Overview of OSIsoft in the T&D Industry

Presented by **Miguel Chavero**

EMEA Power and Utilities Industry Principal

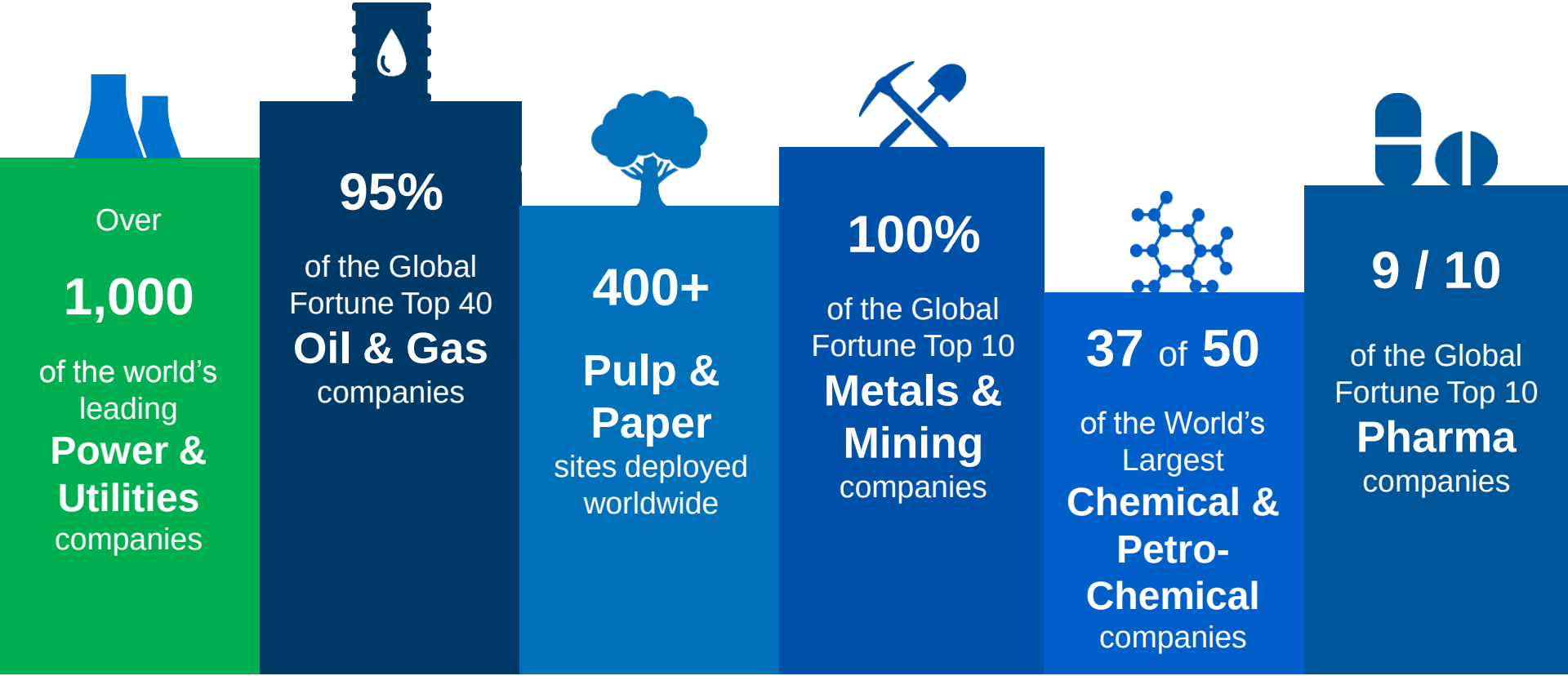
Agenda

- Introduction
- Uses cases
  - Real Time awareness
  - Renewable Integration
  - CBM (Condition Based Mantenaince)
  - WAMS (Wide Area Measurement System)
  - Smart Grid
- Summary

Introduction

We believe People with Data can Transform their world

OSIsoft is trusted by the world's leading companies



Defacto Standard in Power and Utilities

European T&D references (non exhaustive)

T&D Industry Pain Points

Aging Infrastructure

Asset Management


Budget Constraints

Capacity Planning


Smart Grid Integration

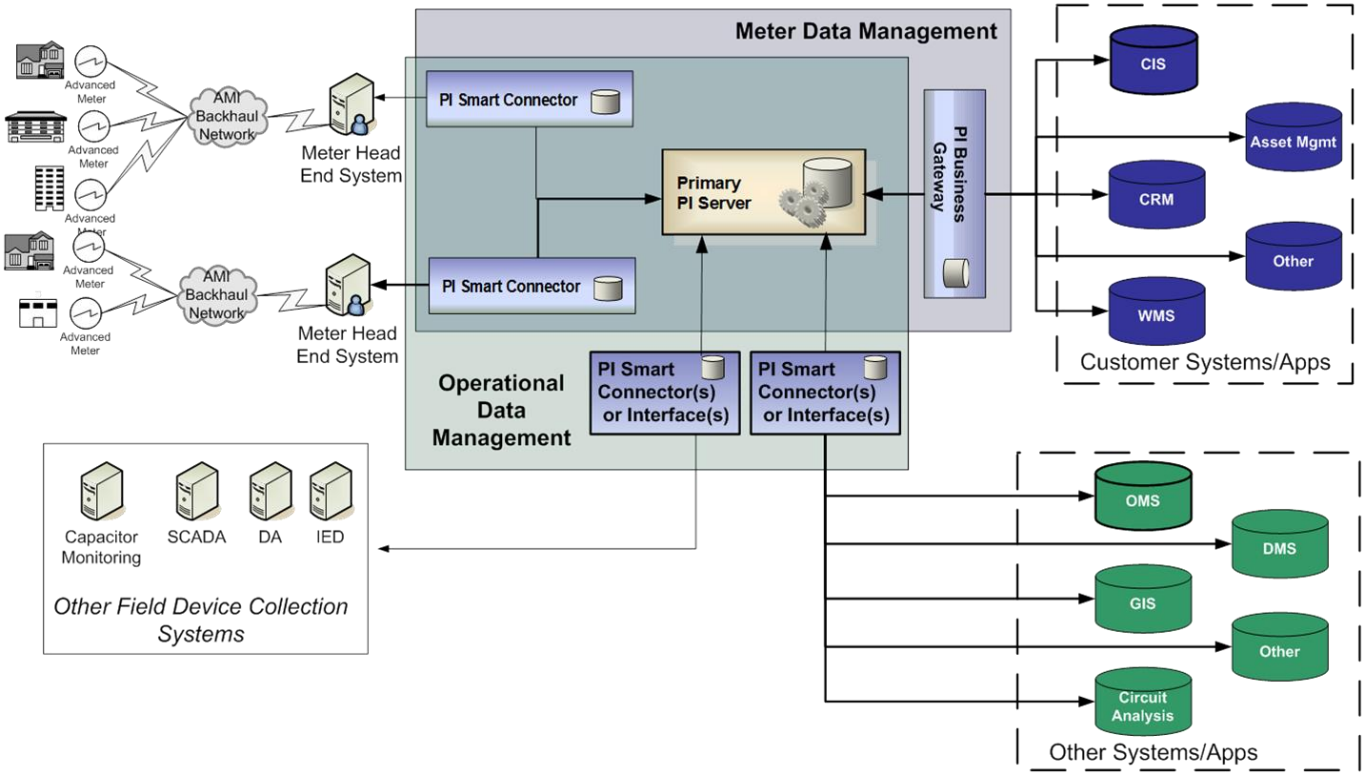

Renewables Integration

Compliance

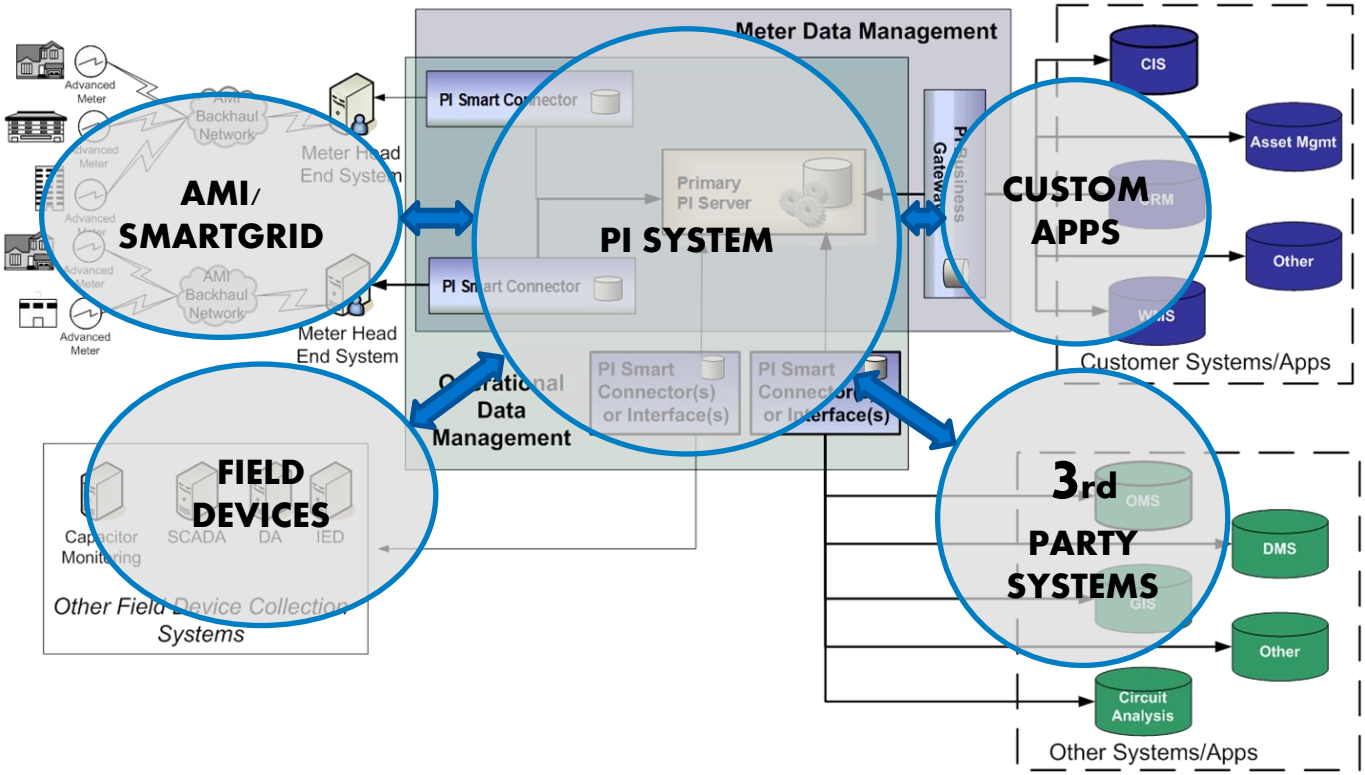
New Industry Trends: GIS Integration, Big Data, etc.

What's coming?

How does T&D use PI?



How does T&D use PI?



Why PI System?

- Standardizing your T&D / Smart Grid data infrastructure on OSIsoft's PI System provides value to a utility in many areas such as
  - ✓ Provides greater Situational Awareness
  - ✓ Increases equipment life
  - ✓ Improves Operations
  - ✓ Reduces CapEx and O&M spend and so lower TCO
  - ✓ Broadens access to a common source for all OT data
  - ✓ Improves decision-making capabilities of staff
  - ✓ Provides End to End Visibility to drive Innovation
- Users across the enterprise include: Operations, Engineering, Energy Trading, Customer Service, Maintenance, and Executive Management

Use Cases

Use Cases

Renewable Integration	Real Time Awareness	WAMS	CBM	Smart Grid	Advanced Analytics

RED ELÉCTRICA DE ESPAÑA

HELEN

BONNEVILLE POWER ADMINISTRATION

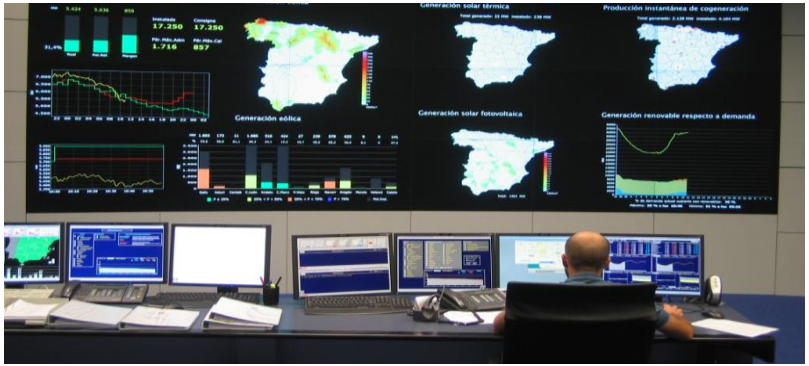
FINGRID

Xcel Energy

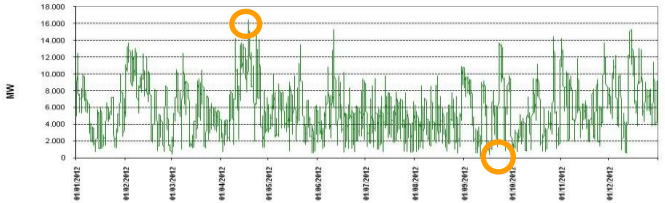
PSE&G

Real-Time Infrastructure use cases deployment in leading companies

REE

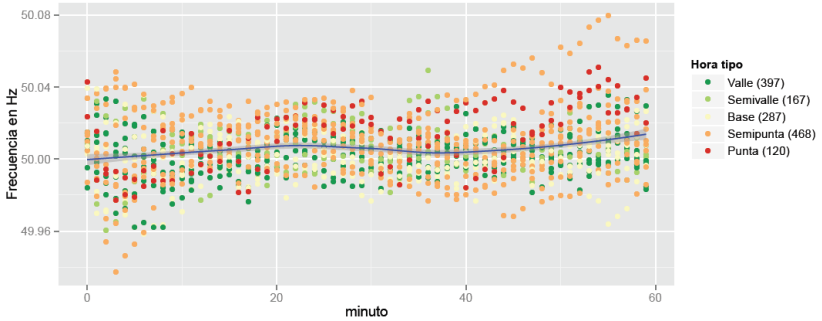


Maximum coverage 64%



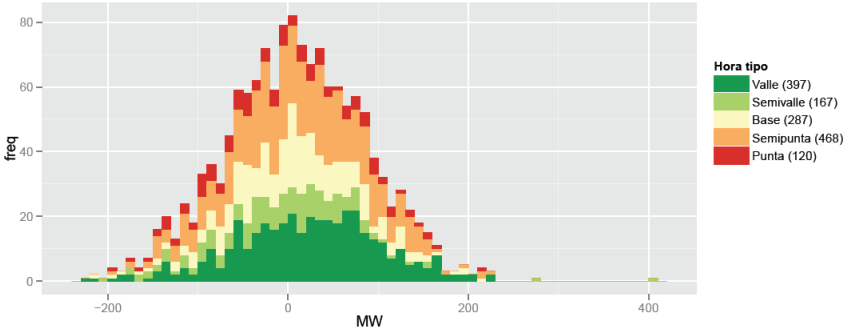
Minimum coverage <1%

Análisis de la frecuencia



- Distribution of frequency values with 1-minute sampled

Análisis del ACE



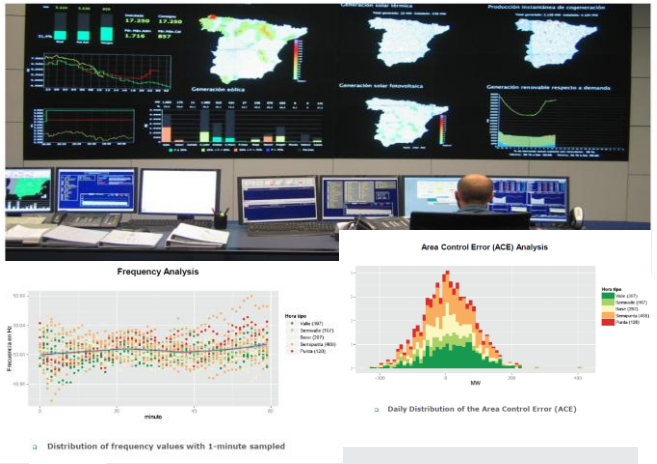
- Daily Distribution of the ACE

Advanced Analytics

REE

“To manage more than 2.5 billion data values every day is not an easy task. If you combine this fact with the variability of the renewable energy in the Spanish Market (it could vary from 1% up to 64% of the total daily production) you need an strong platform to analyze this amount of data in a very easy way to take the optimum decisions to integrate wind, hydro and solar generation into the grid. We achieved it by combining the PI System and the “R” platform.”

Alberto Gil| Electrical Engineer analyst at CECRE (REE)



CHALLENGES

Hugh amount of real time data to process to integrate renewable energy effectively into the grid

High variability of renewable production in the Spanish Market (it could vary from 1% up to 64%)

SOLUTION

Implement PI system for collection, simple analytics, visualization and storage of renewable data.

Combining PI with R platform for complex statistical analysis of large amount of data.

RESULTS

Better operational tools for system operation analysis.

Better understanding about how the market operates avoiding electrical grid impacts while integrating renewable sources.

HELEN

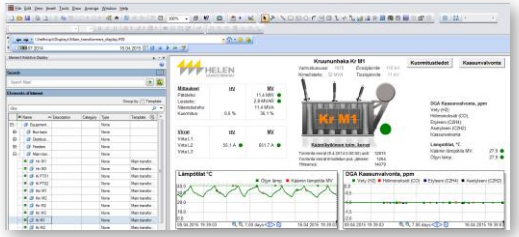
Multiple data sources

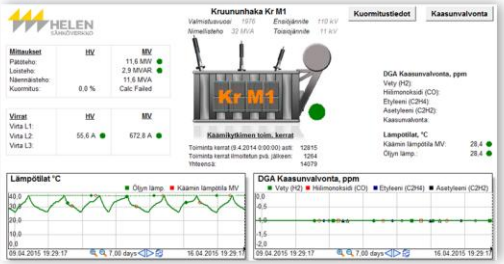
Network Information System
- Trimble NIS

Asset Management System
- Solteq Artturi

SCADA-server
- Interface
- Buffering

Application server
- PI AF
- PI Notification





Graphical interfaces for:
- Asset management
- Network Planning
- Network operators

Asset monitoring is turning to be more proactive.

PI System is one of the process development enablers

Improving Business Performance with the PI System

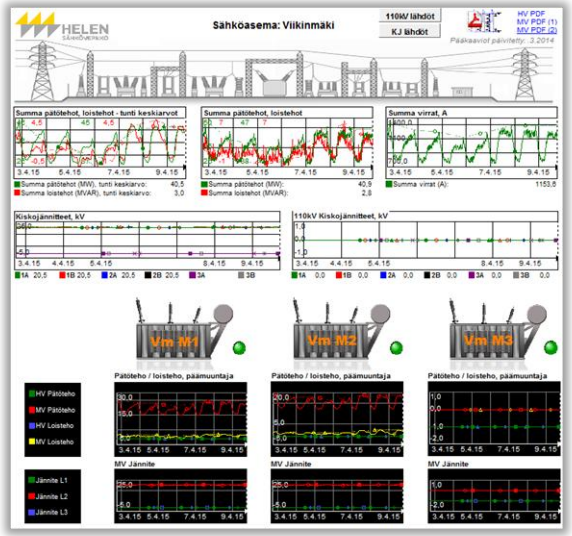
Bringing data available for decision making on all the levels from strategic planning to daily operations.

The solution is based on products lowering the TCO and improving developing and availability.

The data is linked with the asset.

PI System is one of the business development enablers!

HELEN SÄHKÖVERKKO



Business Challenge

- Bring the measured data available and link it with the asset data.

Solution

- PI Server
- PI AF
- PI DataLink
- PI ProcessBook
- PI Notification

Results and Benefits

- Measured data is easily available and linked with the asset components.
- All users have the same data available.
- Asset monitoring is proactive.

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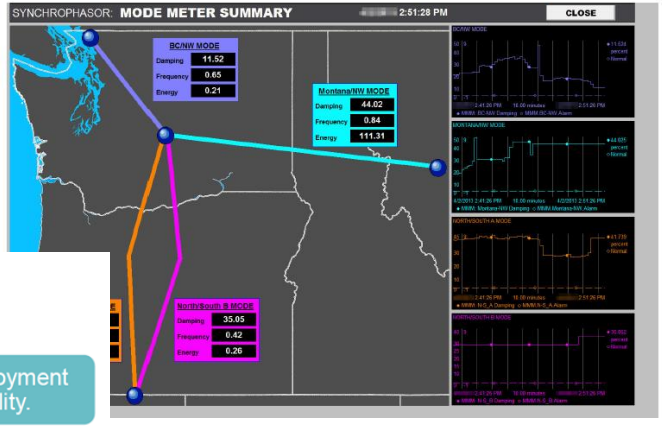
ODM Detail-Outputs

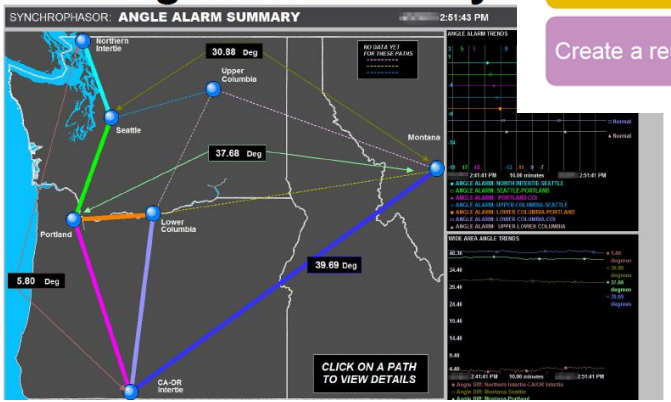
Mode Meter (MMM)



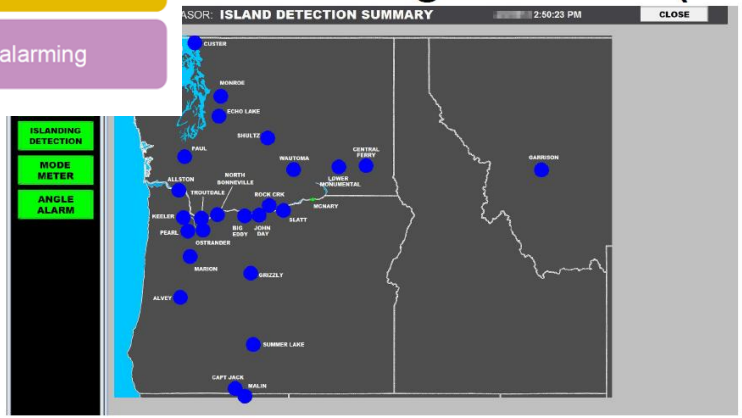
BPA Business Challenge

- Leverage new Phasor Measurement Units (PMUs) deployment to provide wide-area situational awareness for grid stability.
- Harden and build out the PI Data Historian beyond SCADA
- Create a reusable infrastructure for analysis and alarming

Angle Alarm Analys



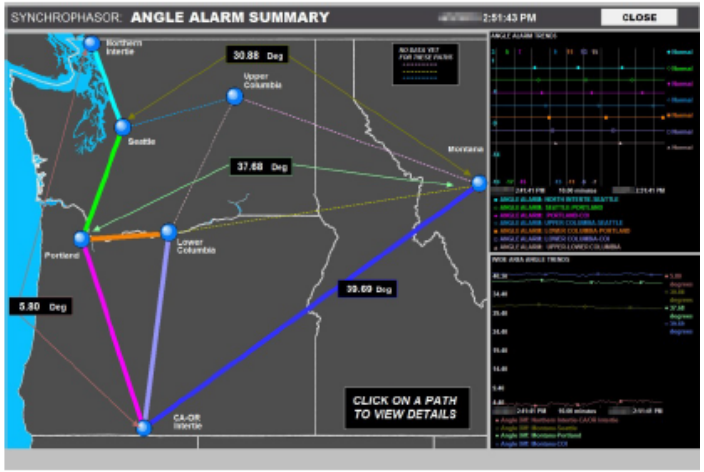
er Islanding Detection (IDM)



BPA Situational Awareness

Advanced Real-Time Situational Awareness using Synchrophasor data.

BONNEVILLE POWER ADMINISTRATION



Business Challenge

- Turn Real-Time PMU data into Operator Awareness
- Leverage latest in high speed Phasor Measurement Analysis
- Prepare for future calculations

Solution

- PI AF based analysis plugin architecture
- PI Server 2012 using PI-AF 2012 data access

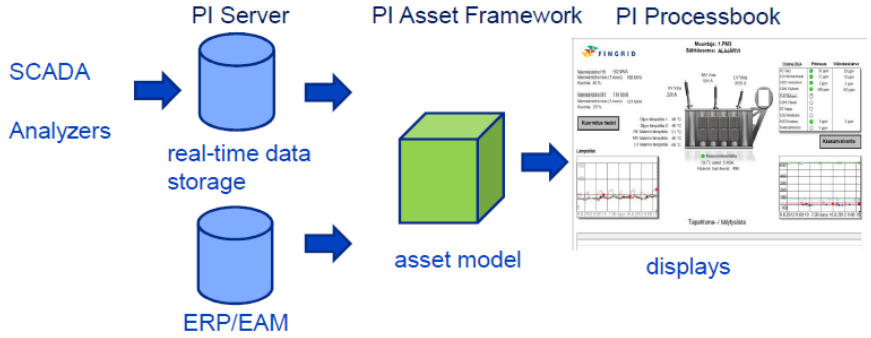
Results and Benefits

- Online displays show abnormal system behavior.
- Replay of real event data shows event identification, ready and waiting!
- Potential of early warning for system instability

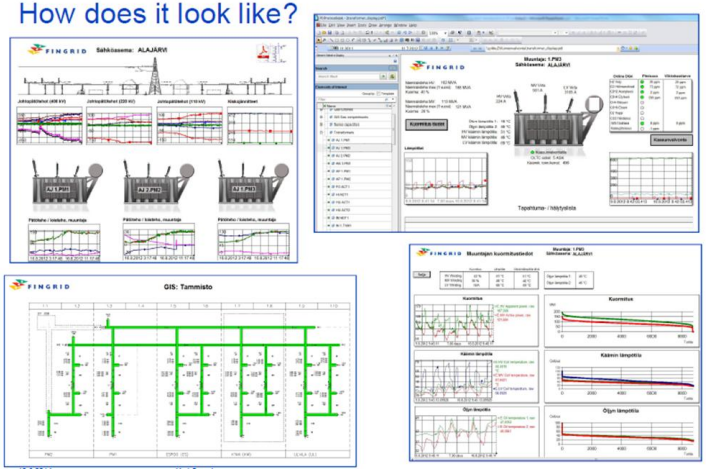
FINGRID

CBM deployment

How it works ?



How does it look like?



- Transformers, breakers, GIS, serie capacitors, reserve powerplants
- ~ 5 years of online data and ~ 20 years of offline data is ready to be used
- Light implementation by existing PI tools = system is easily configurable and users can make own displays

Transformer fault

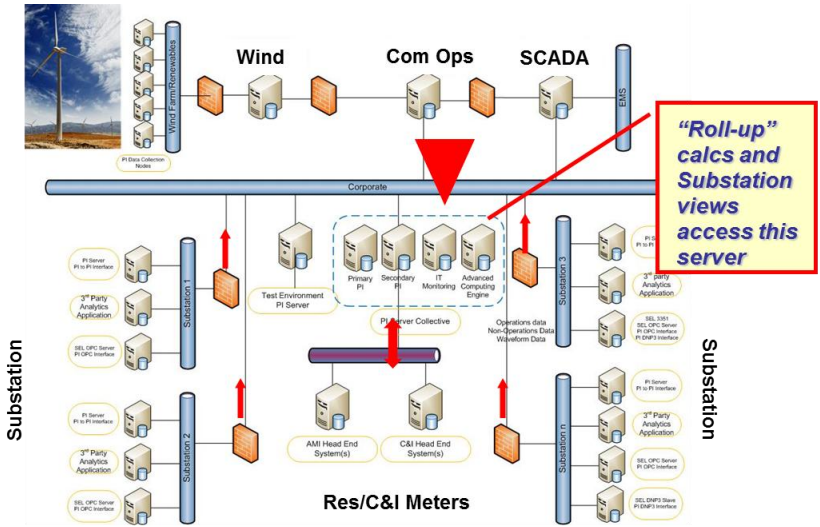
- Increasing oil gas ratio was noticed and taken under observation in May 2012. Strong correlation between LV current and oil gas ratio was detected by CMS and confirmed with diagnostics measurements. The early notice gave time to react and remedial actions were launched in time.

XCEL Energy

OSIsoft Deliverables for Xcel's SmartGridCity™

PI OSIsoft Operational Data Management System (PI-ODMS):

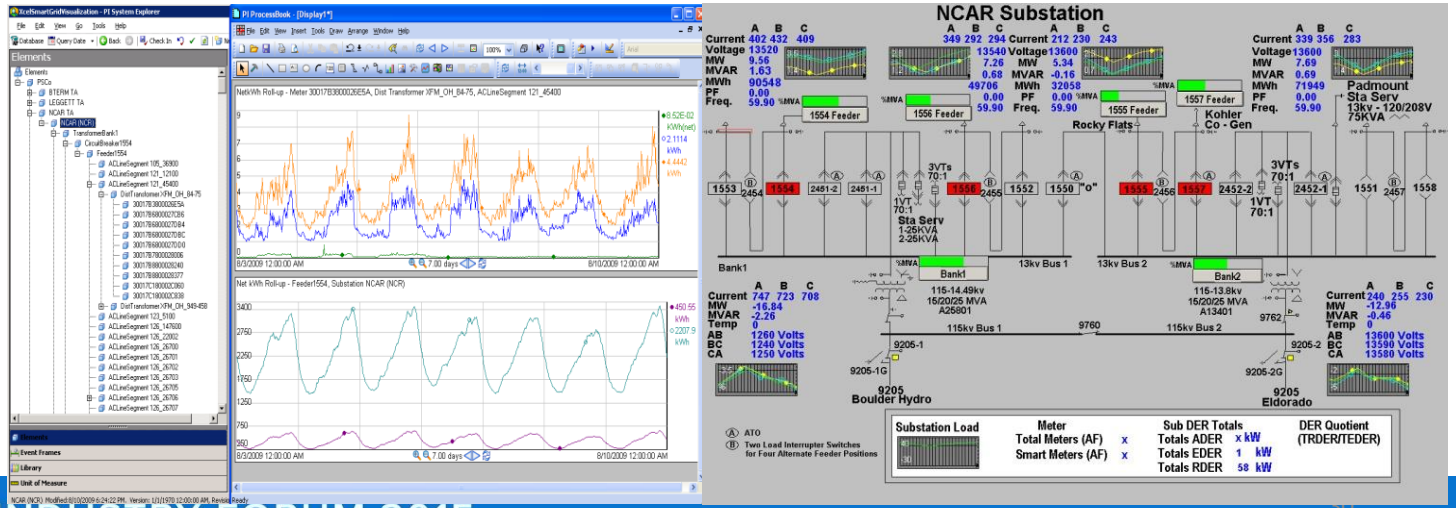
- Blend of meter and operations in one system
  - Probably first time in history
- 1 Million Points with 2-second to 15-minute scan/updates
  - Represents 4 substations, 25K customers & 25 feeders
    - Meter has 34 points per customer raw & validated
  - End-to-end Seamless View of the grid
  - System of Record for Time-series Data
- Meter & Substation Data Management
  - Meter Validation for Spike, Clock Drift and Zero Value
- Model Management
- Visualization with Situational Awareness



The End-to-End Visibility: “Roll-up” Mechanism: Net KWh Roll-Up

•Key Points:

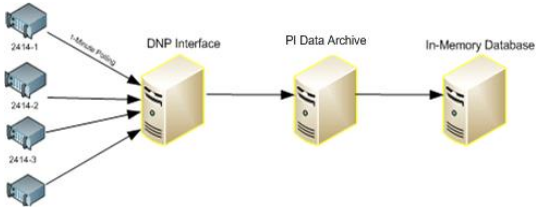
- Each trend shown is aggregated load (kWh) up to the next higher trend from an individual meter, transformer, line segment, breaker, and sub.
- If you overlay the Distribution SCADA load (from PI), the difference would be losses or leakage
- The physical model is in AF (CIM) allowing the aggregation and roll-up of individual loads
- End to End visibility – Basic PI integrating meter and distribution system(s) operational data



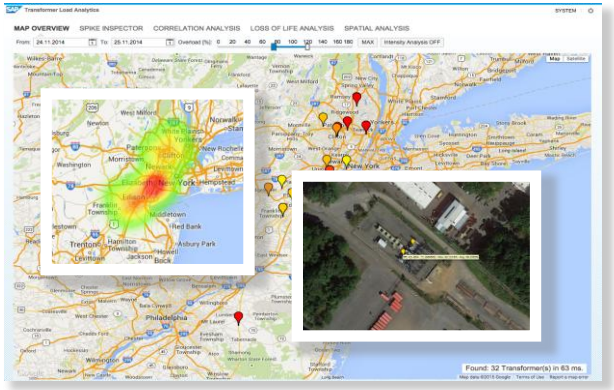
PSE&G

Advanced Analytics

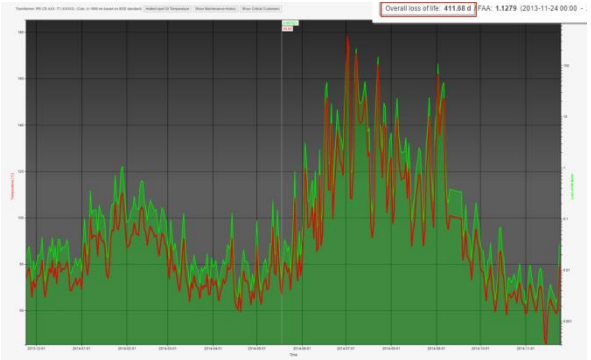
- Calculates Transformer LOL based on **IEEE C57.91-2011**



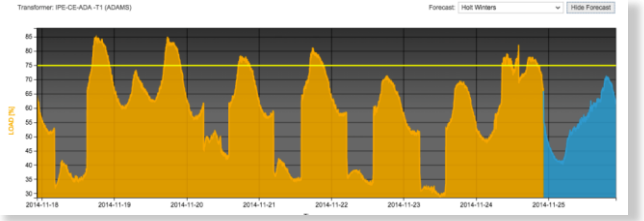
Map overview of load or LOL situation



resulting hottest-spot oil temperature (red) and loss-of-life factor (green) over the year



Forecasting percent current load to nameplate rating



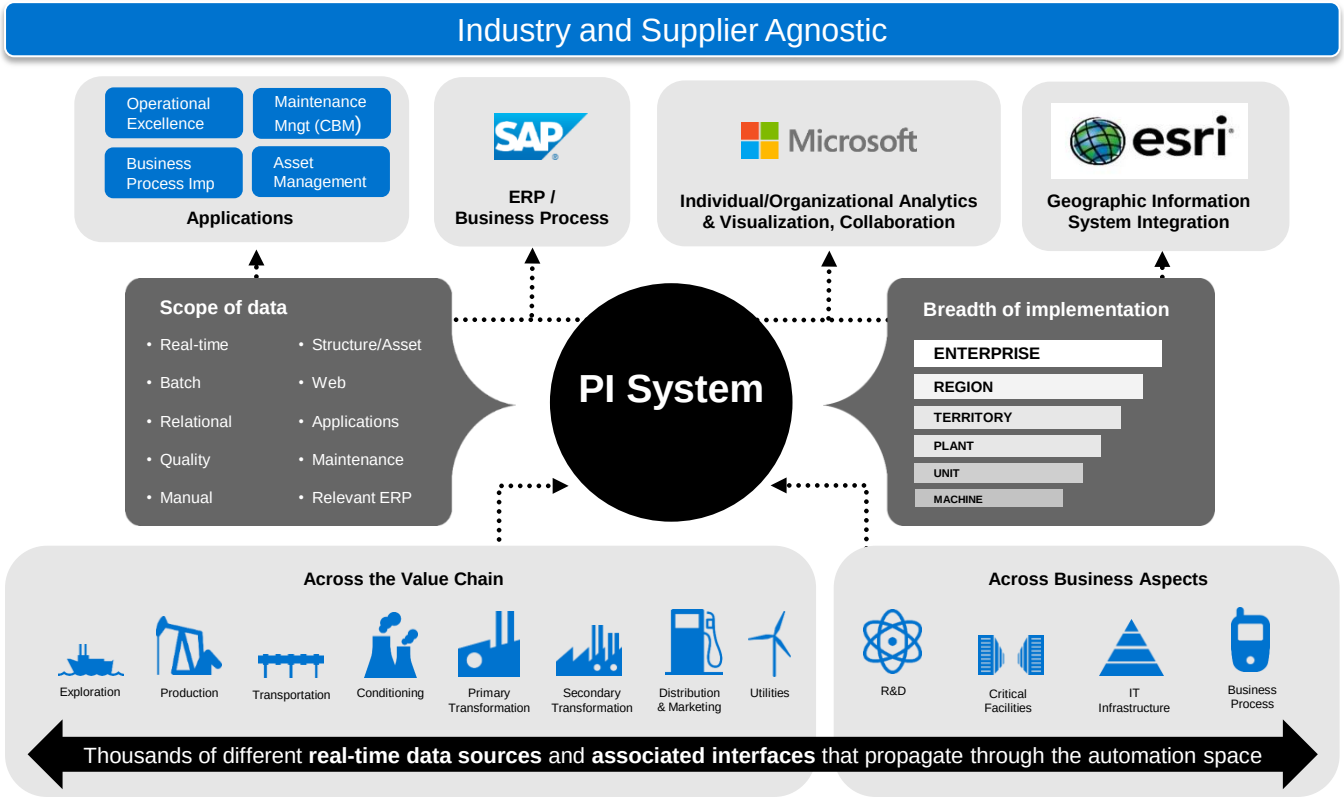
Benefits

- Calculate **true age** of the transformer using IEEE C57.91-2011 Loss of Life
- Use true aging factor to drive replacement algorithm
- Provides engineers with load & loss of life profiles
- Extrapolate/forecast data into future and past
- Excellent tool for calculating transformer end of life for future engineers (installing monitoring devices on new transformers)

Summary

Business Impacts: An agent for change

Renewable Integration	Real Time awareness	WAMS	CBM	Smart Grid	Advanced Analytics
RED ELÉCTRICA DE ESPAÑA	HELEN	BONNEVILLE POWER ADMINISTRATION	FINGRID	Xcel Energy	PSE&G
Better understanding about market behavior ***avoiding electrical grid impacts***	Integrating multiple data sources ***turning asset monitoring to proactive***	advanced WAMS applications provided ***early warning of system instability***	***2 transformer fault detection paid-off*** all the investment	Blending operational and meter data ***reduced network losses***	Use true aging factor to drive replacement algorithm ***maximized capital expenditures***



- Operational Excellence Program (OEP)
- Smart Asset Management (SAM)
- Condition Based Maintenance (CBM)
- Business Process Improvement (BPI)

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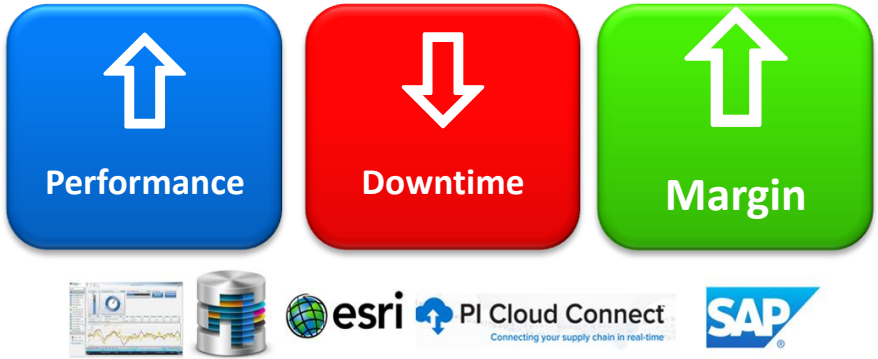
Proven Outcomes



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