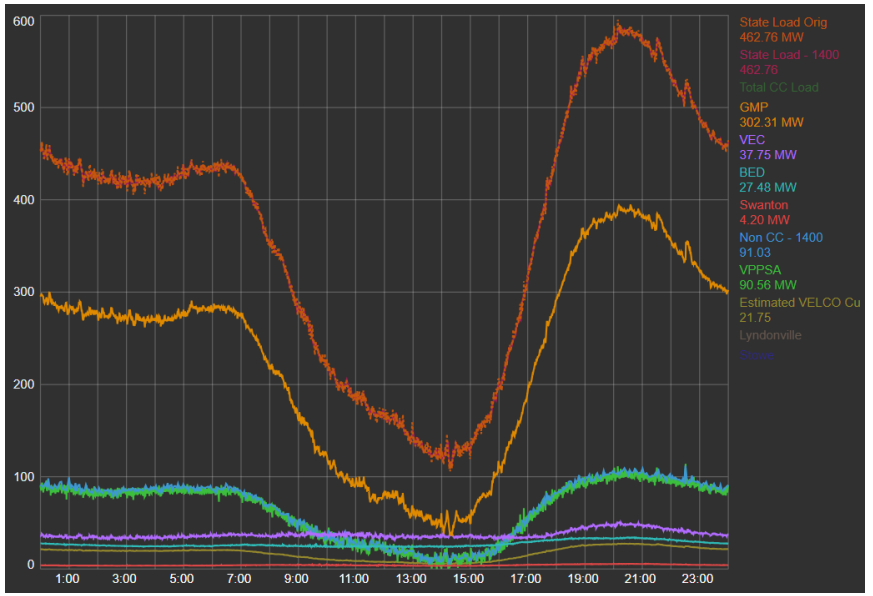
- VELCO provides power accounting services to Distribution Utilities, and Distribution Utilities need to see the PI data to know how much power they are receiving from the transmission network. Historically, VELCO employees have generated an Excel report and emailed the report to the Distribution Utility users.

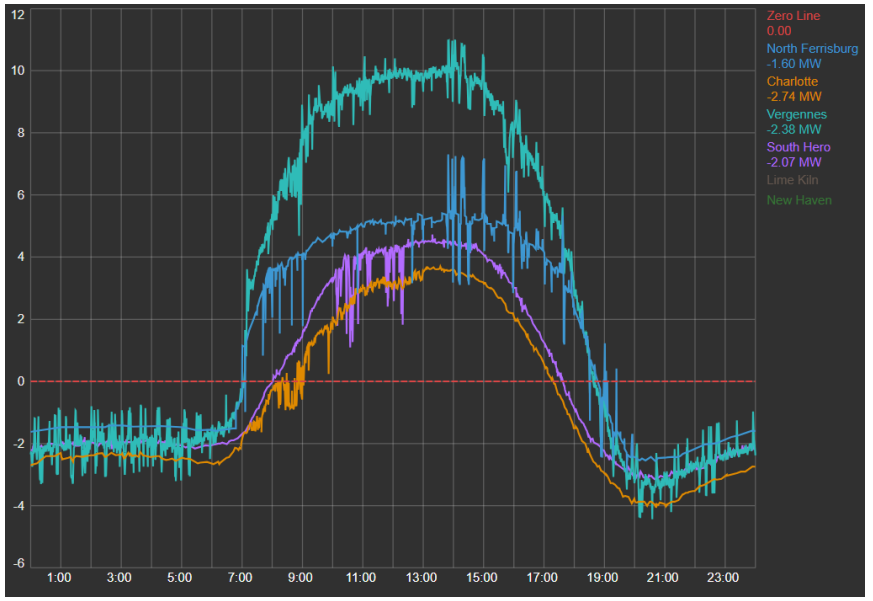
Solution

- Set up a PI System for Power Accounting users and the Distribution Utilities to freely access their own data on their time.

Results

- **Saves time and money with person-hours**
- **Provide self-service model for customers to access data**
- **Reduces at least 20 hours/month**





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Operational Insights and Analysis Near Real-Time

Challenge

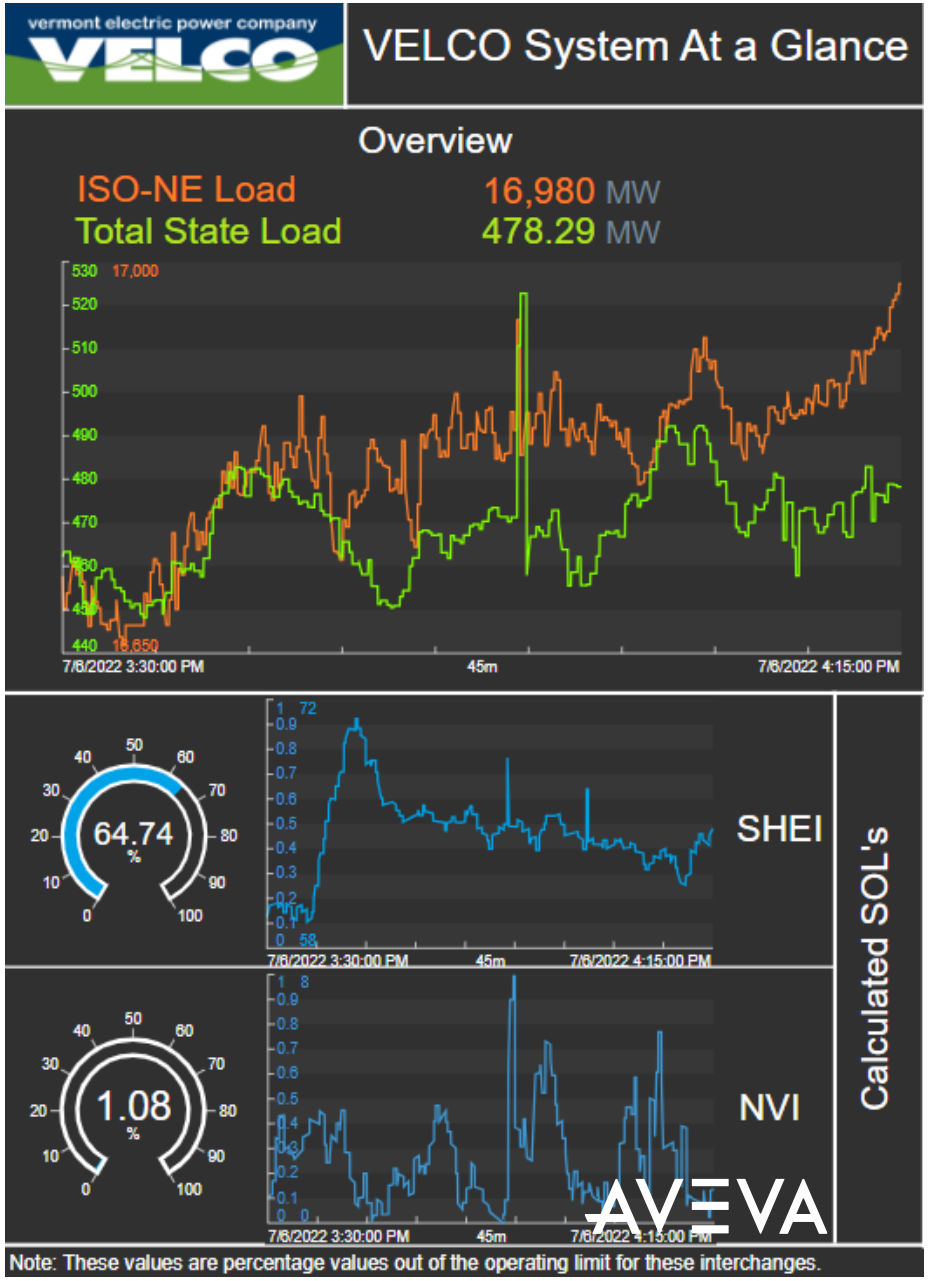
- VELCO Operations is responsible for the real-time reliability of the high voltage transmission network. Although operators monitor generation (Conventional, Wind, Solar, Hydro), system load (ISO-NE Load, Total State load), and interchange (Importing and Exporting) in SCADA/EMS, engineers and other departments lacked near-real time insight into potential issues operators were encountering due to lack of access.

Solution

- Set up a PI Vision Display that summarizes what the VELCO Operator sees, specifically the Generation, System Load, and Interchange values, how those values impact NERC System Operating Limits (SOL's).

Results

- **Improved situational awareness and insight for engineers, planners, and other technical stakeholders**
- **Enhanced event detection of potential issues linked to grid transformation, i.e., distributed energy resource tripping in response to contingencies**



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Value of PI to VELCO

- VELCO success stories
  - System One Line monitoring
    - Automation of data retrieval for power planning
  - Radio site monitoring
    - Automate Statewide reporting on health of radio system
  - EMS team support
    - Leverage historical data to support compliance with TOP 001-5, R21
  - System Planning
    - These Engineers utilize historical real-time flows and voltages on a regular basis

- VELCO success stories
  - Physical Security Surveillance for Substations
    - Enhances capabilities to monitor the physical security assets within the substations
  - Operational Engineers leverage data for compliance requirements
    - We can provide evidence that no System Operating Limits were exceeded during an incident
  - System Protection Maintenance Interval Extension
    - Evidence of protection system monitoring to support PRC-005 compliance

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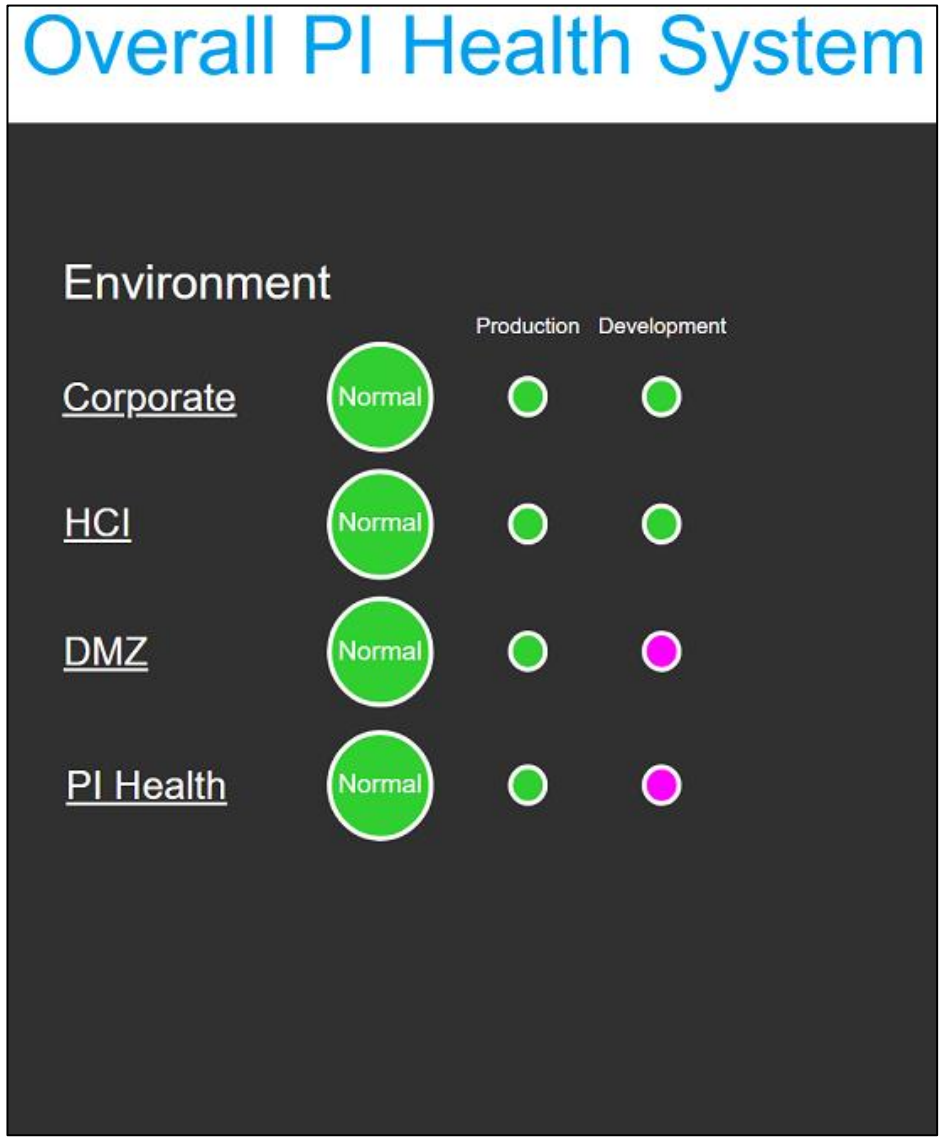
Ensure VELCO has full utilization of PI System in a healthy state

Challenge

- VELCO has numerous areas dependent upon PI. Ensuring the seamless operation of the PI System is of paramount importance to our organization's data infrastructure. The PI System serves as the backbone of our data management and analytics processes, enabling us to gather, analyze, and derive critical insights from our industrial processes and systems. Therefore, it is imperative that the PI System always remains in a state of operational readiness.

Solution

Results



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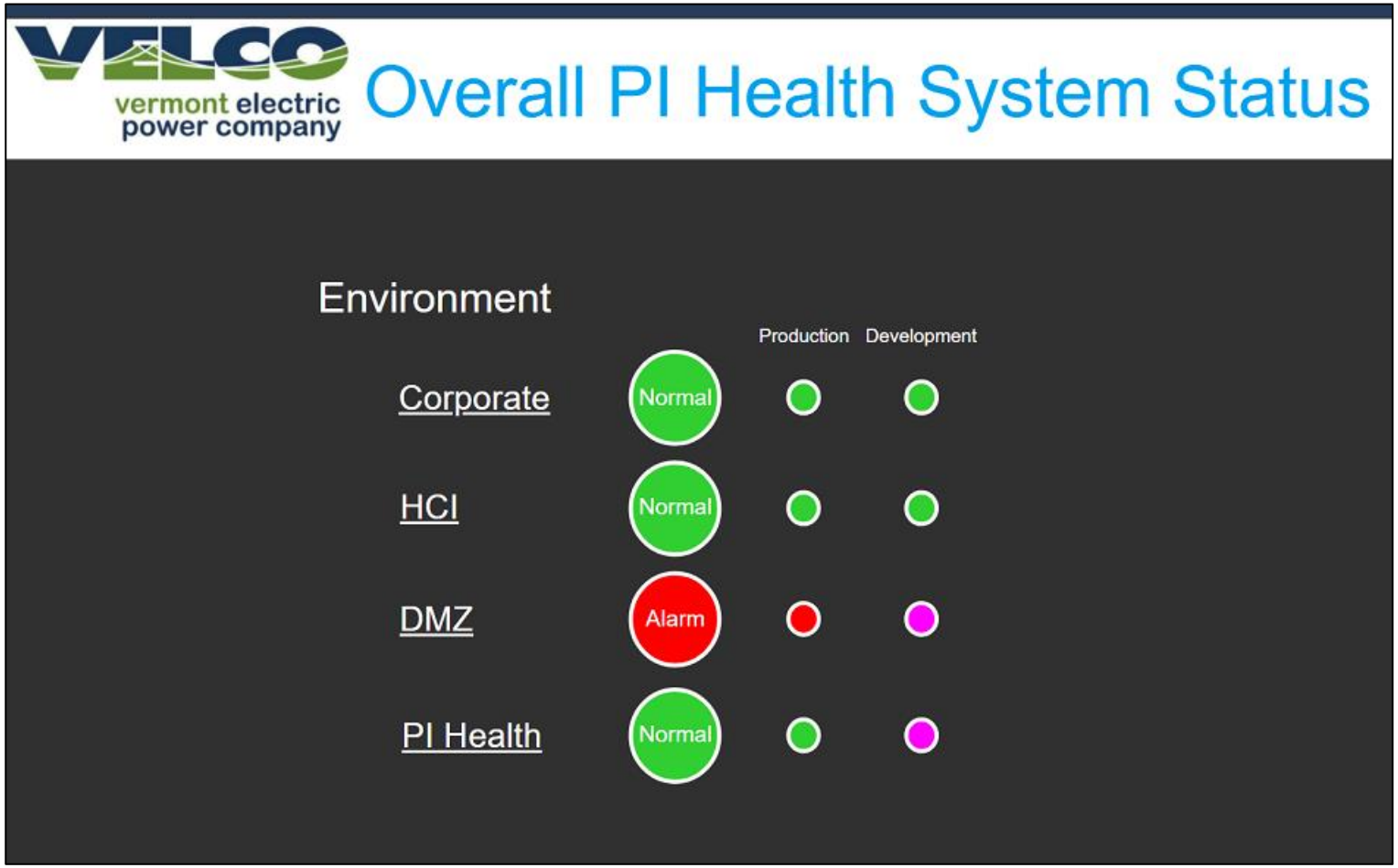
Health of a PI System

- What is a healthy PI System
  - Data flowing
  - Successfully storing the data
  - No corruptions
  - No significant errors
  - Capacity to continue doing this
  - Users can access data freely
- Benefits of monitoring PI
  - Ensure data availability and integrity
  - Detect and prevent potential issues
  - Timely resolution of issues
  - Optimize system performance
  - Proactive decision-making based on real-time insights



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Tools and Technologies

- PI PerfMon Interface
  - Collect data
- PI Interface Health points
  - Monitor the health of the interfaces
- AF Templates
  - Standardize data collection, creates tags and set up PI Analyses
- PI Analyses
  - Turn data into information
- PI Notifications
  - Send alerts when issues arise
- PI Vision
  - View data and assess current status

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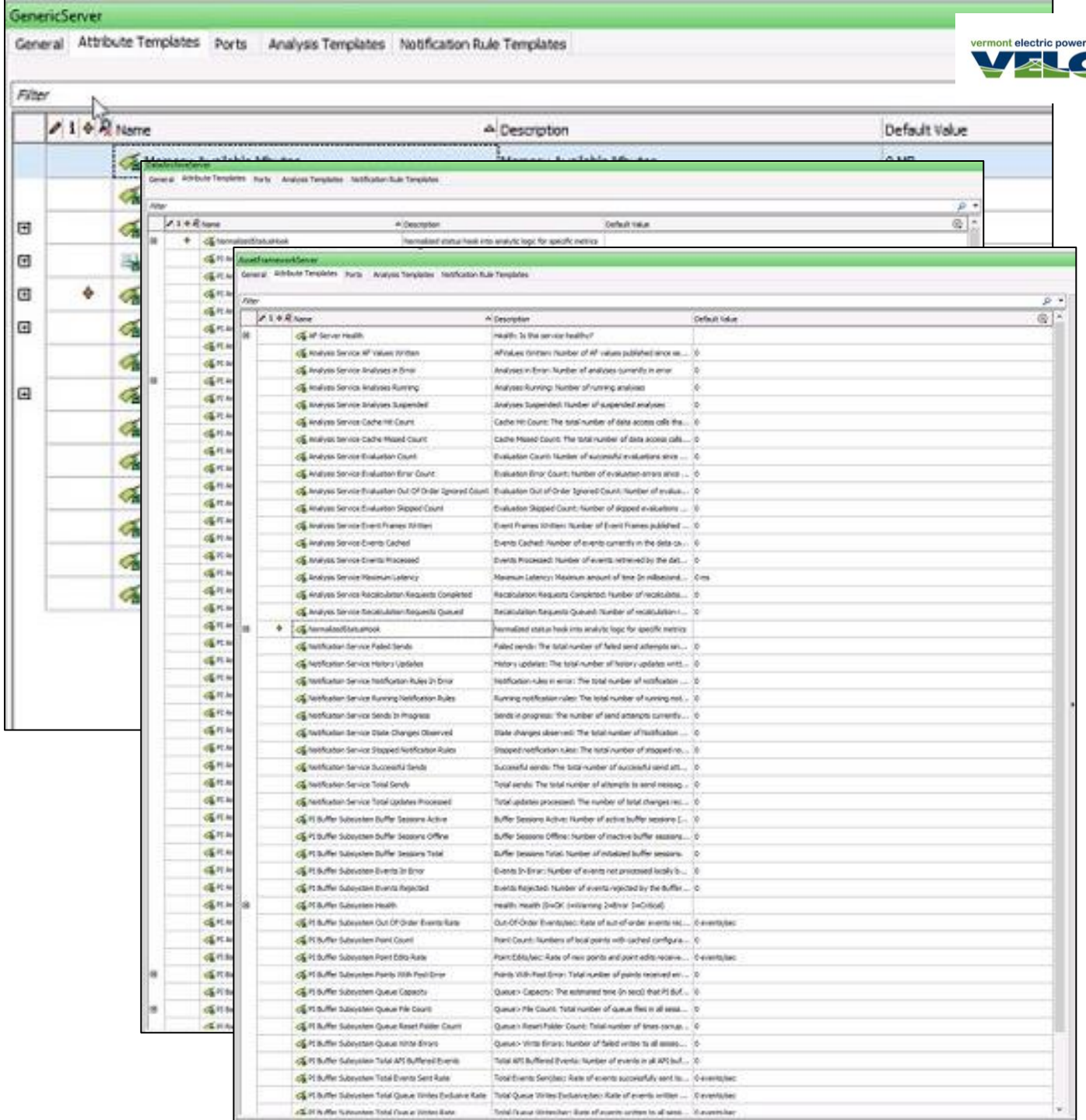
AF Templates

- Standardize the monitoring of each system
- Create the tags automatically
  - PI PerfMon Interface
  - PI Analysis Outputs
- Elements will contain
  - PI Analyses
  - PI Notifications
  - PI Vision Displays



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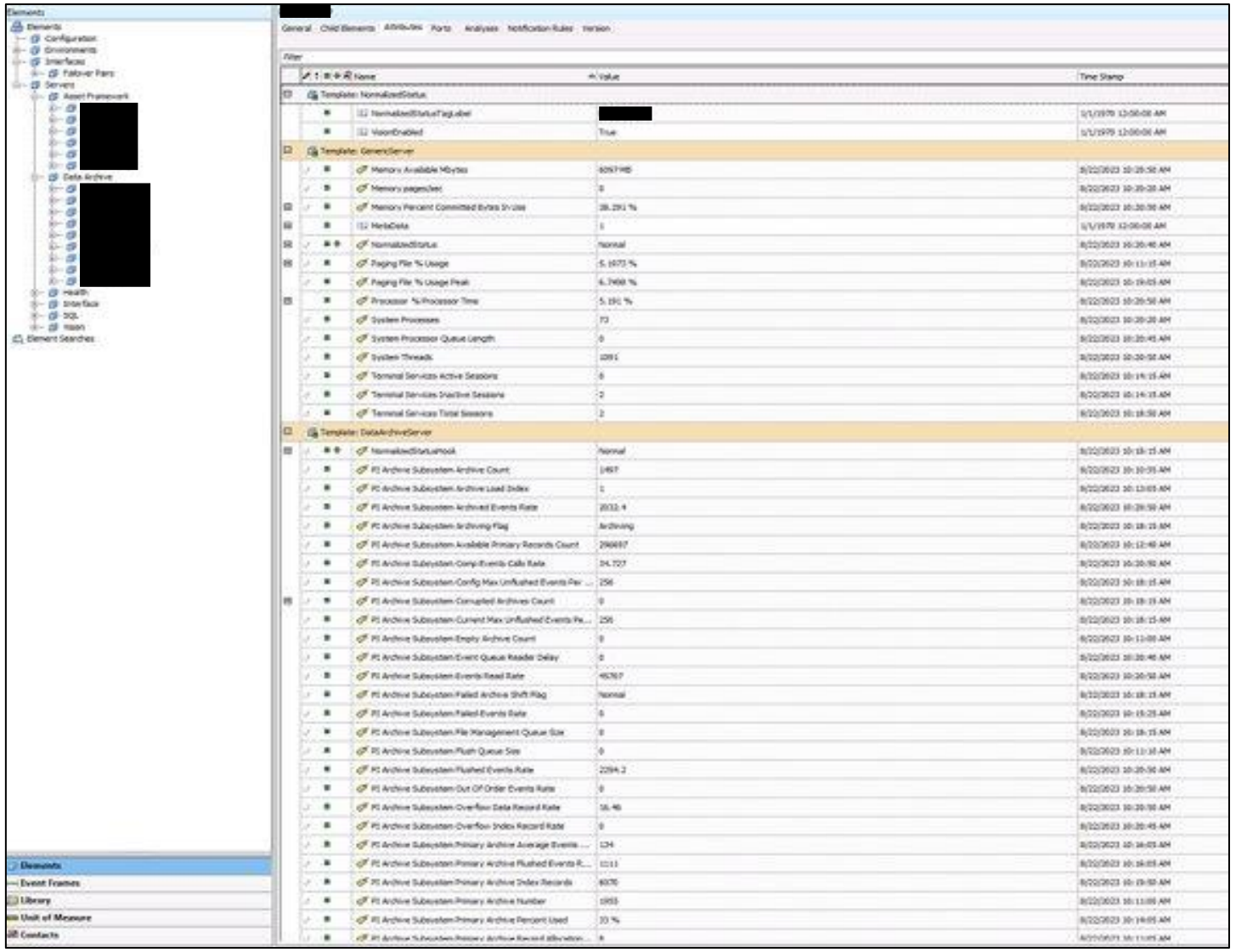
AF Structure

- Plan out a good AF structure
  - Leads to organized data
  - Brings context to data
  - Standardization
  - Scalability



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Notification Alerts

- Allows for early detection of issues and real-time awareness
- Leads to reduced downtime
- Plan for predictive maintenance

The PI Data Archive Collective on [redacted] is not in a good state. This started on 8/9/2023 3:34:05 PM Eastern Daylight Time (GMT-04:00:00). This node is the Secondary node in the collective.

Please investigate the cause of the issue and reach out to any necessary personnel in order to resolve the issue.

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PI Vision Displays

- Supports real-time visualization
- Customizable dashboards
- Trend analysis
- Event visualization

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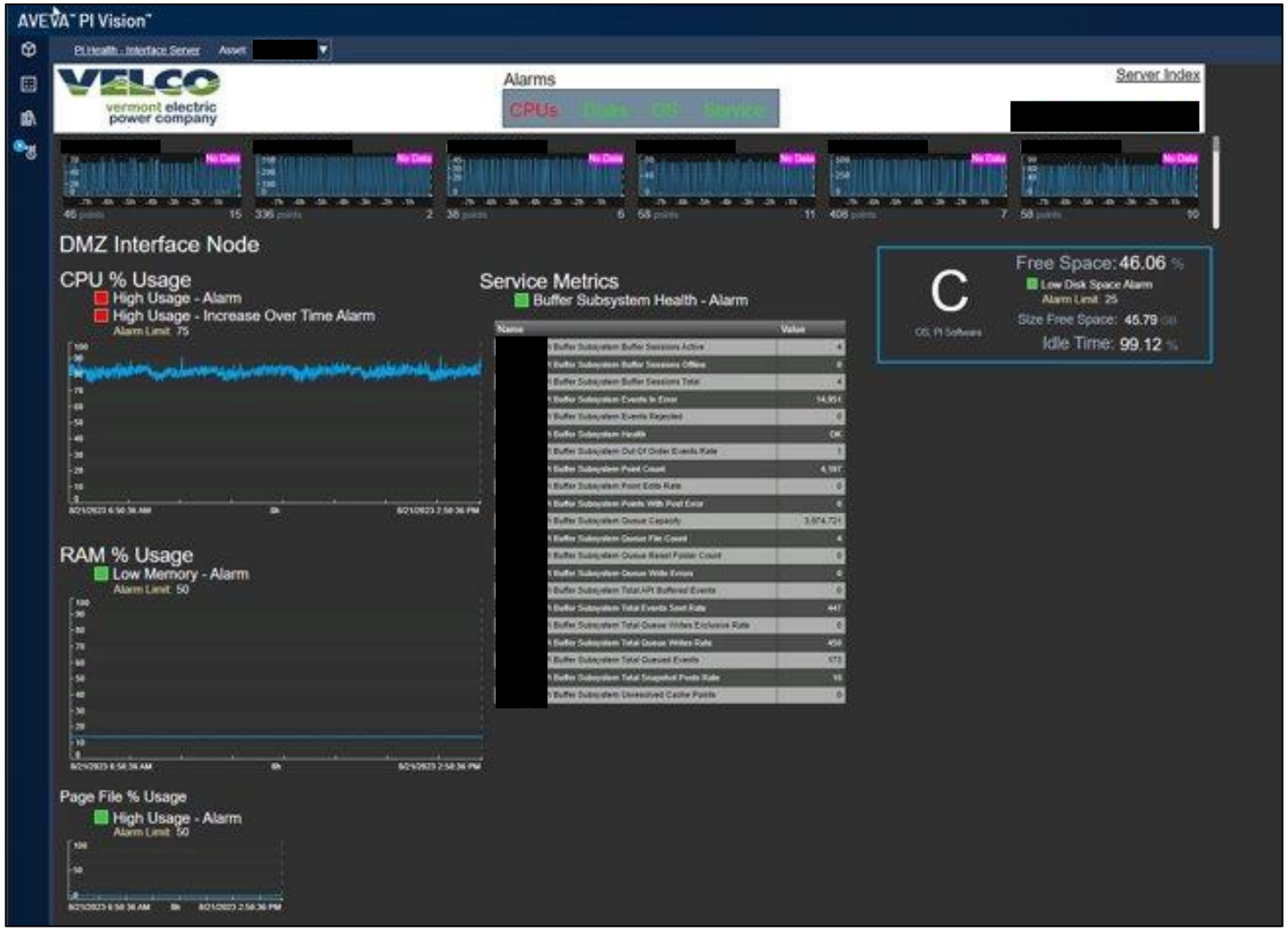
PI Vision Displays



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PI Vision Displays

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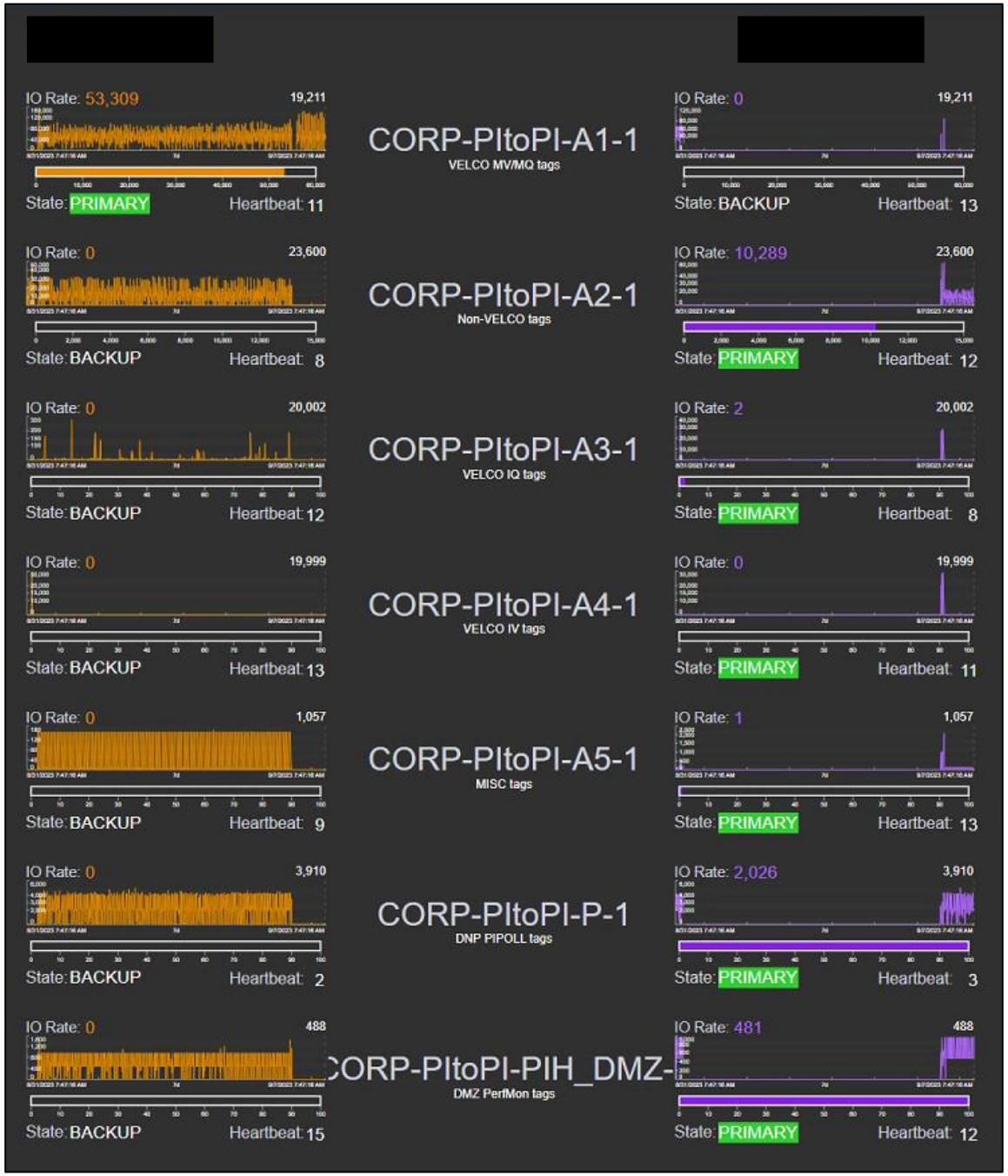
PI Vision Displays



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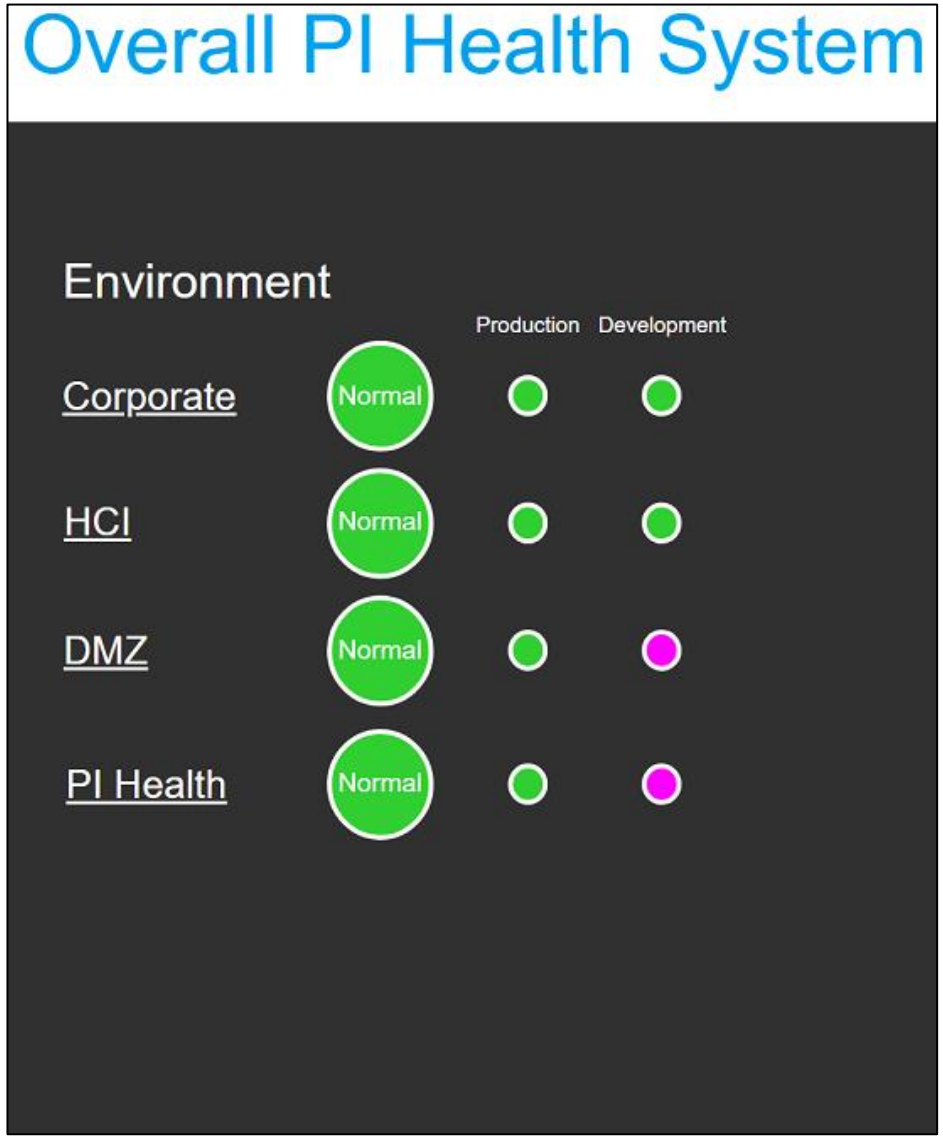
- VELCO has numerous areas dependent upon PI. Ensuring the seamless operation of the PI System is of paramount importance to our organization's data infrastructure. The PI System serves as the backbone of our data management and analytics processes, enabling us to gather, analyze, and derive critical insights from our industrial processes and systems. Therefore, it is imperative that the PI System always remains in a state of operational readiness.

Solution

- Set up a PI System used to help monitor the status of the entire PI Environment and be able to alert if things go wrong

Results

- **Ensure data availability and integrity**
- **Detect and prevent potential issues**
- **Optimize system performance**
- **Proactive decision-making based on real-time insights**



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Best Practices for Effective Monitoring

- Keep system up to date for best performance
- Set up baselines to detect changes
- Enable real-time monitoring
- Set thresholds and alerts
- Perform in-depth health checks at regular intervals
- Documentation
- Review monitoring practices

vermont electric power company
VELCO

PI STANDARDS AND CONVENTIONS

Philosophies, Standards, and Best Practices Concerning the Development, Configuration, and Utilization of the OSIsoft PI System at VELCO

Version: 20210625.1.00

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Conclusion

- Value of PI System for VELCO
  - PI has been critical for the operation of VELCO
  - Keeping it running is of the utmost importance
- Next steps
  - Investigate incorporating new monitoring tools into the PI Health Monitoring System
  - Review current monitoring practices
  - Investigate new technologies to incorporate to help improve monitoring

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State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

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