Brunswick Rehost Project

SCS-2017

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Project Scope

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

Brunswick Nuclear Plant
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

| Virtualization + Performance | ✓ 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 |
| Model Modernization | ✓ 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. |
| Model Integration | ➢ 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
- Subversion
- Confluence
- Mantis
- JIRA

## Application Accelerators
- Sublime Text
- Ultra Edit
- Notepad++

## Graphics
- Adobe Creative Suite CS6
- JADE JDesigner
- JADE Editor
- Java

## Model & Executive
- Windows 10
- Intel Fortan Composer
- Microsoft Visual Studio

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[Diagram showing the flow of development and testing stages, with labels for DevOps, AppDev, Test, and QA.]
**Lessons Learned:**

**ONE TEAM FOR SUCCESS**

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