Improved Situational Awareness with OSIsoft PI for the U.S. Nuclear Regulatory Commission (NRC)

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Agenda

- About PPC
- Story of the project
- OSIsoft PI Solution for Situational Awareness and CBM
- Results & Benefits

ppc

PPC is a recognized and responsible leader in innovative and cost-effective Technology and Management Solutions.

PPC is ever mindful to be at the forefront of Green Thinking and Sustainability in our key customer markets of: Energy, Environment, Public Safety, National Security, Financial, and Regulatory Compliance. We provide superior quality and always deliver on our promises.

FOCUS AREAS

- INFORMATION SYSTEMS DEVELOPMENT
- KNOWLEDGE & INFORMATION MANAGEMENT
- CYBER SECURITY & INFORMATION ASSURANCE
- ENERGY MANAGEMRNT & ENVIRONMENTAL CONSULTING

CONTRACT VEHICLES

General Services Administration Schedules

Information Technology Professional Services (IT 70)
Management, Organization, and Business Improvement Services (MOBIS)

Government-wide Acquisition Contract (GWACs) & Multiagency Contracts (MACs)

Chief Information Officers – Solutions and Partners 3 (CIO-SP3)

ISO 20000:2011 ISO/IEC 27001:2013 CERTIFIED ISO 9001:2008 COMPANY KM World 2015 100 COMPANIES That Matter in Knowledge Management

CMMI DEV /3 SM
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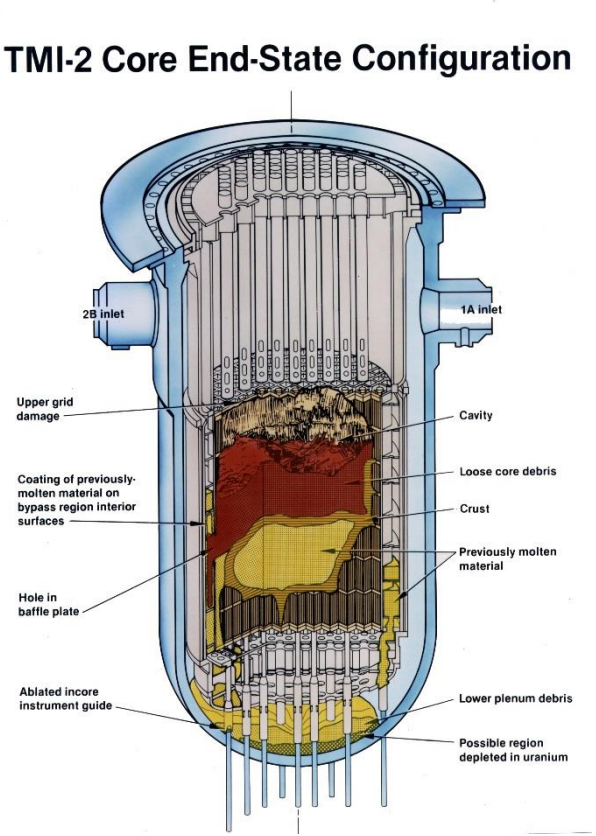
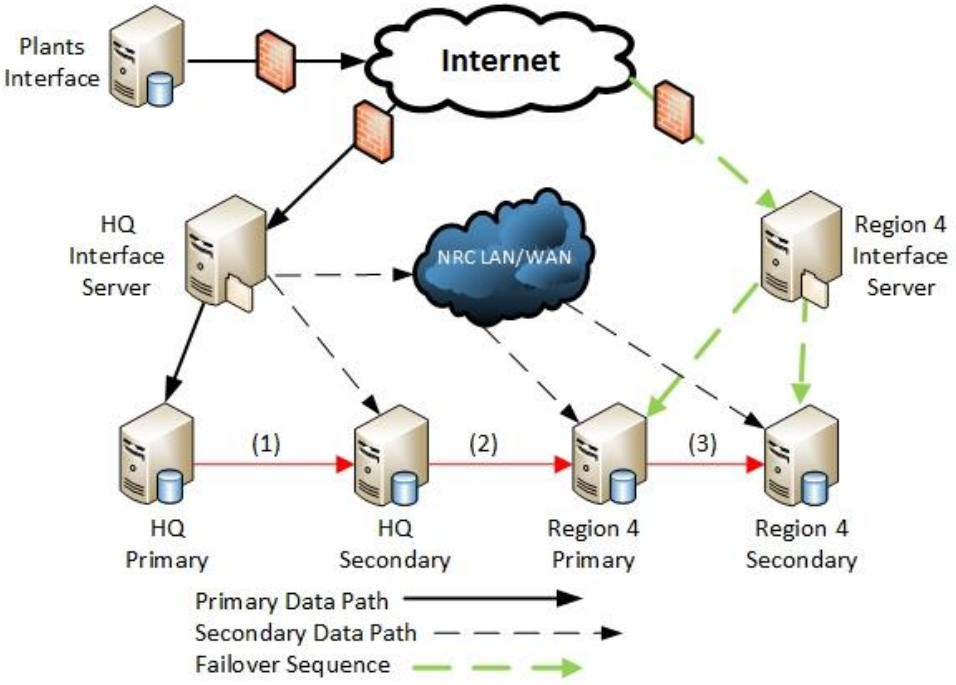
Story of the PPC ERDS project

- On March 28, 1979, Three Mile Island Unit 2 (TMI-2) reactor, near Middletown, Pa., had a partial melt down
- This was the most serious accident in U.S. commercial nuclear power plant operating history
- The NRC to tightened and heightened its regulatory oversight
- In 1985 the NRC deployed the first Emergency Response Data System (ERDS)
- In 2006 the NRC decides to replace an antiquated system with a new modern ERDS



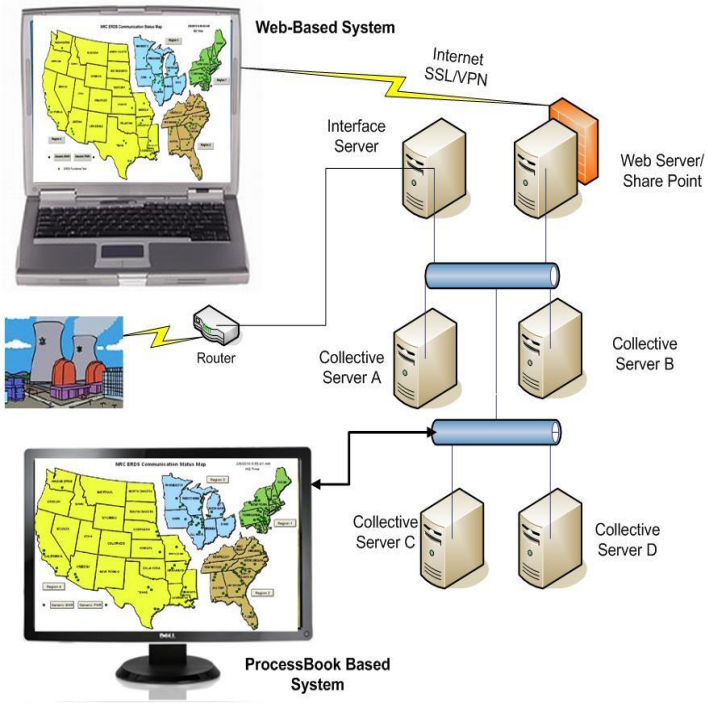
Solution

- In 2006, PPC deploys an integrated architecture based on OSIsoft PI that is designed to collect nuclear power plant performance and environmental data for analysis by NRC an State emergency response personnel. It includes :
  - Secure connectivity to all plants and State Regulators
  - Redundant and high availability capabilities
  - A common interface for situational awareness
  - Stores and present data from nuclear power plants for the purpose of review and analysis – All 103 NRC licensed commercial nuclear power plants can be displayed
  - Leverage PPC expertise in OSIsoft, nuclear expertise, and best practices to design solution



US NRC ERDS PI Fact Sheet

- More than 38,500 PI Tags configured to receive data from nuclear facilities
- Connectivity with most plant systems that converts the hardware communication protocol used by a PLC into the OPC protocol
- Approximately 350 concurrent licenses of ProcessBook
- More than 150 concurrent web end users
- Customized PI to ERDS interfaces with HA
- Custom code behind links to module database
- Calculated tags
  - + 500 PI Totalizer tags
  - + 250 PI Performance Equations

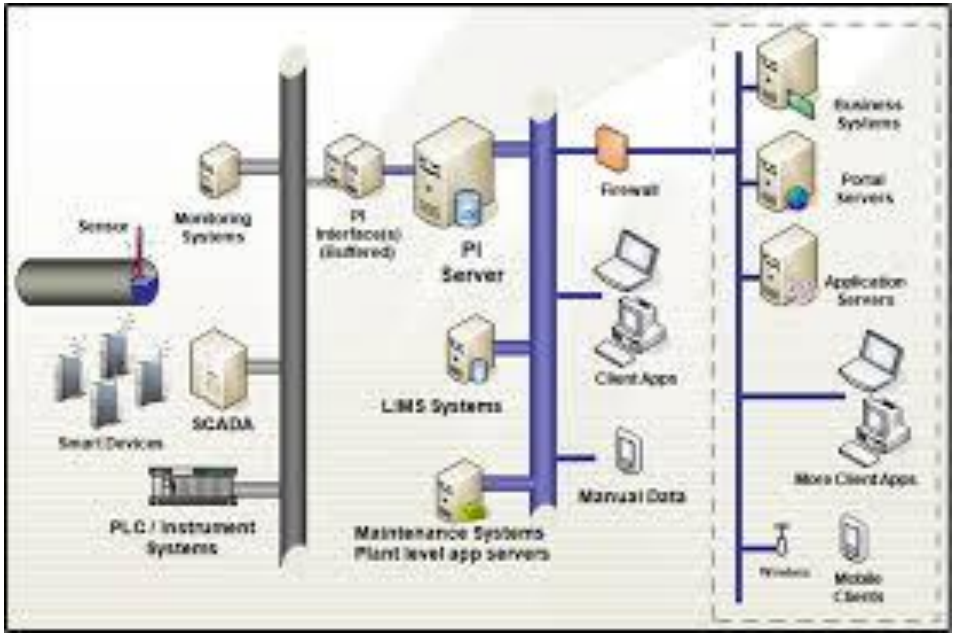


OSIsoft PI Technologies at US NRC Today

- (4) node 64 Bit PI Servers (Higher performance, high availability, and redundancy)
- OSIsoft PI Agent and PI Diagnostics monitoring (Alarms and Notifications)
- Enhanced global support with Enterprise Agreement and OSI NOC monitoring
- Remote centralized support via Citrix
- OSIsoft PI Batch and PI Manual Logger enables users to easily and securely collect manual data
- OSIsoft PI WebParts provides visibility, navigation, and presentation of OSIsoft PI System data
- OSIsoft PI System Access - PI SDK, PI OLEDB, PI API, PI OPC
- Introduction of Simulator server to alleviate shutting down Production systems for licensee drills, exercises and training

OSIsoft PI Technologies for US NRC Scheduled for 2015 / 2016

- Standardized architecture
  - VMWare implementation
  - Mobile connectivity
  - Alternative network paths and redundancy failover utilizing load balancers
- PI Server 2012
  - PI Notifications 2012
  - PI Asset Framework (AF)
  - SQL server clusters and HA
- Data Access
  - PI OLEDB Enterprise
  - PI Web Services
  - PI OPC Server
- PI Visualization Suite
  - PI DataLink 2012
  - PI ProcessBook 2012
  - PI Webparts 2012
  - PI ActiveView
  - PI Coresight



Solutions for Situational Awareness and CBM

Definitions – DoD CBM+

Condition Based Maintenance Plus (CBM+) is the application and integration of appropriate processes, technologies, and knowledge-based capabilities to achieve the target availability, reliability, and operation and support costs of DoD systems and components across their life cycle.

At its core, CBM+ is maintenance performed based on evidence of need, integrating Reliability Centered Maintenance (RCM) analysis with those enabling processes, technologies, and capabilities that enhance the readiness and maintenance effectiveness of DoD systems and components. CBM+ uses a systems engineering approach to collect data, enable analysis, and support the decision-making processes for system acquisition, modernization, sustainment, and operations.

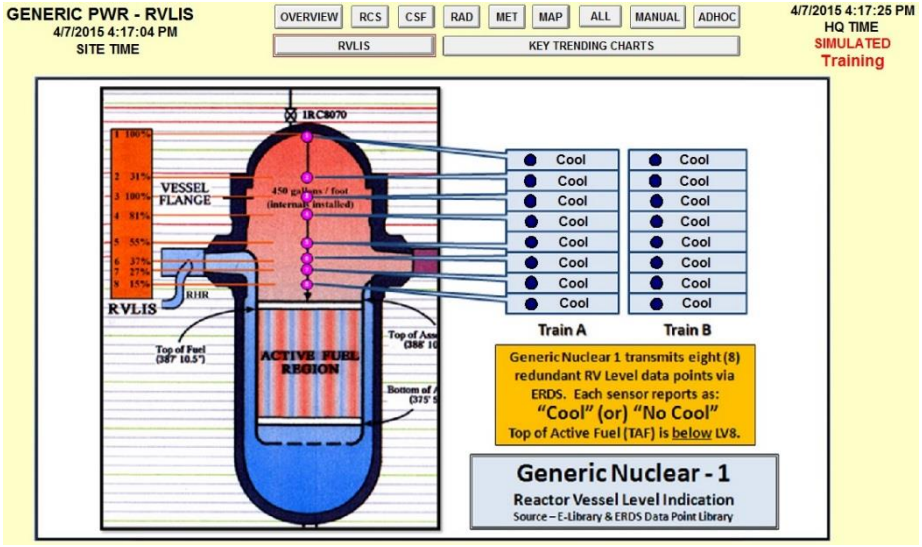
Source: www.acq.osd.mil Office of the Assistant Secretary for Defense (Logistics & Material Readiness)

Definitions

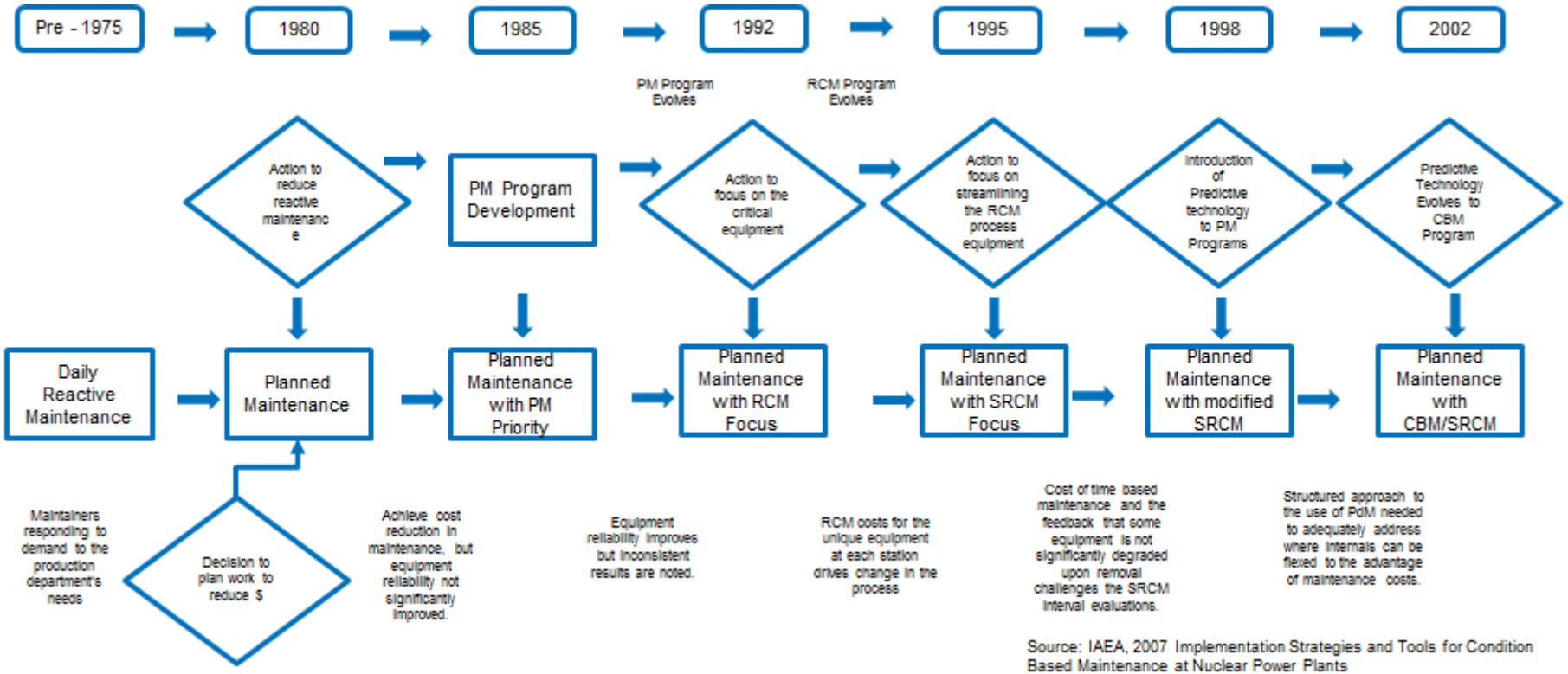
- Situational Awareness: is the perception of environmental elements with respect to time or space, the comprehension of their meaning, and the projection of their status after some variable has changed, such as time, or some other variable, such as a predetermined event.

- Condition Based Maintenance: shortly described, is maintenance when need arises. This maintenance is performed after one or more indicators show that equipment is going to fail or that equipment performance is deteriorating. This concept is applicable to mission critical systems that incorporate active redundancy and fault reporting. It is also applicable to non-mission critical systems that lack redundancy and fault reporting.

Source: Wikipedia

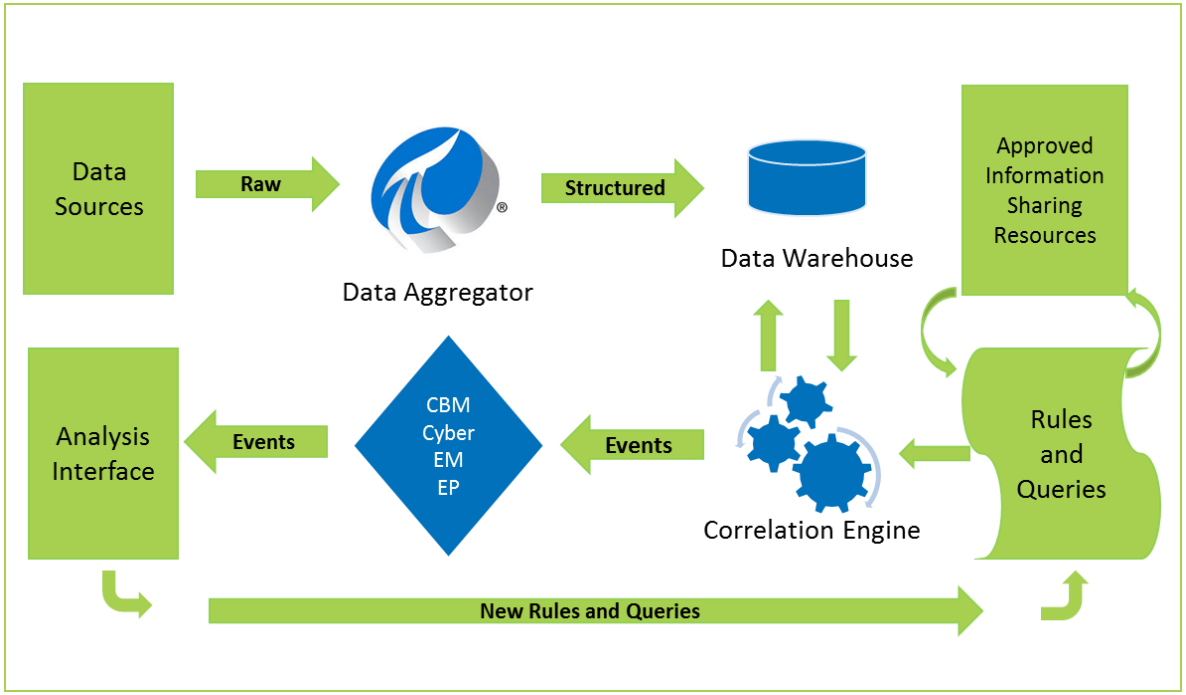


Transformation of Maintenance Strategies



Source: IAEA, 2007 Implementation Strategies and Tools for Condition Based Maintenance at Nuclear Power Plants

PPC OSIsoft PI Solutions for Situational Awareness



- Provides a comprehensive situational awareness tool to capture and maintain an accurate, shared common operating picture
- Applicable to:
  - CBM
  - Cyber Security
  - Energy Management
  - Emergency Preparedness

Goals of CBM for Nuclear Power Plants

- Lower Lifecycle Maintenance Costs
  - Maintenance costs are a major part of the operating costs of all manufacturing or production plants. Depending on the specific industry, maintenance costs can represent between 10 and 40 per cent of the costs of goods produced[1]. Based on federal and state regulatory controls, most power production facilities in the United States fall into the upper range of costs
- Achieving Maximum Use of Equipment
  - Increase intervals to achieve maximum interval between repairs
  - Optimize condition of equipment and operating efficiency of process systems
  - Minimize the number and cost of unscheduled outages created by failures
- Prevention of Catastrophic Failures
  - Prevent catastrophic failures and detect problems earlier in failure lifecycle
  - Implement CBM to prevent serious damage or potential for destructive failure to systems, plants, people, and community
  - Reduce liability to organization through risk based management processes which will contribute to the determination of maintenance requirements

[1] Source: IAEA, 2007 Implementation Strategies and Tools for Condition Based Maintenance at Nuclear Power Plants

Susquehanna nuclear Unit 2 shut down for scheduled outage

Source: 4/13/2015 Power Engineering Magazine

Caption: Susquehanna nuclear power plant Unit 2 at PPL's (NYSE: PPL) Susquehanna nuclear power plant was disconnected from the grid to begin a scheduled refueling and maintenance outage.

Workers will replace 40 percent of the uranium and complete several equipment maintenance tasks and upgrades during the shut down. The plant will also invest millions into upgrades with state-of-the-art technology and perform thousands of routine maintenance tasks. About 1,000 contract workers were hired for the project. Each of the two units is taken out of service for scheduled maintenance every 24 months.

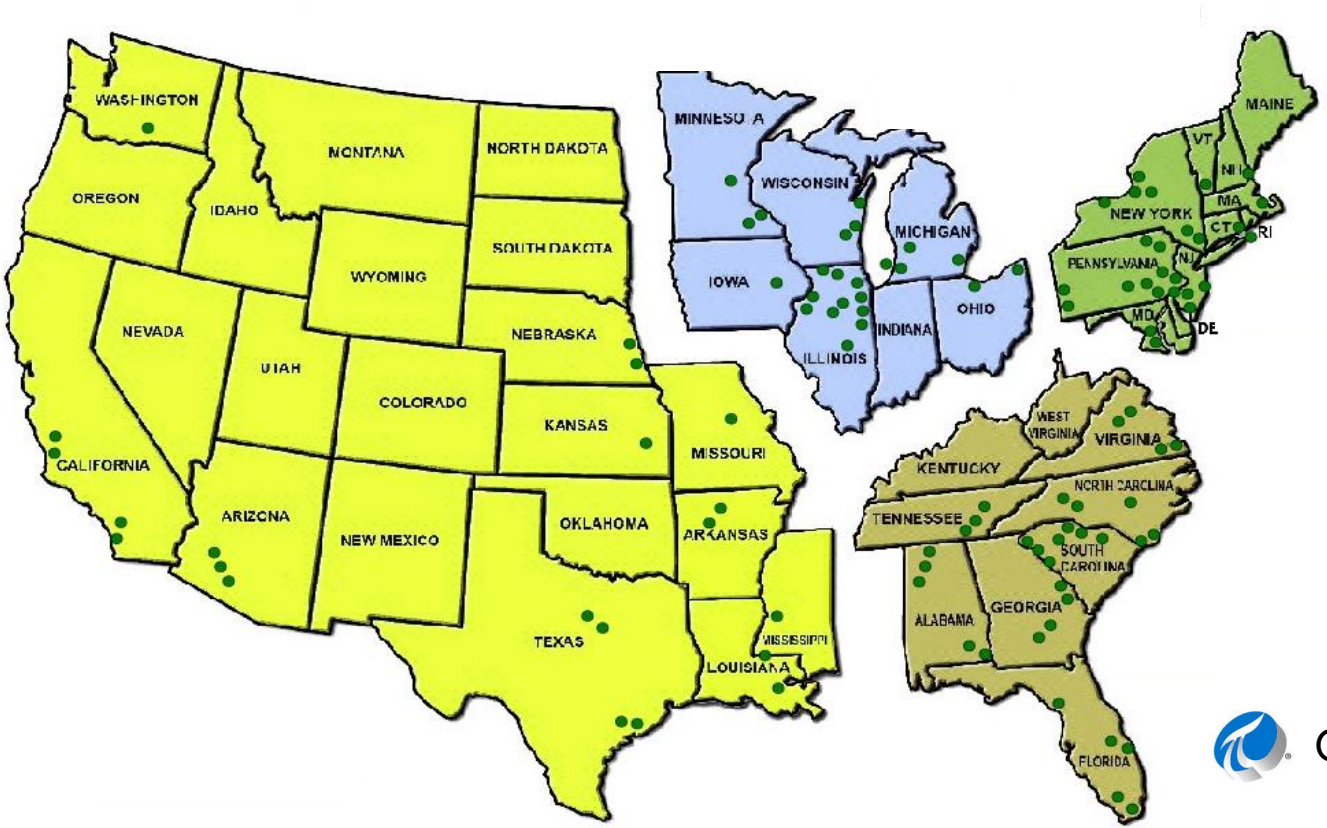
Unit 1 continues to operate at full power.

Operating Reactor Maintenance Effectiveness

- The regulatory objective of the Maintenance Rule, 10 CFR 50.65, is to require licensee monitoring of the overall continuing effectiveness of their maintenance programs to ensure the following:
  - Safety-related structures, systems, and components (SSCs) and certain SSCs that are not safety related are capable of performing their intended functions
  - For equipment that is not safety related, failures will not occur that prevent the fulfillment of safety-related functions
  - Failures resulting in scrams and unnecessary actuations of safety-related systems are minimized

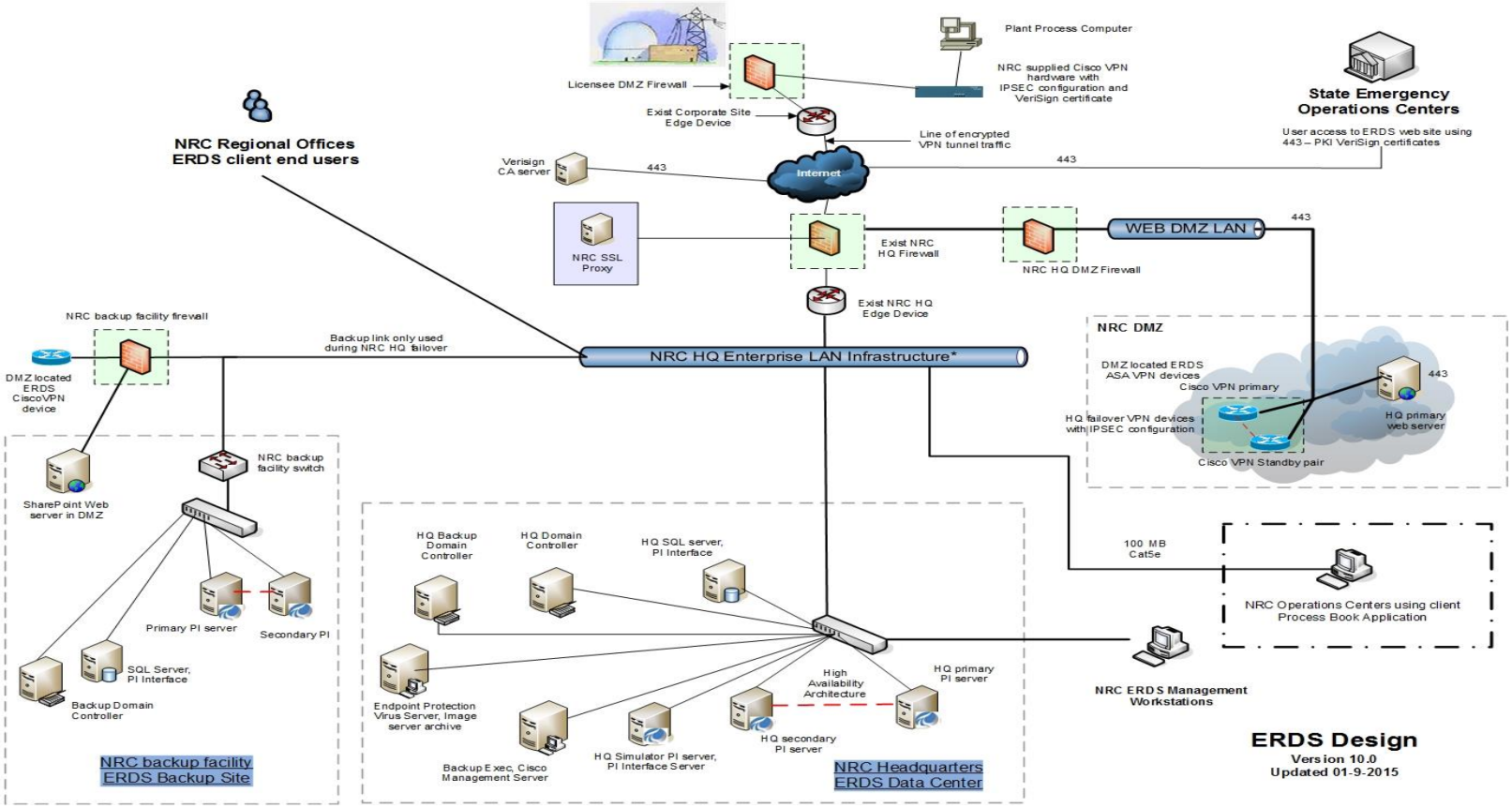
NRC ERDS Example

OSIsoft in the Nuclear Power Industry

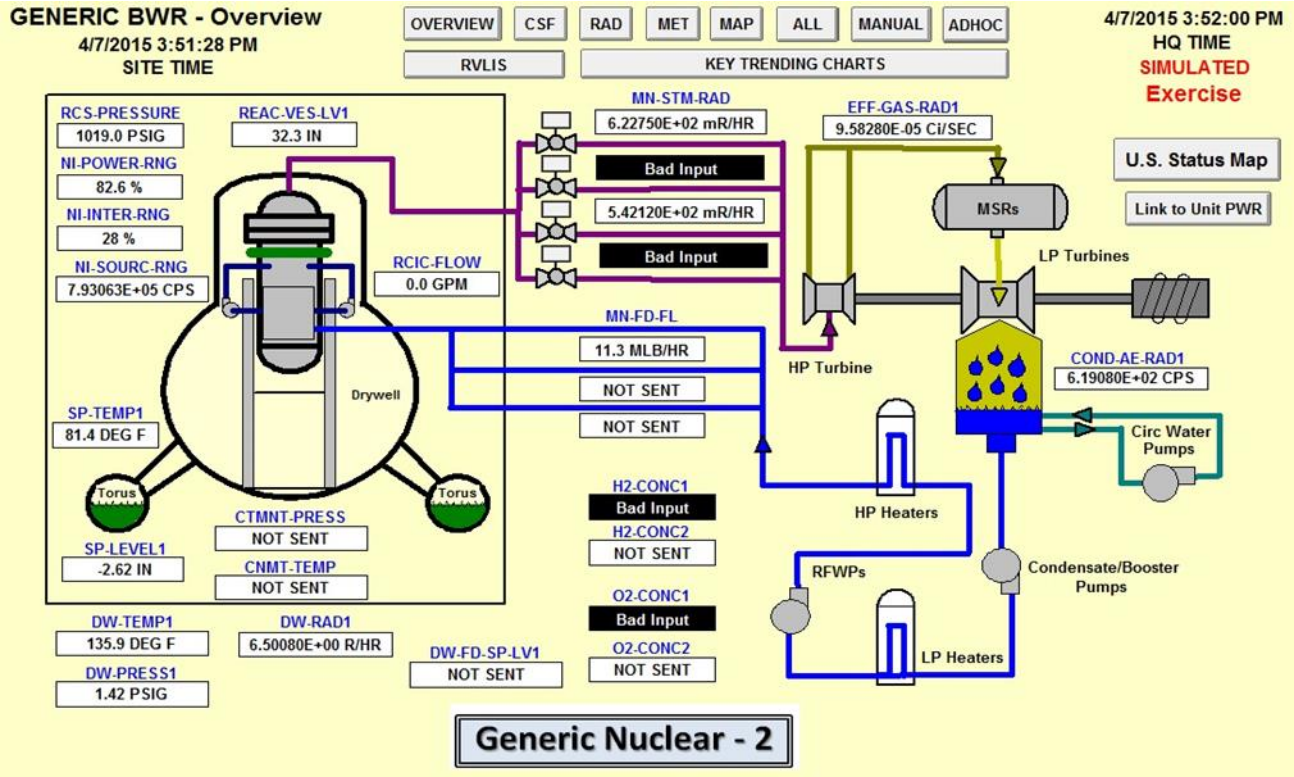


Operating in 66 NPP

Solution Architecture



Single Pane of Glass

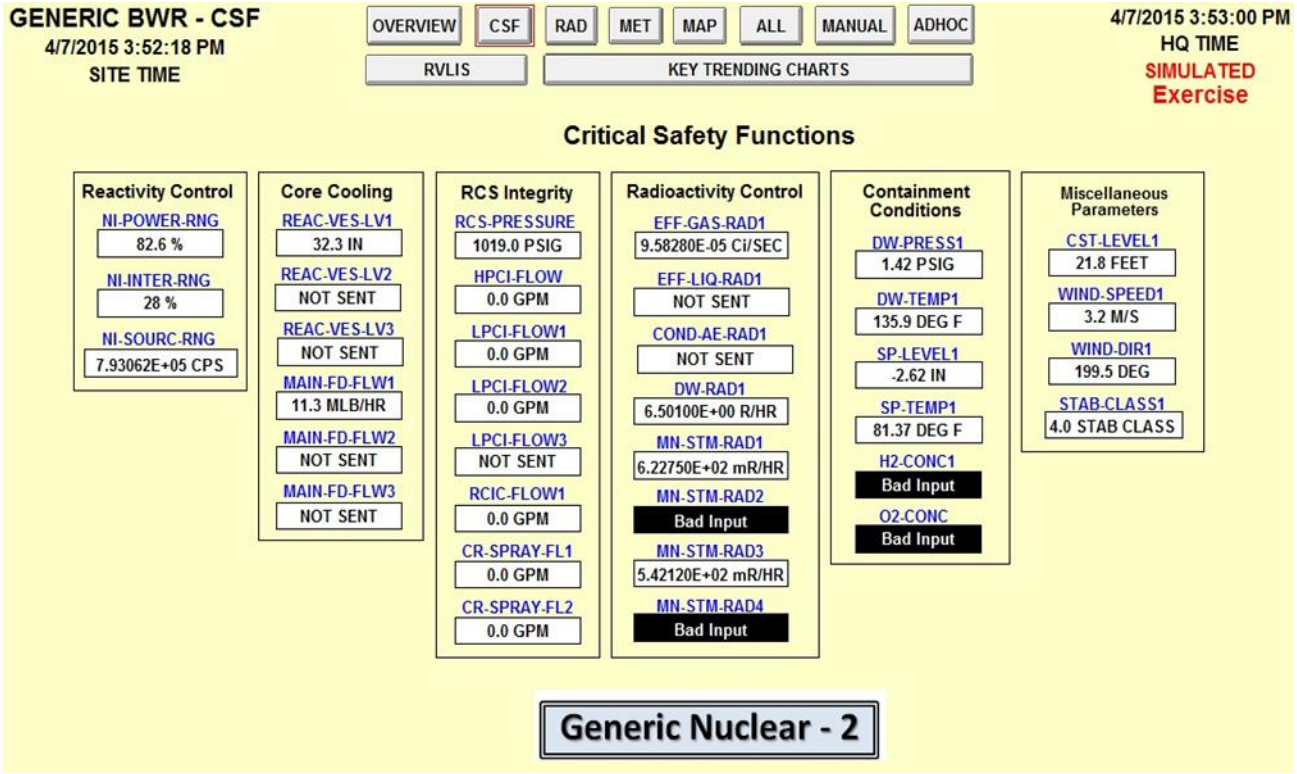


The integration of OSIsoft PI:

- Data Historian,
- ProcessBook,
- WebParts

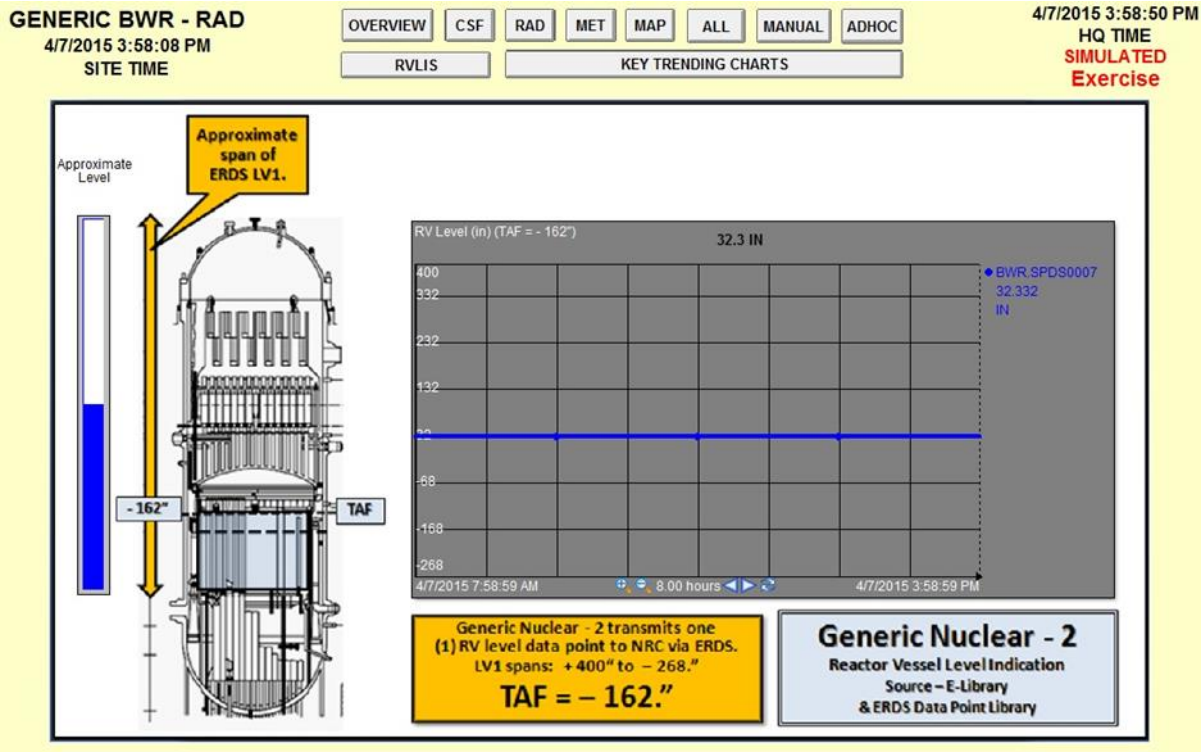
delivers decision makers a single pane of glass dashboard of critical data to make informed decisions

Critical Maintenance Monitoring



- OSIsoft PI has over 400 pre-built interfaces to Industrial Control Systems
- Provide flexibility to customize monitoring to your needs

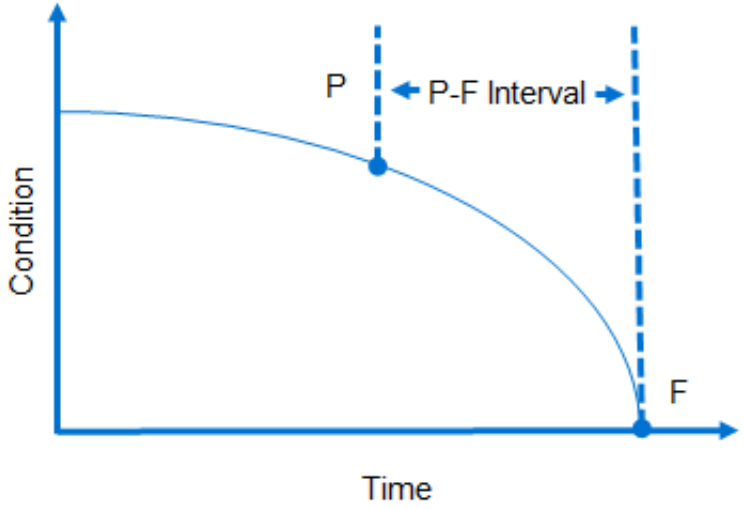
Real-time Trending at Component Level

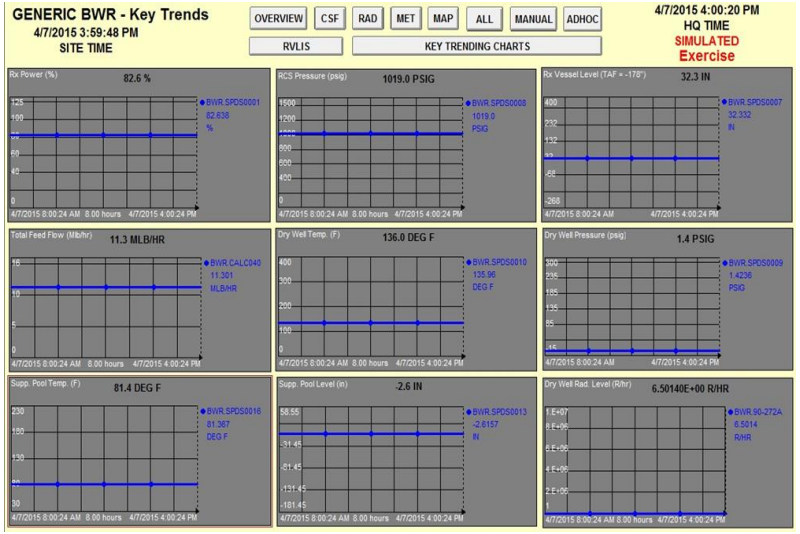


- CBM with OSIsoft will require integration with existing instrumentation and metering or installation of new equipment to deliver data.
- Function, failure, and risk will need to be determined in order to optimize CBM.

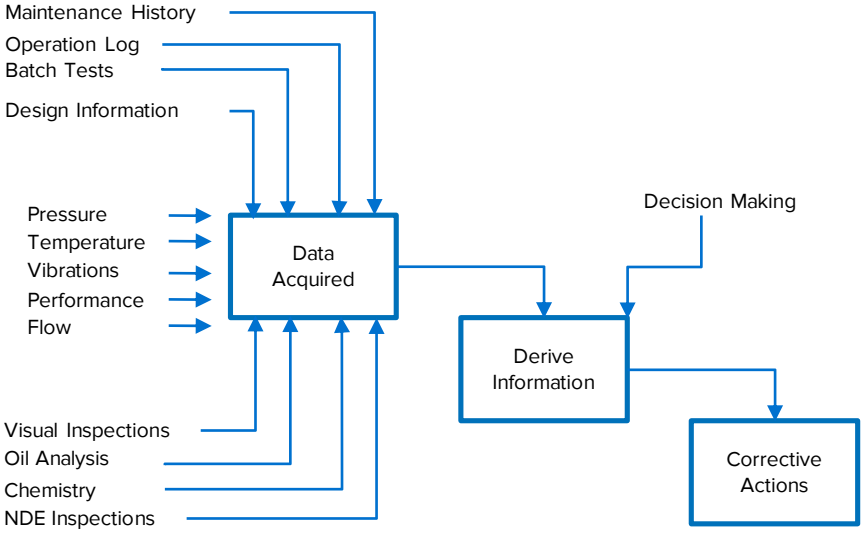
Key Maintenance Trends

- Applying the Potential Failure–Functional Failure (P–F) curve illustrated below, system failure data related to functional failures, contributing conditions and detectable signs of potential failure, and the outcomes of each failure can be used to calculate effective monitoring data points which can be tracked and trended with OSIsoft PI.



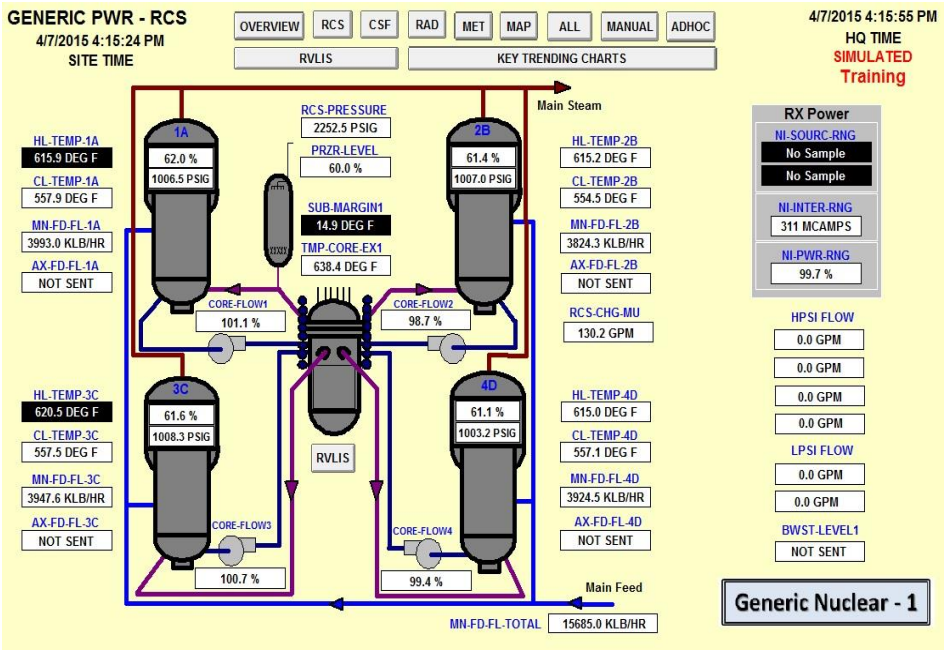


Data Points and Information Flow



Source: IAEA, 2007 Implementation Strategies and Tools for Condition Based Maintenance at Nuclear Power Plants

- Maintenance Orders Issued
- Post Maintenance Inspection
- Operational and Procedural Adjustments
- Document and Close Out



"What Gets measured, gets managed." – Peter Drucker

Results of Situational Awareness and CBM

- Improved Readiness and Availability of Systems
  - Using diagnostics to monitor failure trends we can increase time between failures by predicting maintenance issues and fixing the problems before they actually occur resulting in increased operational availability of platforms
- Lower Lifecycle Maintenance Costs
  - Diagnostics can extend planned maintenance requirements periodicities
  - Minimize stock supplies for parts
- Achieve Expected Service Life of Systems
  - Foresee or predict potential pending failures to help prevent catastrophic failures on deployment

"Data Feedback is Critical to all Supportability Elements" – Sean Olin, DoD Maintenance Symposium 2012 – This where OSIsoft Drives the Power of Data

Questions & Answers

Thank You

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