

Extended Power Uprate (EPU)

License Amendment Requests

BVPS Unit 1 - LAR 302

BVPS Unit 2 - LAR 173

AGENDA

- Overview
 - Background
 - EPU Technical Process
 - Licensing Basis Changes
- Impact on Plant
 - Plant Modifications
 - Staged Power Increase
- Submittal
 - Submittal Structure and Completeness
 - Technical Specification Changes
- Schedule
- Summary

BACKGROUND

BVPS Full Potential Program

- Atmospheric Containment Conversion
- BELOCA
- Extended Power Uprate
- Replace Steam Generators and Reactor Vessel Head
- License Renewal
- Improved Standard Technical Specifications

BACKGROUND (Continued)

- Both units originally licensed to 2652 MWt
- Up rated by 1.4% to 2689 MWt (October 2001)
- Extended Power Uprate to 2900 MWt (Additional 8%)
 - BVPS Unit 1 with Model 54F Replacement Steam Generators (RSG)
 - BVPS Unit 2 with Original Steam Generators (OSG)

BACKGROUND (Continued)

- Key Elements
 - Atmospheric Containment Conversion
 - Stand-alone submittal
 - Analyses performed at EPU conditions
 - BELOCA
 - License methodology for BVPS
 - Results presented include containment conversion and EPU
 - Extended Power Uprate
 - Containment Qualified in Containment Conversion submittal
 - LOCA analysis performed using BELOCA methodology

BACKGROUND (Continued)

To Position BVPS Units for EPU:

Submittals Completed NRC Review

- New Fuel Storage Rack Enrichment Limit Increase Amendments 1-204 /2-135
- Positive Moderator Temperature Coefficient Amendments 1-251 /2-129
- Accumulator and RWST Increased Boron Concentration Amendments 1-242 /2-125
- Selective implementation of AST Amendments 1-241 /2-121 and 1-257 /2-139
- Minimum Decay Time Before Fuel Movement Amendments 1-247 /2-126

Containment Conversion LARs 1-317 /2-190 submitted 6/04

**Large Break Best Estimate Loss-of-Coolant Accident (BELOCA)
Methodology** LARs 1-318 /2-191 submitted 10/04

**Extended Power Uprate (EPU) with RSG (Unit 1) and Full
Implementation of AST** LARs 1-302 /2-173 submitted 10/04

EPU TECHNICAL PROCESS

- Identify Changes Due to Upgrading the Core Power by an Additional 8%
- Technically Review for Impact
 - Safety and Transient Analyses
 - Systems, Structures and Components
 - Programs
 - Procedures

EPU TECHNICAL PROCESS (Continued)

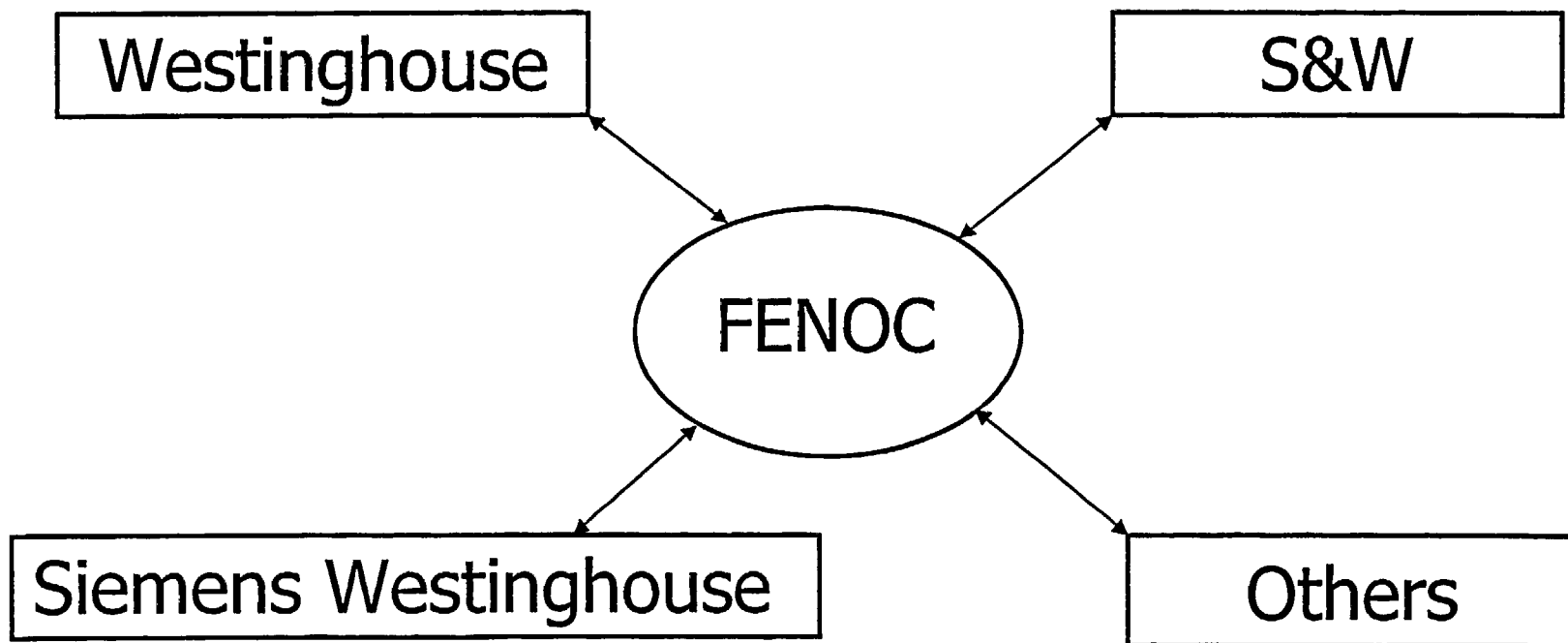
- General Criteria
 - Follow current licensing bases unless specifically identified
 - No new BVPS analytical methodologies unless specifically identified
 - No new industry (unlicensed) methodologies
 - Consistent with other power uprates

EPU TECHNICAL PROCESS (Continued)

- Based on Review:
 - Update Safety Analyses
 - Update Licensing and Design Basis Calculations
 - Evaluate Impact on Operation
 - Implement Necessary Plant Modifications
 - Implement Documents for Configuration Control
 - Implement Procedures

EPU TECHNICAL PROCESS (Continued)

Inputs and Information Control



EPU TECHNICAL PROCESS (Continued)

- Westinghouse
 - NSSS Systems and Components
 - Fuel/Core Design
 - Safety Analyses
 - Transient Analyses
- S&W
 - BOP (Balance of Plant) Systems
 - Radiological Analyses and AST
 - Piping
 - Programs
 - Environmental Assessment

EPU TECHNICAL PROCESS (Continued)

- Siemens Westinghouse
 - Turbine, Generator and Auxiliaries
- Others
 - MSRs (Moisture Separator Reheaters)
 - Grid Stability
 - FAC (Flow Accelerated Corrosion)
- FENOC
 - Consistency of Inputs
 - Consistency with Plant Conditions and Configuration
 - Proper Interfacing of Information

LICENSING BASIS CHANGES

Licensing Basis changes include:

1. Safety Analysis based on 2900 MWt
2. Full implementation of the Alternative Source Term methodology of Regulatory Guide 1.183
 - Selective implementation previously approved in Amendments 1-241/2-121 and 1-257/2-139
- First time BVPS application of VIPRE and WRB-2M
- First time BVPS application of the BELOCA Methodology

IMPACT ON PLANT

- Higher reactor core power level
- Higher secondary flow rates
- Higher generator output
- Higher heat load on condenser and cooling towers

PLANT MODIFICATIONS

Safety Related Plant Modifications

- Replacement of charging/safety injection pump rotating assemblies
- Conversion from a sub-atmospheric to an atmospheric containment design
 - Installation of fast acting feedwater isolation valves (Unit 1 only)
 - Installation of auxiliary feedwater cavitating venturies (Unit 1 only)
 - Addition of reactor cavity drainage port
 - Elimination of Quench Spray Cutback (Unit 1 only)
- Replacement of Steam Generators (Unit 1 only)

PLANT MODIFICATIONS (Continued)

Unit 1 Replacement Steam Generators Changes

- Expanded narrow range level span
- New tube material - no alternate repair criteria (thermally treated Alloy 690)
- Reduced moisture carry-over (less than 0.1%)
- Steam outlet nozzle venturi (limits break flow and internal loads)
- Increased primary side volume/mass
- Decreased secondary side volume/mass
- Reduction in accumulated outage dose

PLANT MODIFICATIONS (Continued)

Balance of Plant Modifications

- Replace high pressure turbine with all-reaction design
- Increase capacity of main transformer coolers (Unit 2 only)
- Install stakes in main condenser (Unit 2 only)
- Modify cooling tower fill (Unit 2 only)
- Raise set-pressure of moisture separator reheater relief valves
- Increase Cv of main feedwater control valves
- Increase flow capacity of some heater drain control valves
- Remove orifices to increase flow to generator hydrogen coolers (Unit 2 only)
- Instrument replacements for higher flow range

STAGED POWER INCREASE

Overview

- Power uprate (increase above currently licensed power) will be limited by balance of plant (BOP). As BOP modifications are completed, power level will be increased
- Operating Power Level
 - Limited by License and Technical Specification
 - Controlled by Licensing Requirements Manual (LRM) within limit

POWER LEVEL LIMITS

Staged Power Increase

- License: 2900 MWt
- Technical Specification

1.3 RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant as specified in the Licensing Requirements Manual, and shall not exceed 2900 MWt

→ All safety related plant modifications will be completed prior to amendment implementation

- Licensing Requirements Manual

1.0.1.a RATED THERMAL POWER - The value of RATED THERMAL POWER, as per Technical Specification Definition 1.3, is 2689 MWt

Extended Power Uprate (EPU)

Questions?

SUBMITTAL STRUCTURE

FENOC Letter No. L-04-125, Dated 10/4/04

- Enclosure 1
 - Description, Background and Technical Analysis
 - No Significant Hazards Analysis
 - Environmental Consideration
 - Technical Specification, Bases and Licensing Requirements
Manual (LRM) Markups
 - Commitments

SUBMITTAL STRUCTURE (Continued)

- Enclosure 2 - EPU Licensing Report
 - * Section 1 - Introduction
 - * Section 2 - NSSS Analysis
 - * Section 3 - NSSS Systems
 - * Section 4 - NSSS Components
 - * Section 5 - Safety Analyses
 - * Section 6 - Fuel Analysis
 - * Section 7 - Containment Analysis

SUBMITTAL STRUCTURE (Continued)

- Enclosure 2 (Continued)
 - * Section 8 - BOP Analyses
 - * Section 9 - Plant Systems
 - * Section 10 - Generic Programs
 - * Section 11 - Environmental
 - * Section 12 - Financial Assurance
 - * Section 13 - Testing

SUBMITTAL STRUCTURE (Continued)

- Enclosure 3
 - Cross References RS-001 Template SER Section to EPU Licensing Report Section
 - BVPS Commitment Summary to SRPs Referenced in RS-001
- Enclosure 4
 - WCAP-16307-P EPU Licensing Report Proprietary Information

SUBMITTAL STRUCTURE (Continued)

- Enclosure 5
 - WCAP-13483-P (Rev. 2) Series 51 Steam Generator Sleaving Report - Laser Welded Sleeves (Unit 2 only)
- Enclosure 6
 - Proprietary Information Affidavits

SUBMITTAL COMPLETENESS

- Licensing Report (Enclosure 2)
 - Information is organized based on previous precedent for power uprate licensing reports, reflecting a thorough plant evaluation
 - Report was initially written before RS-001 (draft) was available
- RS-001 was reviewed for “topics” to address
 - Licensing Report was revised to include any topics addressed in RS-001 that were not already addressed
 - Licensing Report sections were cross-referenced to RS-001 sections (Enclosure 3)

SUBMITTAL COMPLETENESS (Continued)

- NRC RAIs for other power uprates were reviewed and information included so that appropriate information is being presented
- Due to uniqueness/plant specific nature of RAI issues for each plant, all details requested in RAIs may not be included

NRC REVIEWER AID

- Enclosure 3 (of submittal)
 - RS-001 review matrices are cross-referenced to Licensing Report sections
 - Lists compliance to each SRP and RG referenced in RS-001
- Reviewer Aid CD
 - UFSAR for both units
 - Original SER for both units
- UFSAR cross-reference file
 - RS-001 topics are cross-referenced to UFSAR sections

DESCRIPTION OF CHANGE

Types of Technical Specification changes:

- Extended Power Uprate (EPU) changes
- Non-EPU changes
- Administrative changes

DESCRIPTION OF CHANGE (Continued)

EPU Technical Specification changes include:

1. Increasing the Maximum Power Level specified in each units' license
2. Revising the value of Rated Thermal Power (RTP)
3. Adding RTP definition to License Requirements Manual (LRM)
4. Revising fuel assembly specific Departure from Nucleate Boiling Ratios (DNBR) and correlations

DESCRIPTION OF CHANGE (Continued)

EPU Technical Specification changes include:

5. Raising the maximum temperature of the refueling water storage tank
6. Modifying Overtemperature ΔT and Overpower ΔT equations (Unit 1 only)
7. Revising the Steam Generator water level low-low and high-high trip setpoints (Unit 1 only)

DESCRIPTION OF CHANGE (Continued)

EPU Technical Specification changes include:

- Revising the required Steam Generator secondary side level in Modes 4 and 5 (Unit 1 only)
- Relaxing the positive tolerance setting for the pressurizer safety valves
- Revising the Steam Generator Technical Specification (low-low level) to reflect the replacement Steam Generators (Unit 1 only)

DESCRIPTION OF CHANGE (Continued)

EPU Technical Specification changes include:

- Revising the Steam Generator Technical Specification tube sleeve reference and TIG welded Steam Generator sleeve repair limit (Remove for Unit 1, Revise for Unit 2 only)
- Revising the specific activity of the primary coolant system (Unit 1 only)
- Increasing the operating band for accumulator water volume and nitrogen pressure

DESCRIPTION OF CHANGE (Continued)

EPU Technical Specification changes include:

- Revising the required charging pump discharge pressure for reactor coolant pump seal injection flow
- Relaxing the positive tolerance setting for the main steam safety valves (all but the lowest MSSV)
- Changing the allowable power limits associated with inoperable main steam safety valves

DESCRIPTION OF CHANGE (Continued)

EPU Technical Specification changes include:

9. Revising the primary plant demineralized water storage tank volume requirement
10. Revising the specific activity of the secondary coolant system (Unit 1 only)
11. Adding WCAP-14565, VIPRE, and WCAP 15025, WRB-2M, to Technical Specification 6.9.5
12. Full implementation of Alternative Source Terms

DESCRIPTION OF CHANGE (Continued)

Not directly EPU related include:

1. Deleting the Power Range, Neutron Flux High Negative Rate trip
2. Adding a footnote to Table 3.3-3, Engineered Safety Features Actuation System Instrumentation, concerning time constants for steamline pressure low (Unit 1 only)

DESCRIPTION OF CHANGE (Continued)

Not directly EPU related include:

- Removing the Boron Injection Tank boron concentration Technical Specification (Unit 1 only)
- Renaming of Boron Injection Tank flow path Technical Specification (Unit 1 only)

DESCRIPTION OF CHANGE (Continued)

Administrative changes include:

1. Removing the amendment number from the operating license for each unit
2. Correcting an inconsistency regarding a referenced permissive, P-9 instead of P-7 (Unit 1 only)

SUPPORTING DOCUMENTATION

- **EPU Changes**
 - Licensing Report (Enclosure 2) and WCAP-16307-P, "Beaver Valley Units 1 and 2 Extended Power Uprate Licensing Report Supplemental Information," September 2004 (Enclosure 4)
- **Unit 2 Steam Generator Repair**
 - WCAP-13483-P Revision 2, "Beaver Valley Units 1 and 2 Series 51 Steam Generator Sleeving Report - Laser Welded Sleeves," October 2002 (Enclosure 3)

SUPPORTING DOCUMENTATION (Continued)

- Deletion of Negative Rate Trip
 - WCAP-11394-P-A, "Methodology for the Analysis of the Dropped Rod Event," January 1990
- Use of VIPRE
 - WCAP-14565-P-A, "VIPRE-01 Modeling and Qualification for Pressurized Water Reactor Non-LOCA Thermal-Hydraulic Safety Analysis," October 1999
- Use of WRB-2M
 - WCAP-15025-P-A, "Modified WRB-2 Correlation, WRB-2M, for Predicting Critical Heat Flux in 17x17 Rod Bundles with Modified LPD Mixing Vane Grids, April 1999

BENEFICIAL IMPACT

- Uniform and updated safety analyses
- Increased operating bands
 - Reactor Coolant System T-avg.
 - Feedwater Temperature
 - RWST temperature
 - Accumulator volume and pressure
- Increased operating margin
 - Increased positive tolerance for pressurizer and main steam safety valves

BENEFICIAL IMPACT (Continued)

- Removal of an unnecessary trip
 - Power Range, Neutron Flux High Negative Rate Trip
- Removal of a Technical Specification (Unit 1 only)
 - 3.5.4.1.1, "Boron Injection Tank $\geq 350^{\circ}\text{F}$ "
- Increased consistency between the units' Technical Specifications

Extended Power Uprate (EPU)

Questions?

CONTAINMENT METAL MASS

- Issue
 - During data development for the containment analyses, different values for heat sink metal mass and surface area were derived than were used in the analysis of record for the units.
- Status relative to EPU
 - Review has confirmed that the new data is more detailed and correct.
 - Design Analyses have been revised and an annual 50.46 report submitted.

TESTING

- Post-mod functional and operational testing
- Power ascension testing
 - Sequence procedure used for control and coordination
 - Data taken at 95% and 100% of current power level
 - Data taken at 2.5% increases above current power
 - Senior management review all anomalies
 - Test reports within 6-months

TESTING (Continued)

Testing under staged implementation

- Testing program will be used when ascending in power beyond previous power level
- Testing will be performed for incremental power increases, as outlined in test plan.
- Final test report will include all testing

SCHEDULE

- EPU submittal dependency
 - EPU relies on containment analysis methodology and mods submitted in Containment Conversion LAR
 - EPU relies on large break LOCA methodology included in BELOCA LAR
- Required Amendment issuance sequence
 - Containment Conversion
 - BELOCA
 - EPU

SCHEDULE (Continued)

- Amendment implementation
 - Due to the interdependencies, FENOC intends to implement all 3 amendments during 2006 outages, including Unit 1 Replacement Steam Generators
 - Unit 1 - 1R17 (first quarter 2006)
 - Unit 2 - 2R12 (fourth quarter 2006)
- Technical Specification changes for Unit 1 SG replacement are included in EPU LAR
- Request issuance of amendments
 - Containment Conversion by June 2005
 - BELOCA & EPU by November 2005

SUMMARY

- Complete and detailed EPU submittal
- Includes Unit 1 Replacement Steam Generator scheduled for 2006
- FENOC staff is available to support NRC's timely and thorough review of the EPU submittal

Extended Power Uprate (EPU)

Questions?

Break-out Sessions