PG&E: AVEVA™ PI System™/ADMS Integration and IT/OT Convergence

Justin Bagley - PG&E
Gary Yegiazaryan - PG&E
About Pacific Gas and Electric Company

- Incorporated in California in 1905
- Header quarters in Oakland, California
- Approximately 23,000 employees
- 106,681 Circuit miles of Electric Distribution
- 18,466 Circuit miles of interconnected transmission lines
- 42,141 miles of natural gas distribution pipelines
- 6,438 miles of natural gas transmission pipelines
- 5.5 million electric customer accounts
- 4.5 million natural gas customer accounts
The AVEVA™ PI System™ at PG&E

- Currently 8 production PI System installations
- Before split out by area contained 20 million PI tags
- Largest system now at ~7 million tags
- Rapid growth in data
  - 2012 – less than 1TB a year
  - 2016 ~1TB
  - 2019 ~10TB
  - 2022 ~20TB
- 4 new data sources in 2022
- AF structure adoption for each area
**PG&E ADMS Vision**

The upgrade our Advanced Distribution Management System will improve the visibility, operability, and security of grid assets—which are critical for wildfire mitigation and daily operations.

### Challenges Today

<table>
<thead>
<tr>
<th>SCADA</th>
<th>DMS / OMS</th>
<th>FLISR</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-year-old, end-of-life application</td>
<td>Does not integrate with other systems, limited operational automation</td>
<td></td>
</tr>
</tbody>
</table>

**DMS**
- Not integrated with SCADA, no ‘single pane of glass’ view as the users have to complete manual data entry across DMS-SCADA

**Cybersecurity**
- Lack of security controls make systems more susceptible to cyber attacks

**Network Infrastructure**
- 20-35-year-old communications infrastructure result in unacceptable volume of truck rolls per year

### Investment Plans

<table>
<thead>
<tr>
<th>SCADA</th>
<th>DMS / OMS</th>
<th>FLISR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leading, integrated platform with visibility to Distributed Energy Resources</td>
<td>Functionality to automate operational processes during wildfire &amp; PSPS events</td>
<td></td>
</tr>
</tbody>
</table>

**DMS**
- Consolidating 10 systems to a single, integrated user interface
- Reduction in # outages-duration due to better load forecasting

**Cybersecurity**
- Secure infrastructure with built-in enhanced network security controls

**Network Infrastructure**
- Modern network assets and a new Field Area Network (FAN) which will provide resiliency, scalability, and reduce manual truck rolls

---

(1) SCADA: Supervisory Control & Data Acquisition; (2) DMS: Distribution Management System; OMS: Outage Management System; (3) FLISR: Fault Locations, Isolation, and Service Restoration
preADMS high level architecture

SEMI-AUTOMATED MERGING OF AS-SWITCHED MODEL WITH SCADA DATA

DIFFERENT DATA FEED FOR EACH SCADA MASTER

UPDATE PROCESS CAN TAKE A WEEK
New Device Process pre-ADMS

Release Letter

Import file

Query as Switched

Stage points to be created

Merge SCADA and model

Create AF element

Check devices to ensure quality

Rebuild source database

Restart source database

Check devices to ensure quality

Stage points to be created

Merge SCADA and model

Create AF element
Merging and Staging
PI ADMS Integration

- Ability to automatically create the appropriate PI Tags and PI Asset Framework structures
- In addition to timeseries data, can transfer network model data in a form of PI AF structures
- Transfers data from caches directly and not from ADMS Historian (MS SQL) database
- Transfers timeseries data without applying historical deadbands
ADMS PI Adapter – PI AF Network Model

ADMS PI Adapter -> PI AF – Key Benefits

- AF model is completely synced with ADMS CIM network model
- Any update/modification/deletion of ADMS CIM model element will be automatically updated in PI AF
- Any topology change on ADMS CIM model will be reflected in PI AF
ADMS PI Adapter – PI Time-Series Tag

ADMS PI Adapter -> PI Data Archive – Key Benefits

- Time Series tag is either created automatically or linked to existing tag if previous tag exists
- AF attribute is automatically linked PI tag
- Any update/modification/deletion of ADMS SCADA signal will be automatically updated in PI Data Archive and PI AF
- Time series data received from field device is sent to PI in real-time (data shows in PI at the same time as ADMS HMI shows the data)
ADMS PI Cutover Requirements

- Historical trending between RTSCADA and ADMS
- Existing client applications cannot be affected
RTSCADA to ADMS Cutover

How did the PG&E PI team cutover distribution data from RTSCADA to ADMS?

Process:
- SCADA RT5 DB consolidation
- Data cleanup
- Mapping data between RT5 and RT6
- Creation of PI builder rename sheets

Technologies used:
- SQL
- PI builder
New device process from ADMS to PI System

- Scan ADMS AF structure for delta
- Create EDPI AF structure
- Check devices to ensure quality
- Map Points
Benefits to PI System and PI Users

- Simplifying Processes
- Fewer Manual Steps
- Standard access method
- Model and Point Updates in minutes
- Point names are readable
- Less Custom applications for O&M
Using PI System for viewing ADMS data

PI System allows for user friendly access to ADMS data

- Users are familiar with the Client tools (PI Datalink, PI Vision, PI System Explorer)
- Programmatic access (PI WebAPI/AFSDK/RTQP engine)
- Ability to view RTSCADA and ADMS data all in one place
- PI AF Analyses/Notifications
What’s next for PI Integration at PG&E
PI and DERMS Integration

- DERMS ADMS integration leverages SE Azure Cloud environment
- Consolidated data flow back to PI using SE PI adapter
- Automatic AF element creation of DERMS assets as they come online
PI System and Line Sensor Integration

High Level Overview

Field
- Line Sensor
- Line Sensor
- Line Sensor

Wireless Network

PG&E internal network

Lighthouse Sensor Management System (SMS)

ADMS

Enterprise PI System

DNP3

AFSDK
Justin Bagley

Supervisor, Operation Data Services

- Pacific Gas and Electric Company
- JZ1D@pge.com

Gary Yegiazaryan

Operational Data Specialist, Expert

- Pacific Gas and Electric Company
- GHY4@pge.com
Questions?
Please wait for the microphone.
State your name and company.

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

Thank you!
This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.
ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life’s essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world’s most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com