OSIsoft.

# FEDERAL WORKSHOP 2014

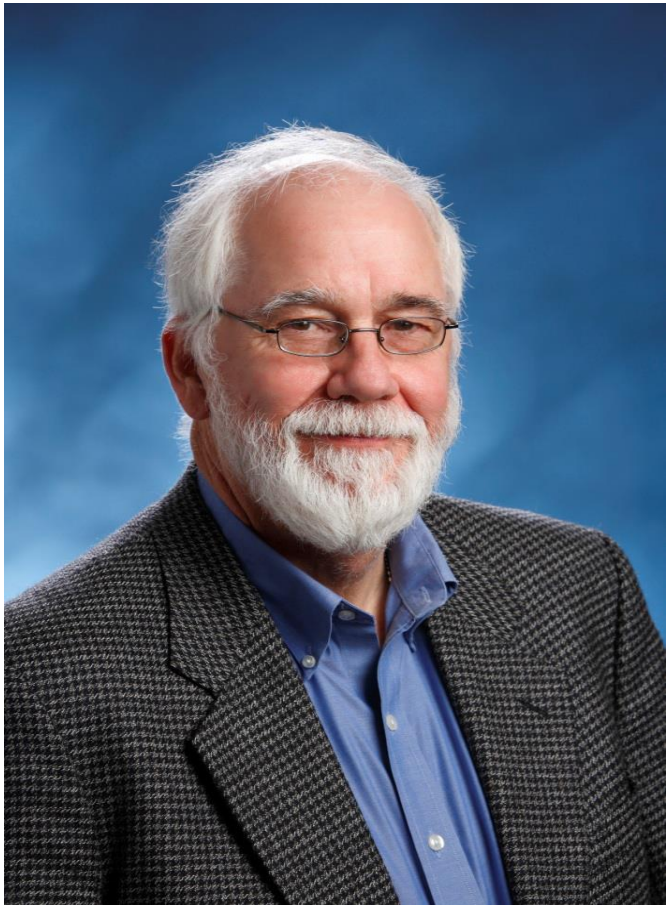
## The Power of Data

DECISION READY IN REAL-TIME

**June 19 Huntsville, Alabama**

# *Energy Security, Surety, Reliability and Situational Awareness – big idea!*

Presented by **Chris Crosby**
**OSIsoft Federal Workshop**
**Huntsville, AL**

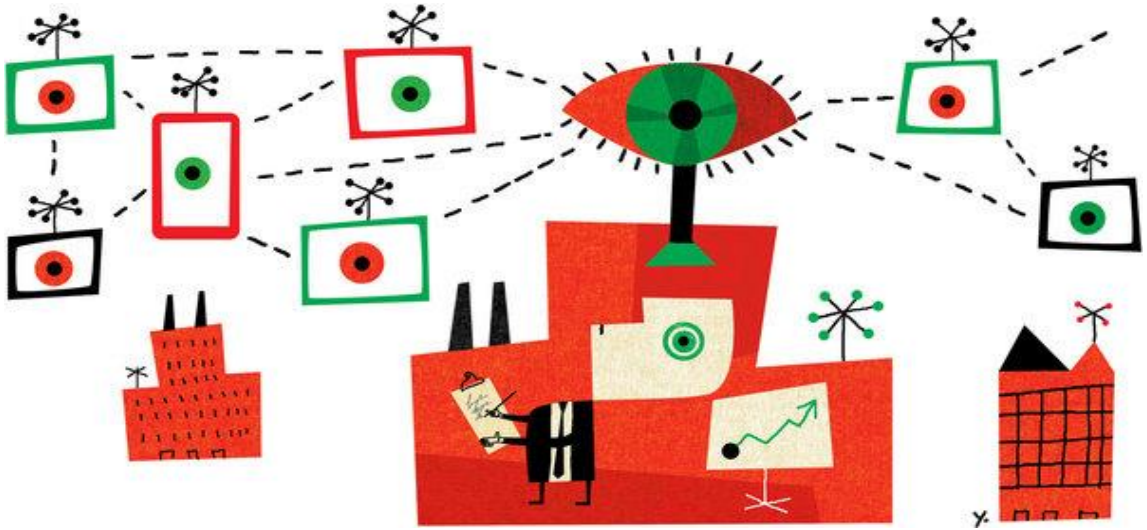


"Our mission is to maximize the VALUE our customers get from our product and services."

Dr. Patrick Kennedy

"OSIsoft and the PI System exist to make you smarter, more intelligent…enabling better decisions."

# No Such Thing as Too Much Information



**“Data Driven Decision Making Results in a Net Gain of 5 to 6 % on Output and Productivity.”**

Reference: Brynfjolfsson, et al., MIT, How does Data-Driven Decision making Affect Firm Performance, 2011.
http://www.nytimes.com/2011/04/24/business/24unboxed.html

“If you can’t measure it, you can’t manage it. If you can’t manage it, you can’t improve it.” Peter Drucker

# Laws, Directives, Policies – Humanitarian Responsibility!

*"Climate change could have significant geopolitical impacts around the world, contributing to poverty, environmental degradation, and the further weakening of fragile governments. Climate change will contribute to food and water scarcity, will increase the spread of disease, and may spur or exacerbate mass migration."*

-- Quadrennial Defense Review, U.S. Department of Defense, February, 2010

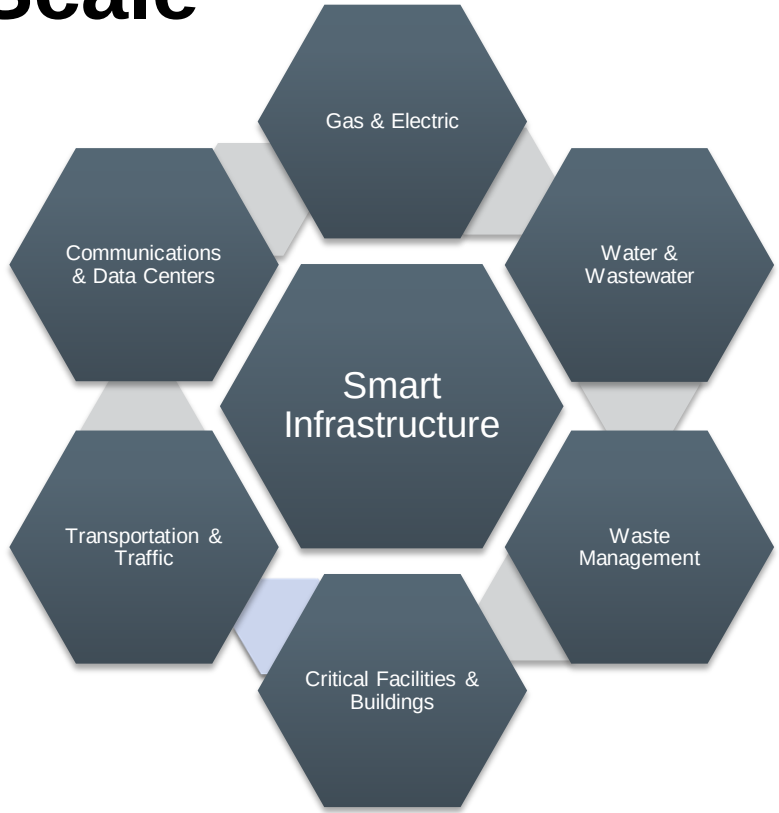
# ‘Smart’ Facilities – Cities, Campuses, Airports & Installations at Scale

## ‘Smart’ Installations

- Energy Management
  - Conservation
  - Efficiency
  - Renewable Production
  - Back-up Distributed Generation
  - Demand Response
  - Energy Storage
  - Microgrids
  - Sustainability
- Asset Optimization
  - Condition Based Maintenance
- Situational Awareness

## A Common Data Infrastructure that Connects All of the Various Physical Assets/Infrastructures

- Gas & Electric
- Water & Wastewater
- Solid Waste Management
- Transportation & Traffic
- Critical Facilities
- Communications & Data Centers
- Buildings



# OSIsoft Microgrid Activity

- UCSD (University California San Diego; smart campus and microgrid); use case available
- ESTPC Secure Automated Microgrid Energy System (SAMES); Feb 2014 demonstration plan available
- PowerStream Microgrid (LDC; Vaughan, Ontario)
- Answered FOA Microgrid Controller (real-time data infrastructure for all six team responses)
- SPIDERS: Smart Power Infrastructure Demonstration for Energy Reliability and Security (not yet, but Harold Sanborn is here today!)

# DOE Microgrid Definition

*A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.* *DOE FOA*

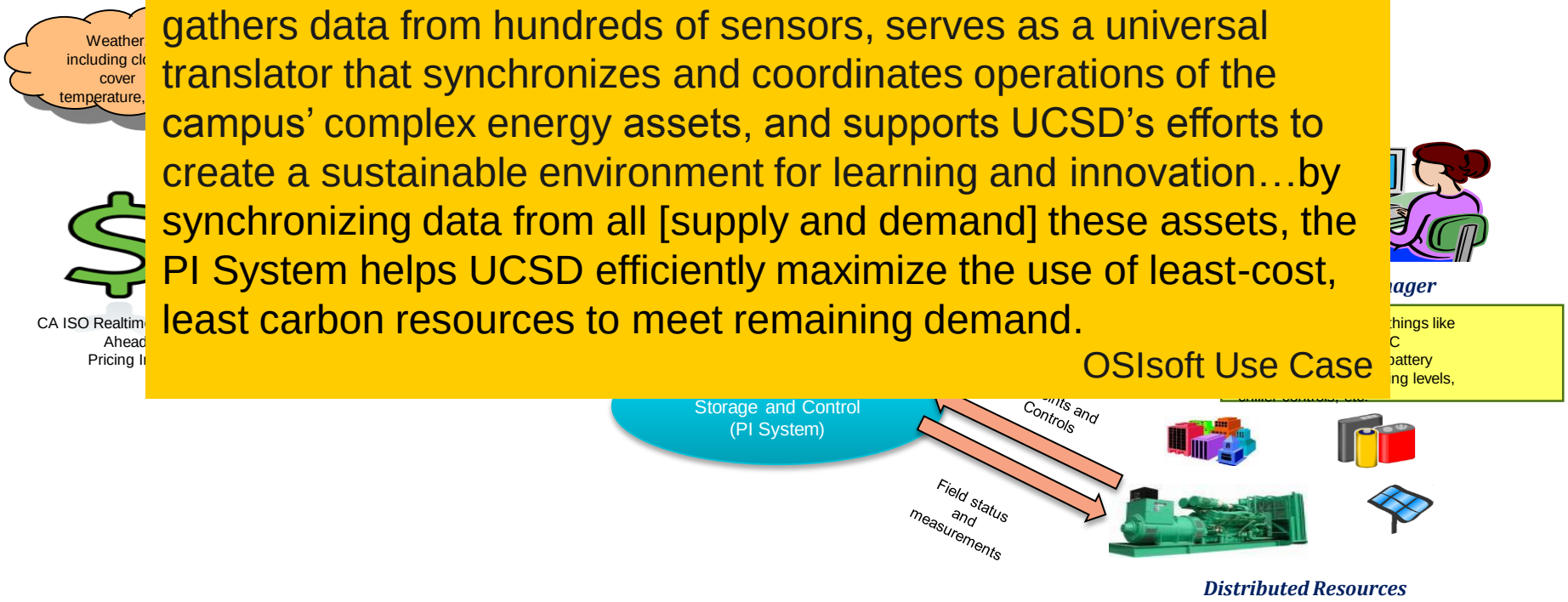
Presented by

# UCSD Microgrid -- Internationally Recognized

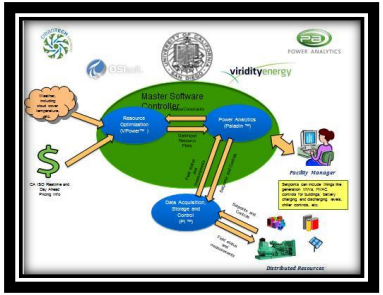
- 28,000 students and 28,000 faculty and staff
  - Daily population of 45,000
  - Size and complexity of small city
  - Two times density of commercial buildings (12 million sq ft)
- Peak load ~42 MW
- Self Generation 30 MW (92%)
- Solar PV ~1.5 MW
  - Soitec CPV (27.5 kW)
- Fuel Cell 2.8 MW
- Battery systems
  - Second life (60 kWh)
  - Peak shifting (30 kW/30 kWh)
  - 3 MW/6 MWH in Q3 2012

The cornerstone of this effort is the OSIsoft PI System, which gathers data from hundreds of sensors, serves as a universal translator that synchronizes and coordinates operations of the campus' complex energy assets, and supports UCSD's efforts to create a sustainable environment for learning and innovation…by synchronizing data from all [supply and demand] these assets, the PI System helps UCSD efficiently maximize the use of least-cost, least carbon resources to meet remaining demand.

OSIsoft Use Case

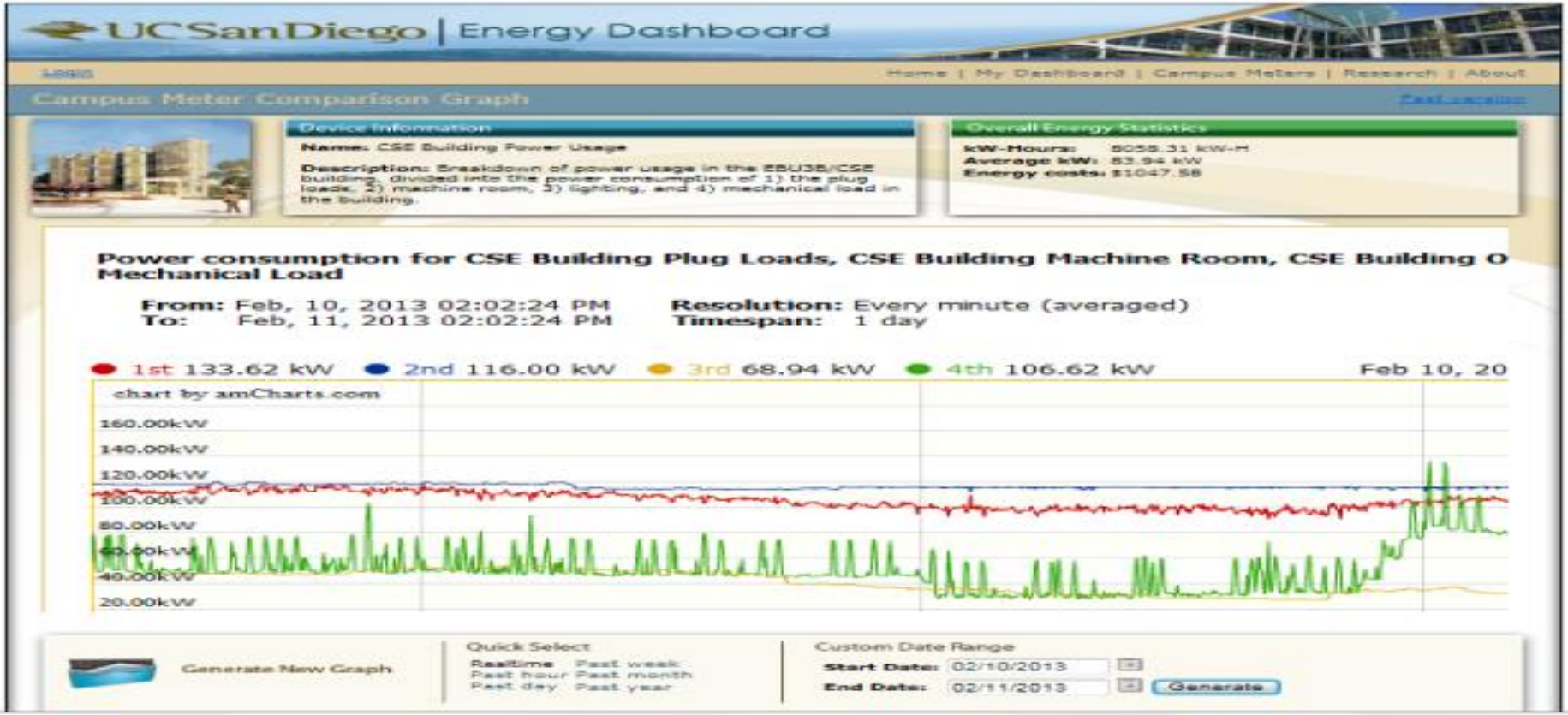


# OSIsoft PI Software

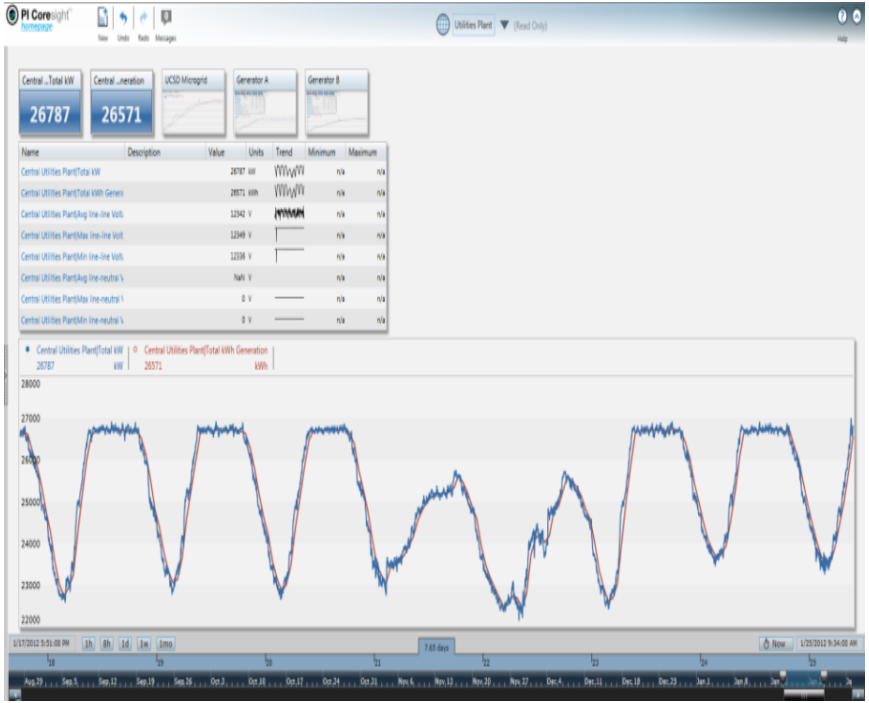



- Key Successes
  - Integration
    - >84,000 data streams across campus (Buildings, DER, CUP)
    - Microgrid Controller Integration (PA Paladin)
    - Grid Event Detection and Notification
  - Projects launched as a result
    - ESTCP for San Diego Navy Bases
    - Student Intern Projects
      - PMU Research – Advanced Warning
      - Buildings – KPIs, Visualization
    - CIEE – DMRI
  - Demonstration/Scaling
    - Site visits
    - Industry Events
    - Exposing RESCO data to UCSD/JSOE Faculty/Students for Open Innovation

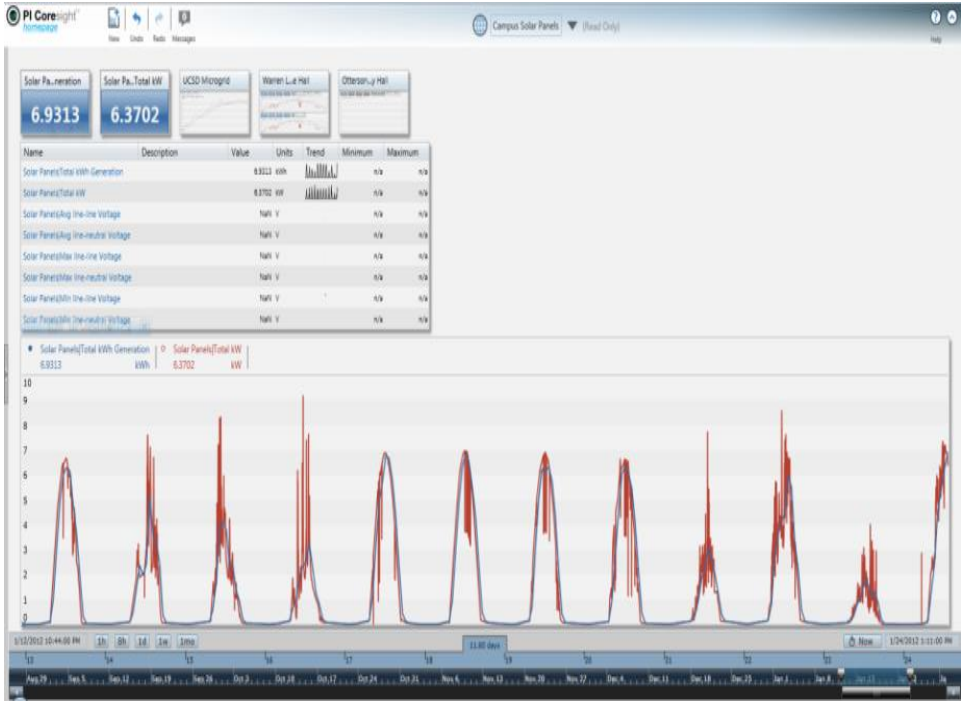
# UCSD – Energy Dashboard



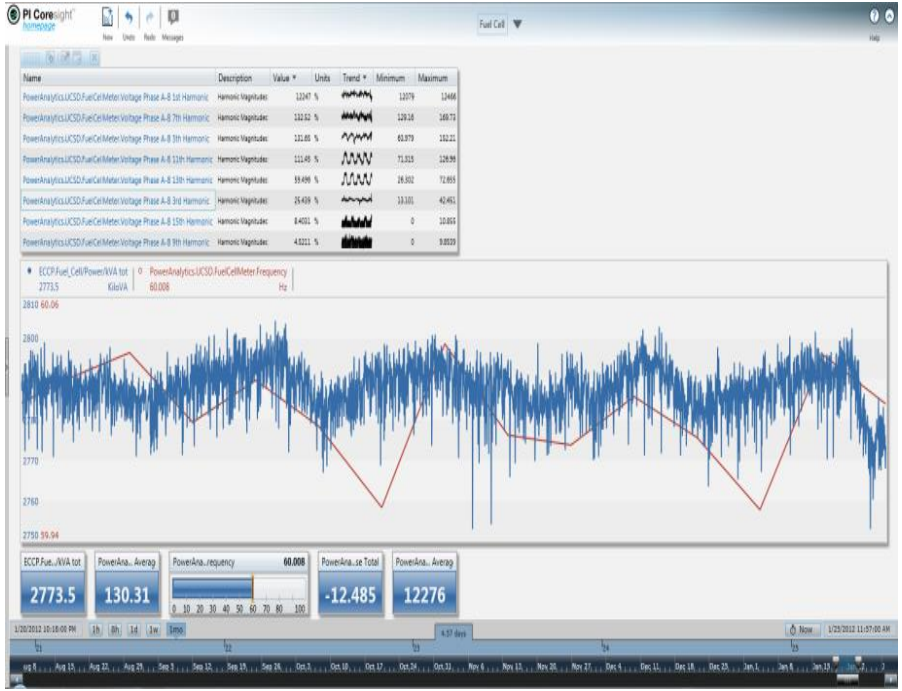
# Visualization – Gas Turbines




# Visualization – Solar Plants

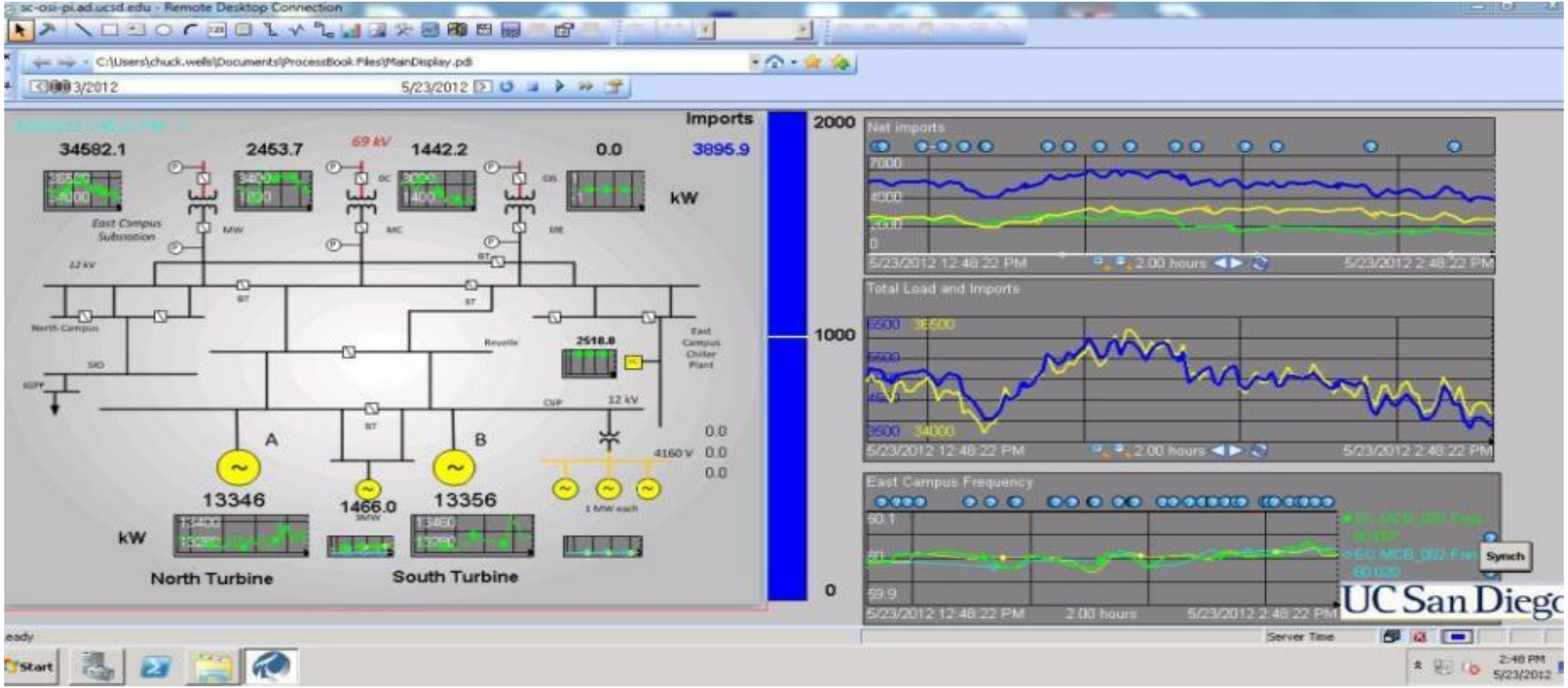


# Visualization – Fuel Cell




# Visualization – T&D Grid

# UCSD -- Campus Generation and Grid Monitoring



# ESTCP - Secure Automated Microgrid Energy System (SAMES)

The objective of SAMES is the creation and operation of a secure microgrid cluster. The cluster maximizes energy security and efficiency at the lowest possible operating cost. The microgrids are at three geographically separated naval bases in San Diego, with their monitoring and control combined in an enterprise-level system at the Naval Base San Diego Utility and Energy Operations Center.

The objective of SAMES is the creation and operation of a secure microgrid cluster.

A microgrid is either a physical or virtual combination of energy assets (loads and generation) which can be disconnected from the local grid. Single microgrids have proven their value in reducing cost and improving reliability in the commercial sector. However, the aggregation of microgrids into a “cluster”, bringing greater benefits in economies of scale, enhanced reliability and greater value in the marketplace, has not yet been proven.

This will be the first instance of the creation of a centrally managed cluster of microgrids in a cyber-secure military environment. It offers great potential to improve energy security, reduce costs, and fully integrate renewable energy sources into a base electrical infrastructure at facilities world-wide.

Environmental Security Technology Certification Program (ESTCP)

# ESTCP – SAMES Scope

Power Analytics' approach is based on technologies being demonstrated at the UCSD microgrid, the Federal

"Power Analytics' approach is based on technologies being demonstrated at the UCSD microgrid, the Federal Aviation Administration (FAA), and several mission critical data centers…We will link microgrids at the three navy bases and place an enterprise-level command and control system into the existing Utility and Energy Operation Center (UEOC) at Naval Base San Diego.

management. Spirae provides the real-time control. OSIsoft provides real-time data acquisition from the control system sensor network and a data warehouse repository. Conner Networks provides network cyber security and secure automatic generator control.

# ESTCP - SAMES

SAMES uses a secure, multi-tiered architecture with proven software components configured for DOD. The database layer has a temporal data store and archiving to manage time-series energy data and a relational data warehouse to

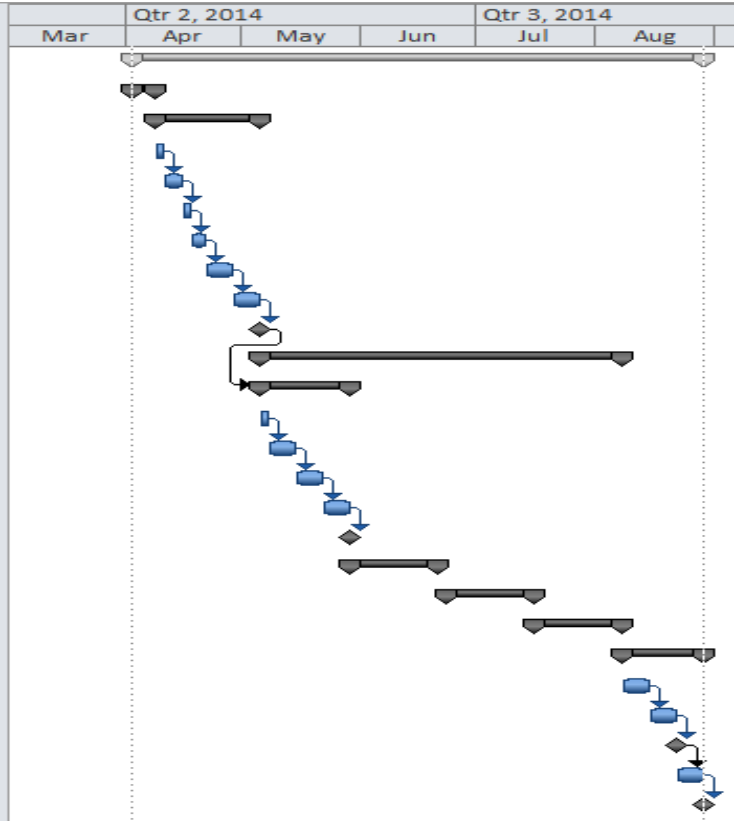
The database layer has a temporal data store and archiving to manage time-series energy data and a relational data warehouse to support associated asset context, business intelligence, situational awareness, and reporting requirements.

The application layer provides business logic for managing energy consumption and delivering alerts, and analytics to improve commercial value and decision making.

The web layer provides secure access to the user interface through tokenization and credential management.

# ESTCP – SAMES Testing Schedule

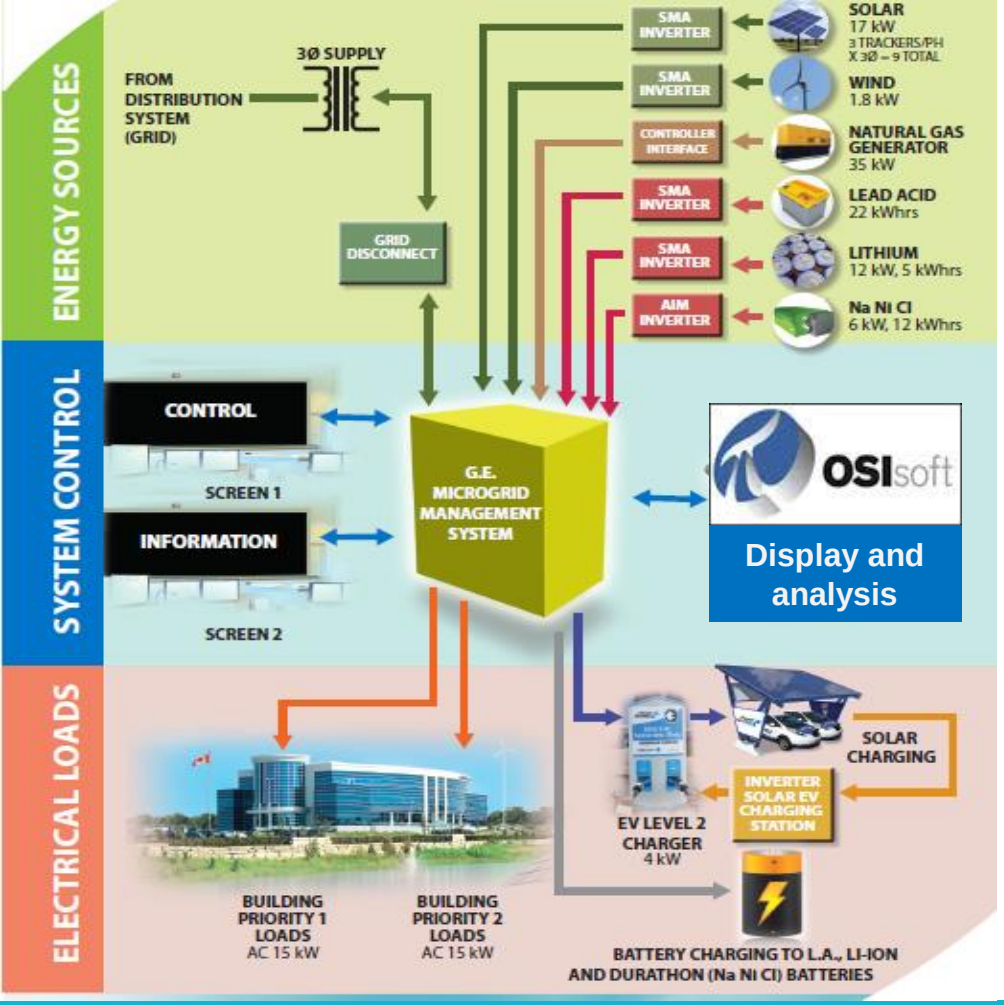
| Task Name | Dur | Start |
|---|---|---|
| **SAMES Testing Subschedule (Plan Sec. 5.4)** | **106 d** | **04/03/2014** |
| **Pre-test system check** | **4 d** | **04/03/2014** |
| **Create control and analysis scenarios for microgrid use cases** | **19 d** | **04/09/2014** |
| Install use-case scenarios | 2 d | 04/09/2014 |
| Dry-run use-case scenarios | 3 d | 04/11/2014 |
| Adjust use-case scenarios | 2 d | 04/16/2014 |
| Re-run use-case scenarios multiple operating conditions | 2 d | 04/18/2014 |
| Adjust use-case scenarios / create sub-scenarios | 5 d | 04/22/2014 |
| Optimize use-case scenarios and sub scenarios for benefits | 5 d | 04/29/2014 |
| Use case offline testing and optimization complete | 0 d | 05/05/2014 |
| **Microgrid use-case testing** | **68 d** | **05/06/2014** |
| **Use case 1** | **17 d** | **05/06/2014** |
| Enact Use case 1 | 2 d | 05/06/2014 |
| Data collection period for Use case 1 | 5 d | 05/08/2014 |
| Adjustments to Use case 1 scenarios | 5 d | 05/15/2014 |
| Re-run Use case 1 and collect data | 5 d | 05/22/2014 |
| End Use case 1 | 0 d | 05/28/2014 |
| **Use case 2** | **17 d** | **05/29/2014** |
| **Use case 3** | **17 d** | **06/23/2014** |
| **Use case 4** | **17 d** | **07/16/2014** |
| **Post-test analyses and findings** | **15 d** | **08/08/2014** |
| Analyze results | 5 d | 08/08/2014 |
| Document findings | 5 d | 08/15/2014 |
| Submit interim report | 0 d | 08/21/2014 |
| Adjust use case scenarios | 5 d | 08/22/2014 |
| **Testing subschedule complete** | **0 d** | **08/28/2014** |



# PowerStream's Micro Grid Project

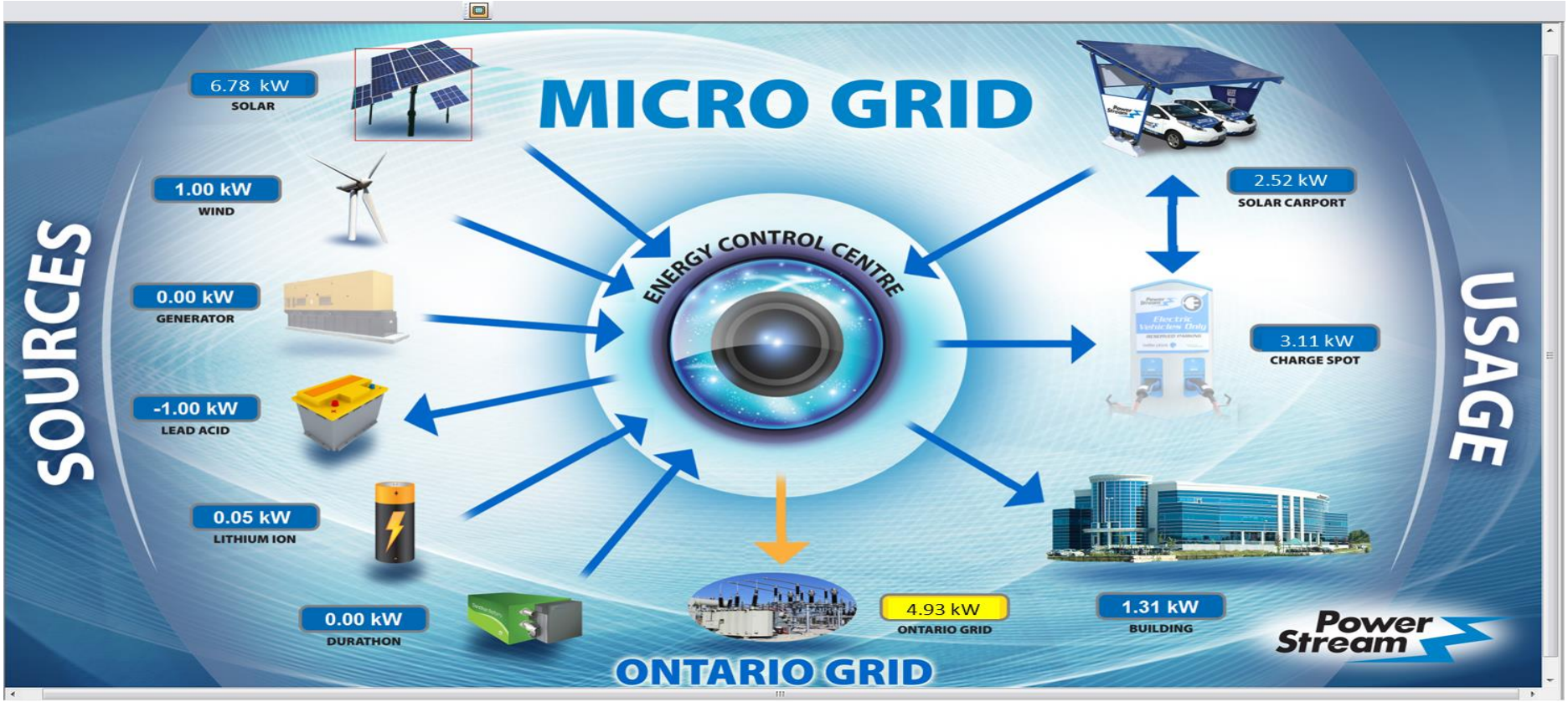
# PowerStream -- Micro Grid Project Details


- Launched the Micro Grid demonstration project in November 2013 at its head office in Vaughan, Ontario.
- Using the project to evaluate a Micro Grid's performance while it is connected to, and also disconnected from, the provincial grid.




- 25 kW Renewables
  - Solar
  - Wind
- 35 kW Natural Gas Generator
- 40 kWh storage
  - Batteries
    - Lead Acid
    - Lithium
    - Na Ni CL
- 30 kW load

# PowerStream -- PI ProcessBook Micro Grid Display



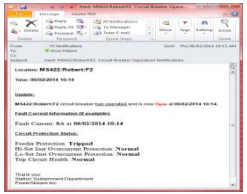
# PI System Benefits – PowerStream Micro Grid Project

**Real-Time Display**

- Intuitive Display
- Various displays catering to different audiences
- Drilldown user interface


**Notifications / Alarms**

- Notifications and alarms (Real-time)



**User Friendly Simple Tools**

- Multiple report options
- Historical data
- Mobility (Smartphone, tablet)

# Phase 2 (Now Underway)

- Further test the system under different operating scenarios:
  - minimizing costs of operation,
  - maximizing use of renewables, and
  - reducing peak loads.
- PowerStream will also collect data that will analyze the performance of the system, including "lessons learned".
- We expect to include new generating technologies such as fuel cells and electric vehicles to grid support.
- Over the longer term, PowerStream expects to install a Micro Grid on a larger scale, one that will connect directly to power lines and that will serve larger loads.

# DOE Funding Opportunity Announcement FOA-0000997 (FOA)

One of the key components in this FOA is to develop a near commercial grade microgrid controller suitable for improving energy security for communities with internal generation between 1 and 10 MW.

The specific performance targets for the project are listed on page 7/67 of the FOA:

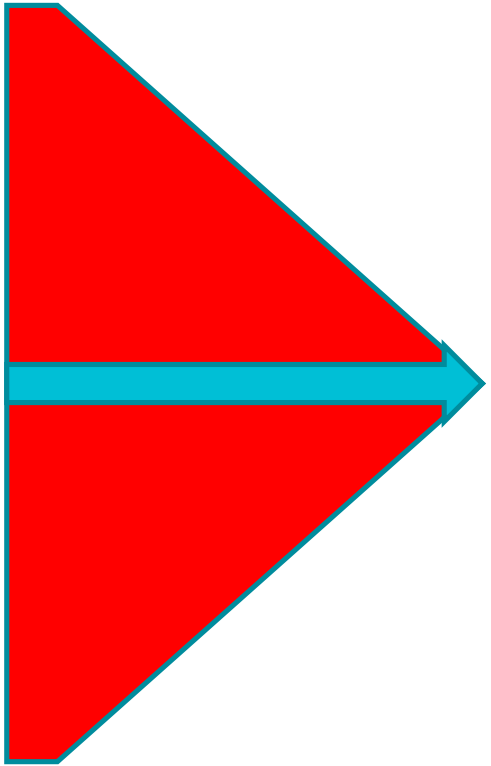
- Reducing outage time of critical loads by >98 percent
- Reducing emissions by > 20 percent
- Improving system energy efficiency by > 20 percent

Certain intellectual property owned by OSIsoft might be used

| | PAT. NO. | | Title |
|---|---|---|---|
| 1 | 8,498,752 | T | Decoupling controller for power systems |
| 2 | 8,457,912 | T | Unwrapping angles from phasor measurement units |
| 3 | 7,961,112 | T | Continuous condition monitoring of transformers |
| 4 | 7,755,371 | T | Impedance measurement of a power line |
| 5 | 7,607,913 | T | CO controller for a boiler |
| 6 | 7,498,821 | T | Non-linear observers in electric power networks |
| 7 | 7,490,013 | T | Power grid failure detection system and method |

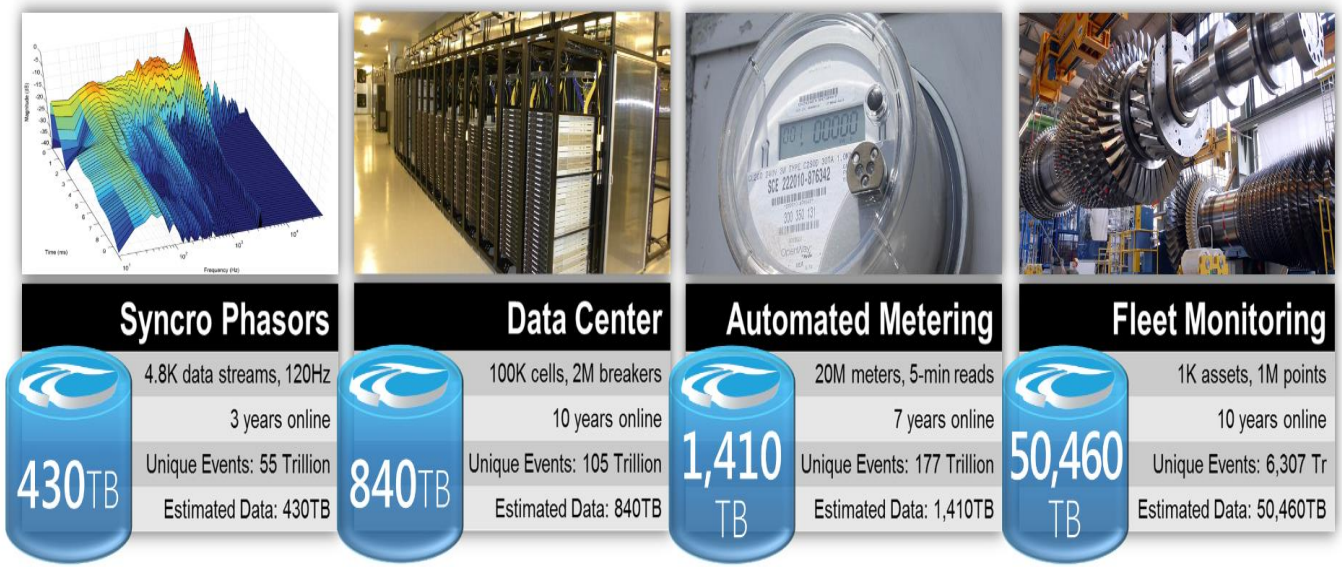
# Technology Trends Enabling Reliability

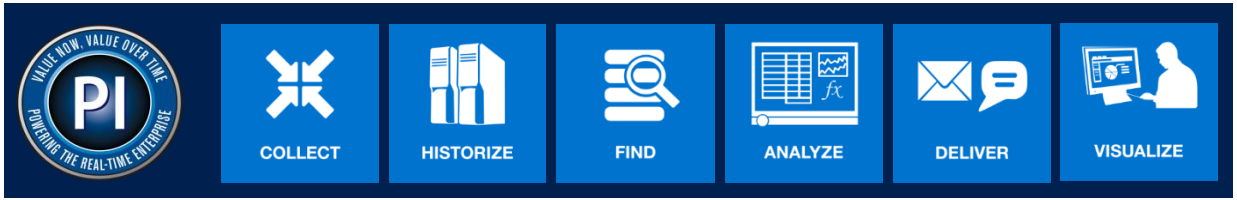
- Digitalization
- Sensors costs
- Wireless
- Historian evolution
  - Asset perspective
  - Complex event streaming
  - Multiple data types
  - Thick and thin client visualization tools
- Interfacing made easy
- OT to IT integration
- Internet of Things
- Predictive analytics/advanced pattern recognition



Lower cost & time saving methods to improve equipment reliability!

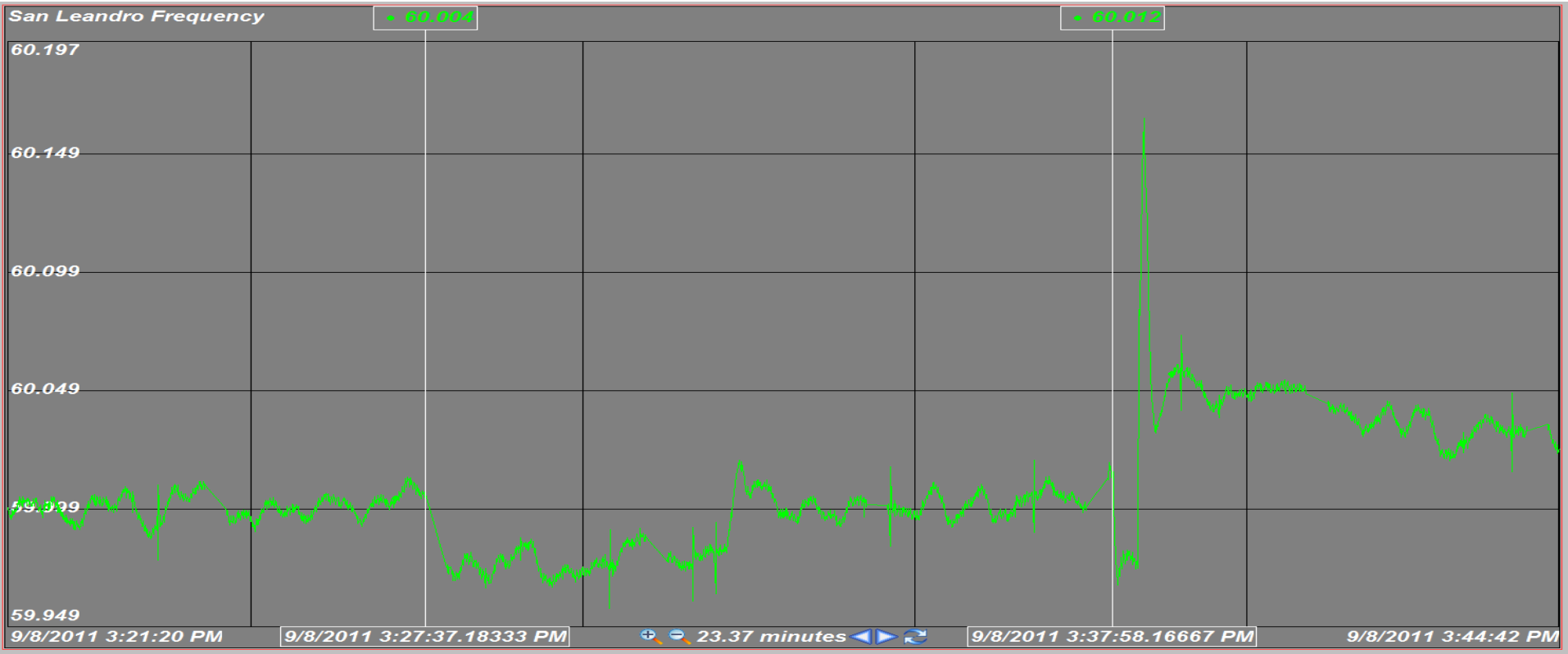
# PI Server 2012 – Scalability & High-Throughput



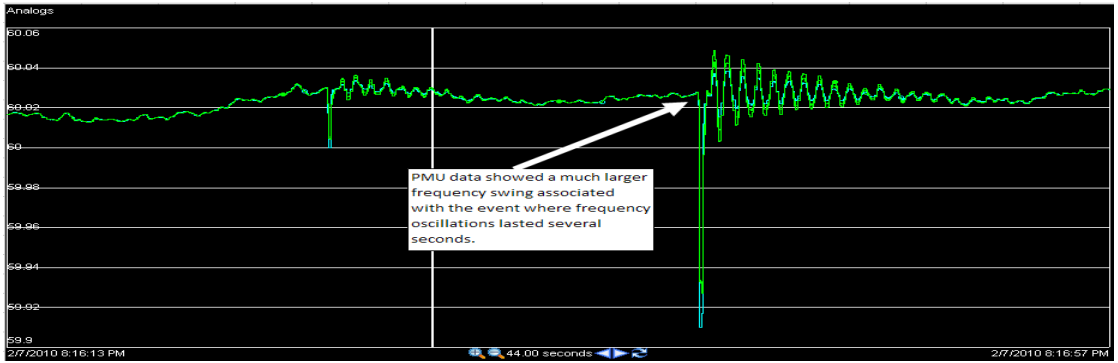

| PI Server | 2012 |
|---|---|
| Max Point Count | $20 \times 10^6$ |
| Max Data In Rate | $1 \times 10^6$ ev/sec |
| Max Data Out Rate | $10 \times 10^6$ ev/sec |
| Online Archives | 50,000 archives |
| Real-time Updates | $10 \times 10^6$ sign-ups |
| Point Changes | 2,000 points/sec |
| | |

# Improved PMU Monitoring Would Have Provided a 10-Minute Warning on the September 8, 2011 Southern CA Outage



# Phasor Measurement Units – PI and PMUs


**Phasor data provides granularity not possible in SCADA. It's like MRI compared to an X-ray!**




# Definition of CBM – Maintenance and Monitoring

Predictive maintenance is also frequently referred to as "condition-based maintenance."

Organizations that place a priority on increasing physical asset reliability and availability can realize significant value from connecting their predictive maintenance applications [and real-time asset and process data] with higher level systems, since the resulting decision-support capabilities can help drive appropriate workforce actions…Ideally, all systems [sources of data] should be connected in real time.

Condition-based maintenance (CBM) is a methodology that combines predictive and preventive maintenance with real-time monitoring. OSIsoft CBM Paper

ARC Insights (ARC and Plant Services), June 28, 2012

# Definition of CBM – Maintenance and Monitoring

With increased data throughput and higher data resolutions, historians have evolved to become a tool for managing plant assets thanks in part to new visibility and trending tools.

Today's historians also support techniques, such as complex event processing, which can analyze multiple streams of plant data in real time to identify and diagnose emerging problems before they can disrupt production.

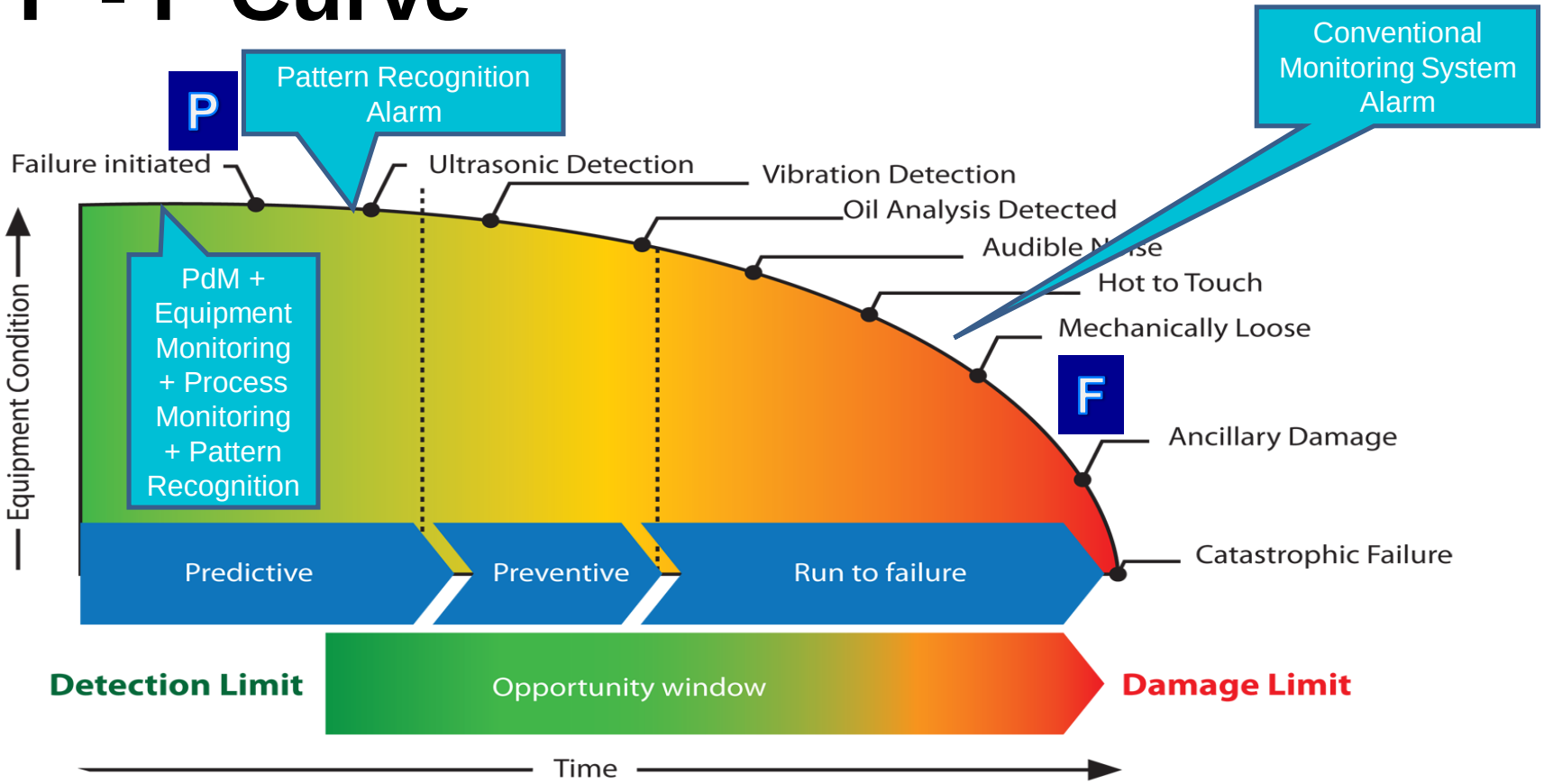
**ARC Recommends…**

Invest in predictive maintenance solutions with real-time analytics functionality that provide the ability to perform dynamic or real-time calculations and to compare current and historical data.

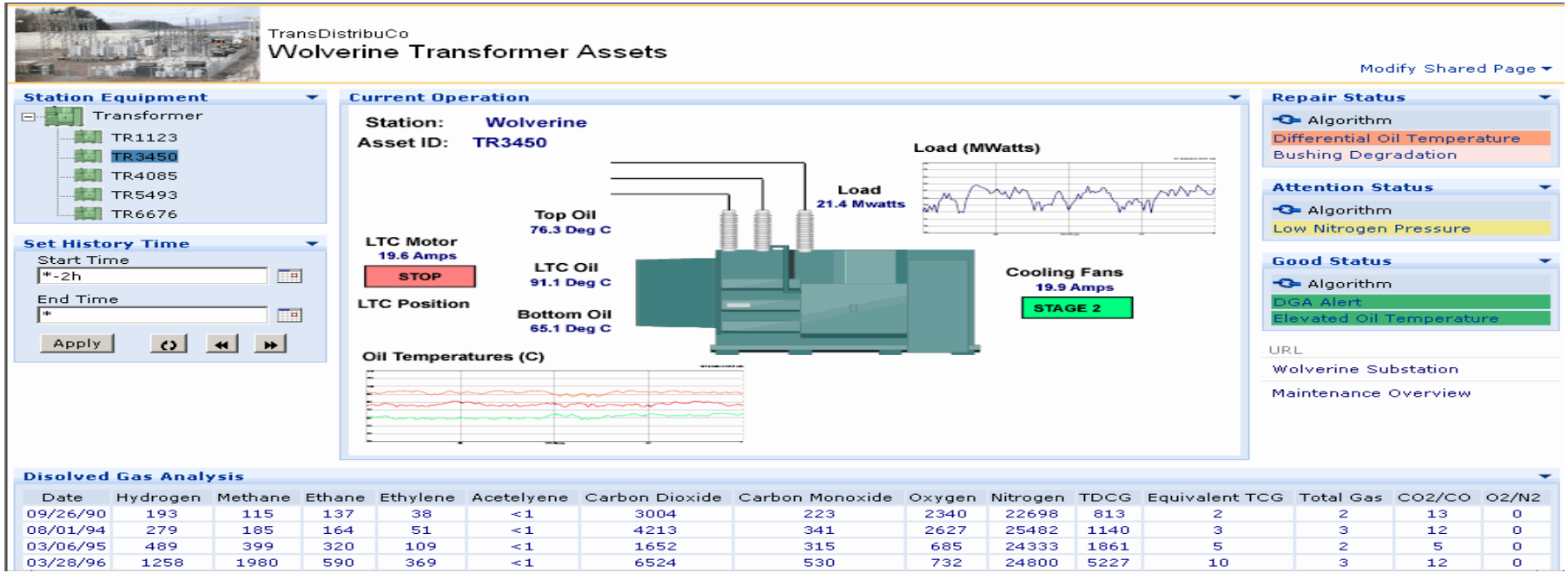
…the ability to easily integrate multiple applications is key for successful predictive maintenance implementations. Integrating allows the workforce to gain additional insight to optimize asset availability and utilization while balancing operational constraints to improve financial results.

ARC Insights (ARC and Plant Services), June 28, 2012

# P - F Curve


Conventional Monitoring System Alarm
P
Pattern Recognition Alarm
Failure initiated
Ultrasonic Detection
Vibration Detection
Oil Analysis Detected
Audible Noise
Hot to Touch
Mechanically Loose
F
Ancillary Damage
Catastrophic Failure
PdM + Equipment Monitoring + Process Monitoring + Pattern Recognition
Equipment Condition
Predictive
Preventive
Run to failure
Detection Limit
Opportunity window
Damage Limit
Time

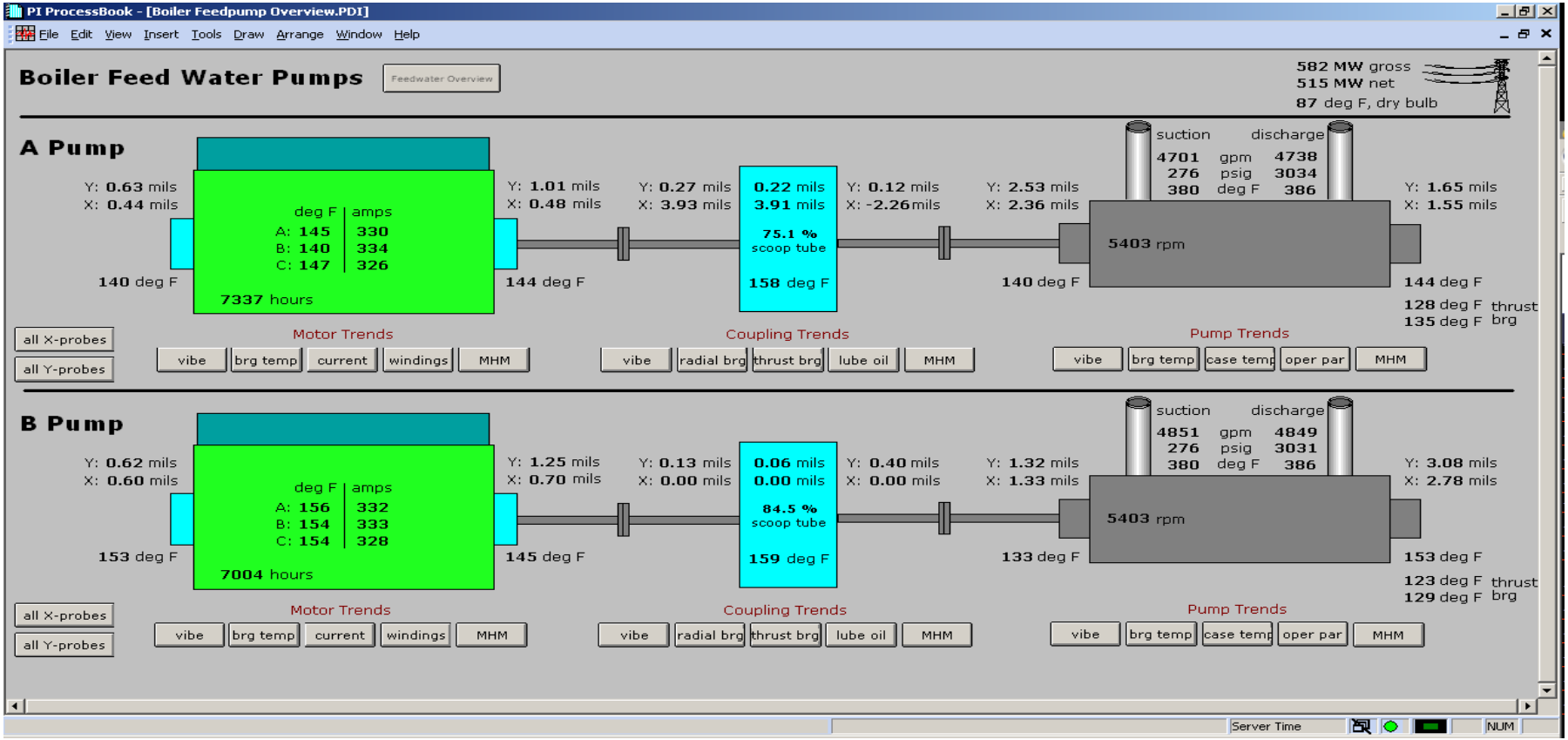
# CBM - Asset Detail



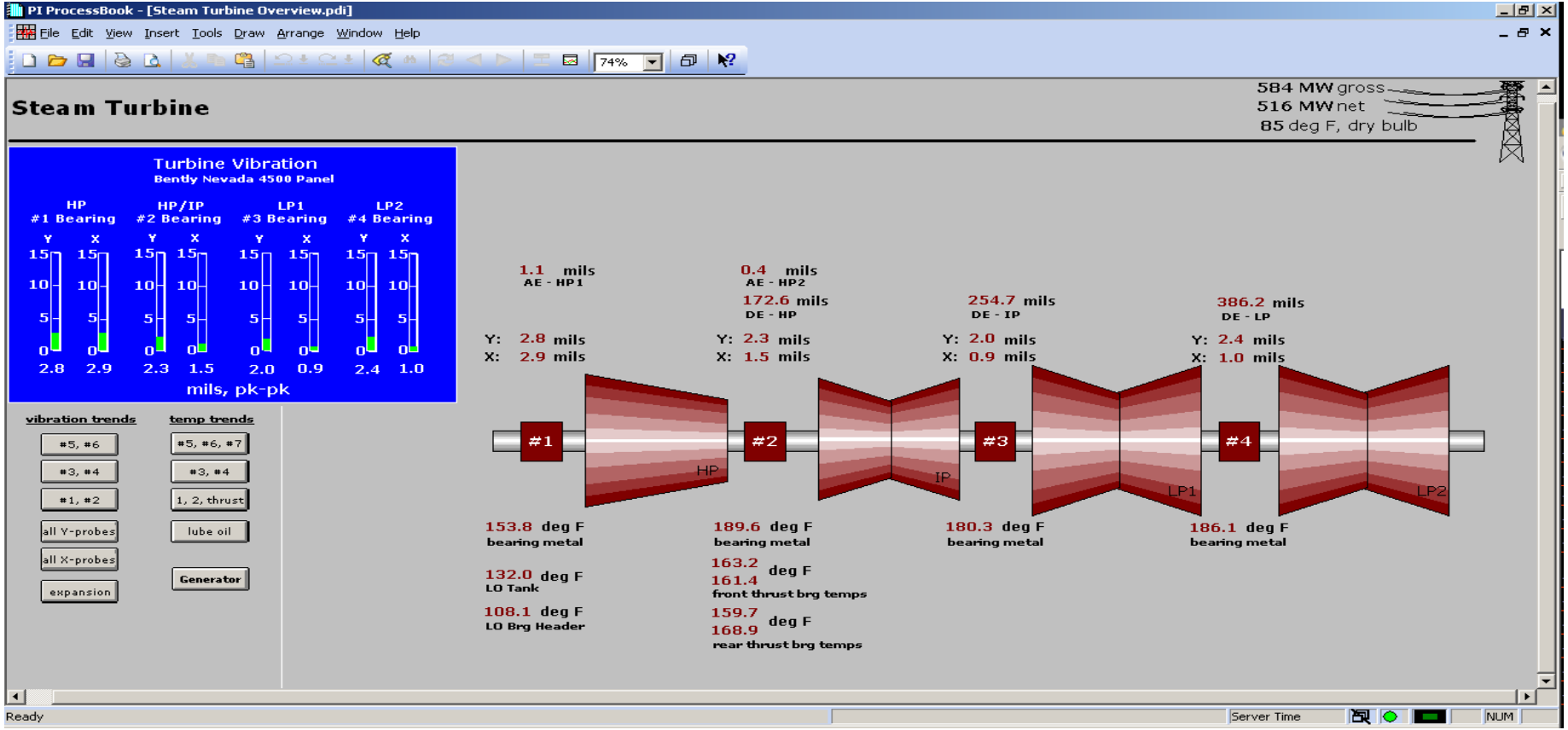

| Date | Hydrogen | Methane | Ethane | Ethylene | Acetelyene | Carbon Dioxide | Carbon Monoxide | Oxygen | Nitrogen | TDCG | Equivalent TCG | Total Gas | CO2/CO | O2/N2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 09/26/90 | 193 | 115 | 137 | 38 | <1 | 3004 | 223 | 2340 | 22698 | 813 | 2 | 2 | 13 | 0 |
| 08/01/94 | 279 | 185 | 164 | 51 | <1 | 4213 | 341 | 2627 | 25482 | 1140 | 3 | 3 | 12 | 0 |
| 03/06/95 | 489 | 399 | 320 | 109 | <1 | 1652 | 315 | 685 | 24333 | 1861 | 5 | 2 | 5 | 0 |
| 03/28/96 | 1258 | 1980 | 590 | 369 | <1 | 6524 | 530 | 732 | 24800 | 5227 | 10 | 3 | 12 | 0 |

The Asset Detail shows the current operation and alert status of each maintenance algorithm used to assess the asset's condition. Note that the graphic displays all the key operating variables that contribute to the asset's maintenance health assessment.

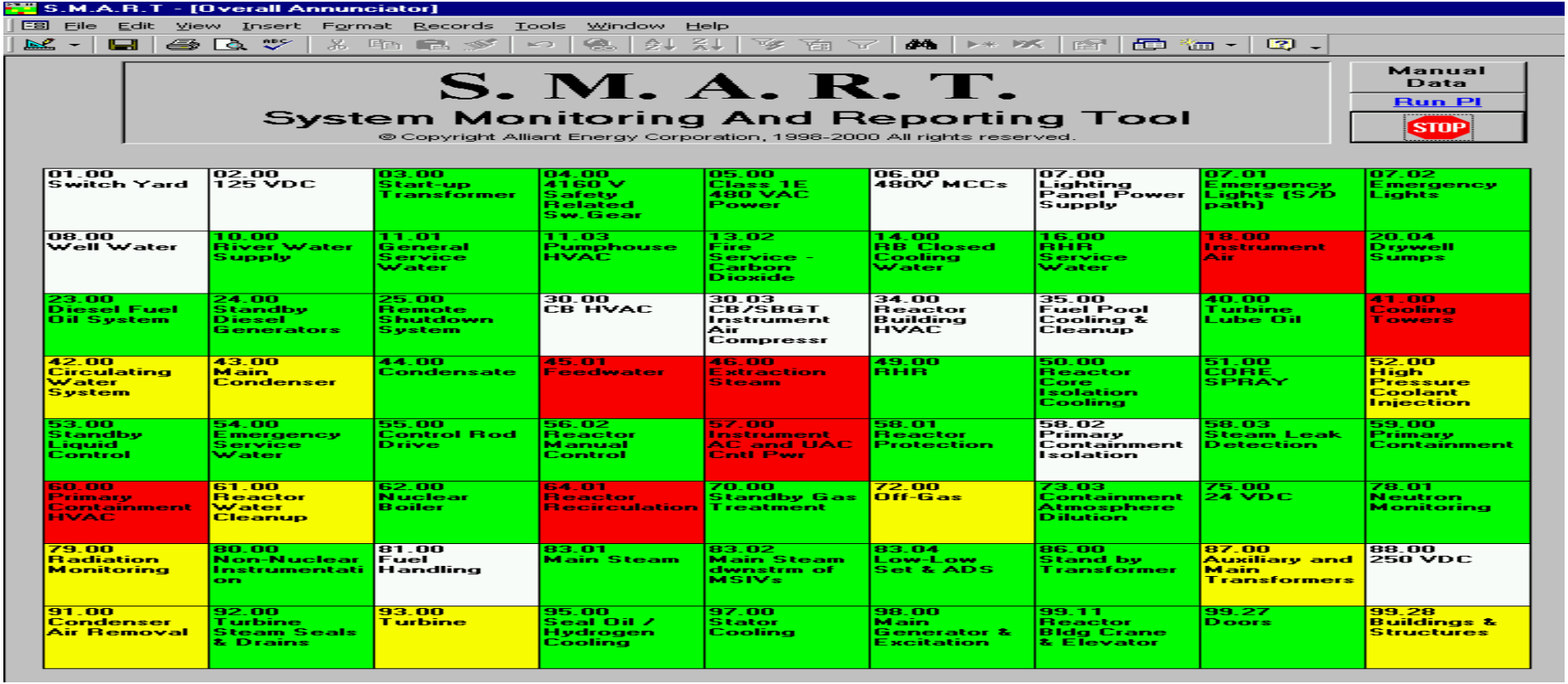
# CBM Monitoring



# CBM Monitoring



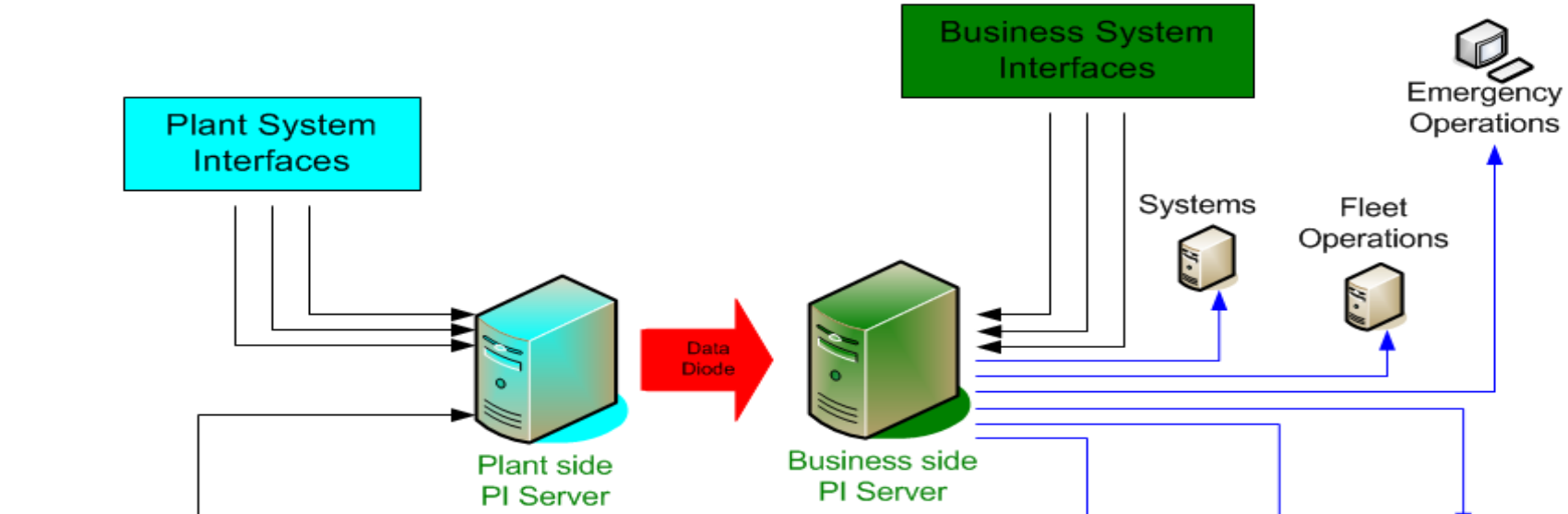
# Alliant Nuclear Energy – S.M.A.R.T



# Exelon Nuclear – Advanced Monitoring, Diagnostics and Prognostics Purpose

- ✓ Build Advanced Monitoring infrastructure capable of significant advancement in system ***monitoring***, ***diagnostics*** and ***prognostics*** capabilities
- ✓ Leverage technology for system and component monitoring and obtain critical plant data in OSIsoft PI data historian
- ✓ Improve plant safety by quickly identifying plant anomalies and initiate corrective or mitigative actions
- ✓ Improve plant reliability and maximize availability of safety systems in operator hands
- ✓ Utilize critical plant resources for data analysis and diagnostics rather than data collection
- ✓ Utilize wireless infrastructure to enhance equipment monitoring and switch limited Time Based PMs to Condition Based PMs
- ✓ Optimize Exelon preventive maintenance (PM) strategy
- ✓ Operate nuclear plants sustainably protecting public safety and gain public trust

# Exelon IT Architecture/Nuclear Plant (PI)




| | |
|---|---|
| **Server Hardware:** | HP ProLiant DL360p Gen8 |
| **RAM:** | 32 GB |
| **CPU:** | 2 x 8 Core; 2.9 GHz |
| **OS:** | WIN SERVER 2008 |
| **PI Version:** | 3.4.380 |

# Exelon Nuclear – Advanced Monitoring, Diagnostics and Prognostics Benefits

✓Engineering

- ~10% system engineer's work load reduction by transferring engineering monitoring and trending function to On-Line Monitoring
- ~30% of unexplained equipment failure can be better understood due to improved wireless equipment monitoring capabilities

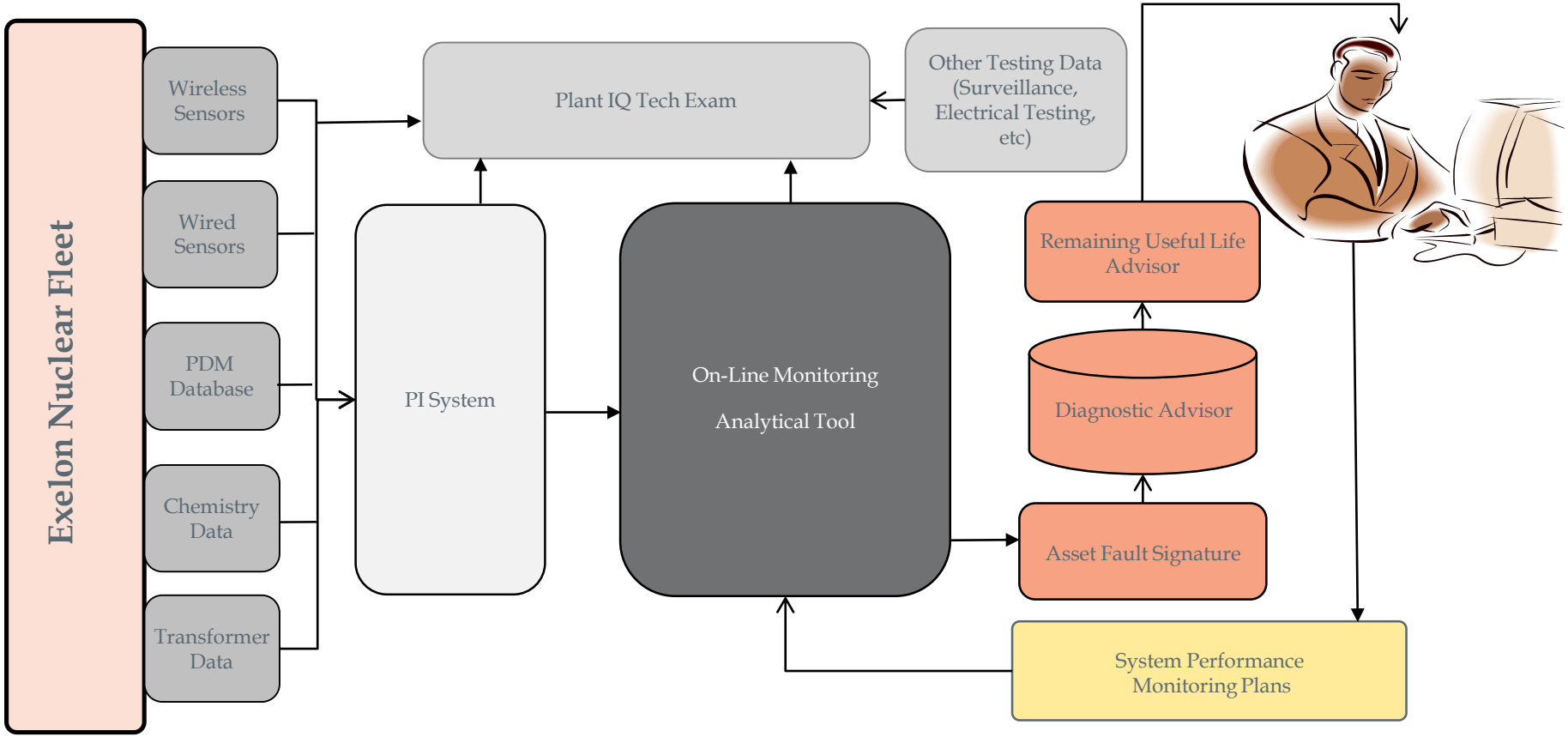
✓Operations

- ~10% Ops rounds optimization by aligning local panel data to data historians
- Dose reduction by remotely monitoring local data and reducing entry into high dose areas

✓Maintenance

- ~50% of vibration specialist efficiency improvement due to on-line vibration data through wireless equipment monitoring
- Better vibration analysis since the expert will spent more time in diagnostics and less in data collection
- ~20% PM reduction by switching Time Based PM to Condition Based PM

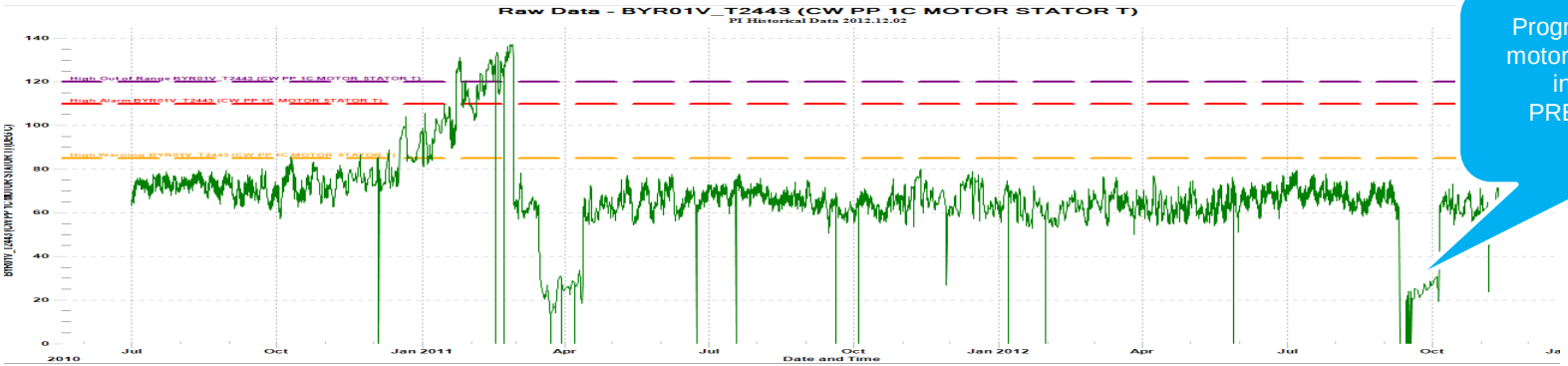
# Exelon Nuclear -- Advanced Monitoring



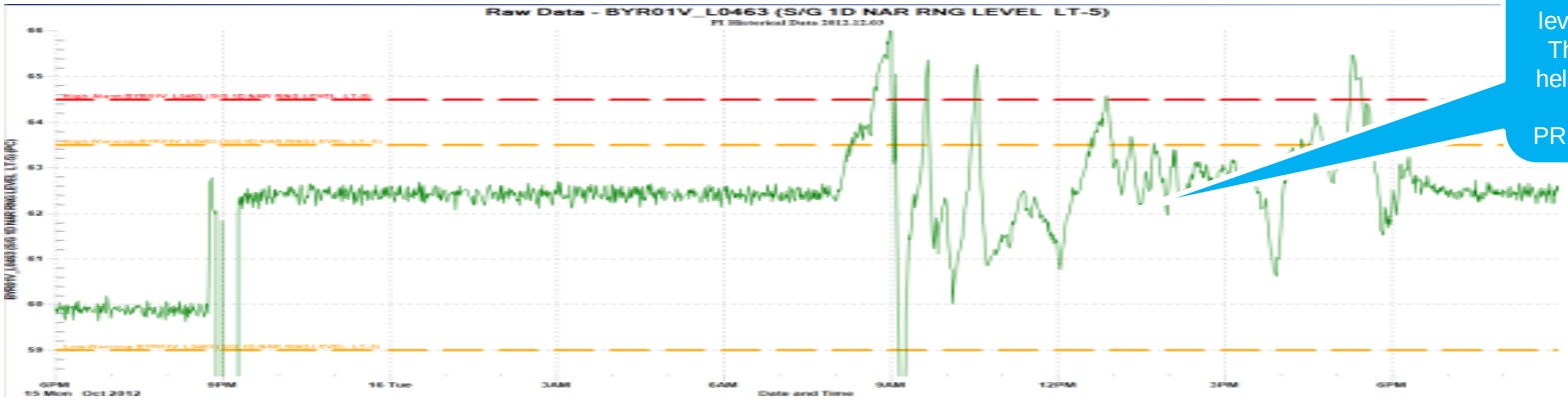
# On-Line Monitoring (OLM)

- ✓The OLM program is a pattern recognition application that monitors plant parameters in real time
- ✓The program acquires raw data from OSIsoft PI
- ✓Designed to provide early identification of degrading trends
- ✓The real time plant data is continuously compared with historical good data
- ✓Any deviation identified by the program is notified automatically to plant staff via email or pager
- ✓Program is currently used by engineering, maintenance and operations
- ✓The Exelon's OLM program is a de-centralized model to improve efficiency of plant staff

# OLM Catches




Program identified CW motor degradation at an incipient stage. PREVENTED UNIT DERATE



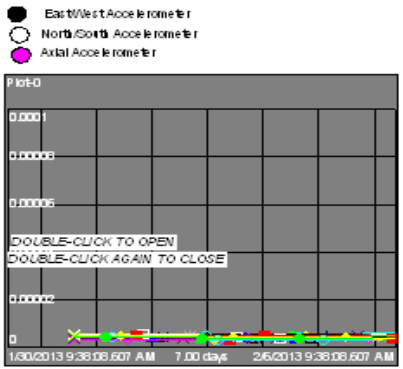

Program identified SG level control card failure. The early identification help operators to control level in manual. PREVENTED UNIT TRIP

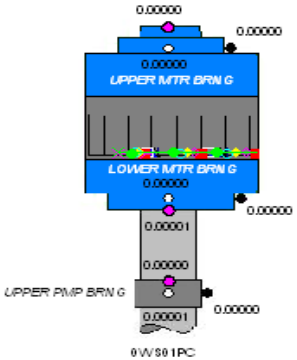
# Prognostic Health Management (PHM)

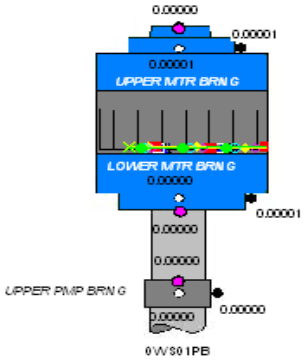
- ✓ An integrated suite of web-based diagnostic and prognostic tools and databases
- ✓ Automated format of Exelon Troubleshooting process
- ✓ Capture human knowledge and retain it in digital format (KT&R)
- ✓ Collaborative project with EPRI and INL
- ✓ Exelon is deploying software for the following projects
  - Diesel Generator
- ✓ Elements of PHM

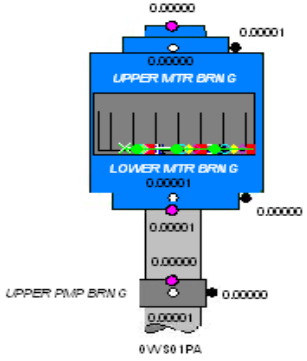
| | |
|---|---|
| Diagnostic Advisor | Identifies impending failures by comparing asset fault signatures with operating data |
| Asset Fault Signature Database | Organizes asset fault signatures collected from Exelon and across the industry |
| Remaining Life Advisor | Estimates how long an aging or faulty asset will continue to provide reliable service |
| Remaining Useful Life Database | Organizes asset remaining life signatures collected from Exelon and across the industry |

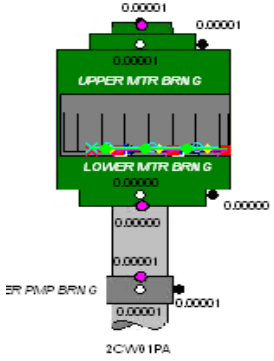
# Recirculating Water Pump Vibration Monitoring

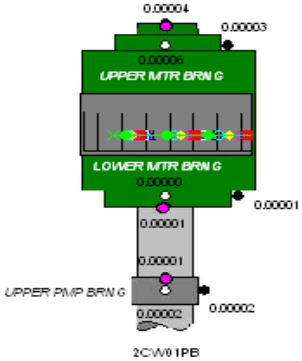


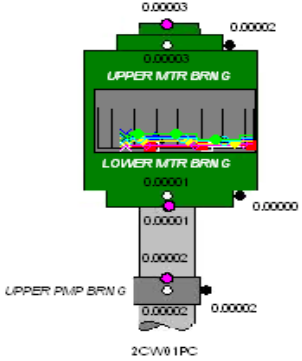



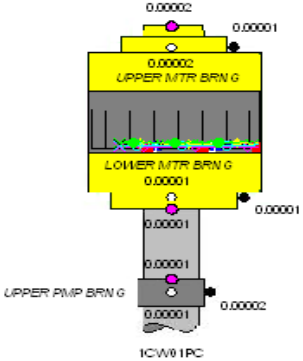



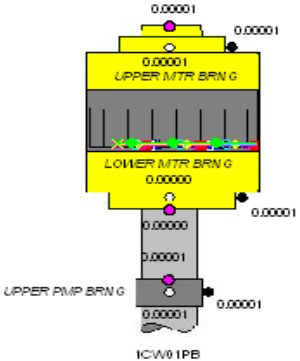



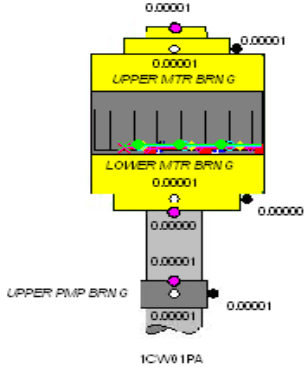



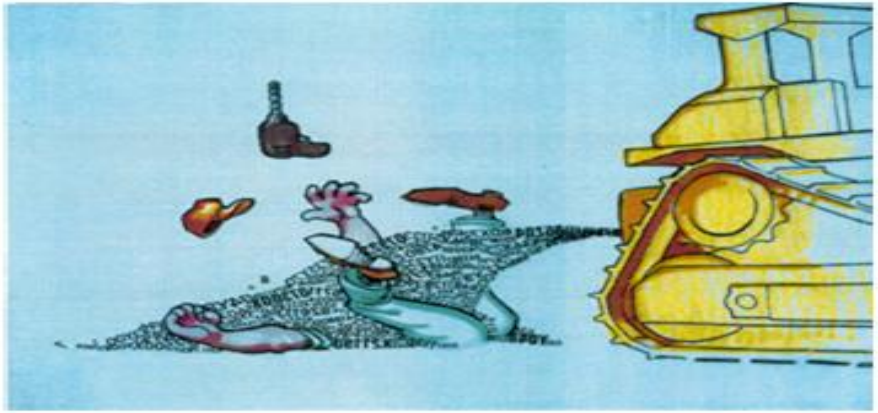



# Caterpillar's Business Challenge

Past



Present

From information overload…….

……To actionable intelligence

- Engage End User
- Visualize Analytics in a Way That's Easily Understood
- Help the End User Understand the Problem to Make More Intelligent Repair Decisions

# Condition Monitoring - Challenges

- Getting data back consistently from mobile assets is a huge challenge
- Assimilating the data and building an analytic structure to process it.
- Turning the data into actionable information that the end user (repair planner) can fully understand and trust to help him make more efficient, accurate repair decisions

# SmartSignal Integration

Occurrence Summary

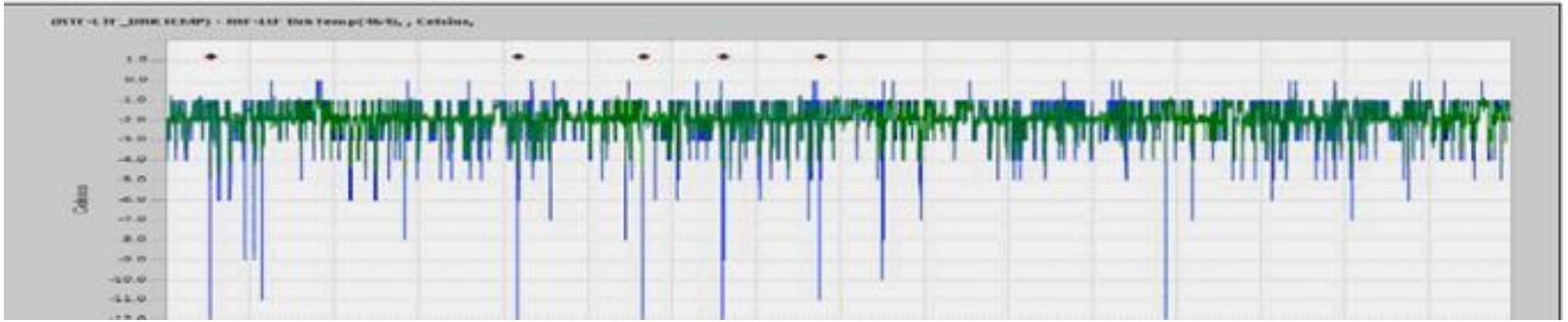
| Number of Occurrences | Data Element | Analytic Model | Channel Id | Channel Name | QV | ATC | T/G |
|---|---|---|---|---|---|---|---|
| 2 | DATALOGGER | Compare To Self | | | | | T/G |

Occurrences (2) First Occurrence: 2/11/14 12:40 AM Last Occurence: 2/12/14 7:13 PM

| Date of Occurrence | Severity | Analytic Model | Data Element |
|---|---|---|---|
| 2/12/14 7:13 PM | 5 Minor | Compare To Self | DATALOGGER |
| 2/11/14 12:40 AM | 5 Minor | Compare To Self | DATALOGGER |

Recommendation Information

Create Recommendation | Add to Recommendation



# CM Analytics Results – Study Done for 18 Month Period 2010 / 2011

## Dealer Asset Overview:

- Actively monitored
  - 4 customer mining sites
  - ~ 125 machines (793C, 793D, 793F and 994F)

Total Failure Avoidance Cost: $3.9 M+

## CM Services Delivered to Dealer:

- Uninterrupted service - 78 consecutive weeks
- Delivered 312 reports
- Communicated over 800 issues with recommended action to dealers
- **Action – taken on over 90% of recommendations**

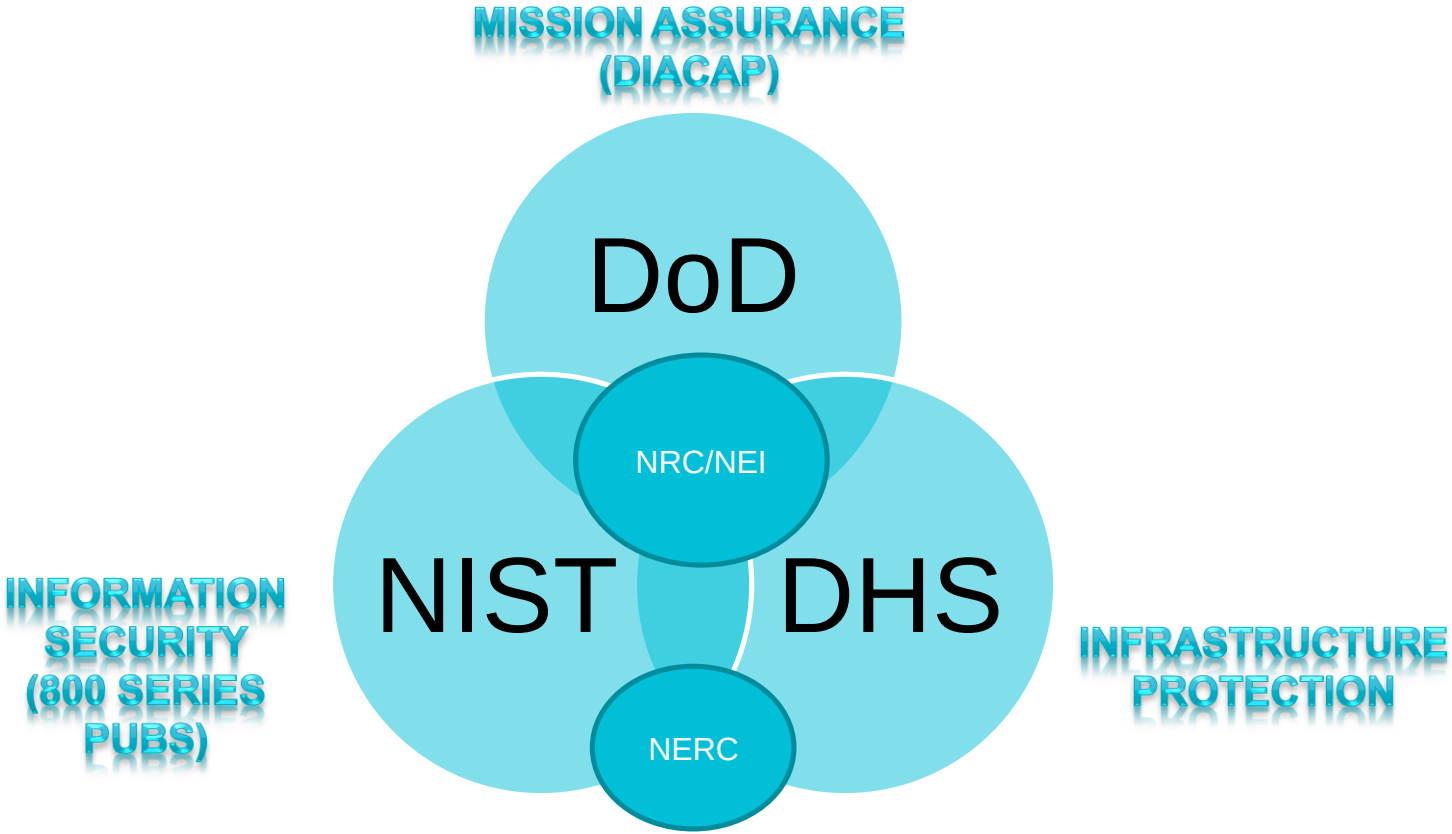
## Results:

- 275+ sensor/harness issues
- 450+ system problems
- 6+ catastrophic engine failure preventions from air leak, premature bearing wear, broken valve stem guide and broken piston rings
- 75+ injector failures
- 15+ cases of coolant entry into engine oil
- 10+ boost/exhaust leaks
- **Value – $3.9M+ savings** in dealer repair costs and improved efficiencies

# OSIsoft and PI System Security

- OSIsoft “gets” security
  - OSIsoft is **NOT** a compliance consulting or security solutions company, but we do “get” security…
  - *Collaboration* with
    - Homeland Security
    - Department of Energy Labs (INEL)
    - Microsoft (Security Development Lifecycle (SDL) and Security ACE team)
    - Infrastructure partners
    - Many large, experienced customers
- Regulations and standards – ***supports*** compliance (not ***insures*** it)
  - **10CFR73.54** -- “Protection of digital computer and communication systems and networks”
  - **NRC Reg. Guide 5.71** -- “Cyber security programs for nuclear facilities”
  - **NIST 800-53** -- “Recommended security controls for federal information systems”
  - **NIST 800-82** -- “Industrial control system security”
  - **NEI 08-09** -- “Cyber security plan for nuclear power reactors”
  - **DHS Control Systems Security Program** -- “Secure architecture design”

# Strategic Security Standards

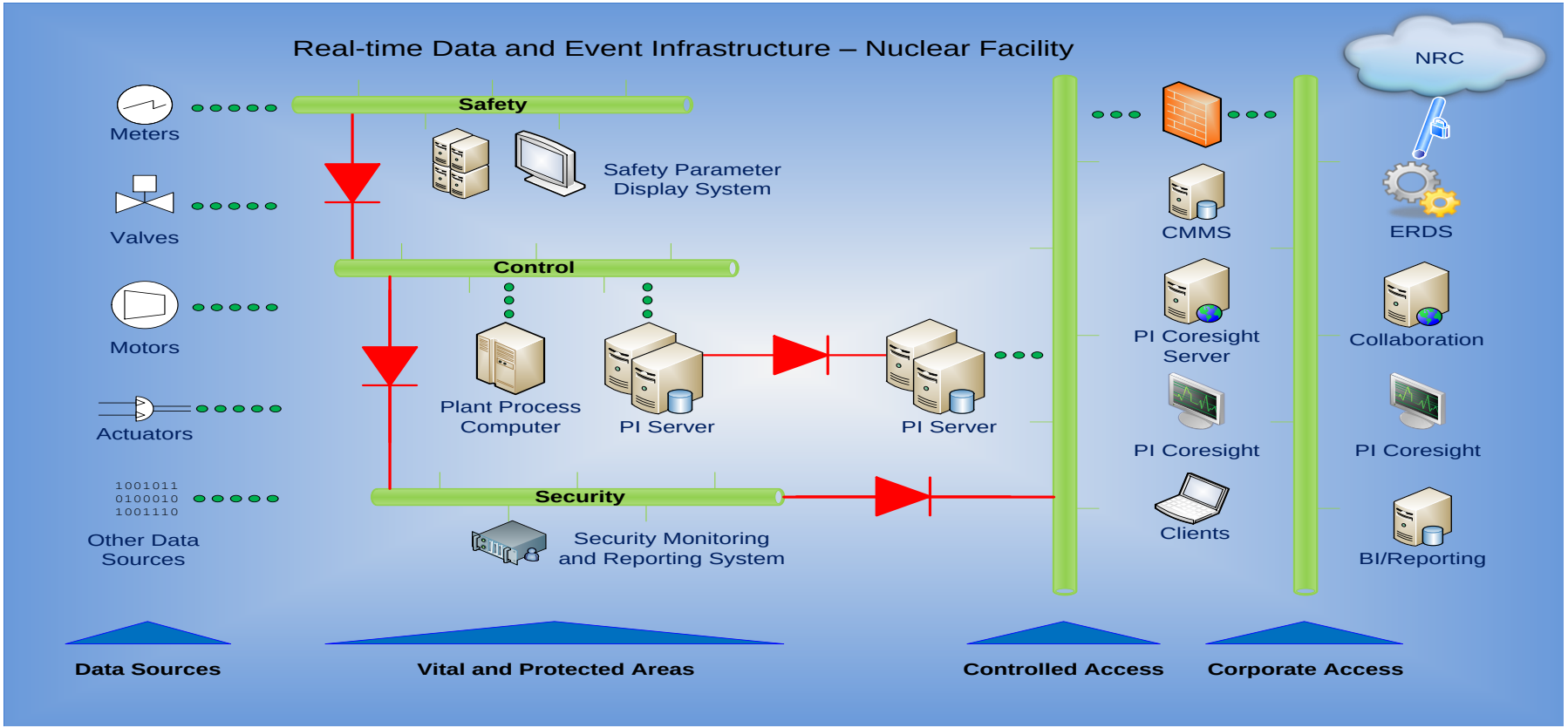


# OSIsoft Security Partners

- Waterfall for OSIsoft PI
  - Unidirectional Gateways (always with the PI System)
- Owl
  - Data Diodes (not always with the PI System)
- McAfee (Intel)
  - Security Information and Event Management (SIEM)
  - Consulting
- Alert Enterprises
  - Software across IT infrastructure
  - Consulting
  - Physical Security Solution

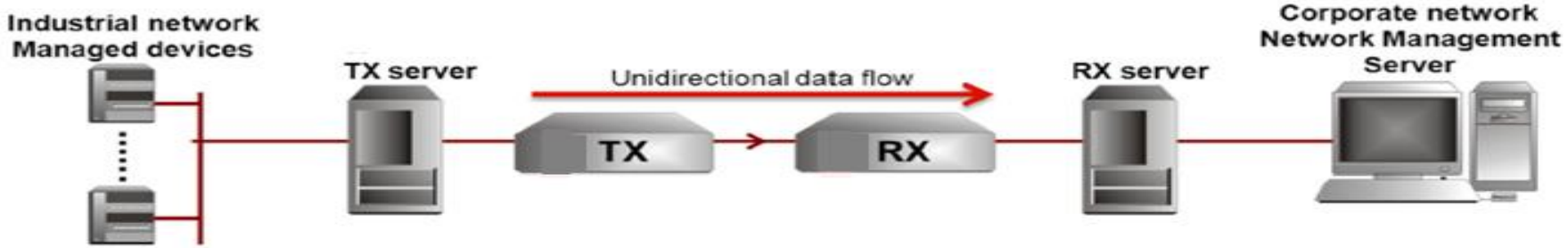
# Waterfall for OSIsoft PI© - Typical Topology

# PI System Nuclear Reference Architecture

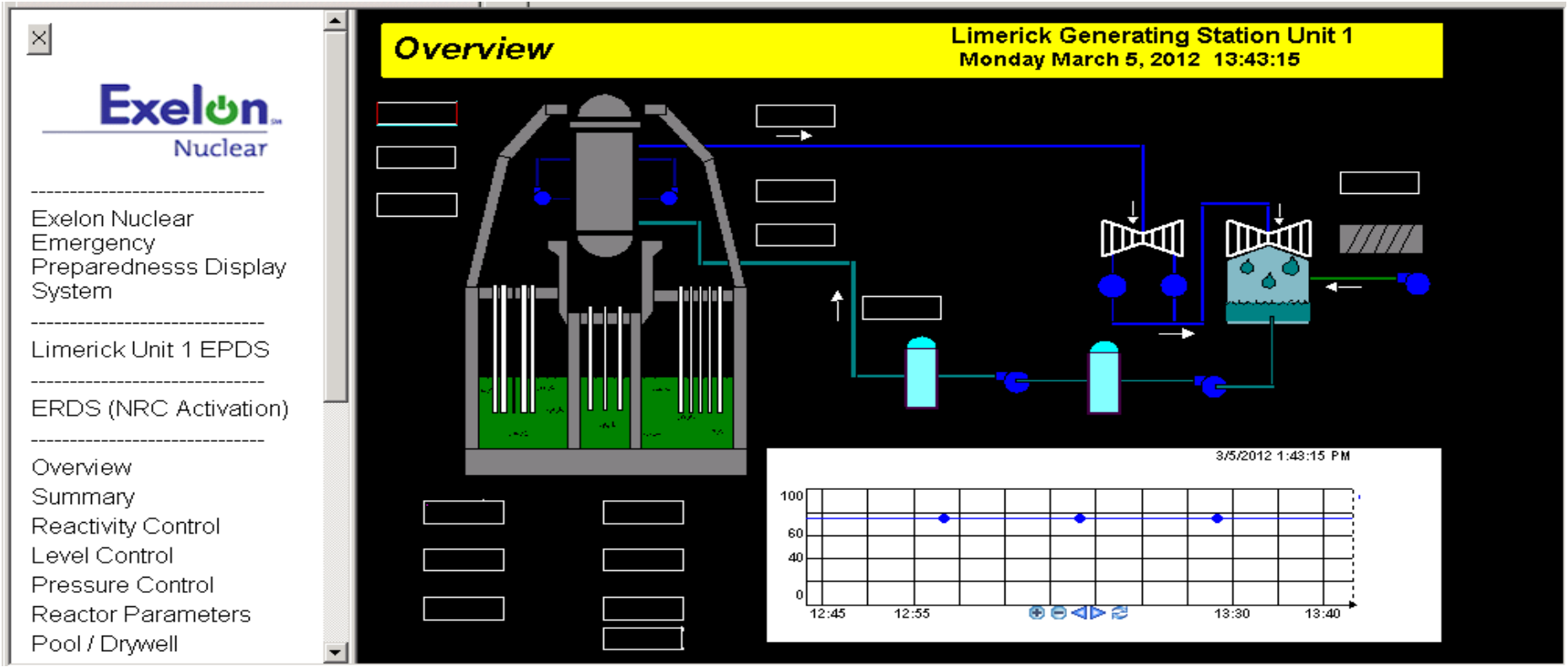


# Exelon Nuclear -- Cyber Security

- Exelon Nuclear completed installations of unidirectional network devices, or Data Diodes, at all 10 Nuclear sites to isolate the real-time process network
  - 10 CFR 73.54
  - NEI 08-09
  - Reg. Guide 5.71
- PI servers were replicated outside the Process network
  - The Diode channels PULL data from process network PI and push to business network PI. When the Diode channels start, the Diode stream waits for a new value to be received in the L3 PI server for all points matching the associated pointsource for that channel.



# Exelon Mid-Atlantic Emergency Preparedness Display System – Limerick



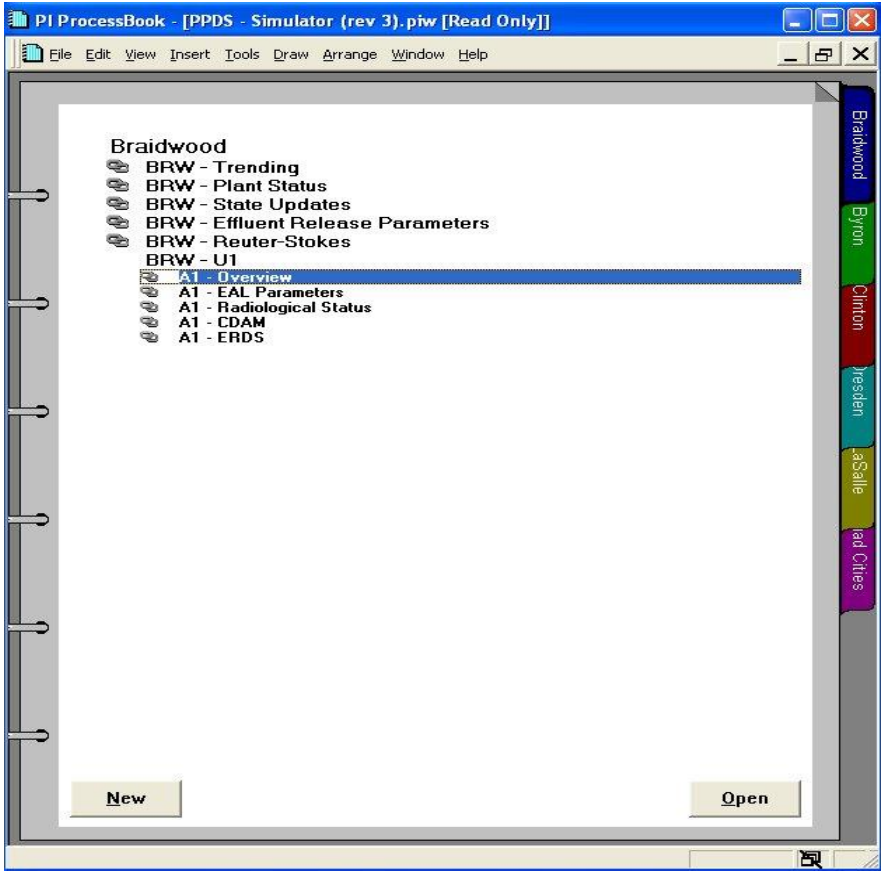
# Exelon Nuclear -- Mid-West Plant Parameter Display System

- PI ProcessBook displays for all 6 sites stored at each Nuclear Station…accessed over internal network

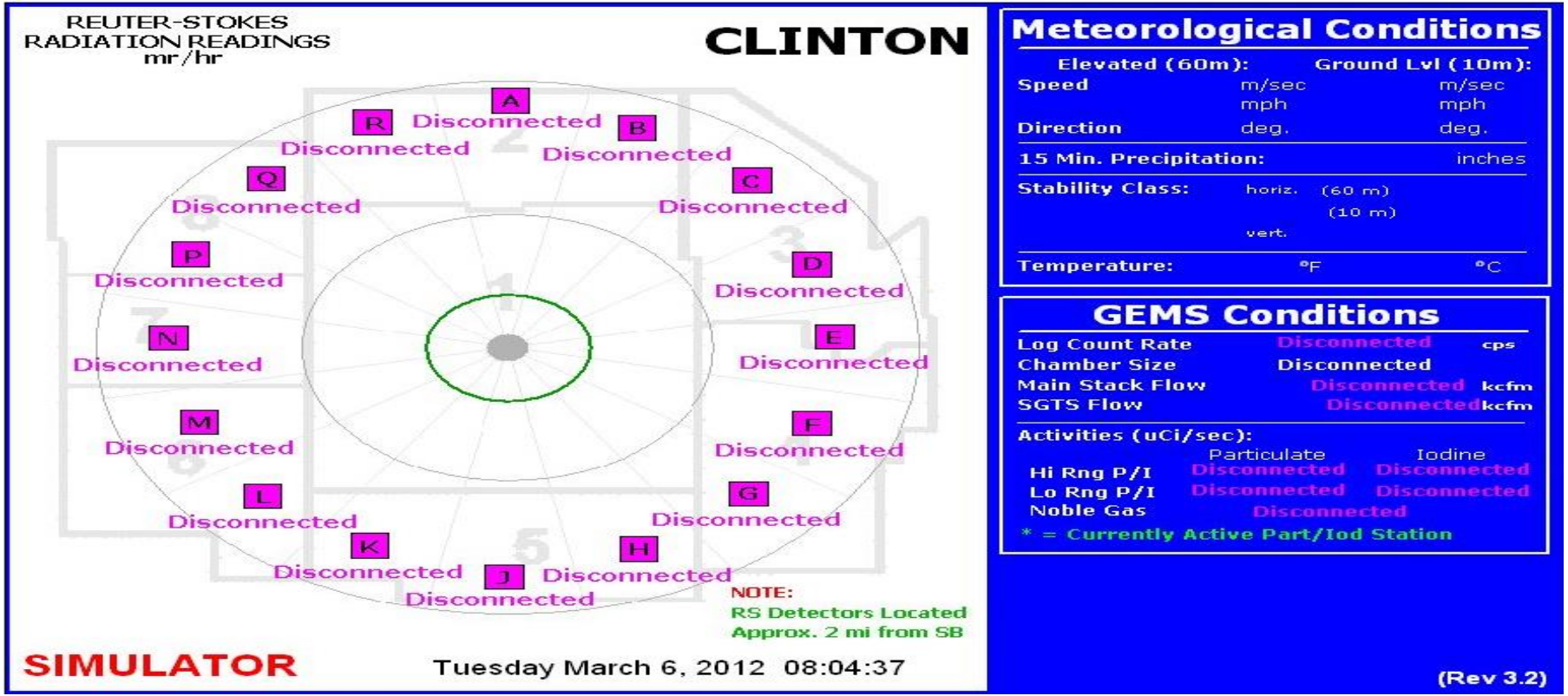
  – Unit-specific data related to Core, Radiological, and Emergency Alert Level status

  – All Mid-West sites have copies of each station's PPDS Suite for additional support and analysis if needed

  ✓Interfaces with the plant simulator for ERO drills



# Illinois Emergency Management Agency Radiation Detectors (MD and PA Too)



# Exelon Nuclear -- ERDS Modernization Project

- Emergency Response Data System (ERDS)
- Pilot program started in 2008
- Legacy ERDS software was modified to use TCP/IP code to communicate to NRC VPN hardware
- Modernize the modem-based ERDS to internet-based communication for both Plant and Simulator data
- NITSL spec for modernized ERDS software sent to industry and OSIsoft responded with the PItoNRCERDS interface.
- The PItoNRCERDS interface sends Plant data from each site's PI system to the NRC ERDS Monitoring Desk.
- This interface makes a network connection thru the Exelon WAN to the Nuclear Regulatory Commission owned VPN switch which creates a secure VPN tunnel for data transmission.
- The Interface is continuously (24x7) transmitting data to the NRC.

# US NRC Emergency Response Data System (ERDS)

## U.S. Nuclear Regulatory Commission (NRC)

- License / regulate civilian use of nuclear materials
  - 104 U.S. commercial nuclear power plants
- Incident response
  - Staff ready to respond
  - Monitor plant protective actions and mitigation strategies
- Emergency Response Data System (ERDS) used to receive plant data

# US NRC Enterprise Customer

## Complete OSIsoft Solution
## OSIsoft Software and Services used

- HA Replicated PI Servers
  - Allows NRC to keep the system online while doing software updates (patches, etc.)
  - No downtime for system maintenance!!!
- PI Module Database
- ProcessBook
- PI Webparts (PI Graphics)
- Custom Interface for ERDS protocol
- Enterprise Agreement (EA)
- Center of Excellence (CoE)

# US NRC ERDS Results

## Results

- **Productivity** – More plants can connect at a given time – More can be monitored at once.
- **Visibility** – NRC supervision has recognized this system as a key tool in emergency response
- **Security** – Replacement System is much more secure than the original system.
- **Reliability** – Redundancy of servers has provided for a VERY reliable system (High Availability)
- **Compliance** – System was able to comply with stringent government (FISMA) security compliance as well as passing the NIST DISA Gold scan

# US NRC ERDS Display

**GENERIC BWR - ALL**

NO_ERDS
SITE TIME

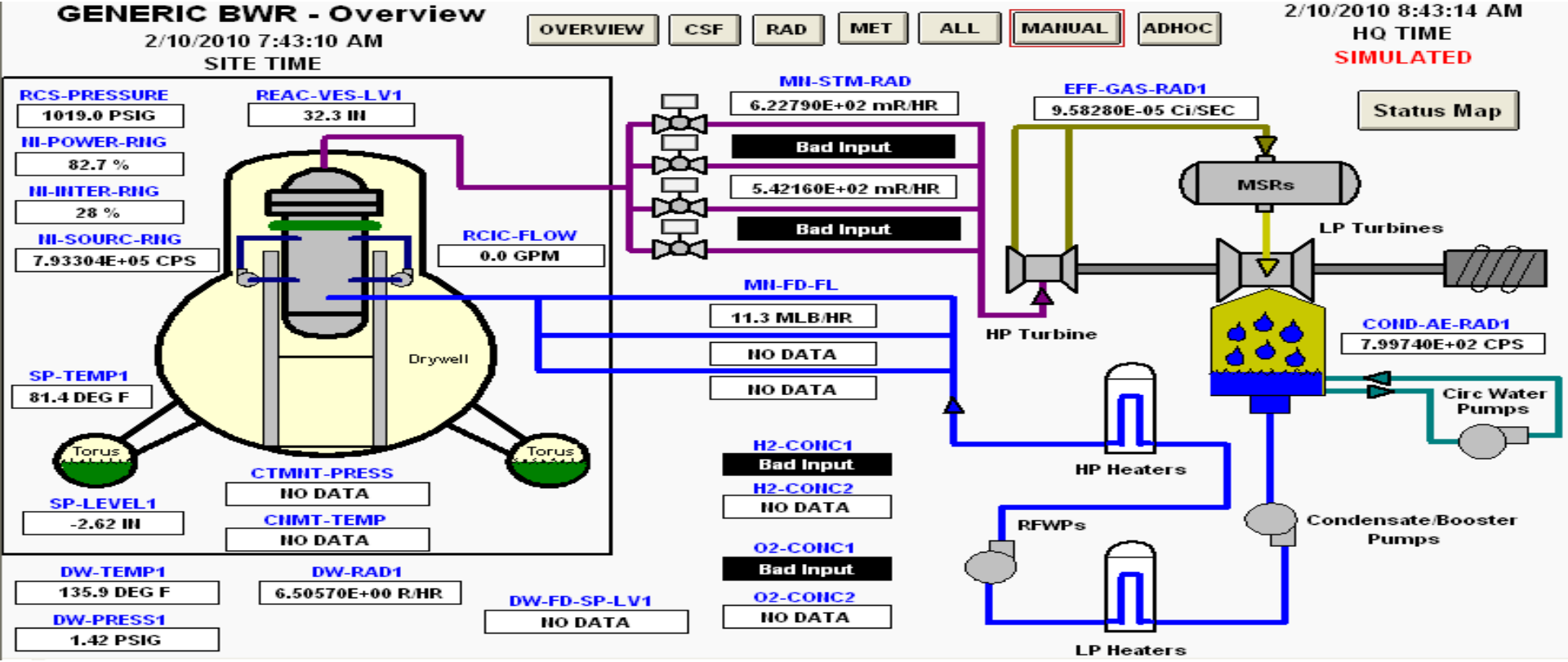
OVERVIEW | CSF | RAD | MET | ALL | MANUAL | ADHOC

1/19/2010 2:53:36 PM
HQ TIME
ACTUAL

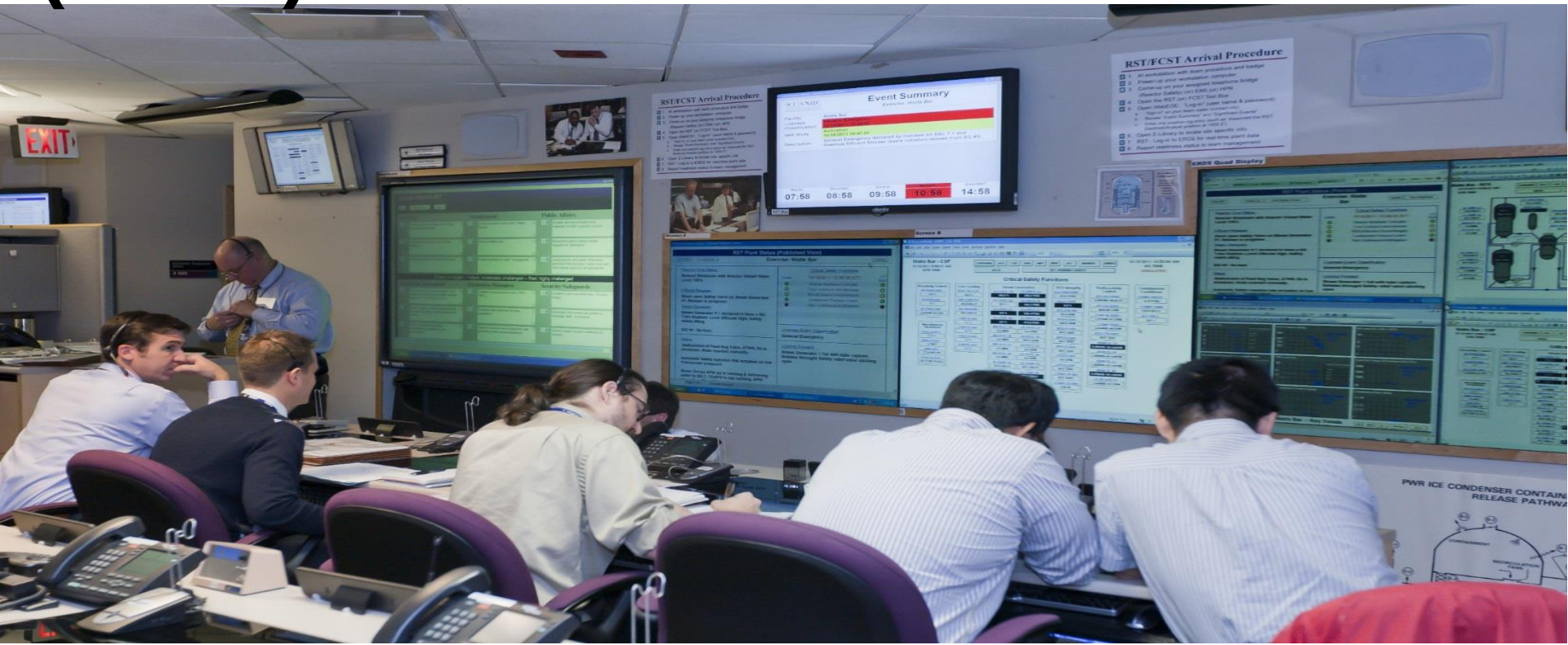
| | |
|---|---|
| COND_AE_RAD1 | NO_ERDS |
| CR_SPRAY_FL1 | NO_ERDS |
| CR_SPRAY_FL2 | NO_ERDS |
| CST_LEVEL1 | NO_ERDS |
| DW_PRESS1 | NO_ERDS |
| DW_RAD1 | NO_ERDS |
| DW_RAD2x | NO_ERDS |
| DW_TEMP1 | NO_ERDS |
| EFF_GAS_RAD1 | NO_ERDS |
| H2_CONC1 | NO_ERDS |
| HPCI_FLOW | NO_ERDS |
| LPCI_FLOW1 | NO_ERDS |
| LPCI_FLOW2 | NO_ERDS |
| MAIN_FD_FLW1 | NO_ERDS |
| MN_STM_RAD1 | NO_ERDS |
| MN_STM_RAD2 | NO_ERDS |
| MN_STM_RAD3 | NO_ERDS |
| MN_STM_RAD4 | NO_ERDS |
| NI_INTER_RNG | NO_ERDS |
| NI_POWER_RNG | NO_ERDS |
| NI_SOURC_RNG | NO_ERDS |

| | |
|---|---|
| O2_CONC | NO_ERDS |
| RCIC_FLOW1 | NO_ERDS |
| RCS_PRESSURE | NO_ERDS |
| REAC_VES_LV1 | NO_ERDS |
| REAL_SIM | ACTUAL |
| SP_LEVEL1 | NO_ERDS |
| SP_TEMP1 | NO_ERDS |
| STAB_CLASS1 | NO_ERDS |
| STAB_CLASS2 | NO_ERDS |
| STAB_CLASS3 | NO_ERDS |
| WIND_DIR1 | NO_ERDS |
| WIND_DIR2 | NO_ERDS |
| WIND_DIR3 | NO_ERDS |
| WIND_SPEED1 | NO_ERDS |
| WIND_SPEED2 | NO_ERDS |
| WIND_SPEED3 | NO_ERDS |

# US NRC ERDS BWR Overview



# US NRC Incident Response Center (ERDS) – Watts Bar 2011 Drill



# US NRC ERDS Status

- ERDS PI System technologies upgraded to latest (most secure) versions
- As of end of 2012, 100% of US reactors connected to ERDS via secure VPN
- As of end of 2013, 50% of US reactors providing data to ERDS 24x7
- Consideration of increasing the number of data streams being provided
- Consideration of integrating real-time reactor data with weather, plume and other geo-special data (ESRI)

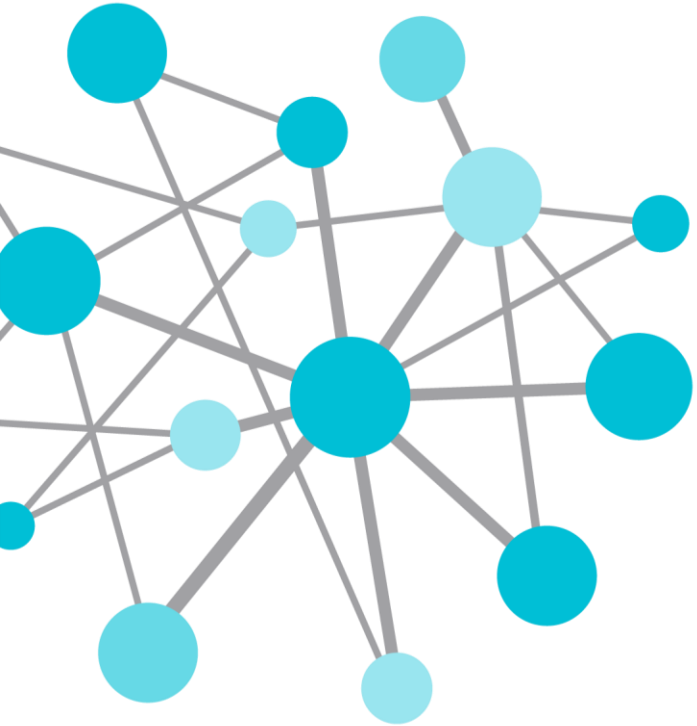
# Key Takeaways

- Real-time data infrastructure is required for any ‘Smart’ city, campus, facility, installation…and is key for doing ‘more with less.’
- OSIsoft and the PI System continue to earn its reputation as a trusted real-time infrastructure supplier to the microgrid industry.
- OSIsoft partners with some of those most knowledgeable and experienced application providers and system integrators in the real-time space…we don’t do solutions alone.
- PI System provides full capabilities for basic CBM and the foundation for advanced CBM. Other enabling technologies and reliability subject matter expertise may be required.
- OSIsoft’s continued investment in software security and cybersecurity provides significant advantages and enables safe, reliable and efficient operations.
- Unidirectional Security Gateways/Data Didoes is an accepted method to meet US NRC nuclear cybersecurity requirements for network protection (high assurance, one way deterministic data flow)…and may be applicable in other situations requiring network protection.
- Integration of time and space with the PI Integrator for ESRI ArcGIS will be game changing.
- Sharing knowledge and best practices with the partners and customers is key to our success.
- The science is NOW!

# Chris Crosby

ccrosby@osisoft.com

Principal – US Federal and Public Sector/Global Nuclear Energy



# THANK YOU

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# FEDERAL WORKSHOP 2014

## The Power of Data

DECISION READY IN REAL-TIME

**Upcoming Federal Workshop:**

October 29 - Washington, DC

JW Marriott, Pennsylvania Avenue, NW