

DC Cook Plant Process Computer Replacement Project

2013 Scientech User's Symposium

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Project

- Organizations
 - DC Cook (Utility)
 - Hurst Technology (Utility Agent and A/E)
 - Scientech (Vendor)
- Schedule
 - Contract Award Sep 2011
 - Unit 1 FAT Dec 2012
 - Unit 1 Simulator Install Sep 2012
 - Unit 1 PPC Delivered to Site Jan 2013
 - Unit 1 Plant Install Aug 2013
 - Unit 2 FAT Jul 2013
 - Unit 2 Simulator Install Sep 2013
 - Unit 2 Plant Install Nov 2013

Existing System

SAIC PMS

- Replacement for Westinghouse P250 / P2500 (circa 1991)
- RTP 7400 I/O with VME HSSP
 - 3 DAS locations
- VAX 4000 (non redundant)
- DECnet network
- 6 control room workstations
- 4 TSC workstations
- 2 EOF workstations
- SAIC RDR (single system for both PPC systems)

R*TIME PSS

- Data feed from PPC
- Two PSS, one for plant systems and one for simulator systems

- PPC Workstations
 - SAIPMS windows viewer
 - Windows 98 (implemented in VMs)
 - BOP, RO and US control room workstations share keyboard and mouse with LAN workstation

- PPC Computer Room Cabinets
 - Original Westinghouse P250 cabinets
 - I/O equipment
 - Non PPC equipment (backup SSPS)
 - Networking equipment
 - DEC cabinets added for current system
 - PPC VAX and disk storage
 - RDR system and storage

- Aux Building Cabinets
 - Original Westinghouse P2500 I/O equipment
 - Replaced with RTP 7400 I/O equipment
- Turbine Building Cabinet
 - Original Westinghouse P2500 I/O equipment
 - Replaced with RTP 7400 I/O equipment

- External System Interfaces
 - Control Room Recorders
 - Serial
 - Ethernet
 - Chemistry Recorders
 - Serial
 - Located around the plant
 - MIDAS
 - FTP
 - RMS
 - Ethernet
 - ISFSI (Spent Fuel)
 - Network

Existing System

External System Interfaces (cont.)

- LEFM
 - Serial
- Digital Display
 - Serial
- Annunciator
 - Hardware (DOs)

Challenges

Project

- Concurrent project with ANN replacement
 - Resource conflicts in all organizations
- Existing Implementation did not match Documentation in all cases
- Other ECs changing the existing PPC configuration while the replacement PPC was being developed
 - Cyber Security
 - ISFSI (Spent Fuel)
- Cyber Security requirements for the replacement system were not settled until after Unit 1 shipped to DC Cook
- Changes in other systems during PPC installation
 - Containment Cooling Interface
 - Moved from PSS to PPC

- I/O Equipment
 - RTP 7400 HSWR system
 - RTP does not have a replacement with the same capability
 - RTP Surge Chassis
 - RTP does not have a replacement
 - Space
 - PPC Computer Room cabinets completely full
 - RTP 3000 has a bigger cabinet footprint
 - Original Westinghouse I/O cabinets limit rear access
 - Equipment on the front side, "clam shell" terminations on the rear side so the rear of the equipment cant be accessed when installed in the cabinets
 - Input impedance issues

- Network
 - Unable to reuse existing fiber cabling
 - Fiber cabling not available to all PPC equipment areas
 - Center control room desk
 - Unable to reuse a significant part of the existing PPC network
 - 10Base2
 - Serial connections utilize phone system cabling and equipment
 - Desire to get rid of reliance on phone cabling and equipment

- Cyber Security
 - Unable to establish requirements
 - Changes to equipment
 - Cabinet door alarms
 - Rebuild of PPC Computer Room cabinets
 - Doors remove because of interference with existing equipment
 - Change to network organization
 - Existing system is one flat network
 - Replacement network is segregated
 - U1 PPC
 - U2 PPC
 - Common PPC

- Schedule
 - Originally scheduled as outage installation
 - Change to non outage install before the outage due to resource conflicts with Annunciator system install
 - Original U1 installation date postponed
 - Lack of site SAT test procedures
 - Updated installation schedule
 - Aug/Sep 2013 U1 PPC
 - Sep/Oct 2013 U2 ANN
 - Nov 2013 U2 PPC

- Equipment Not Replaced
 - eDNA Historian used with PSS limited data point name length

- Development System
 - Plant conflicts over who owns PPC Development System and location of system
 - Design Engineering I&C? IT?
 - DC Cook Training Building? Buchanan Office Building (20 miles from the plant)?

- 9 Workstations
 - 6 Control Room
 - 1 for 1 replacement of existing workstations
 - 1 PPC Computer Room
 - 1 TSC Computer Room
 - 1 TSC per unit
 - EOF and remaining TSC workstations moved to Business LAN workstations on PSS
 - Dell Optiplex 390
 - All desktop systems
 - BOP and RO monitors mounted on "pedestals"

- Redundant PPC Servers
 - HP DL380
- Redundant Domain Controllers
 - HP DL360

- RTP 3000 I/O Equipment
 - Analog Inputs
 - TC
 - RTDs (converted to voltage by bridge modules on the "clam shells"
 - Voltage (High level)
 - Digital Inputs
 - 48 VDC
 - Analog Outputs
 - Control room trend recorders
 - Digital Outputs
 - 125 VDC (Main Control Room Annunciator)

- RTP 3000 I/O Equipment (cont.)
 - Redundant Node Processors (RTP 3000D)
 - Redundant Chassis Processors
 - Redundant Chassis Power Supplies
 - 3 DAS nodes
 - PPC Computer Room
 - Aux Building
 - Turbine Building
 - RTP does not provide a 125 VDC Relay Output I/O card
 - Utilize Cyber Research Interposing Relay Panel





- CyberResearch Surge Chassis Equipment
 - Provides surge ability originally provided by existing RTP surge chassis
 - Each I/O channel signal level can be separately configured
 - "Personality" module per channel
 - Solves signal level intermixing
 - Each input channel "normalized" to 0 to 10V output
 - Solves space problem by utilizing 32 channel I/O cards (analog and digital)
 - Four 8 channel AI surge cards are connected to one 32 channel RTP I/O cad
 - Two 16 channel DI surge cards are connected to one 32 channel RTP I/O card
 - Reduces all analog input and digital input I/O cards to a single model
 - Decouple input scanning from input signal impedance





- Network
 - New Plant Data Network (PDN) fiber backbone
 - PPC system
 - ANN system
 - Push out Ethernet network to remote plant location with Chemistry Recorders
 - Obsolete phone network wiring used for serial connections
 - Benefit of connecting new devices to the PPC
 - Segregated Network
 - U1 PPC Network
 - U2 PPC Network
 - Common PPC Network
 - Chemistry Recorders
 - RMS
 - ISFSI

Replacement System

- Network
 - Segregated Network (cont.)
 - Firewalls between each network

Cyber Security

- Network Intrusion Detection System
 - Located in the Common Network
 - Connections to U2 DAS Network and U2 HMI Network
- Event Log Manager
 - Located in the Common Network
 - Receives logs from all devices in U2 Network
- Project only implementing for U2, DC Cook implementing for U1

- Applications
 - SPDS & EOP Status Trees
 - Blackout and Time Response Testing
 - Digital Reactivity
 - Control Rod Functions
 - Calorimetric
 - Xenon Follow and Prediction
 - Set-point Supervision
 - Saturation Margin
 - Core Burnup Calcs
 - Flux Mapping
 - Plant Mode Change

- Applications
 - Delta Flux
 - Tilting Factors
 - Core Exit Thermocouple
 - RCS Leakrate
 - Deviation & Redundant Measures
 - RMS Annunciator

- Interfaces
 - Digital Display Interface
 - Recorder Interface
 - Rad Monitoring Interface
 - MIDAS Interface
 - LEFM Interface
 - NRC ERDS VPN Interface
 - Simulator Interface
 - PSS Interfaces
 - System Monitoring

Installation

- Online Installation
 - 30 day window from Flux Map to Flux Map
 - Pre installation of Turbine Bldg. I/O node
 - Temporary Calorimetric System
 - LEFM inputs
 - Manual data input
 - Additional manual entry screen
 - Temporary recorder to collect plant data
 - Eliminate need to downpower during PPC outage

Installation

- Existing I/O equipment wired spare channels
 - Westinghouse P250 / P2500
 - 6 or 7 channel analog inputs
 - SAIC wired the channels not connected through the "clam shells" to new terminations as spare points
 - Need to move 1 or 2 hard wired inputs as part of replacing surge chassis equipment
 - 14 or 16 channel digital inputs
 - SAIC wired the channels not connected through the "clam shells" to new terminations as spare points
 - Need to move 2 hard wired inputs as part of replacing surge chassis equipment

Installation

- Not all interfaces tested in FAT
 - DC Cook unable to provide test units for all Chemistry and Control Room recorders to Scientech for Development / FAT testing
 - Plant systems
 - Flux mapping
 - Rod control
- No parallel operation testing between existing system and replacement system

Installation

- Easy Buttons
 - DC Cook has used R*TIME PSS since 2007, users already familiar with the HMI interface
 - Operators already use PSS displays in the control room
 - Schedule delay
 - Allowed for more system run time in the Simulator
 - U2 FAT completed before U1 installed

Questions?