

TENNESSEE VALLEY AUTHORITY BROWNS FERRY NUCLEAR PLANT

Units 1, 2, and 3 Extended Power Uprate

November 30, 2007

Enclosure 2

Agenda



- Introductions
- Objectives
 - Extended Power Uprate
 - Background
 - EPU Modifications
 - Remaining EPU Issues
 - Path Forward
- Closing Remarks

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Objectives



- Common Understanding of Remaining EPU Issues
- Agree on a Path Forward to Address Open Issues
- Establish a Basis For Proceeding With Implementation of BFN EPU.



Background



- Initial Submittals June 2004
 - Unit 1 100% to 120% OLTP with pressure increase
 - Units 2 & 3 105% to 120% OLTP
- Acceptance Review May 2005
- Unit 1 approved for 105% March 2007
 - Included pressure increase
 - Units 1, 2, and 3 now at same licensed power level
- Provided responses to approximately 450 questions per submittal contained in 14 rounds of RAIs
- Three issues remain
 - GE Fuel Methodology
 - Containment Overpressure
 - Steam Dryers

EPU Modifications Upgrade moisture separator internals High Pressure Turbine modifications to Steam Dryer Mods, for moisture removal efficiency accommodate additional steam flow Recir Motor Upgrades, Jet Pump Inst Clamps **Moisture Separators** AVS's, Strain **Bus Duct Cooling** Gages & Modify System Mods MSIV's Transitioned To A-10, GE-14 Fuel Generator Rerate. Hydrogen Cooling Modifications Added 10th Demin Feedwater Heaters modified due Vessel and New to increased pressure and flow. **Demin Control** Select Heater Shells, Nozzle Repl, Reactor System **Tube Staking & Relief Valves** Feedwater Pump Feedwater Feedwater Condensate Heaters Heaters **Demineralizers** Feedwater Pump and Turbine modifications to Condensate and Condensate Booster Pump / Motor accommodate increased flow modifications to accommodate increased flow



EPU Modifications

Outages	2006	2007	2008	2009	2010
Outages		U1 Restart			
_		EPU Core			
	U2 Mid-cycle 🚫	O LICC14 EPU Core		U2C15 EPU Core	
			🚯 U3C13		U3C14 EPU Core
Plant Modifications	<u>Mid-cycle</u> tall Strain Gages	U1 Restart Install Strain Gages EPU Mods Minus • EPU Setpoints U2C14 EPU Mods Minus • HP Turbine • EPU Setpoints	U1C7 AVS EPU Startup Testing U3C13 Install Strain Gages AVS	<u>U2C15</u> AVS HP Turbine EPU Setpoints EPU Startup Testing	U3C14 EPU Mods EPU Setpoints EPU Startup Testing



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EPU Remaining Issues

- GE Fuel Methodology
- Containment Overpressure
- Steam Dryers



GE Fuel Methodology

- Issue
 - Application of GE methodology to extended operating domains
 - 。 GE fuel in Unit 1 (AREVA fuel in Units 2 and 3)

Resolution

- Last RAI response submitted August 9, 2007
- GE thermal limit restrictions have been established
- GE Interim Methods LTR SER still outstanding
- All BFN issues resolved



Containment Overpressure

- Issue
 - Appendix R COP magnitude and duration
 - More complete risk evaluation needed
- Resolution
 - Last RAI response submitted November 15, 2007
 - Performed more realistic fire shutdown analysis
 - Developing more realistic COP magnitude and duration
 - All BFN issues with NRC staff resolved

Bob Marks



<u>Timeline</u>

- October 2006: Strain gages installed on BFN-2 steam lines to collect data to support analysis
- January 2007: BFN-1 installed dryer modifications changed cover and front face plates, installed newer model tie bars, minor weld reinforcements
- April 2007: One finite element model was generated for BFN-1, one model generated for BFN-2,3
- April 2007: BFN-2 strain gage data used to perform analysis for BFN-1,2,3;
- July 2007: Two separate data analyses submitted; one for BFN-1 and one for BFN-2/3 combined
- October 2007: NRC letter requesting additional information; six areas identified
- November 2007: Response provided to RAI on steam dryers



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- Issues
 - Finite Element Analysis (FEA) Frequency Based vs Time History
 - Elimination of 218 Hz Peak
 - Unit Similarity
 - Benchmark of Low Frequency Hydrodynamic Loads
 - Dynamics of Steam Dryer Components
 - Acoustic Circuit Model (ACM) Application of Bias & Uncertainties



FEA – Frequency Based vs. Time History

- Issue
 - Previous analyses performed with Time History; need to validate Frequency based approach
- Resolution
 - CDI Reports 07-05P/06P compared the results between frequency based and time history analyses
 - Two frequencies chosen; 15 and 120 Hz compared favorably
 - Used BFN-1 dryer model to compare
 - Additional work being performed by CDI for Hope Creek and Browns Ferry.



Elimination of 218 Hz Peak

- Issue
 - Dominant component of stress and load occurs at 218Hz
- Resolution
 - Unused SRV standpipes determined to be the source
 - Modify standpipes with Acoustic Vibration Suppressors (AVS)
 - AVSs will be installed during Unit 3 Spring 2008 outage
 - Steam line strain gage data will confirm intended effect





Unit Similarity

- Issue
 - Analyses for all three units performed based on Unit 2 data

Resolution

- Comparison of Unit 1 & Unit 2 steam line data performed
- Unit similarity based on comparison of physical locations of relevant components
- Unit 1 analysis will be re-performed utilizing Unit 1 data and will be submitted in January 2008
- Steam line instrumentation will be installed on Unit 3 during Spring 2008 outage for data analysis
- Unit 3 analysis will be re-performed utilizing Unit 3 data and will be submitted in June 2008



Benchmark of Low Frequency Hydrodynamic Loads

- Issue
 - Adequacy of benchmarking Acoustic Circuit Model (ACM) R4 only to Quad Cities
- Resolution
 - Quad Cities data has significant low frequency loads, thus is suitable for benchmarking
 - Other plant data is proprietary



Dynamics of Steam Dryer Components

- Issue
 - Justification of proprietary method
- Resolution
 - CDI Reports 07-05P/06P/11P provided in July 27, 2007 submittal
 - EEMB.127/94 response provided in November 23, 2007 submittal



ACM Application of Bias & Uncertainties

- Issue
 - Application of bias and uncertainties to BFN specific resonance peaks
- Resolution
 - Peak resonance found at 218 Hz for all three units and maximum uncertainty and bias of 75% applied to this interval
 - With installation of AVS, BFN will not have a resonance peak
 - Resonance peak bias and uncertainty not applicable



Proposed Path Forward

BFN Response to Dryer Preliminary Findings	November 2007
Time vs Frequency Domain Information to NRC	December 2007
NRC Issue Anticipated Steam Dryer RAIs	December 2007
BFN Submit Unit 1 Analysis w/Unit 1 Data	January 2008
BFN Submit Response to Anticipated RAIs	January 2008
BFN Install AVSs & Instrumentation on Unit 3	April 2008
BFN Submit Unit 3 Vibration Analysis (with AVS data)	June 2008
BFN1 EPU Implementation Fall Outage	October 2008



EPU Outage Schedule

Unit 1 Implementation Outage Install AVSs Implement Setpoints Power Ascension Testing including Steam Dryer 	October 27, 2008
Monitoring Program (SDMP)	
Unit 2 Implementation Outage	Spring 2009
- Install ASVS Perform Turbine Modifications	
 Implement Setpoints 	
 Power Ascension Testing including SDMP 	
Unit 3 Implementation Outage	Spring 2010
 Perform EPU Modifications)
 Implement Setpoints 	
 Power Ascension Testing including SDMP 	



Path to EPU Success

- Clear open lines of communication
 - Technical exchange of information
 - Face to Face Meetings With Staff
 - Senior Management TVA/NRC Engagement
 - Periodic TVA/NRC Senior Management Meetings
- TVA to provide comprehensive responses to RAIs
- Improve efficiency by utilizing common vendor methodology
- Mutually agreed dates for submittal/review
- Mutually achievable ACRS schedule to support Unit-1 EPU in Fall 2008.

Bob Marks