
AVEVAWORLD

Welcome to AVEVA PI System Automation

— From PI Tags to AF Models —

Joshua M, Data Engineer
Bruno B, Power and Utilities Consultant

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Driven by the Grid

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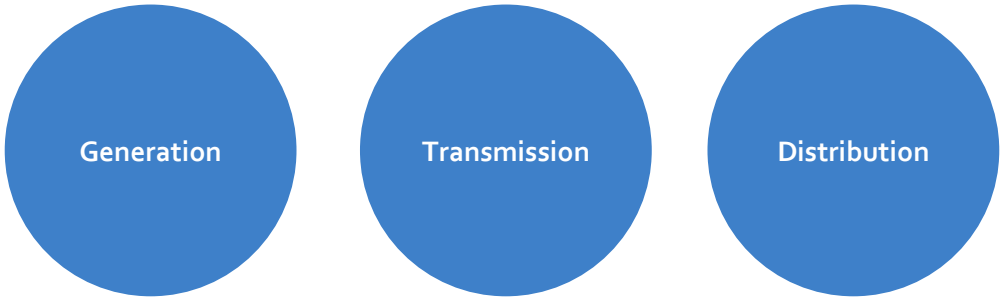
An Industry in Flux

The electric utility and its service landscape are evolving rapidly

- For decades, the model was sound: Generation, transmission, and distribution worked as isolated organizations
- The shift to renewables and a growing load on Dominion Energy's system is posing new challenges that is demanding a transformation in the operating model
- More than 70% of the world’s internet traffic flows through Dominion Energy’s territory
- Data centers in Dominion Energy’s footprint can account for up to 21% of our system loading
- By 2035, Virginia’s data center demand will require as much power as New York City (16.5GW)



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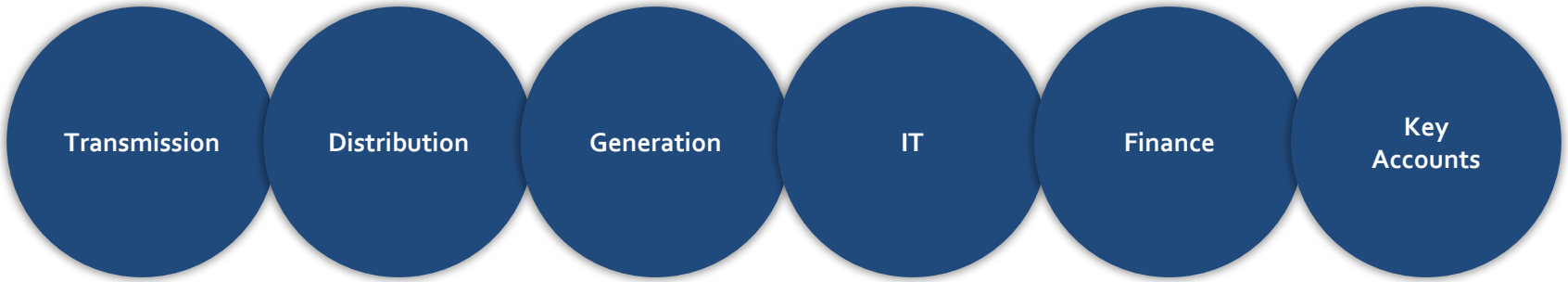
Dominion is Big… and Regulated

Fast-Paced Innovation is Tricky

- Like most big companies, we can suffer from a case of corporate segmentation and siloing of our data
- Conventional business units continue to focus on their functional and operational needs
- The challenges of an evolving system will not wait, but the regulations are here to stay
- We need to enable a data environment that allows for nimble development and greater accessibility to information while ensuring we meet the complex regulations of our industry



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In an industry that avoids risk and change in the name of reliability, we had to take steps to build an environment that challenges decades of habit

Challenge

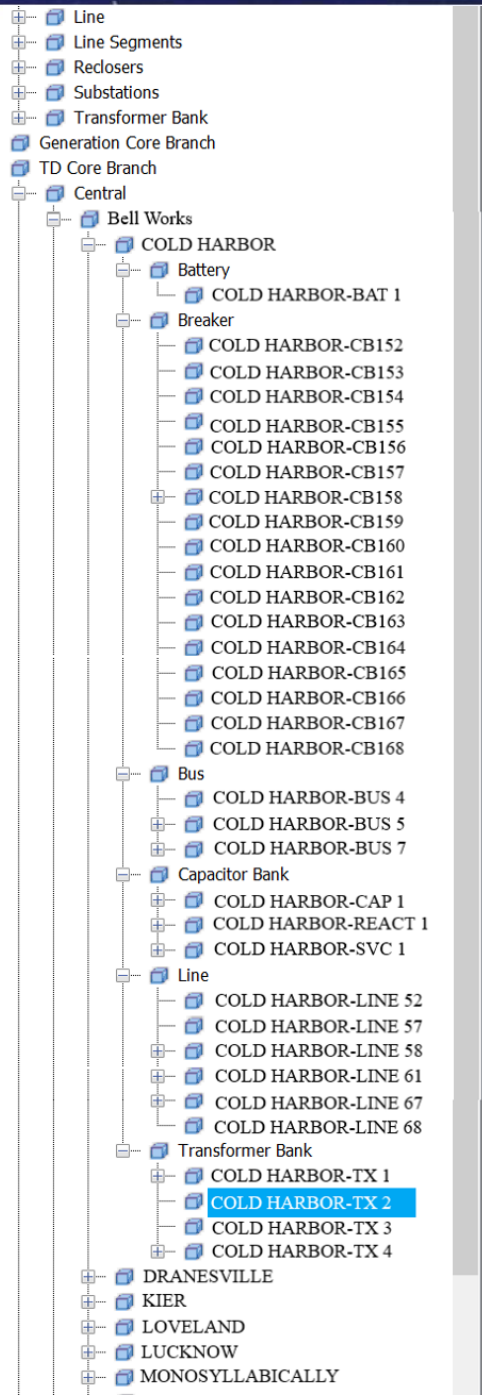
- Our SCADA historian was increasing in size and complexity
- Thousands of new assets come online or get retired weekly
- Disparate business function means inconsistent data

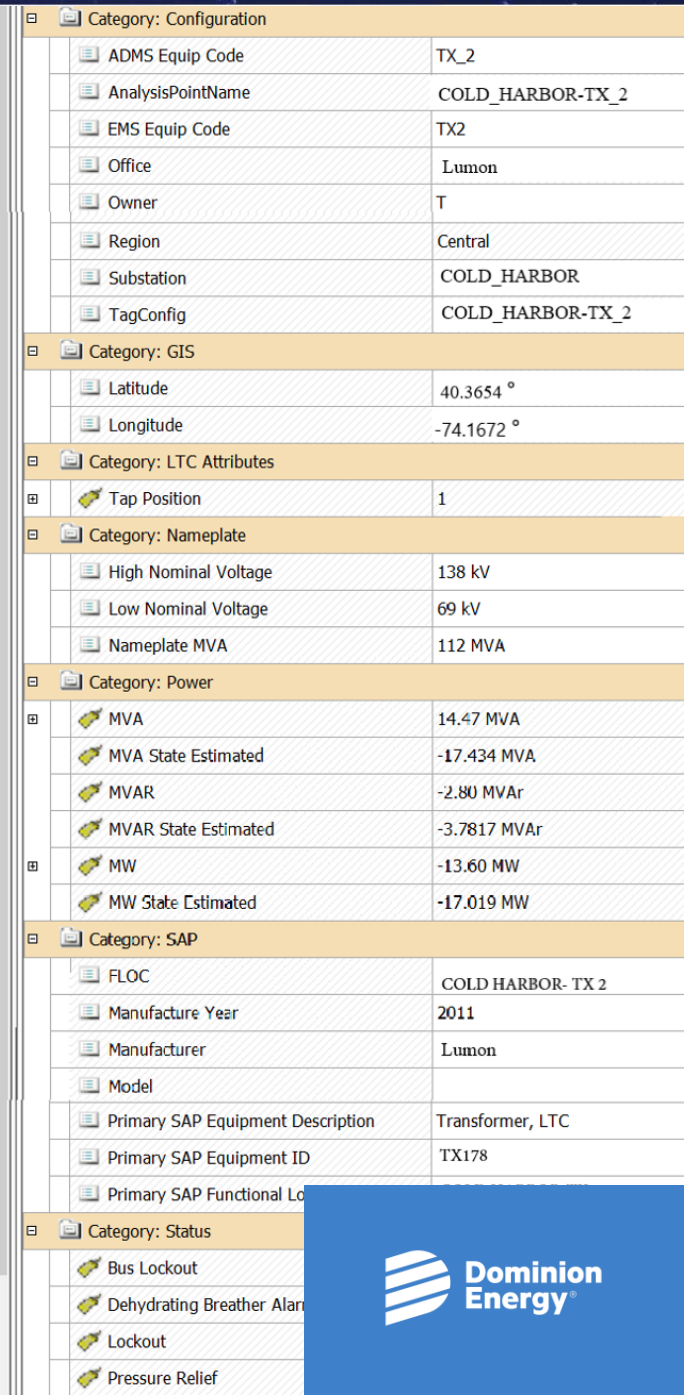
Solution

- Dominion deployed an evergreen centralized model that combines data from multiple systems of record for an intuitive and easy to use experience

Results

- An automated AF that reduces data exploration and data cleansing exercises
- Enabled data analysis and data science capabilities by integrating with powerful modeling software (ESRI, Seeq, PredictiveGrid)
- More intelligent data-forward decision-making including CBM





Business Challenge

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Business Challenges

Developing new data capabilities was difficult for many reasons. We had to enable Dominion

Convoluted Environment

Required substantial domain knowledge and data skills to find and gather information

Data Silos

Each group would build a solution for their specific needs, leading to Excel warriors and/or highly specialized gatekeepers required to get data

Access

Requests for data could take weeks to months. It is not always clear who to ask to obtain data

Unprecedented Growth

New assets come online, and old ones get retired at rates that make it extremely difficult to maintain a model manually. We are talking 5k to 10k point updates a week, sometimes more

Complex Layering

Decades of naming conventions, no centralized naming convention, legacy names, and multiple systems

Solution and Implementation

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Automated Point management and Model Updates

We have worked to overcome the obstacle of data access, data naming, and data misalignment

EMS

ADMS

SAP

ESRI

Others

Point Updates
- Create
- Retire
- Rename
- Rekey

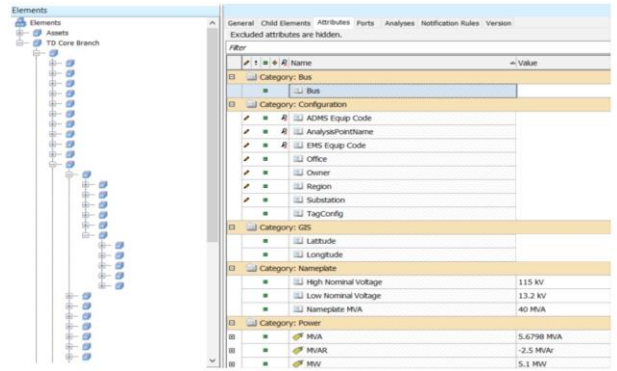
PI System SYNC App

AF Model Updates
- New/retire
- N naming conventions
- Version/backup
- Summary Emails

PI Data archive

PI Points

PI AF Models



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Growth of an Enabling Asset Framework

Asset Framework Today

- Templates: **53**
- Analysis: **135K**
- Elements: **27K**
  - Substations: **634**
  - Transformers: **1068**
  - Circuits and Breakers: **7216**
  - Capbanks: **1074**
  - Lines: **1461**
  - Reclosers: **3343**
  - Batteries: **800**
  - Buses: **216**
  - Delivery Points: **301**
  - Distributed Generation: **188**

5.4 Million

Points on PI Data Archive

54 VMS

Across Prod, QA & Dev

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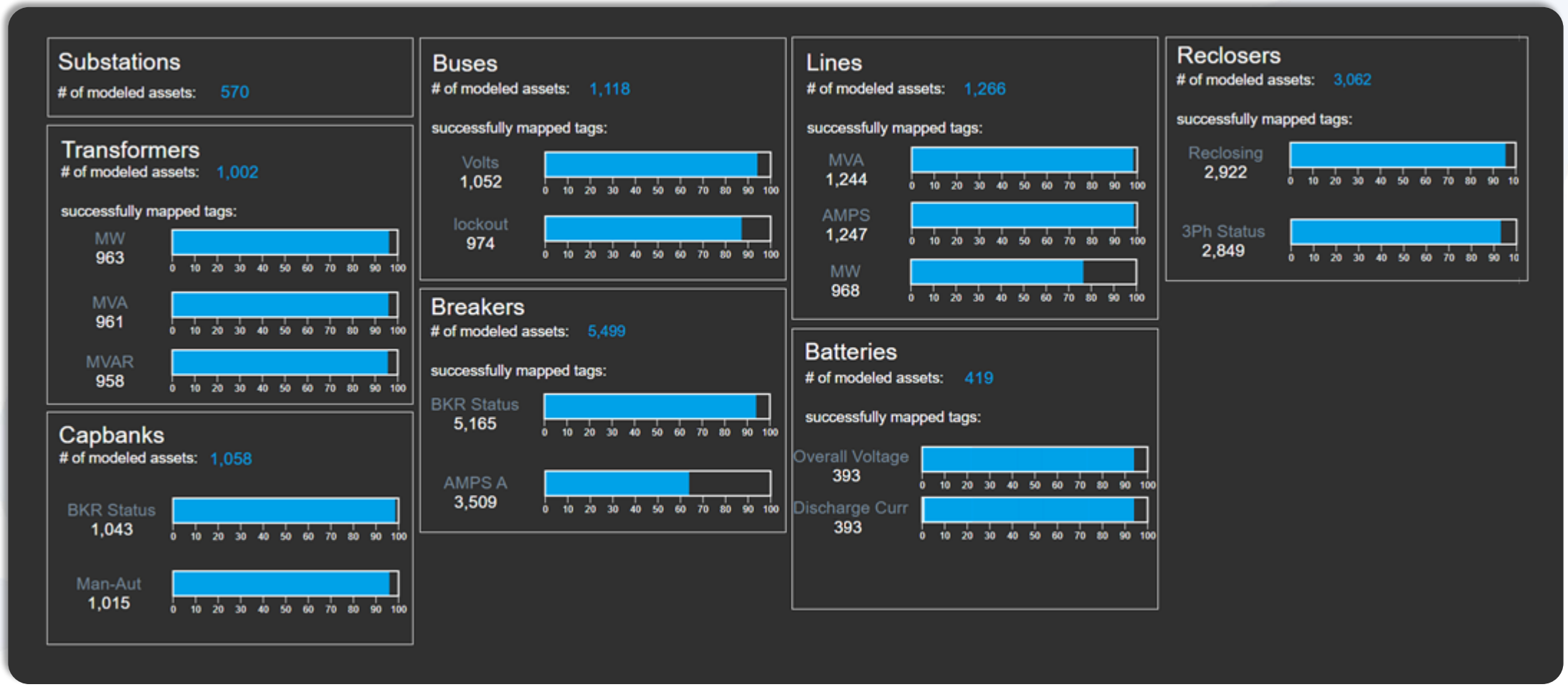
Model Validation



Providing Proactive Vigilance

Creating a culture of awareness for admins and the business was critical for the growth and adoption of the AF

- The application runs daily as a service
- An email goes out to admins with all updates
- Model backups created daily

Information Shared Includes

- NEW assets includer
- RETIRED assets
- Point mapping success/errors

Sample Email Report

[PROD] AFsync Run Report

B Bruno.Bachiega@dominionenergy.com
To Bruno Bachiega

Manual—Auto mapped: 1/1
LINES
Number: 1501
[NEW] LINE7 under COLD HARBOR Substation
[NEW] LINE9 under ALLENTOWN Substation
Line AMPS mapped: 1410/1497
Line MVA mapped: 1410/1497
RECLOSERS
Number: 3222
Reclosing tags mapped: 9201/9237
Hot Line tags mapped: 9201/9237
BATTERIES
Number: 1374
[NEW] DRANESVIL_BAT under DRANESVILLE substations
TX BREATHER ALARMS
Number: 576
[NEW] Alarm for ZURICH.TX1_BREATH_TROUB under TX Breather Alarms
Execution completed in 01:22:25.5193267

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Success Stories at Dominion

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Supporting the Maintenance of Load Tap Changers (LTC)

Through the newly deployed asset framework, the Engineering Analytics & Modeling team helped model and visualize hundreds of transformer LTCs

- Integrated with maintenance system to forecast future maintenance dates
- Capture events and notify engineers on multiple alarms and events use cases
- Incorporated drill-down capabilities to help engineers diagnose and take action

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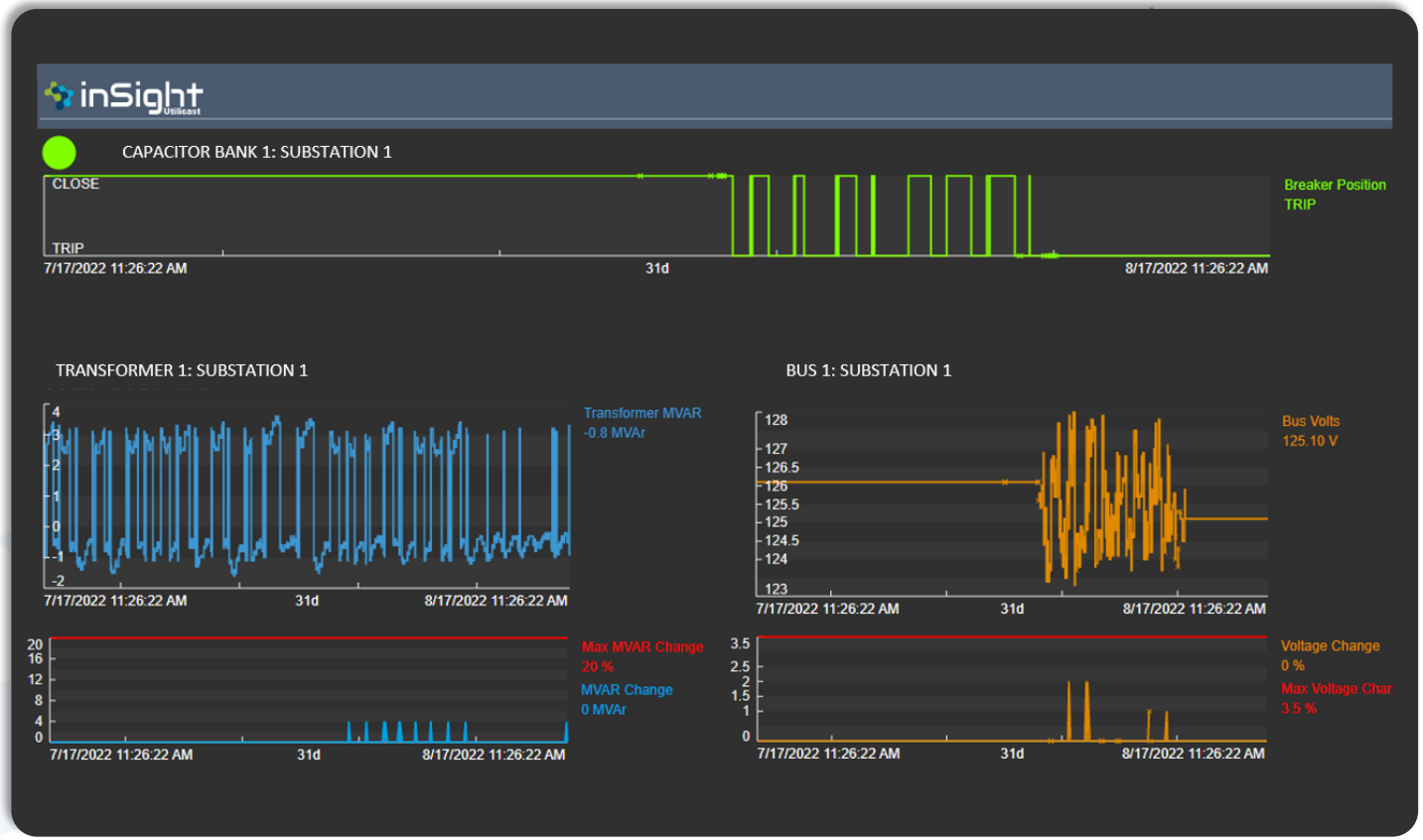
The Larger Impact of VOLT VAR Control



The deployed AF Hierarchy enables disparate resources to co-exist.

Today, engineers can promptly find and visualize an array of assets including:

- Capbanks
- Transformers
- Buses

We now serve an increasingly complex set of use cases with greater expediency that allow experts to meet business requirements previously maintained manually (or left entirely unserved)

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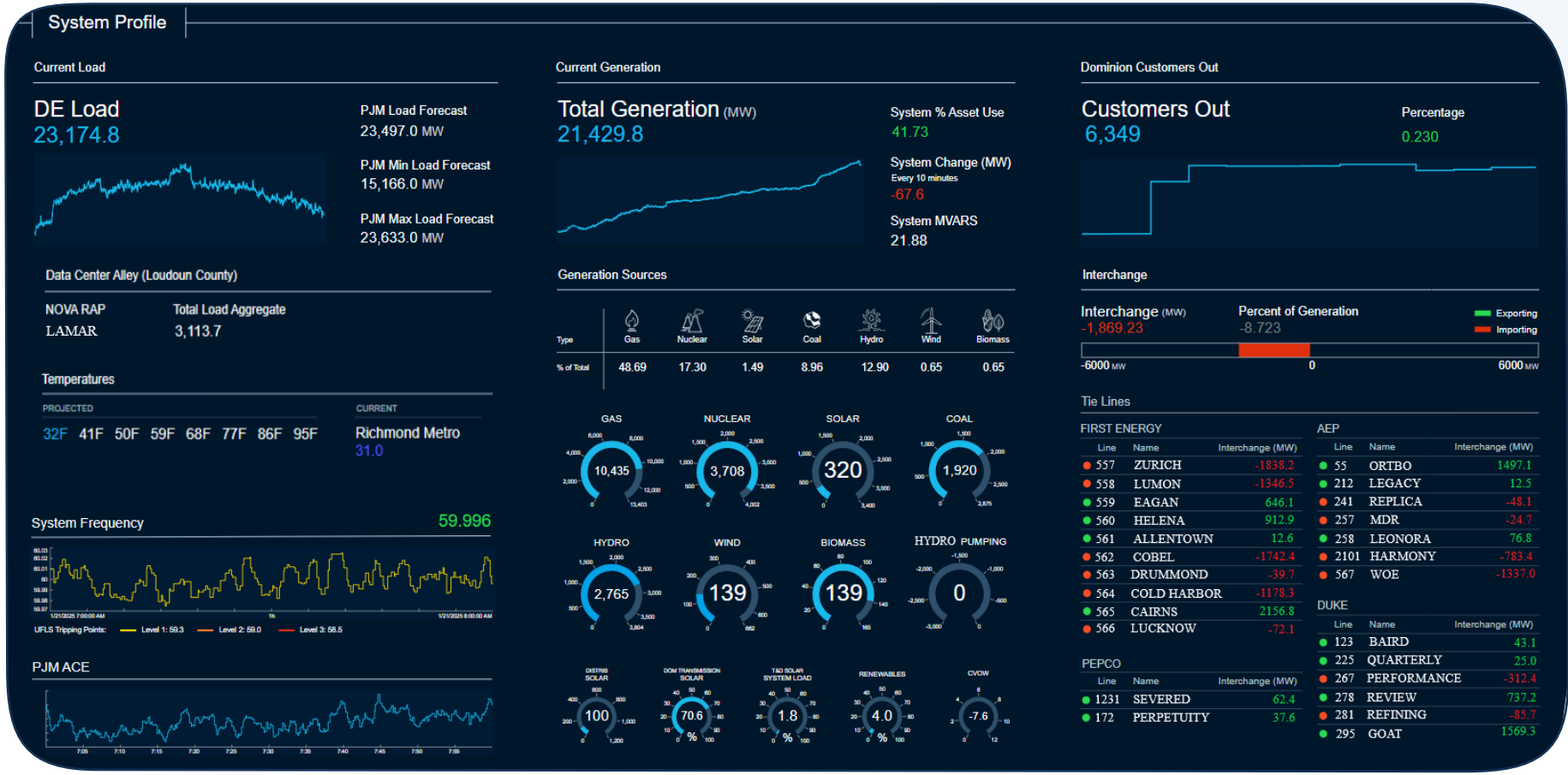
Keeping up with Growing Load

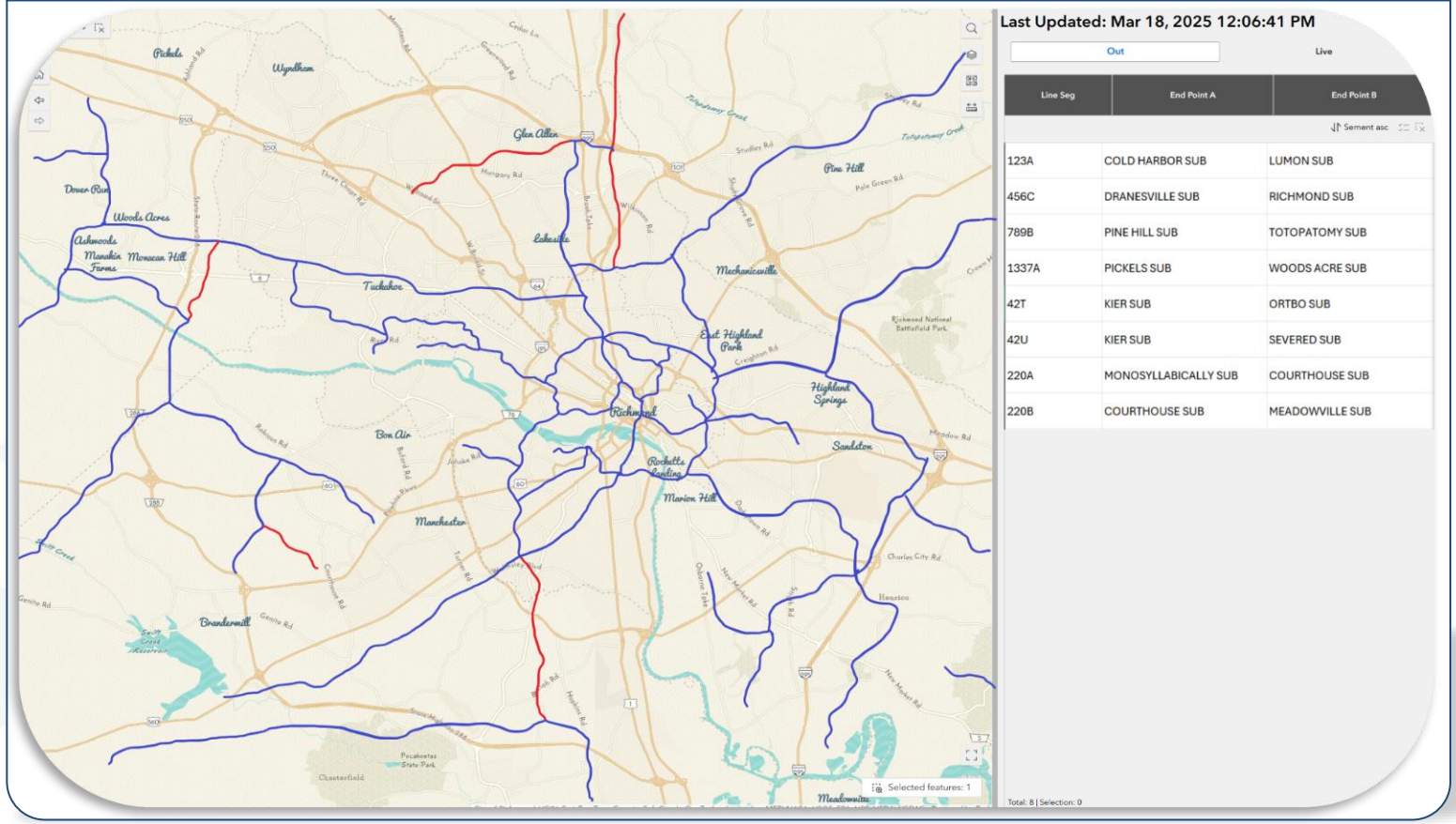
Dominion's system is slated to grow as much as 5% year over year. Executives and engineers want to keep up.

- Roll ups at multiple levels of the hierarchy
- Pre-calculation of computer intensive analysis for quicker view and reporting
- PI Vision allows for easy playback and backtrack



Enabling a Geo-Spatial Capability

ARCGIS to Track a Physical System



From asset monitoring to loading heat maps, AF is helping EA&M deploy new geospatial capabilities for its customers

The deployment of an AF based entirely on templates provided a seamless means for an ESRI integration

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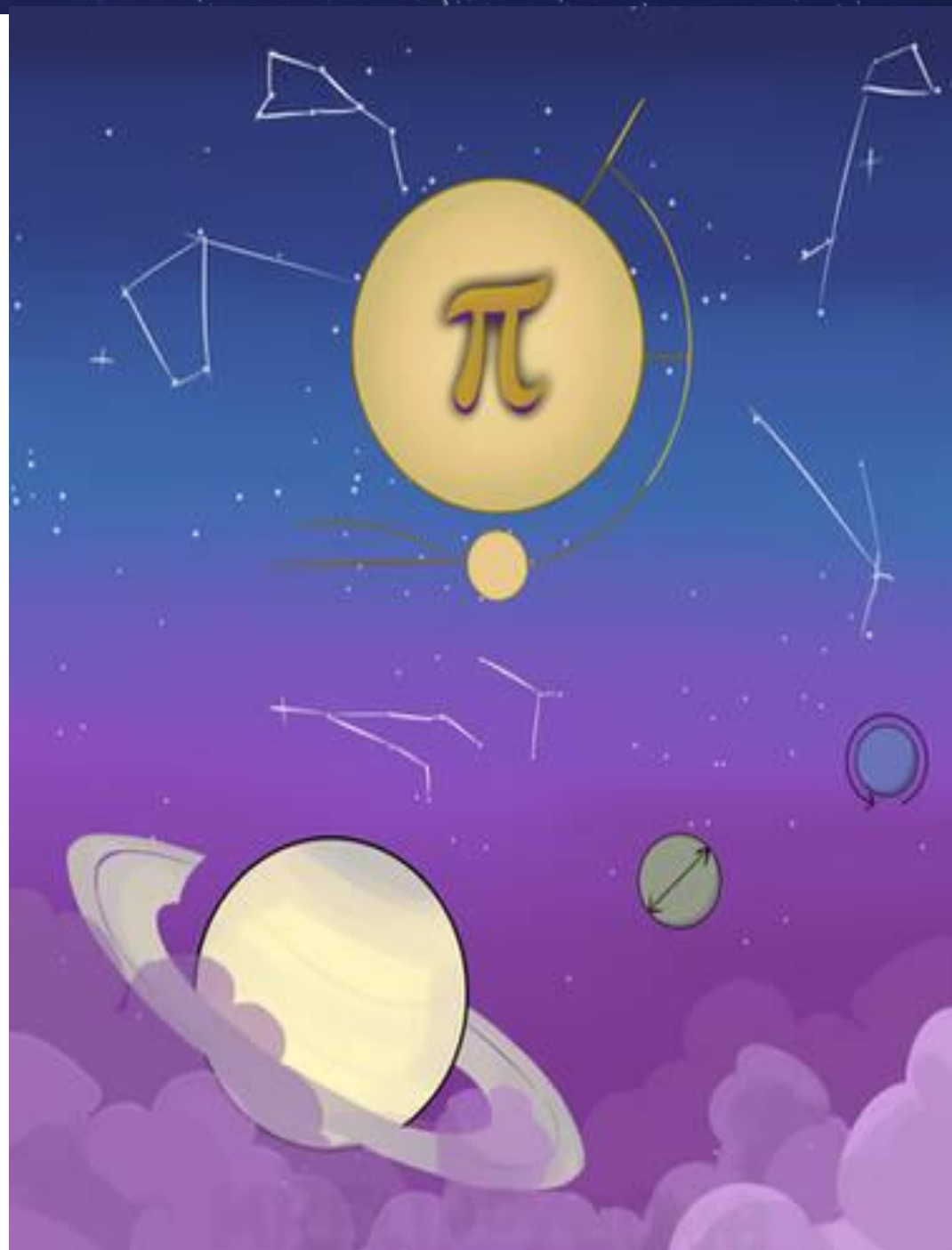
Next Steps

- Full ESRI integration
- Implementation of more business use cases (large backlog)
- Roll out and training for a growing user-base
- Full-time Engineering Analytics Team set to grow from 4 to 16 by the end of 2025



Seth Milchick

MANAGER, MACRO DATA REFINEMENT

The automation of the PI System has bestowed upon our team the extraordinary boon of alleviating laborious tasks related to creating points and maintaining a digital twin in AF.

Furthermore, this august innovation also helped reduce the technical debt from the manual methodologies that were in place before the automation, whose inefficiencies now stand as mere relics of a less enlightened epoch.

As a result, our esteemed colleagues have now the latitude to engage in pursuits of greater consequence.

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