SDGE

A Sempra Energy utility®

Condition Based Maintenance (CBM) Dashboard

Tanner Mjelde & Jim Tran

Agenda

- Introduction
- Introduction to SDG&E
- About San Diego Gas & Electric (SDG&E)
- CBM Introduction
- CBM Challenges
- CBM Dashboard Solution
- Results
- Future Enhancements
- Questions

Introduction to Jim & Tanner

Jim Tran
Software Developer
San Diego Gas & Electric
Electric Transmission & Distribution Ops

SDSU – Computer Engineering

Tanner Mjelde
Engineer II
San Diego Gas & Electric
Substation Construction & Maintenance

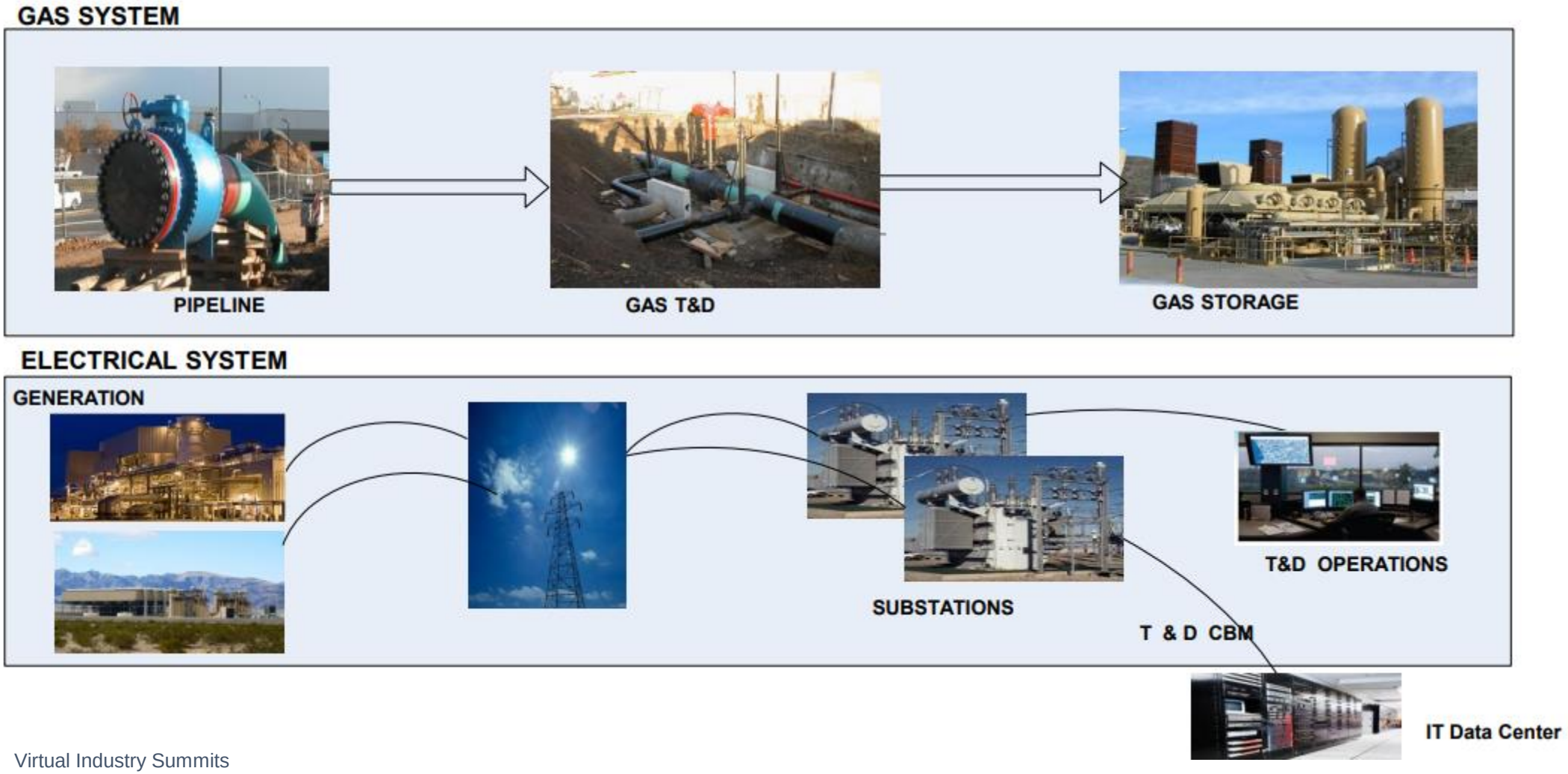
Cal Poly, SLO – Electrical Engineering
Professional Engineer in California

Introduction to SDG&E

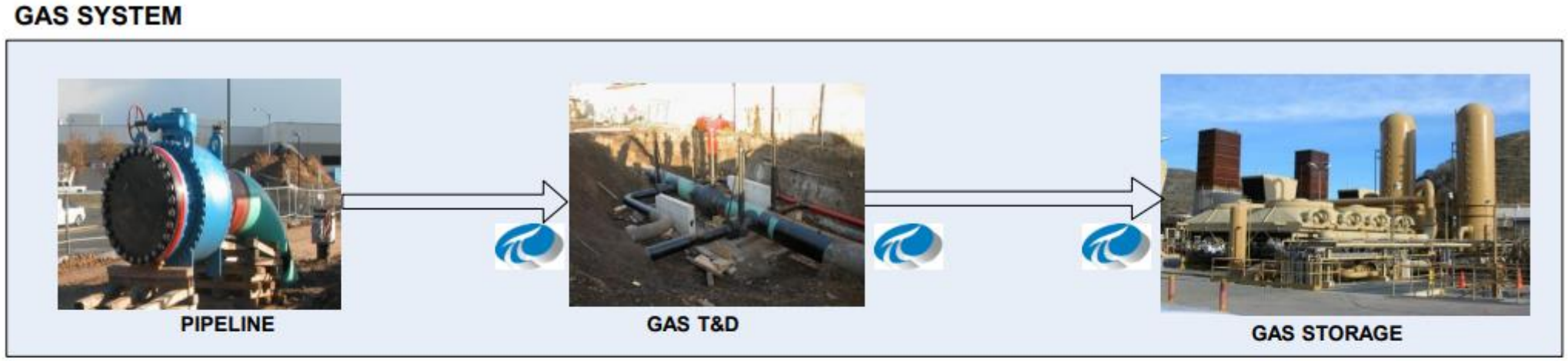
- Subsidiary of Sempra Energy
- Regulated Public Utility
- Provide safe and reliable energy service to 3.6 million consumers
  - 1.4 million electric meters
  - 873,000 natural gas meter
- 4,100 square mile service territory in San Diego and southern Orange Counties (25 cities)

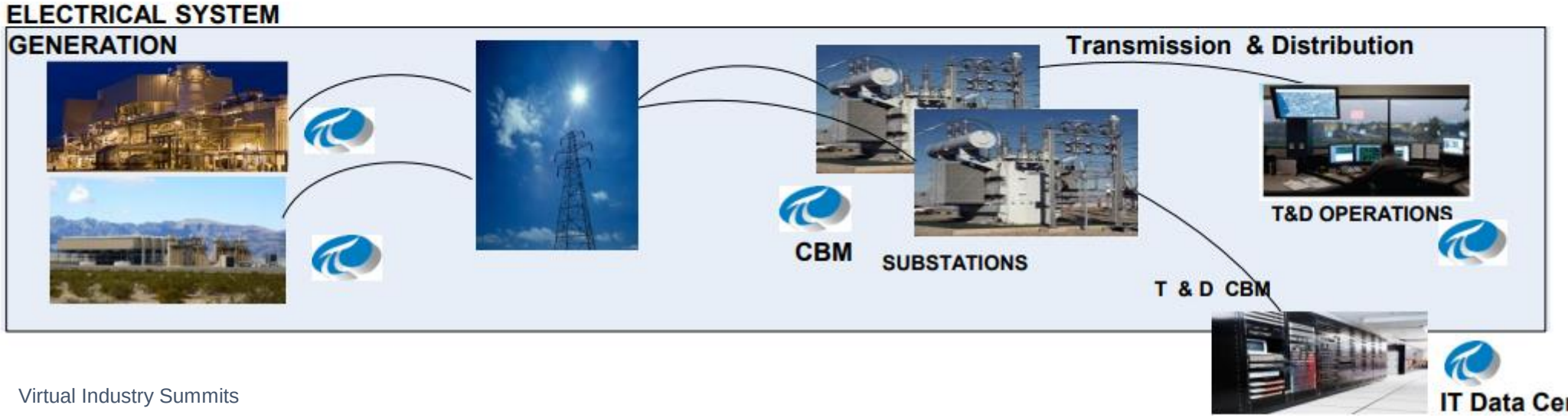
- 1,800 miles of electric transmission lines and 21,600 miles of electric distribution lines
- Two compressor stations, 160 miles of natural gas transmission pipelines, 8,100 miles of distribution pipelines and 6,200 miles of service lines
- 4,500 employees

San Diego Gas & Electric (SDG&E) Overview



SDG&E Overview with PI System





SDG&E PI System Usage

2003 - T&D Operational Data (~ 260,000 tags)

Ability to integrate Transmission and Distribution data

2003 fire storm & activated in EOC, monitor EMS IT assets,T&D Planning, Engineering, Grid Operations, Distribution Operations, Substation

2005 - Generation (~ 30,000 tags)

Palomar, Miramar, Desert Star

Ability to monitor assets 24x7, operational efficiency, maintenance

2007 – CBM non-Operational Data (~ 150,000 Tags)

Monitor T&D substation assets, Reduce operational maintenance costs

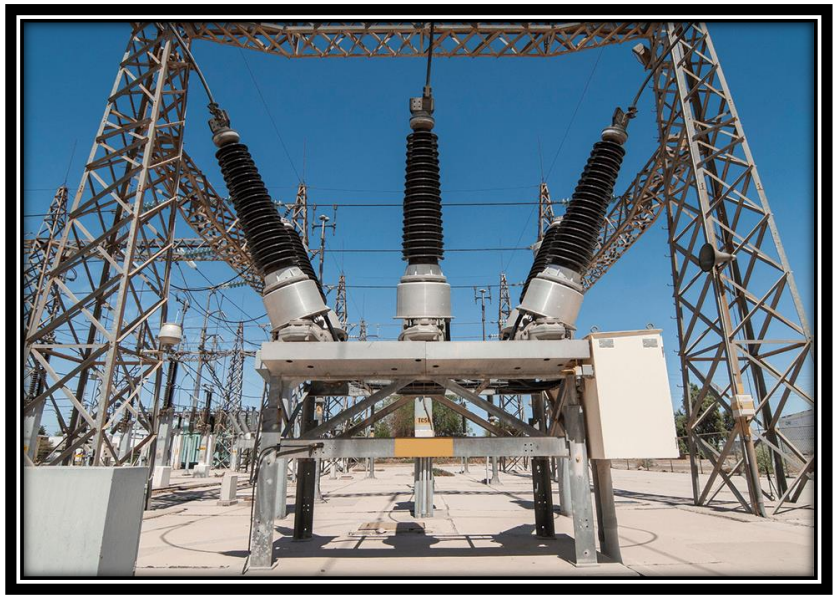
Event based notification, Dissolved gas analysis, LTC & Bushing monitoring

2011 – Enterprise Agreement (unlimited tags, EA Services)

Microgrid, Synchrophasors, PV integration, LPCN (On-Ramp) Interface, Cell Relay Monitoring, Gas Meter Events, Meter data (non-billing), EV's, etc., Electric T&D, Asset Management

Condition Based Maintenance (CBM)

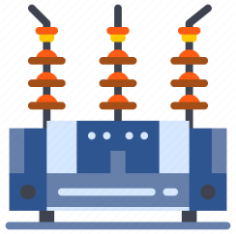
- A maintenance strategy that monitors the actual condition of an asset to decide what maintenance needs to be done
- Over 1000 GCBs & over 300 Transformers have monitors



Condition Based Maintenance (CBM)

- Transformers
  - Dynamic Ratings E3
  - Dynamic Ratings BHM
  - General Electric DGA
- Gas Circuit Breakers
  - Incon's OPTimizer2

PI Usage for CBM



SUBSTATION GATEWAY

Remote Terminal Unit (RTU) Technician loads PI Points into the Substation Gateway

ENTERPRISE GATEWAY

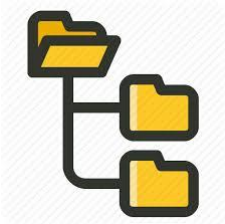
Substation Gateways points are stored within each Enterprise Gateway (EG). There are currently six Production EGs and one Staging EG

PI INTERFACE

Windows Server, there is one production interface server and one staging interface server. Each EG has its own interface running on the server

PI DATA ARCHIVE

There is one production PI data archive server and one staging. Data stored in PI data archive consists of primarily of point name, value, and timestamp



ASSET FRAMEWORK

New elements are created then mapped to PI Points Notification triggers are AF attributes Notification content data is also from AF attributes

PI NOTIFICATION

Each alert email contains one or more triggers Notifications are dependent on the notification server, mail server, PI AF Server, and PI server being operational

CBM Challenges

Challenge | Solution | Benefits

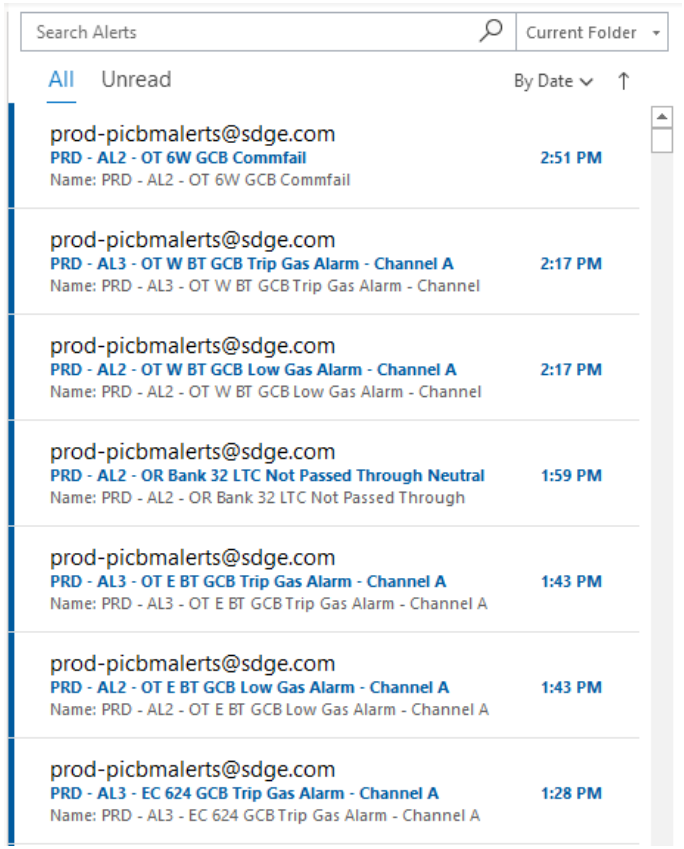
Providing a dashboard to house reliable and accurate data for analysis by the SDG&E asset management team. As well as, a database for our team to view alerts that we receive from the monitors.

Deployed the latest OSIsoft PI System technology including PI AF and PI Vision as an advanced foundation for CBM & Advanced Analytics

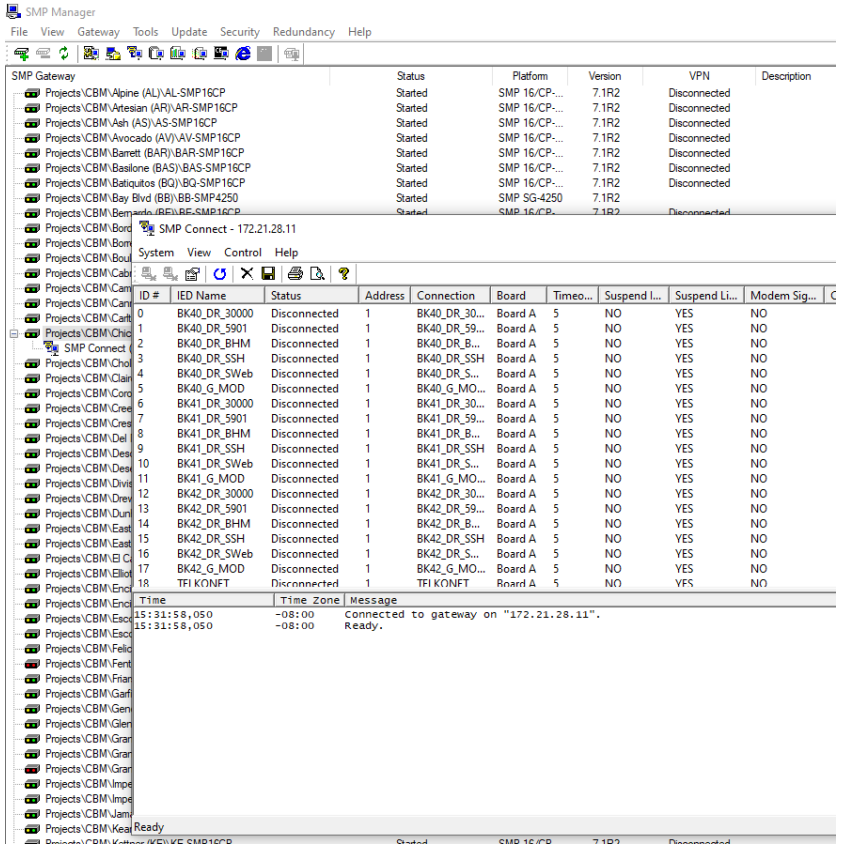
Increased operational efficiency of the assets management department and increased awareness of the substation asset's health

CBM Challenges – Emails & Data

Organization of alerts/emails



Accessibility of CBM data



CBM Solution

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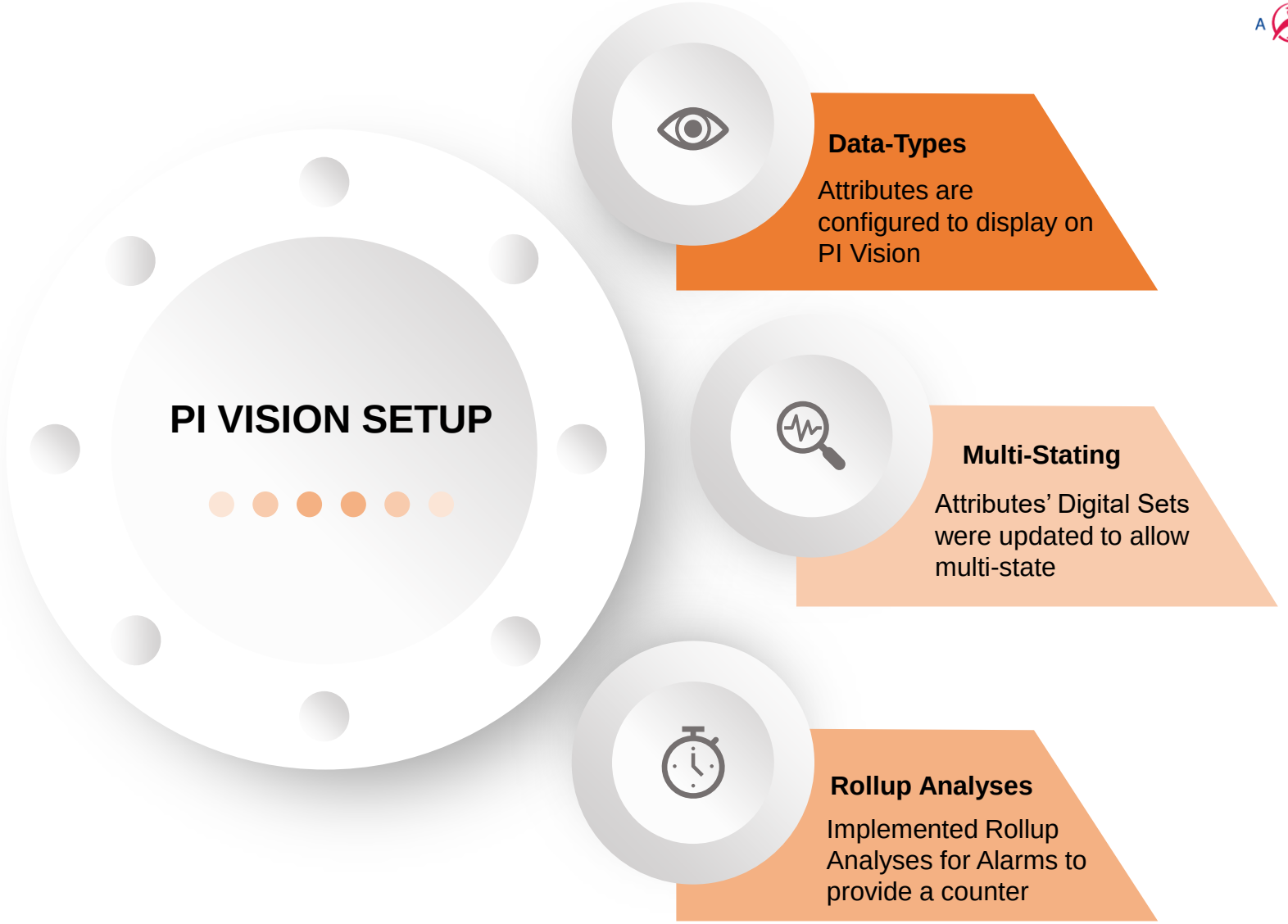
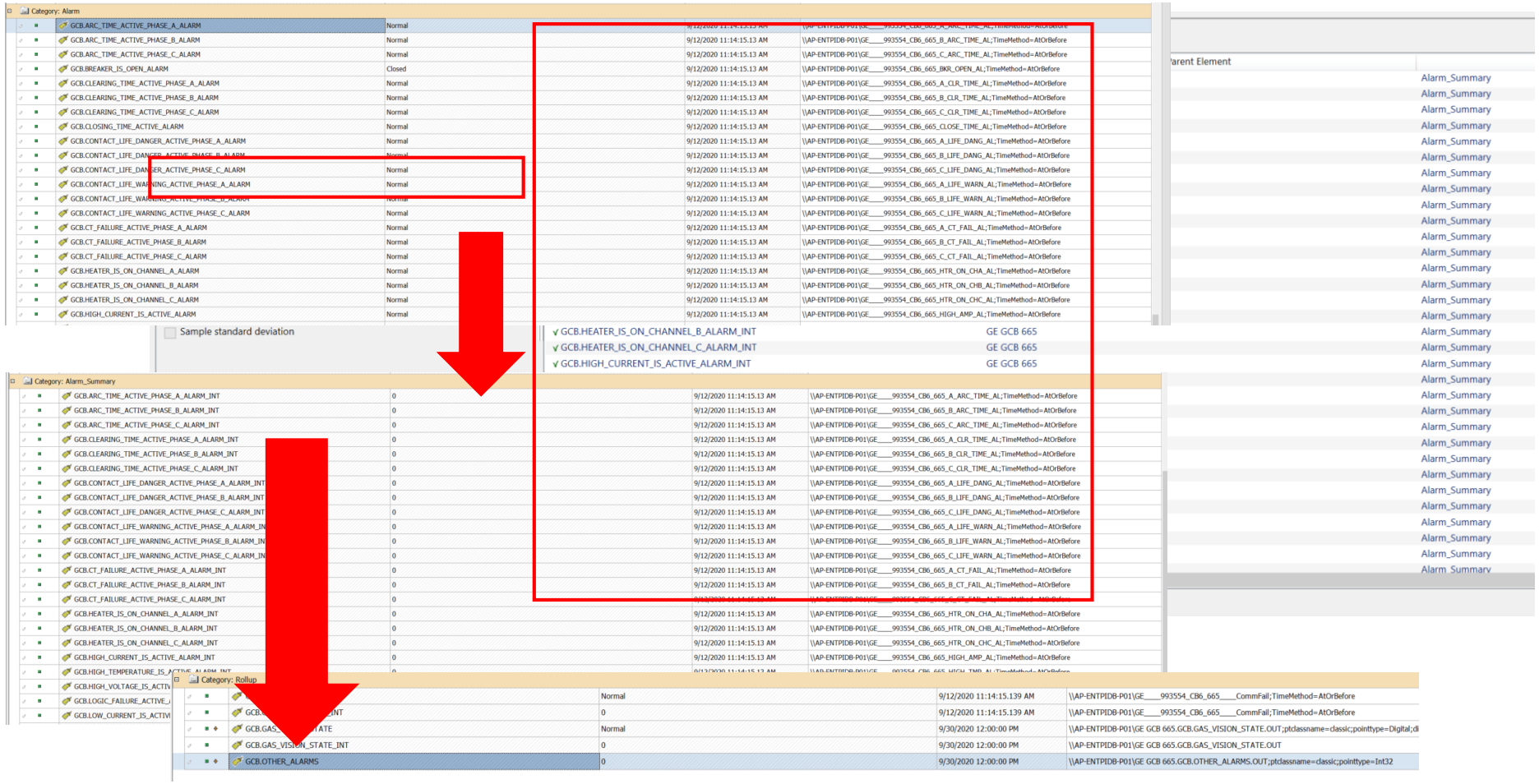
PI Usage at SDG&E



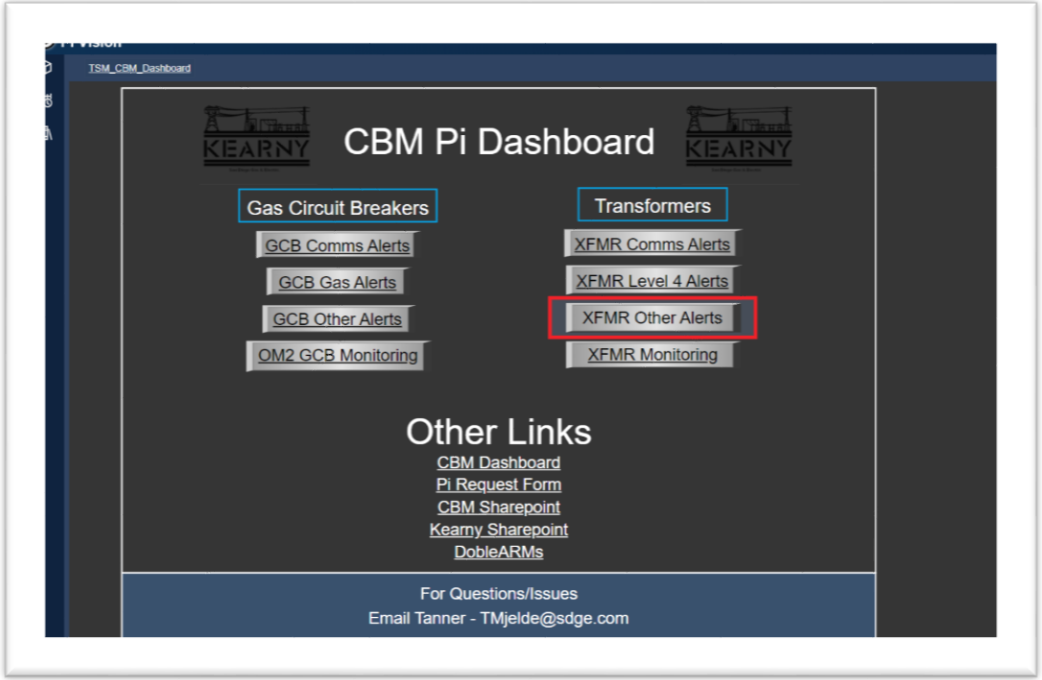
Rollup Analysis

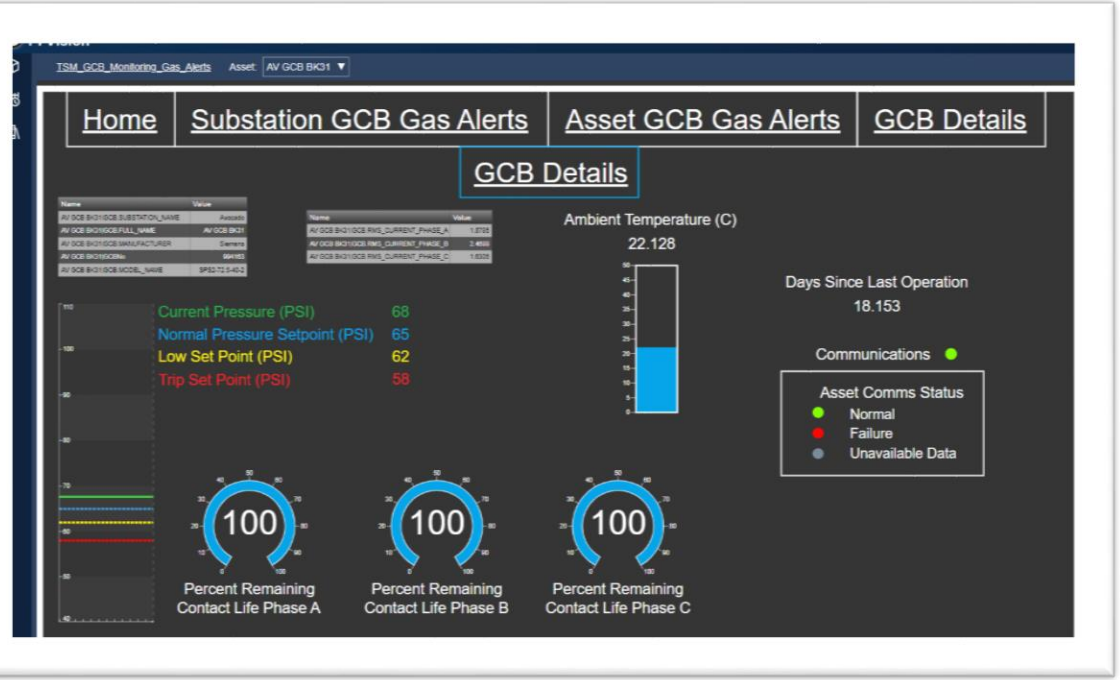


Multi-state PI Vision

CBM Dashboard Results

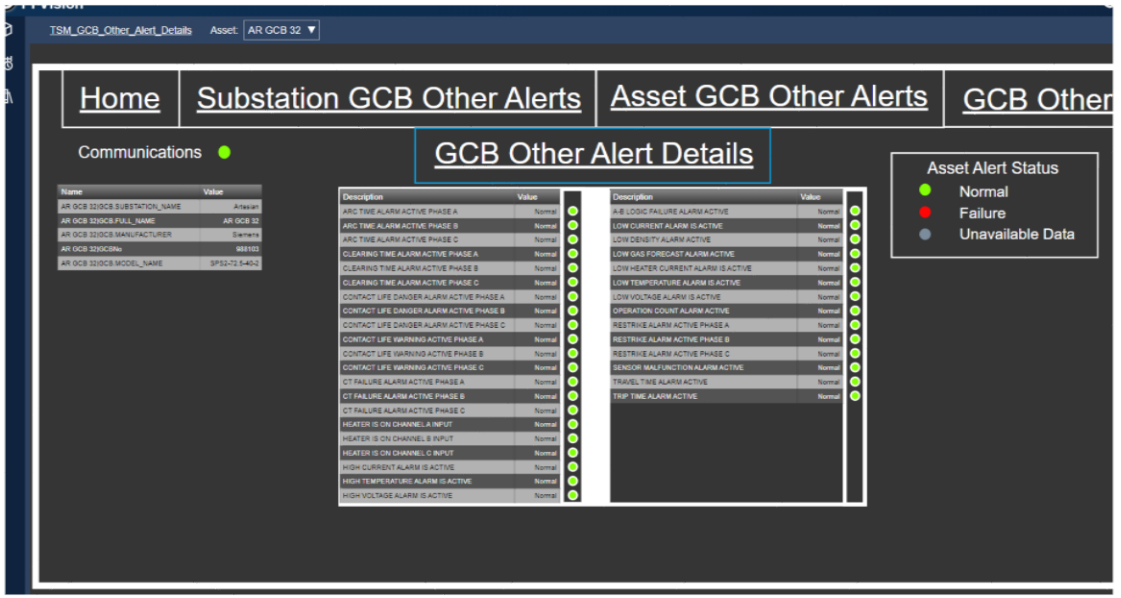
- Comprehensive database for all Gas Circuit Breaker and Transformer data points
- Allows engineers to easily view every asset's health

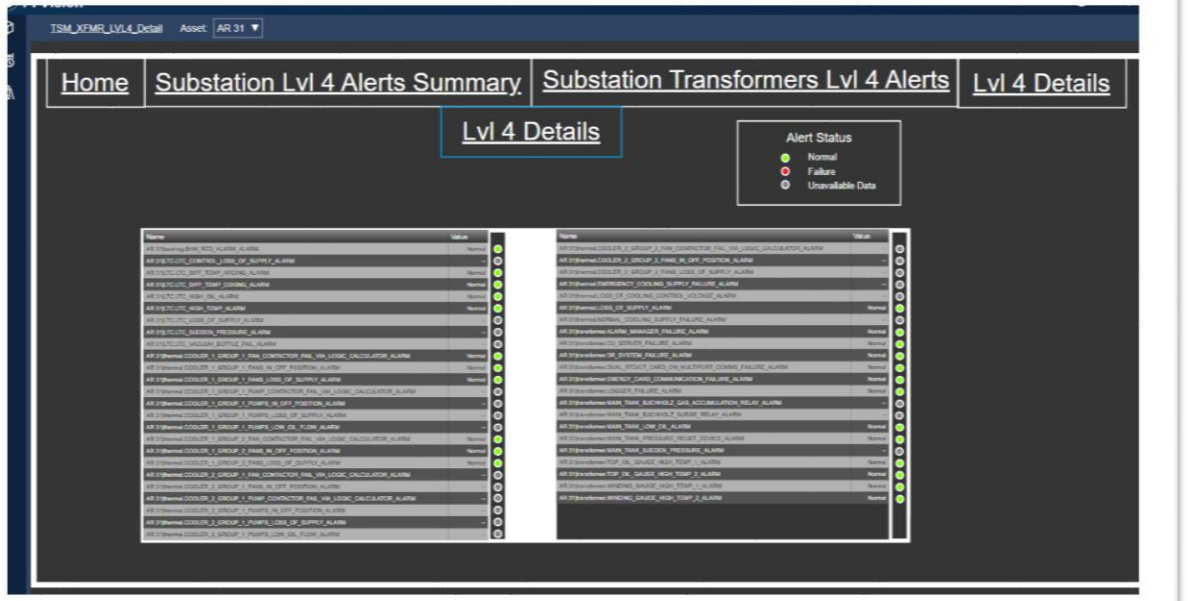




CBM Dashboard Results

- Allows engineers and supervisors to view all alerts from the monitors in one view





CBM Solution Benefits

Challenge | Solution | **Benefits**

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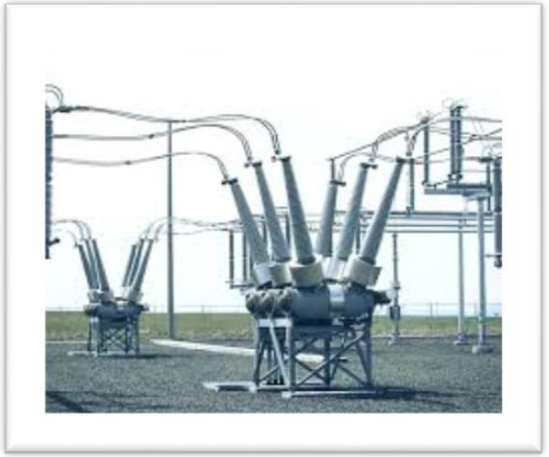
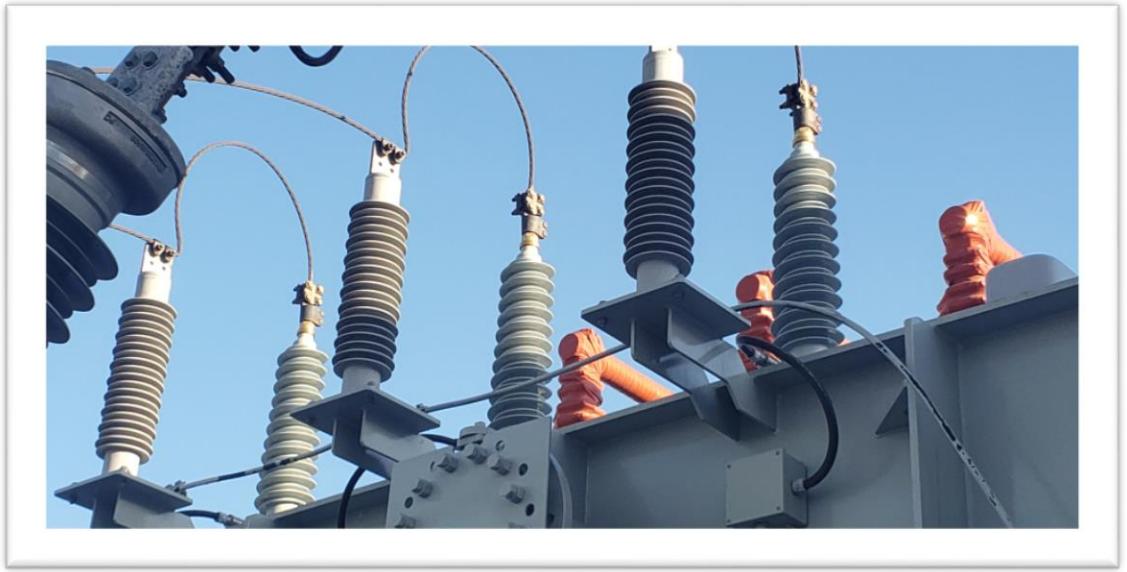
CBM Benefits and Saves

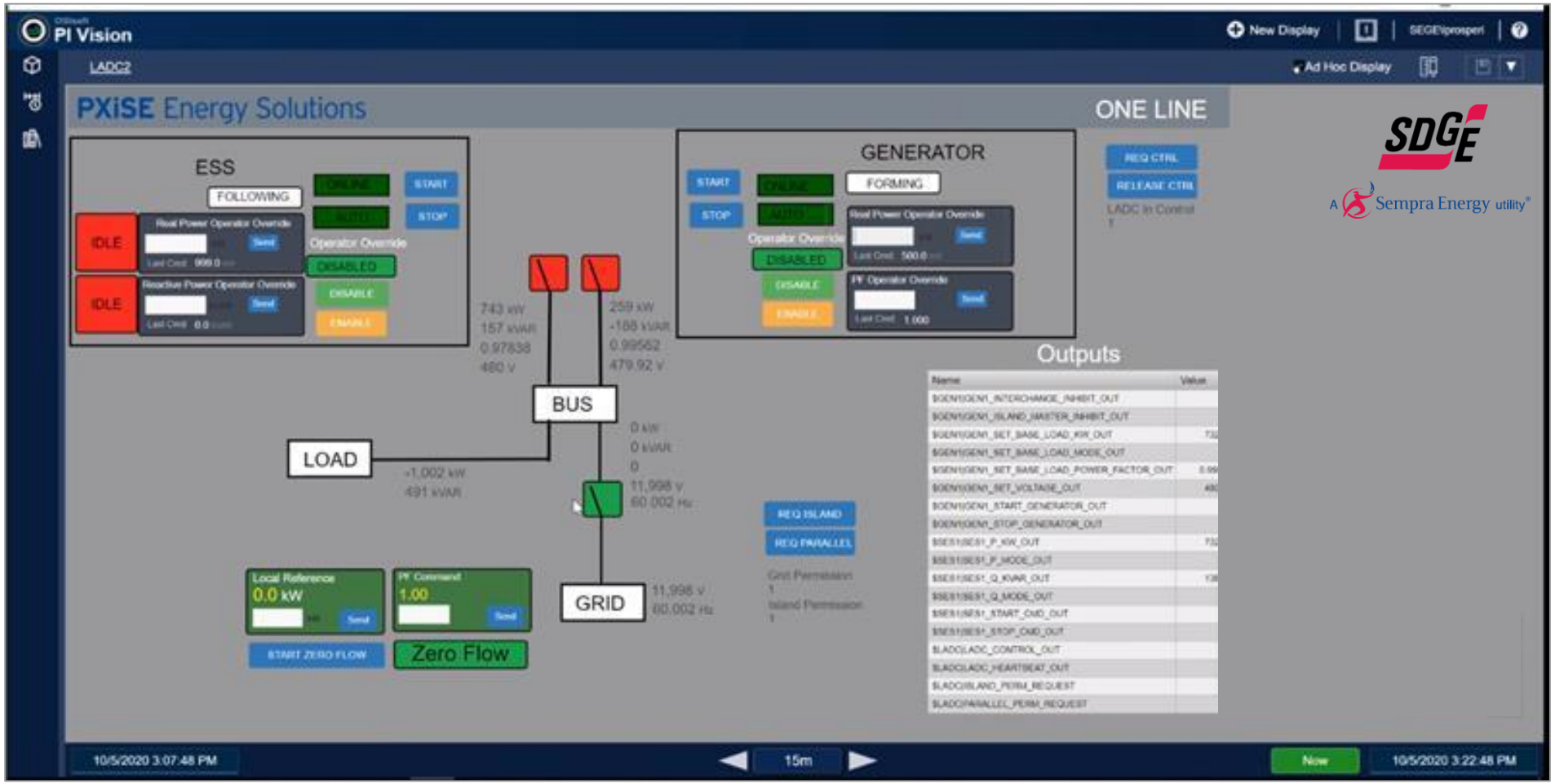
- Increased work efficiency

- Asset Saves
  - Del Mar Bank 32 Gas
  - Mesa Rim TL CB Gas
  - Kearny West Bank 30 Bushings





Future Enhancements



Questions?

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