Oconee Nuclear Station
Operations Training Simulator Rehost Project

Big Project
+ Short Timeframe
= Success
Training Facility

- 2 Full Scope Simulators
  - Simulator Alpha – 1983
  - Simulator Bravo – 2008
- 2 Part Task Simulators
  - Standby Shutdown Facility
  - Integrated Control System
- 4 Glass Panel Simulators
The Oconee Team

- Larry Hawkins, Licensed Operator, Instructor, Official Tester
- Ken Just, Project Manager
- Bill Rostron, Modeling
- Tam Vo, Plant Computer, External Systems
- Joey Woolbright, Hardware
Why did we rehost?

• Outdated development tools, Visual Studio 6, VB6, Rose 3.3
• Home built Executive and Instructor Station, limited features
• Limited resources for in-house development
• Increase model fidelity
• Develop relationship with major vendor
• Plant planning for 2nd license extension
Selling Management

- Started working with vendors February 2016 to get budgetary quotes
- Capital project submitted April 2016
- Project was NOT approved
- Discussed project at Simulator Review Board meeting February 2017
- Preliminary approval by site management March 2017
- Funding approved June 2017
- Contract signed July 2017
- Commitment to meet September 2018

Release
Timeline

- 07/2017 – Contract signed
- 10/2017 – Design Review
- 02/2018 – Rehost FAT
- 05/2018 – Preliminary FAT
  - 1 Day Initial Instructor Training
- 06/2018 – Factory Acceptance Testing
  - Readiness Assessment
- 08/2018 – Site Acceptance Testing
  - 3 Day Instructor Training
- 09/2018 – Ready for Training
- 10/2018 – Final Documentation
Scope

- Move to Orchid Platform
- Upgrade Steam Generator model
- Replace sections of Fortran with Orchid models, ~ 380 devices
- Upgrade Glass Panels
- Replace camera recording system
- Add sound capability
- New computers, add Domain Controllers
- Upgrade network, 290 devices, consolidate 40 network switches
- Replace remaining RTP I/O with TMI I/O
Strategy for Success

• Teamwork
• Commitment
• Ownership
• Be Responsive
• Limit Rework
• Maintain Scope
• Eliminate Distractions
• Provide Hardware to Vendor
  • Plant Computers
  • Siemens Controller
  • Digital Chart Recorder
  • EHC & PCS Computers
  • Camera
Soft Panels

- First Portable Sim received Dec 2017
- Tested on Oconee Glass Panels
- Used Access database to generate test procedures
- Photos of every device in test procedure
- Used VBA to automate CTS for efficient testing

Problems Encountered
- Some simulator switch labels did not match reference unit
- Legacy I/O database not accurate leading to confusion
Siemens Controllers

- 27 on Full Scope, Network controlled
- Process runs in simulator
- Only used for HMI
Digital Chart Recorders

- 13 on Full Scope, Network controlled
Rehost FAT

- Performed in Montreal
- 2 Week Duration
- Testing Soft Panels prior to Rehost FAT was very helpful
- No model changes
- Verified legacy simulator models produced same results
- Concurrent testing at Oconee on Glass Panel simulator.
Pre-FAT

- Performed in Montreal
- 4 Week Duration
- Used additional instructor resources to augment simulator support staff
- Lots of errors discovered
- Legacy code still in place fighting new Orchid Models.
- Simulator crashes
- Siemens Controllers not working correctly
- Most challenging time of project
FAT

- Performed in Montreal
- 3 Week Duration
- Used additional instructor resources to augment simulator support staff
- Still lots of errors discovered
- Oconee behind on clearing CRs
- Team is getting tired
- Siemens Controllers working correctly by end of FAT.
Training

- Performed in Montreal
- 2 Week Duration
- Good content and presentation
- Retention rate low
SAT

- Equipment installed before SAT
- 4 Week Duration
- Instructors on 12 hour shifts used to perform complete startup and shutdown
- Instructors started developing scenarios for next cycle during free periods on 2nd simulator.
- Missed testing some legacy malfunctions during FAT, discovered during SAT.
Instructor Booth

- Instructor Station
- Multimedia Server
Network Upgrade

- Rack Mount Cabinets
- Patch Panels
- Cisco Switches
- Split I/O Network
Network Upgrade

Simulator Bravo Patch Panels

Electrical Room
- BPP1 48
- BPP2 48
- BPP3 48

Computer Room
- BPP6 12
- BPP7 12

Desk
- BPP8 12

Booth
- BPP9 12

1VB1-3
- BPP4 48
- BPP5 48

Red connections indicate network upgrades.
Network Upgrade

• Added Domain Controllers
• I/O devices on Alpha, Bravo and Common network use same configuration
Conclusion

• Project Goals Met
• Teamwork & Commitment
• Testing, testing, testing…
  • > 2,200 man-hours of testing
• Expect Management Pushback