TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT

Extended Power Uprate (EPU)

Rockville, Maryland
December 15, 2010

Agenda

- Introductions
- Meeting Purpose
- Review BFN Extended Power Uprate Regulatory History
- Future Plans
  - Containment Accident Pressure Mitigation
  - Steam Dryers
  - Schedule

Meeting Purpose

- Revive Browns Ferry EPU project license submittal
- Confirm outstanding project scope
- Communicate planned Containment Accident Pressure (CAP) mitigation strategy relative to Draft NRC guidelines
- Communicate plans for Steam Dryers

Browns Ferry EPU History

- **June 2004**: Initial EPU Submittals
  - Unit 1 - 100% to 120% OLTP with pressure increase
  - Units 2 and 3 - 105% to 120% OLTP

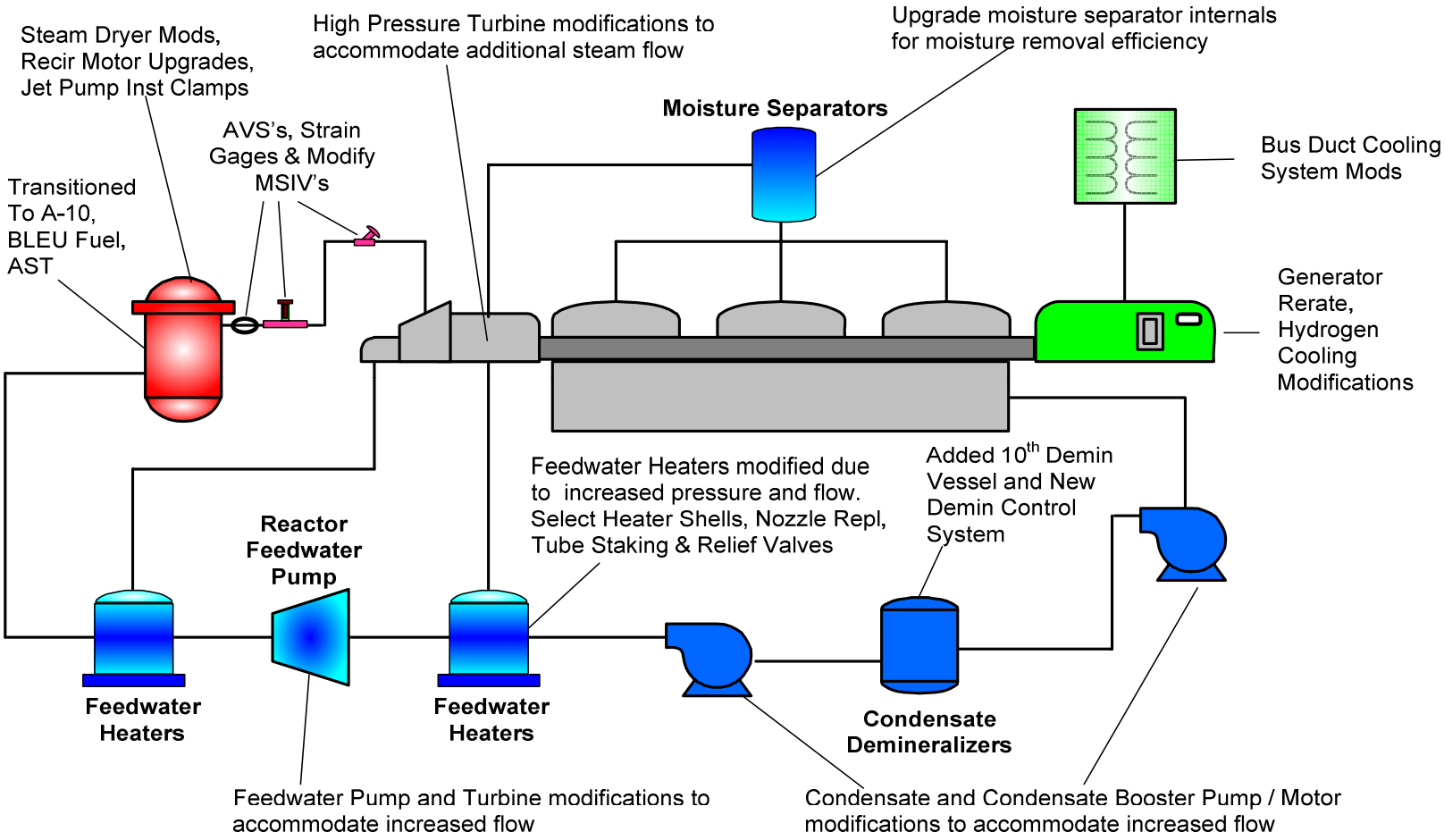
- **February 2007**: ACRS reviewed Unit 1 analyses for 120% operation

- **March 2007**: Unit 1 approved for 105% operation
  - Included pressure increase
  - Units 1, 2, and 3 now at same licensed power level

- **September 2009**: EPU CAP review placed on hold pending development of CAP guidance

- **March 2010:** NRC Draft Guidelines on CAP provided

EPU Modifications



Modification Status

		U1	U2	U3
Reactor Systems	New Main Steam Isolation Valve Internals and Actuators	Complete	Complete	Complete
	Up-rated Reactor Recirculation Motors / Pumps	Complete	Complete	Complete
	Replacement Steam Dryers			
Secondary Systems	New Condensate Pumps and Motors	Complete	Complete	Planned 2012
	Additional Condensate Demineralizer Vessel	Complete	Complete	Planned 2012
	New Condensate Booster Pumps and Motors	Complete	Complete	Planned 2012
	Condensate Demineralizer Digital Upgrade	Complete	Complete	Planned 2012
	New Reactor Feed Pumps	Complete	Complete	Planned 2012
	New Reactor Feed Pump Turbines	Complete	Complete	Complete
	New Feedwater Heater Nozzles, Relief Valves and #3 Shell	Complete	Complete	Planned 2012
	New HP Turbine			
	New Moisture Separator Internals	Complete	Complete	Complete
	New Generator Bus Duct Coolers and Fans	Complete	Complete	Complete

EPU Open Issues

- Containment Accident Pressure (CAP)
- Replacement Steam Dryers (RSD)

CAP Mitigation Evaluation

- Based on Draft Guidelines provided, comprehensive engineering analysis was performed to identify and evaluate strategies to address CAP for all events
- Evaluation used Draft Guideline criteria to determine CAP need:
  - NPSHR 3% curve for LOCA plus uncertainty adder
  - NPSHR 3% curve for Special Events
  - Evaluation conservatively used 4 feet for uncertainty adder

CAP Evaluation Results

- Use of NRC Draft Guidelines eliminates CAP for Station Black Out (SBO) event
- Use of NRC Draft Guidelines eliminates CAP for Anticipated Transient Without Scram (ATWS) event
- Implementation of NFPA-805 (including comprehensive safe shutdown analysis upgrade, comprehensive improvements to safe shutdown procedures) is expected to eliminate Appendix R CAP requirement, to submit NFPA-805 LAR March 2012
- Changes to credit improved RHR Heat Exchanger performance eliminates CAP for Long-Term LOCA Core Spray event
- CAP credit needed for Short-Term LOCA event only

CAP Evaluation Results cont'd

Long-Term LOCA Core Spray Event:

- RHR heat exchanger performance tests have measured fouling factors significantly better than vendor values used in current CAP analyses
- Revisions required to Generic Letter 89-13 Heat Exchanger program to reflect use of higher heat transfer coefficient value would credit improved Residual Heat Removal (RHR) Heat Exchanger performance
- Improved RHR Heat Exchanger performance eliminates CAP for Long-Term LOCA Core Spray event

CAP Evaluation Results cont'd

Short-Term LOCA Event:

- CAP credit needed for Short-Term LOCA event
  - Short-Term LOCA CAP has low risk significance and PRA analysis will be performed
  - CAP is required for only short time period of ten minutes
  - Low probability of a large break LOCA and simultaneous gross containment failure
  - Operation at EPU power levels do not significantly worsen existing CLTP CAP for the short term LOCA event

EPU CAP Summary

		Existing EPU Submittal Values	Planned EPU Submittal Values
Short-Term LOCA (< 10 minutes)	Current CLTP values		Revised values using draft CAP guidelines
Core Spray	1.47 psi < 10 minutes	2.0 psi / 8.9 minutes	3.2 psi / 9.9 minutes
RHR Intact Loop	None Required	0.2 psi / 3.2 minutes	2.2 psi / 9.0 minutes
RHR Broken Loop	1.57 psi < 10 minutes	2.1 psi / 9.3 minutes	5.0 psi / 10 minutes
Long-Term LOCA (> 10 minutes)			
Core Spray		3.0 psi / 22.5 hours	None Required
RHR - Containment Cooling		None Required	None Required
Special Events			
Appendix R (NPSH 3%)		6.1 psi / 27.8 hours	None Required
Station Black Out		1.4 psi / 1.4 hours	None Required
ATWS		1.9 psi / 1.2 hours	None Required

Replacement Steam Dryers

- To improve required stress margins, TVA will replace the existing steam dryers
- RSDs will be designed and analyzed by General Electric Hitachi (contract scheduled to be finalized in early 2011)
- RSD analyses will use GEH Plant Based Load Evaluation (PBLE) methodology
- Analyses will use Main Steam Line (MSL) strain gage data taken at CLTP conditions
  - Data for Units 1 and 3 already taken
  - Additional data for Unit 2 to be taken Spring 2011

Replacement Steam Dryers

- Goal to submit RSD analyses by January 2012
  - Lessons learned from ongoing Grand Gulf reviews will be incorporated as required
  - Submittal will address all open BFN applicable steam dryer related RAIs from previous reviews
- Plan to instrument dryer on lead unit only to measure performance during power ascension to EPU conditions
- Will initiate dryer construction following approval of EPU submittal
- Dryer replacement is predicated by successful resolution of EPU CAP

Draft Schedule for EPU

Submittals

- Steam Dryer analysis and design — February 2012
- NFPA-805 LAR (Appendix R Cap elimination) — March 2012
- Remaining plans to mitigate CAP — March 2012
- Unit 1 Areva fuel analysis for EPU — March 2012

NRC Activity

- 18 months for NRC review, ACRS meetings, etc.
- Issue SER for EPU September 2013

EPU Implementation Activities

- Unit 1 EPU — Fall 2014
- Unit 2 EPU — Spring 2015
- Unit 3 EPU — Spring 2016

Closing Remarks

- We will design and install new steam dryers
- We plan to eliminate requirement for CAP for all accident scenarios except Short Term LOCA
- We will follow up and issue a key assumptions letter in January based on discussions today regarding our planned strategy to mitigate/ eliminate Containment Accident Pressure
- We will maintain an open dialogue of communication in the form of a bi-weekly telecon with project manager

Questions/Comments?