



Brunswick Rehost Project

SCS-2017

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Project Scope

Complexity

- ✓ Core Upgraded to Studsvik S3R Neutronics and Athena II Thermalhydraulics
- ✓ Six Model Upgrades
- ✓ Simulator Rehost from EXITECH's Chattanooga to GSE's OpenSim Platform
- ✓ Creation of P&IDs from Plant Drawings with Instructor Station Capabilities
- ✓ Complete Set of Panel Graphics with Instructor Station Capabilities

Duration



Project Stakeholders



Brunswick Nuclear Plant



Studsvik

Roles and Responsibility

Duke Energy

Brunswick Nuclear Plant

Customer

Data Collection

- EXITECH Corporation
Project Management
Model Development
Graphic Development
Quality Assurance
- GSE Systems, Inc.
Rehost
Model Development
Graphic Development
- Studsvik Scandpower
S3R Core Neutronics Upgrade

Motivations for Rehost and Upgrades

<p>Virtualization + Performance</p>	<ul style="list-style-type: none"> ✓ Turbine Control System Upgrade necessitated moving computer platform to IBM Blade Servers with virtual machines and Honeywell DCS as well as the need for upgrading the steam flow interface to the Nuclear Boiler (Thermal Hydraulic Model) to a better nodal performance, requiring upgrade of the core model to match. ✓ TCS Project provided funding for the upgrade
<p>Model Modernization</p>	<ul style="list-style-type: none"> ✓ Need for additional computer power required modern system executives and computer performance to support the new Core and Thermal Hydraulic modeling required a move to different OS. ✓ Several Simulator Vendors were evaluated based on capability, company size, project timeline, cost, and product similarity to existing system.
<p>Model Integration</p>	<ul style="list-style-type: none"> ➤ GSE Opensim was chosen primarily for architectural synergies and compatibility to the Exitech Chattanooga system ➤ Additional models which interfaced to the Nuclear Boiler (various ECCS systems) and several other models were also chosen to be included in the upgrade

Simulator Rehost

- Rehost from EXITECH's Chattanooga/Ocoee to GSE's OpenSim/Xtreme platform
- Performed Baseline and Transient Testing to ANSI 3.5 Standards

Graphics Upgrades

- Move away from multiple platforms to one set of graphics
- Creation of Panel Graphics and P&IDs for use on glasstop simulators, and instructor station
- Tested using JADE Object IDs to track overall functionality and ensure correct variables are set



Model Upgrades

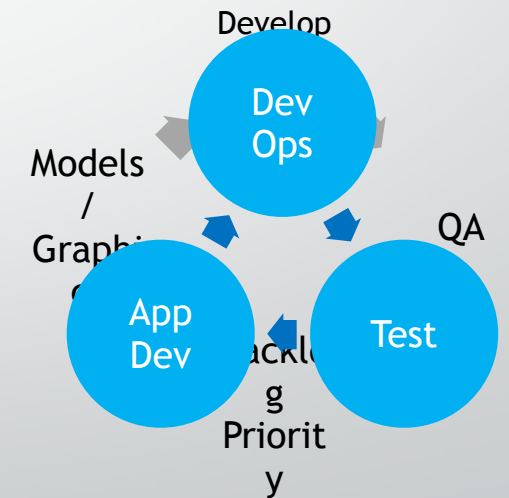
- HPCI, RCIC, CS and RHR Models Developed in GSE's JTopMeret Model Builder
- Containment and Rad Transport Models Developed in EXITECH's Model Builder
- 480V Motors done in EXITECH's ELECTREX Model Builder

Core Upgrades

- Upgraded older CAE (L3) Core to Studsvik S3R Neutronics
 - 16 axial nodes by 560 radial nodes
- Upgraded ATHENA Thermalhydraulics to ATHENA II
 - Upgrade from single active core channel and a bypass channel (each with 8 axial cells) to five active channels and a bypass channel, each having 16 axial cells

Technology Stack & Delivery Approach

Project Management	Smartsheet	Mantis
	Subversion	JIRA
	Confluence	
Application Accelerators	Sublime Text	
	Ultra Edit	
	Notepad++	
Graphics	Adobe Creative Suite CS6	
	JADE JDesigner	
	JADE Editor	Java
Model & Executive	Windows 10	
	Intel Fortran Composer	
	Microsoft Visual Studio	



Lessons Learned: ONE TEAM FOR SUCCESS

Issues	Solutions
<i>Delayed Start Due to Financials</i>	<i>Revised Schedule to Provide More Tasks in Parallel which Condensed Project Schedule End Date</i>
<i>Personnel Changes</i>	<i>EXITECH Provided Support to New Graphics Personnel at GSE for Continuing Success Path</i>
<i>Communication</i>	<i>Implemented Smartsheet and Increased Phone Communication for Transparency</i>
<i>Testing</i>	<i>FAT and SAT Testing on All Major Project Tasks Throughout Project VS. Lumped Together at End</i>