Oconee Nuclear Station
Major Projects Update Meeting
May 27, 2015

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Duke Participants

- Bill Pitesa – Senior Vice President and Chief Nuclear Officer
- Preston Gillespie – Senior Vice President
- Scott Batson – Site Vice President
- Tom Ray – Plant Manager
- Ed Burchfield – General Manager, Nuclear Engineering
- Dave Baxter – General Manager, Significant Regulatory Projects
- Scott Lynch – Senior Project Director, PSW Project
- Carrie Dunton – Director, Site Support
- Dana Jones – Manager, Fukushima Response
- Doug Phelps – Director, Critical Systems Engineering
- Terry Patterson – Director, Organization Effectiveness
- Chris Nolan – Manager, Fleet Regulatory Affairs

Agenda

▪ Opening Remarks	Scott Batson
▪ Protected Service Water (PSW)	Scott Lynch
▪ National Fire Protection Association (NFPA) 805	Ed Burchfield
▪ Keowee Hydro Upgrades	Doug Phelps
▪ Tornado/High Energy Line Break (HELB)/ Main Steam Relief Valves (MSIVs)	Dave Baxter
▪ Significant NRC Commitments	Terry Patterson
▪ Fukushima	Dana Jones
▪ External Flooding	Dave Baxter
▪ Upcoming Regulatory Submittals	Carrie Dunton
▪ Closing Remarks	Preston Gillespie / Bill Pitesa

Opening Remarks

Scott Batson

Site Vice President, Oconee Nuclear Station

Scott Lynch

Senior Project Director, PSW Project

PSW – Milestone Summary Update

Completed Milestones:

- Milestone 1 – Commercial Power Path to Standby Shutdown Facility
- Milestone 2 – Power Path from Keowee Hydro
- Milestone 3 – Power Path from PSW to High Pressure Injection (HPI) System
- Milestone 4 – Align PSW Pump to Steam Generators

Remaining Milestones on track to meet required dates:

- Milestone 5 – PSW System Complete – February 4, 2016
- Milestone 6 – Satisfy the Requirements of NFPA 805 – November 15, 2016

Milestone 1 – Commercial Power Path to Standby Shutdown Facility – Complete

- Completed Items
  - Milestone 1 completed and turned over to Operations
  - A Selected Licensee Commitment was implemented to track unavailability of PSW power via Maintenance Rule
  - 13% estimated Fire Core Damage Frequency improvement
  - Milestone 1 completion notification letter submitted to NRC on August 28, 2013

PSW Building

For Information Only

PSW Building Switchgear

For Information Only

Milestone 2 – Power Path From Keowee Hydro – Complete

- Completed Items
  - Milestone 2 completed and turned over to Operations
  - The Selected Licensee Commitment was revised to add Keowee power path to the tracking mechanism for unavailability of PSW power via Maintenance Rule
  - Additional 1% estimated Fire Core Damage Frequency improvement
  - Milestone 2 completion notification letter submitted to NRC on December 12, 2013

Keowee Switchgear Cabinet

Milestone 3 – Power Path From PSW to HPI System – Complete

- Completed Items
  - Milestone 3 completed and turned over to Operations
  - The Selected Licensee Commitment was revised to add HPI to the tracking mechanism for unavailability of PSW power via Maintenance Rule
  - Additional 8% estimated Fire Core Damage Frequency improvement
  - Milestone 3 completion notification letter submitted to NRC on July 7, 2014

Milestone 4 – Align PSW Pump to Steam Generators – Complete

- Completed Items
  - Milestone 4 completed and turned over to Operations
  - Installation and integrated testing of the PSW system
    - Unit 1 Steam Generators supplied by PSW during the fall 2014 Refueling Outage
  - Installation and integrated testing of the Alternate Chilled Water (AWC) system
  - A Selected Licensee Commitment was implemented to define PSW allowed outage times, required actions, and surveillance requirements
  - Additional 15% estimated Fire Core Damage Frequency improvement
  - Milestone 4 completion notification letter submitted to NRC on March 24, 2015

Milestone 4 – NRC Inspection Results

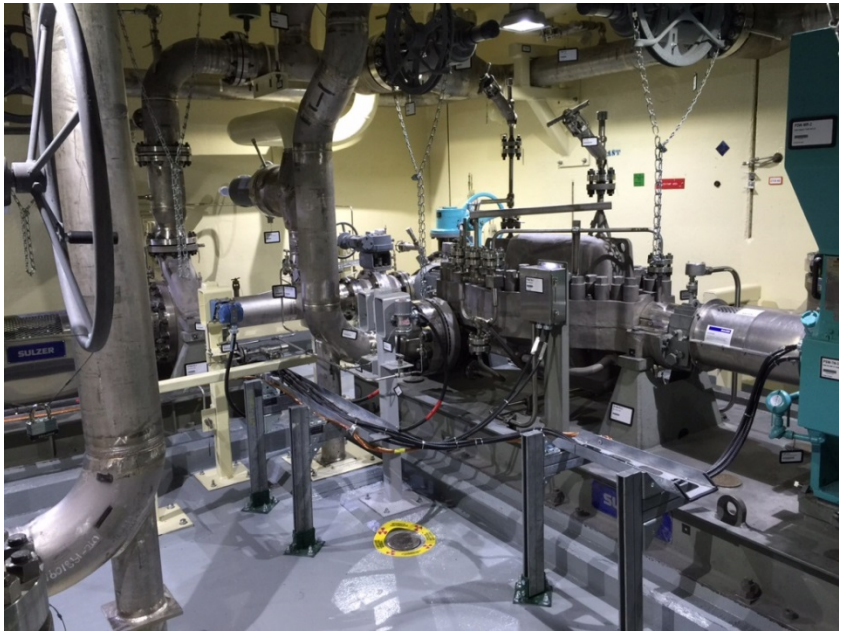
- Onsite inspection began April 5, 2015; debrief conducted April 24, 2015
- Inspectors identified discrepancies between the flow model and the as-built plant

Response to Inspection Results

- Cause Evaluation initiated on flow model discrepancies
- Field-verified system dimensional data and configuration
- Validated flow coefficients, flow requirements, and resistance values
- Updated flow model to resolve as-built discrepancies
- On-site presence at vendor facility for flow model re-work
- Reevaluated design basis requirements for HPI motor coolers
- Follow-up onsite inspection began May 26, 2015

PSW Pump Room

PSW Booster Pump



PSW Primary Pump

AWC – Unit 1 East Penetration Room Piping

AWC Chillers

Milestone 5 – PSW System Completion – February 4, 2016

Scope

- Units 1, 2, and 3 Pressurizer Heater and Vital I&C Battery Charger Repowering from PSW
- Units 1, 2, and 3 Vital I&C Cable Reroutes
- Units 1, 2, and 3 Replace Pressurizer Heater Breaker Panels with Fuse Panels
- Units 1, 2, and 3 Vital I&C Battery Ventilation Fan Repowering

Milestone 5 – PSW System Completion – February 4, 2016

Completed Items

- Infrastructure installation (cable tray, supports, termination boxes, etc.)
- Cable pulls to MCCs to provide PSW power to select Pressurizer Heaters
- Cable pulls to provide PSW power to Vital I&C Battery Chargers
- Unit 2 Vital I&C cable reroutes
- Unit 2 Pressurizer Heater Fuse Panel installation

Milestone 5 – PSW System Completion – February 4, 2016

In Progress Items

- Unit 1 Vital I&C cable reroutes
- Cable terminations in the PSW Building and Auxiliary Building
- Unit 1 Replacement of Pressurizer Heater breakers with fuses
- On track to meet February 4, 2016 completion date

Milestone 6 – Satisfy the Requirements of NFPA 805 – November 15, 2016

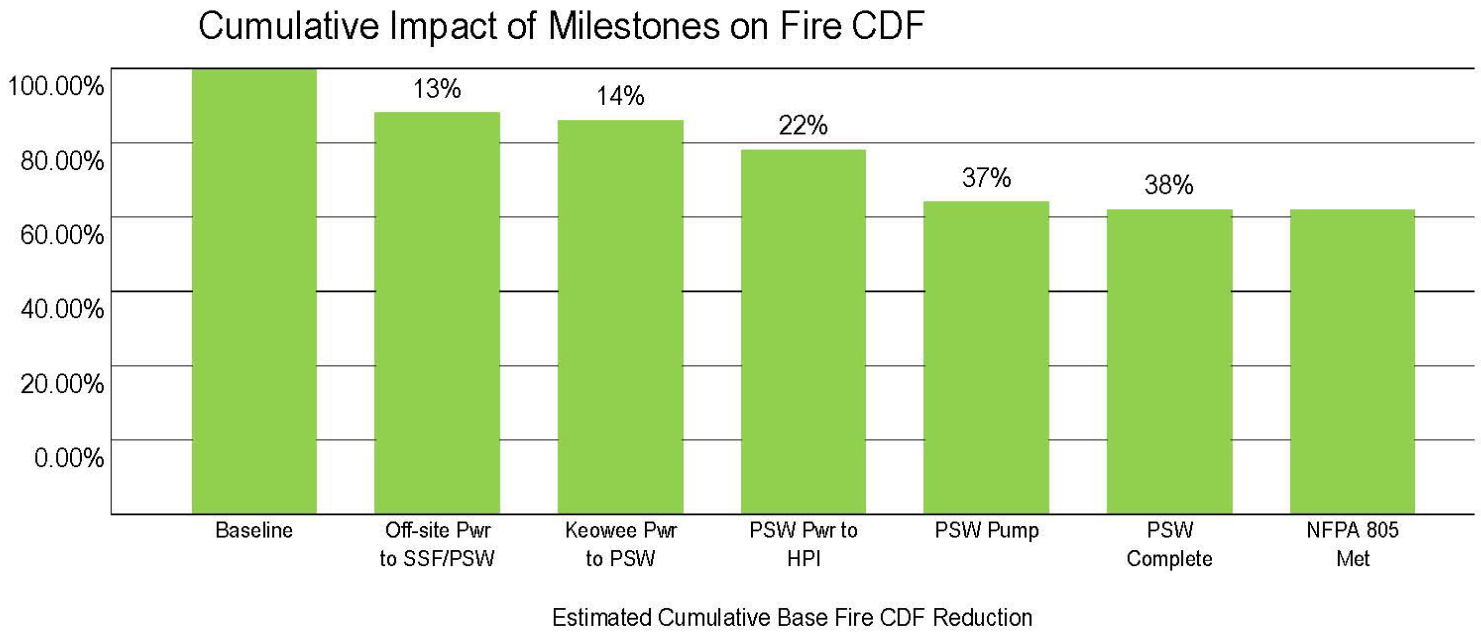
Transition License Conditions

- The Transition License Conditions will be discussed by Ed Burchfield in the NFPA 805 presentation

Ed Burchfield

General Manager, Nuclear Engineering

Estimated Fire CDF Impact of Each Milestone



For Information Only

NFPA 805 Project Status

- NRC Safety Evaluation issued December 29, 2010
- Program implemented January 1, 2013
- All items on schedule
- Turbine Building / Auxiliary Building wall penetrations modifications completed
- Units 1 and 3 fire detection modifications completed
- Units 1, 2, and 3 Purge Inlet Room/West Penetration Room fire barrier modifications completed
- PSW Milestones 1-4 completed

Remaining NFPA 805 Items to Complete

- Unit 2 fire detection modifications
- PSW Milestone 5 modifications
- PSW Milestone 6
  - Incorporate the PSW modifications into site documents
  - Update the fire PRA with as-built data
  - Confirm that the as-built risk decrease from installation of PSW bounds the transition risk
  - Complete the analysis of non-power operation fire impacts

Ongoing Actions until PSW modifications are complete

- Fire watches for Appendix R non-compliances
- Additional prudent fire risk reduction compensatory actions

Oconee's fire safety has benefited from the implementation of NFPA 805 and PSW

Doug Phelps

Director, Critical Systems Engineering

Keowee Hydro Upgrades

- Keowee Hydro Station commissioned in 1971
- Previous Major Maintenance and Refurbishment Upgrades
  - 1979 – Weld repair of turbine blades for each KHU
  - 1987 – Keowee Hydro Unit (KHU) -1 generator stator maintenance
  - 1994 – Keowee transformer upgrade
  - 2004 & 2005 for each KHU – Turbine refurbishment; governor, voltage regulator, battery replacements
- 2008-2009 preventative maintenance inspections identified aging mechanisms in rotor pole assemblies
- 2009 Duke Energy started planning efforts to refurbish/overhaul both Keowee generators
  - Refurbished/replaced all 56 generator field poles on each KHU
    - KHU-2 completed February 28, 2014
    - KHU-1 completed August 1, 2014

Planned Upgrades

- Online Monitoring System
  - Provides real time and trend monitoring of turbine/generator
  - Installed during normal maintenance windows
  - Operational in 2015
- Governor Oil Pump Unloaders
  - Replace mechanical unloaders with electric unloaders
  - Resolves obsolescence issues
  - Increases operating margin
  - No unavailability to install, test during normal maintenance windows
  - On track for 2016

Planned Upgrades

- Keowee Main Step-up Transformer Replacement
  - Contract issued to purchase
  - Onsite October 2016
  - Install within allowed Technical Specification completion time
- Stator replacement for Keowee Unit 1 & 2
  - We are evaluating the feasibility to pre-build each stator on site and replace the entire stator
    - Decreases outage duration
    - Allows for testing of new stator prior to entering outage
  - License Amendment Request (LAR) required is very similar to Generator Rotor Pole Project
    - Planning pre-submittal meeting in 3rd quarter 2015

Dave Baxter

General Manager, Significant Regulatory Projects

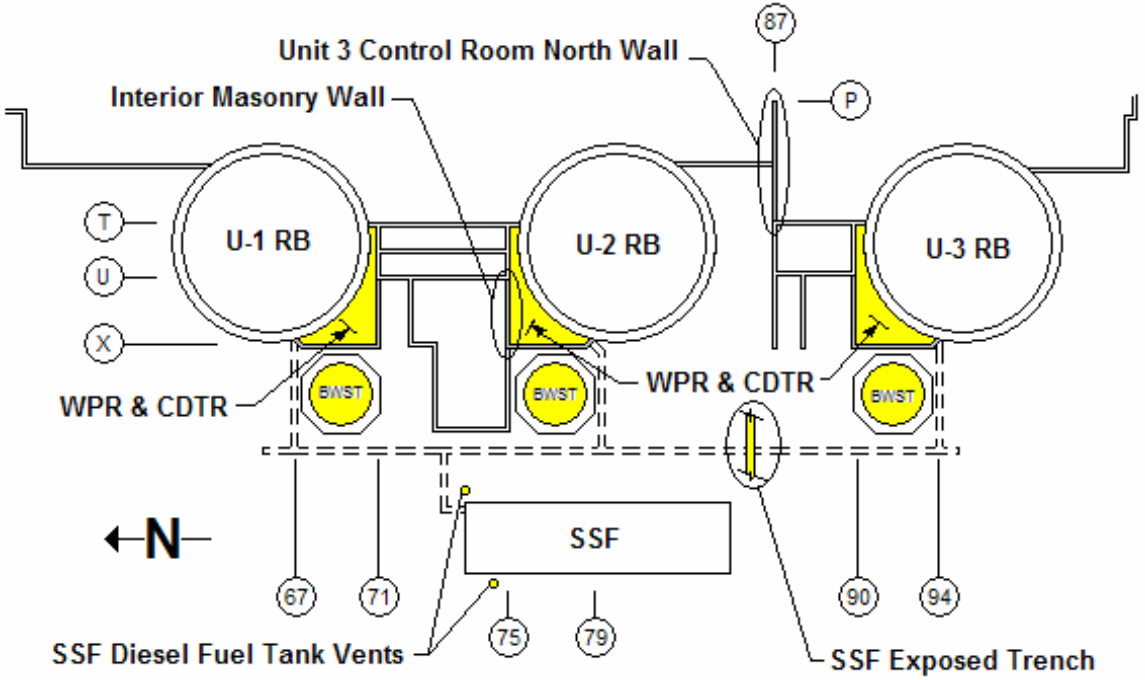
Tornado Mitigation Activities Completed

- Completion of PSW Milestones 1-4
  - Milestone 1 – Commercial Power Path to Standby Shutdown Facility
  - Milestone 2 – Power Path from Keowee Hydro
  - Milestone 3 – Power Path from PSW to High Pressure Injection (HPI) System
  - Milestone 4 – Align PSW Pump to Steam Generators

Tornado Mitigation Activities Completed (continued)

- Unit 3 Control Room North Wall
- SSF/CT-5 Trench Crossover
- SSF Diesel Generator Fuel Oil Vent
- Borated Water Storage Tank (BWST) Piping/Instrumentation Protection
- West Penetration Room (WPR) and Cask Decontamination Tank Room (CDTR) Reinforced Siding and Fibrwrap® Installation

Tornado/HELB/MSIVs



Unit 3 Control Room - North Wall Construction

SSF Trench / CT-5 Trench Crossover

Unit 3 BWST Piping/Instrumentation Protection

In Progress Photo

Completed Photo

WPR/CDTR Fibrwrap® & Steel Siding Installation

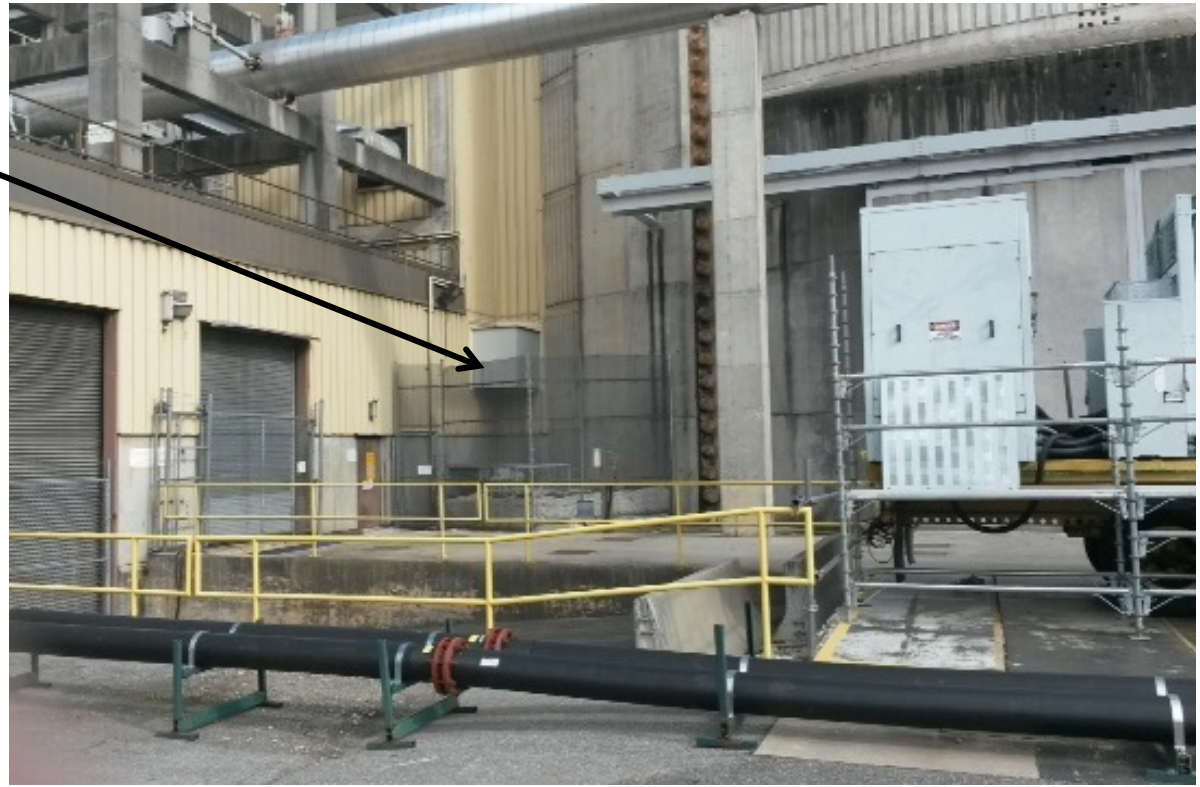
High Energy Line Break Mitigation Activities Completed

- Completion of PSW Milestones 1-4
  - Milestone 1 – Commercial Power Path to Standby Shutdown Facility
  - Milestone 2 – Power Path from Keowee Hydro
  - Milestone 3 – Power Path from PSW to High Pressure Injection (HPI) System
  - Milestone 4 – Align PSW Pump to Steam Generators
- Implementation of Main Steam and Main Feedwater piping located in the East Penetration Room (EPR) inspection program

High Energy Line Break Mitigation Activities Completed (continued)

- Initial inspection and repair of EPR electrical penetration termination enclosures
- Implementation of EPR electrical penetration termination enclosure inspection program
- Installation of EPR Flood Outlet Device and Flood Impoundment Walls
- Replacement of valves 2/3HP-1 & 2 to allow termination of a postulated letdown break outside containment
- Installation of reach rods to valves 1/3HP-103 & 107 to allow manual remote operation to terminate postulated High Pressure Injection Pump outlet breaks

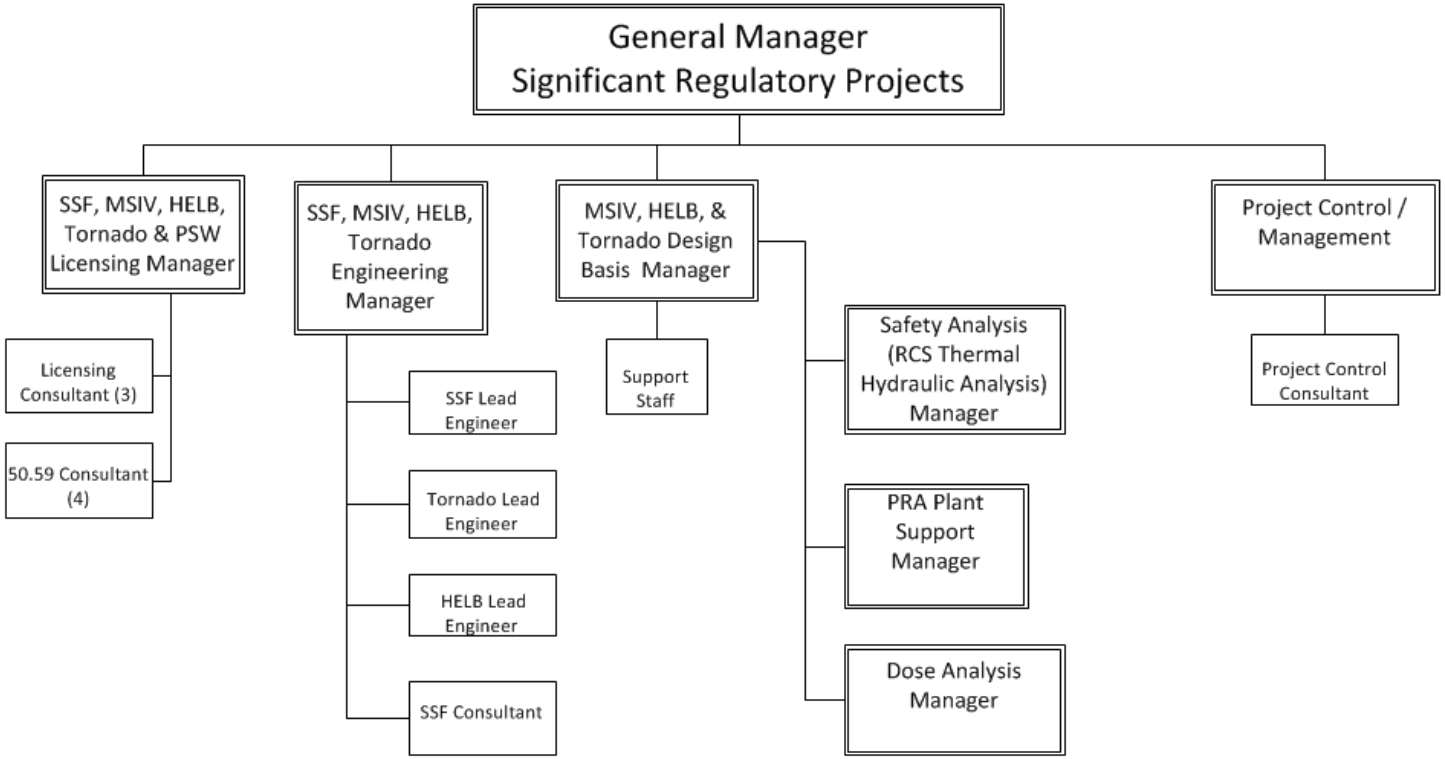
Unit 1 Flood Outlet Device



Tornado/HELB/MSIV Current Activities

- Oconee Staff is fully engaged in implementing PSW, External Flood and Fukushima activities
- As we complete PSW implementation, we are refocusing on Tornado/HELB/MSIV activities
- Established new organization to support Tornado/HELB/MSIV
- Based on the complexity associated with installation of MSIVs, the new organization will begin a review of the project to determine any improvements/changes that may be needed to ensure the optimal solution is achieved to ensure appropriate design and viability of installation
- The final resolution will be selected based on the expectation that the three Oconee Units will operate for an extended period

Tornado/HELB/MSIVs



Remaining Tornado Mitigation Project Activities

- Modification to the SSF South End Double Doors for protection against tornado induced effects – scope, schedule and implementation date will be provided by September 30, 2015
- Modification of the SSF North Trench for protection against tornado induced effects – March 31, 2016
- SSF Diesel Service Water Discharge for protection against tornado induced missiles – March 31, 2016

Remaining Tornado Mitigation Project Activities (continued)

- Modification of the Main Steam (MS) yard supports for protection of the MS lines from tornado induced missiles (U1 – Fall 2016; U2 – Fall 2015; U3 – Fall 2016)
- Main Steam Isolation Valve (MSIV) / Atmospheric Dump Valve (ADV) Installation in Tornado Protected Enclosure (Implementation 1EOC31 in 2020; 2EOC30 in 2021; 3EOC31 in 2022)
- Completion of PSW Milestone 5, PSW System Complete – February 4, 2016

Remaining HELB Project Activities

- Replacement of valves 1HP-1 & 2 to allow for termination of a postulated letdown break outside containment – Fall 2016
- Installation of reach rods to valves 2HP-103 & 107 to allow for termination of postulated High Pressure Injection Pump outlet breaks – Fall 2015
- Protection of Control Complex Heating, Ventilation, and Air Conditioning (HVAC) ductwork from postulated HELBs – Schedule to be determined upon receipt of HELB SER
- Modification to certain Turbine Building columns to mitigate potential damage following postulated HELBs – Schedule to be determined upon receipt of HELB SER

Remaining HELB Project Activities (continued)

- Replacement of Condenser Circulating Water (CCW) discharge stop gates – Schedule to be determined upon receipt of HELB SER
- Completion of PSW Milestone 5
  - Milestone 5 – PSW System Complete – February 4, 2016
- Installation of Main Steam Isolation Valve (MSIV) / Atmospheric Dump Valve (ADV) in Tornado Protected Enclosure (Implementation 1EOC31 in 2020; 2EOC30 in 2021; 3EOC31 in 2022)

Licensing

- Tornado License Amendment Request and High Energy Line Break License Amendment Request deferred to focus on licensing PSW system
- Tornado and HELB LARs credit installation of MSIVs / ADVs
- PSW Safety Evaluation Report received from NRC on August 13, 2014
- As we complete PSW implementation, we are refocusing on Tornado/HELB/MSIV activities

Terry Patterson

Director, Organization Effectiveness

Significant NRC Commitments

- Oconee tracks NRC commitments in the Problem Identification Program (PIP) by assigning a unique flag to the Corrective Action
- On-going commitments are institutionalized in procedures or permanent plant modifications and any changes to the commitments are managed using the process outlined in NEI 99-04, Guidelines for Managing NRC Commitment Changes
- Oconee has open commitments being tracked in eight specific categories:
  - Tornado
  - High Energy Line Break (HELB)
  - NFPA 805 including Protected Service Water (License Condition)
  - Fukushima Lessons Learned
  - Cyber Security (Rule Implementation)
  - Reactor Vessel Internals Inspection Plan License Amendment Request (LAR)
  - AREVA LOCA Analysis Thermal Conductivity Anomaly
  - LAR submittal for TSTF-523, Gas Accumulation in ECCS Systems

Significant NRC Commitments

- The status of commitments in the 8 specific categories is as follows:
  - Tornado
    - 23 of 30 commitments are complete
    - Remaining 7 on-track
  - High Energy Line Break
    - 35 of 45 commitments are complete
    - Remaining 10 on-track
  - NFPA 805 Modifications
    - 4 of 6 commitments are complete
    - Remaining 2 on-track
  - Remaining Fukushima Lessons Learned on-track

Significant NRC Commitments

- The status of commitments in the 8 specific categories is as follows: (continued)
  - Cyber Security Program Plan submitted in response to NRC Revision to 10 CFR 73 consisted of nine specific milestones
    - Milestones 1-7 complete
    - Final 2 Milestones on-track
  - Reactor Vessel Internals Inspection EPRI MRP adoption on-track
  - AREVA LOCA Analysis Thermal Conductivity Error on-track
  - NRC approved approach to GL 2008-01, Gas Accumulation, on-track

Dana Jones

Manager, Fukushima Response

Fukushima Implementation Schedule

Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016
McGuire 1 10/2014 Complete	**Brunswick 2** 4/2015 Complete	**McGuire 2** 10/2015	**Brunswick 1** 4/2016	**Oconee 1** 11/2016
	Catawba 2 4/2015 Complete	**Oconee 2** 11/2015	**Oconee 3** 5/2016	
	Harris 5/2015 Complete	**Catawba 1** 12/2015		
	Robinson 6/2015 In-Progress			

Fukushima
Flexible and Diverse Mitigation Strategies (FLEX)

1 **SSF** – Phase 1 coping for T=0 event
2 **FLEX Building** – multiple deployment paths
3 **CTP-1** – supplies S/G feed inventory for 24 hours
4a **3000 gpm portable pump** – provides S/G feed to all units (Warning Time event)
4b **3000 gpm portable pump** – provides S/G feed to all units (T=0 event)
5 **2500 psi portable pump** – provides RC make-up per unit (both events)
6a **600 VAC portable generator** – re-powers each unit through XPSW 1,2,3 (T=0 event)
6b **120 VAC portable generator** – re-powers each unit through various panelboards (Warning Time event)
7 **Intake** – inventory for indefinite coping (T=0 event)
8 **CCW piping** – inventory for S/G feed after CTP-1 (Warning Time event)

Flexible and Diverse Mitigation Strategies (FLEX)

- Compliance Dates: 2EOC27 (Fall 2015); 3EOC28 (Spring 2016); 1EOC29 (Fall 2016)
- 2 Strategies based on type of external events
  - T=0 strategy (uses SSF for Phase 1 coping; all events except upstream dam failure)
  - Warning Time Strategy (based on 2011 SE Jocassee Dam Failure - CAL)
- Equipment
  - Most major components are onsite
  - Remaining major components have been ordered
- Physical Modification Status
  - Online Modifications - Complete
  - Outage Modifications
    - Three on schedule to complete during 2EOC27, 3EOC28, and 1EOC29

Fukushima

Fukushima

Fukushima

Spent Fuel Pool Level Indication

- Compliance Dates: 2EOC27 (Fall 2015) for Unit 1&2 shared SFP
  3EOC28 (Spring 2016)
- Providing wide-range level indication using Fleet-consistent approach: AREVA Through-Air Radar System
- 2 channels per pool with local indication as well as indication in the Control Rooms
- Factory Acceptance Testing complete
- Equipment onsite
- Implementation In-Progress on both pools
- On schedule for Fall 2015 implementation complete (both pools, Unit 1/2 and Unit 3)

Seismic

- Recommendation 2.3
  - Walkdowns Complete
  - TI-188 Inspection Complete
- Recommendation 2.1
  - Updated Seismic Hazard Submittal Complete
  - Oconee identified as Group 1 plant
  - SPRA activities underway

Emergency Preparedness (EP)

- Communications
  - Assessment complete; review of potential enhancements in-progress
- Staffing
  - Phase 1 staffing study submittal complete
  - Phase 2 staffing study complete – on schedule for June 2015 submittal

Flood

- Recommendation 2.3
  - Walkdowns Complete
  - TI-187 Inspection Complete

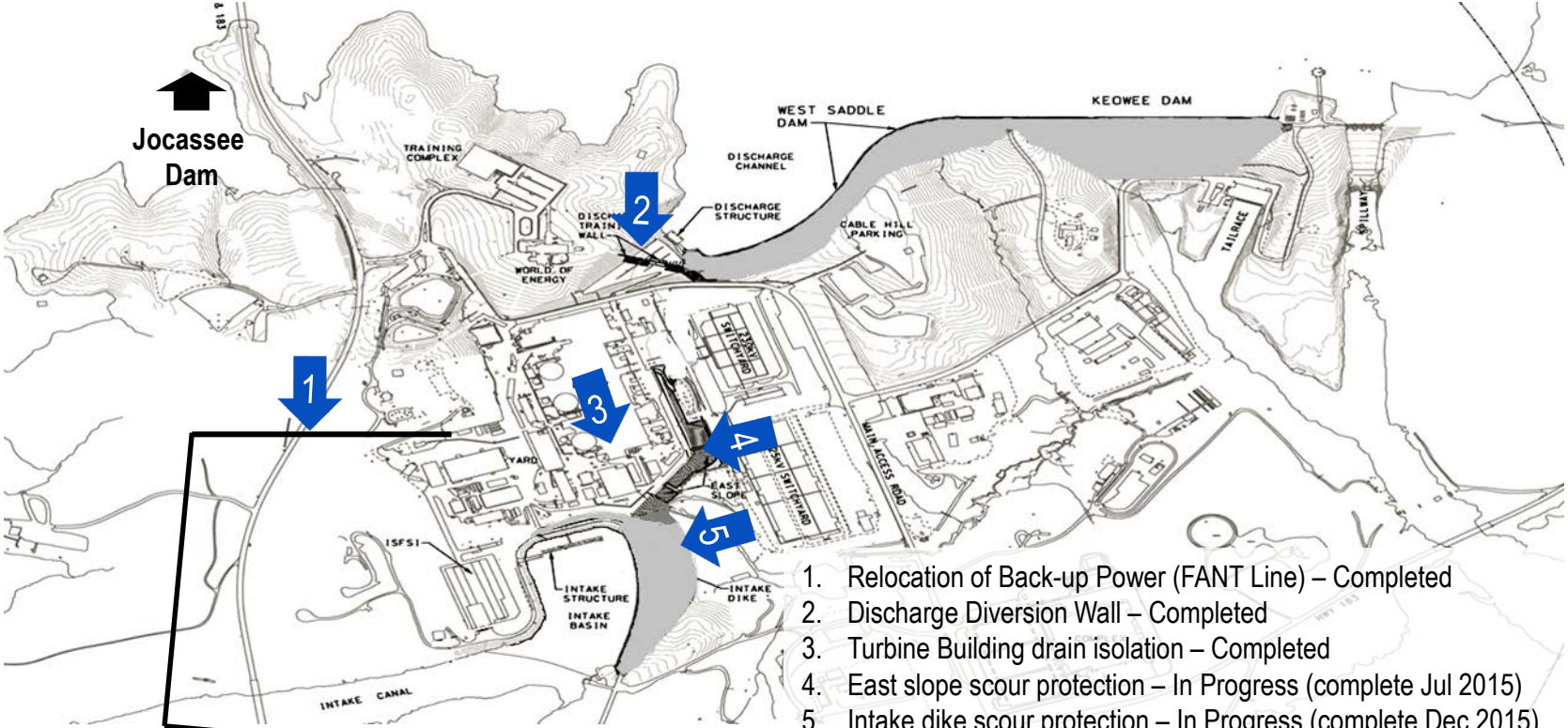
Flood (continued)

- Recommendation 2.1
  - Flood Hazard Reevaluation Complete
    - Jocassee Dam Failure
    - PMP/LIP
  - Flood Hazard Reevaluation Report (FHRR) revision complete; submitted March 6, 2015
  - Flooding strategy
    - Protection for flooding levels below the SSF Flood wall
    - Mitigation for flooding levels above the SSF Flood wall
    - Mitigation for indefinite coping capabilities
  - Integrated Assessment on hold until COMSECY decision – NRC 6 month due date extension to September 12, 2015
  - Protection Modifications in progress; on schedule to complete 2016

Dave Baxter

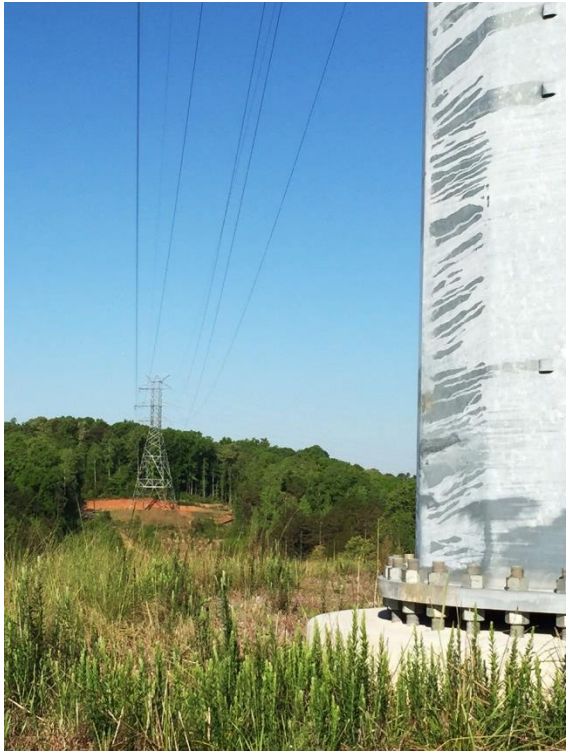
General Manager, Significant Regulatory Projects

External Flooding Modifications



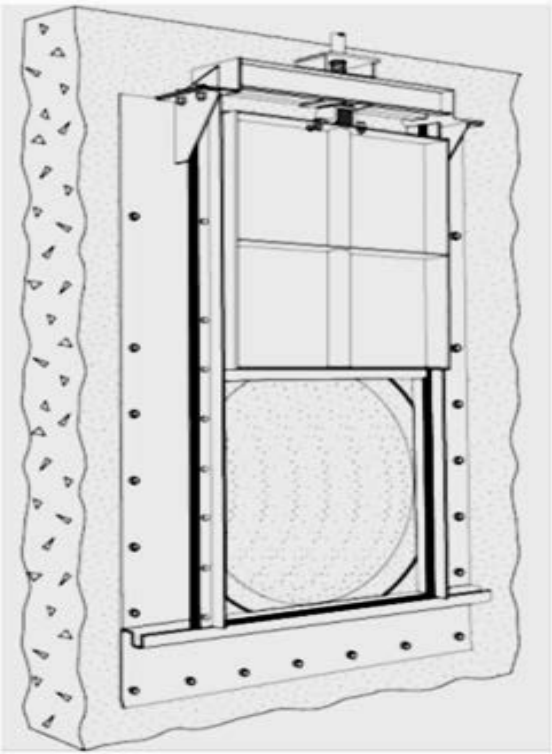
1. Relocation of Back-up Power (FANT Line) – Completed
2. Discharge Diversion Wall – Completed
3. Turbine Building drain isolation – Completed
4. East slope scour protection – In Progress (complete Jul 2015)
5. Intake dike scour protection – In Progress (complete Dec 2015)

Relocation of Back-up Power Path – Complete

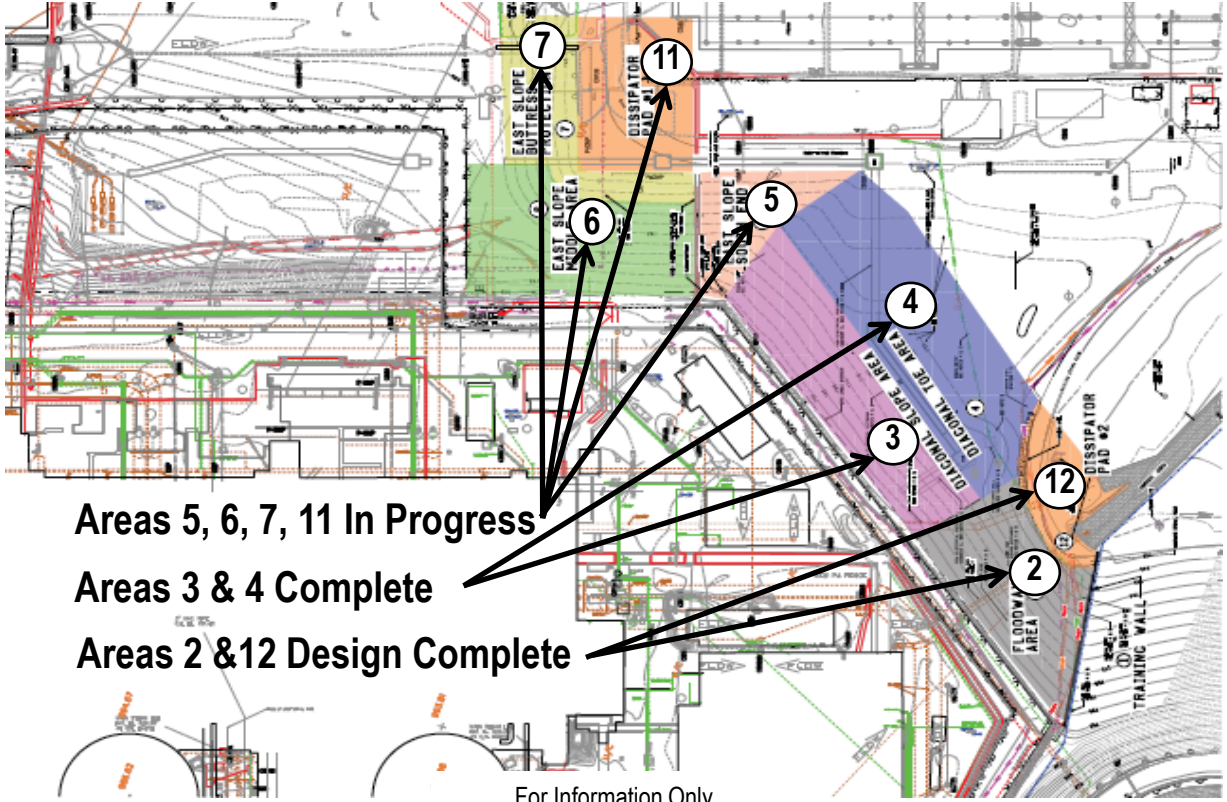


Discharge Diversion Wall – Complete

Turbine Building Drain Isolation – Complete



Scour Protection – Plan View



For Information Only

Scour Protection – East Slope (Areas 3 & 4) – Complete

Scour Protection – East Slope (Areas 5, 6) in progress

FHRR Update

- Interim Actions for flooding have been inspected and remain in place
- Revised FHRR submitted March 6, 2015
- Regulatory Path Forward letter submitted March 6, 2015
- Weekly webinars between NRR/NRO and Duke in-progress
  - FHRR Overview
  - Seismic Dam Performance
  - Hydraulic Modeling

Flooding Response Strategy – Defense-in-depth

Jocassee Dam failure – Mitigation Strategies deployed followed by:

<u>Flooding with peak levels below site grade</u>

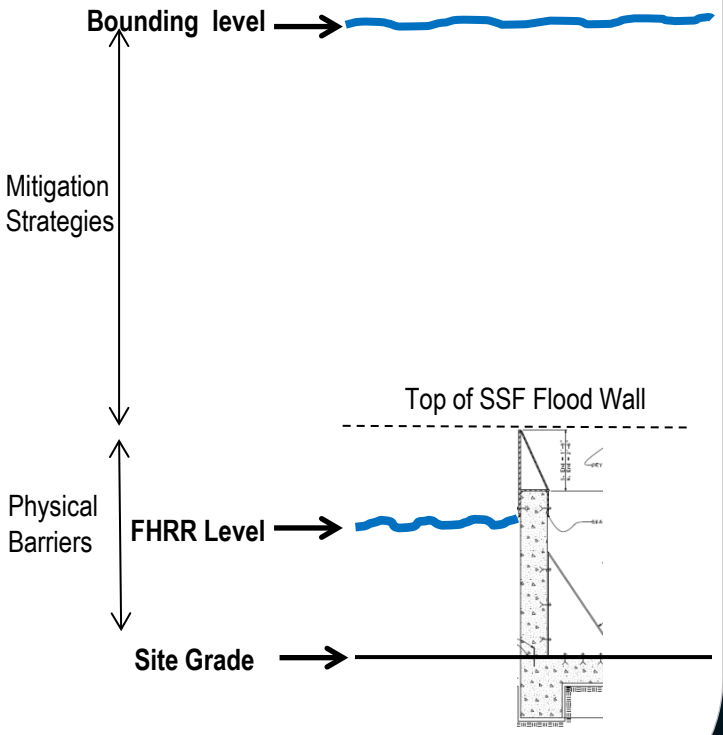
- Plant SSCs provide feedwater and reactor coolant makeup
- SSF available to provide back up to plant SSCs

<u>Flooding levels above site grade but below top of SSF flood walls</u>

- Plant SSCs provide feedwater and reactor coolant makeup until plant SSCs are lost
- SSF is staffed and available
- SSF provides feedwater and reactor coolant makeup if normal SSCs lost

<u>Flooding levels above SSF flood walls</u>

- Plant SSCs provide feedwater and reactor coolant makeup until plant SSCs are lost
- SSF is staffed and available
- SSF provides feedwater and reactor coolant makeup when normal SSCs are lost
- When the SSF is lost, Mitigation Strategies are put into service providing
  - Feedwater and reactor coolant makeup (diesel powered)
  - Instrumentation
  - Spent fuel pool make-up



Regulatory Path Forward

- Establish new Jocassee Dam failure licensing basis
  - Based on updated Jocassee FHRR Flooding Analysis
  - New Beyond Design Basis Event to be included in Oconee UFSAR Chapter 2
- 2011 SE Flooding Levels become the bounding dam failure flood
  - Mitigation Strategies for flooding will address maximum flooding levels from 2011 SE
  - Safety Evaluation for EA-12-049 to be incorporated in the site licensing basis UFSAR Chapter 3
- Flooding modifications and response strategies
  - Jocassee dam failures are considered to be Beyond Design Basis events
  - Site modifications required to support protection and mitigation strategies completed – June 2016
  - Mitigation strategies as outlined in Final Integrated Plan (for EA-12-049) completed fall 2016
- Ongoing CAL actions to be maintained after the CAL is closed

Carrie Dunton

Director, Site Support

Planned License Amendment Submittals

- Adoption of NEI 99-01, Rev. 6 Emergency Action Limits
- TSTF-448, Control Room Habitability
- TSTF-523, Managing Gas Accumulation
- Gas Gap Release Fractions for High Burnup Fuel
- Add COPERNIC Fuel Performance Code to Tech Specs and Core Operating Limits Report
- Keowee Stator Replacement
- SSF Thermal Margin
- Self-approval for risk-informed Fire Protection Program Changes

License Amendment Submittals Currently Under NRC Review

- Adoption of MRP-227 (Reactor Vessel Internals Inspection)
- Adoption of ASME OM Code
- Revision to Technical Specification 3.5.2 (High Pressure Injection)
- Adoption of TSTF-513 (Reactor Coolant Leakage Monitoring Instrumentation)
- Cyber Security Milestone 8
- Adoption of TSTF-510 (Steam Generator Inspection Program)
- Addition of a High Flux Trip for 3 Reactor Coolant Pump Operation

Closing Remarks

Preston Gillespie, Senior Vice President

Bill Pitesa, Senior Vice President and Chief Nuclear Officer

Acronyms

- ADV – Atmospheric Dump Valve
- AWC – Alternate Chilled Water
- BWST – Borated Water Storage Tank
- CAL – Confirmatory Action Letter
- CCW – Condenser Circulating Water
- CDF – Core Damage Frequency
- CDTR – Cask Decontamination Tank Room
- CTP – Chemical Treatment Pond
- EOC – End of Cycle
- EPR – East Penetration Room
- FHRR – Flood Hazard Reevaluation Report
- FLEX – Flexible & Diverse Mitigation Strategies
- HELB – High Energy Line Break
- HPI – High Pressure Injection
- I&C – Instrumentation and Control
- KHU – Keowee Hydro Unit
- LAR – License Amendment Request
- LIP – Local Intense Precipitation
- LOCA – Loss of Coolant Accident
- MCC – Motor Control Center
- MS – Main Steam
- MSIV – Main Steam Isolation Valve
- NFPA – National Fire Protection Association
- PMP – Probable Maximum Precipitation
- PRA – Probabilistic Risk Assessment
- PSW – Protected Service Water
- RC – Reactor Coolant
- SE – Safety Evaluation Report
- SFP – Spent Fuel Pool
- S/G – Steam Generator
- SPRA – Seismic Probabilistic Risk Assessment
- SSF – Standby Shutdown Facility
- UFSAR – Updated Final Safety Analysis Report
- VAC – Volts Alternating Current
- WPR – West Penetration Room

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