UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 25, 2000

LICENSEE: Entergy Operations, Inc.

FACILITY: River Bend Station, Unit 1

SUBJECT: SUMMARY OF MEETING BETWEEN THE NUCLEAR REGULATORY COMMISSION (NRC) STAFF AND ENTERGY OPERATIONS, INC. (EOI), RIVER BEND STATION, FEBRUARY 10, 2000

On Thursday, February 10, 2000, a meeting was held between members of the NRC staff and representatives of EOI, the licensee for the River Bend Station (RBS). The purpose of the meeting was to discuss implementation and other issues related to the licensee's power uprate license amendment application, dated July 30, 1999. The meeting was open to interested members of the public, petitioners, intervenors, or other parties to attend as observers pursuant to "Commission Policy Statement on Staff Meetings Open to the Public" (see Volume 59, *Federal Register*, page 48340, published September 20, 1994). The discussions lasted approximately two hours. A list of attendees is provided as Enclosure 1 to the meeting summary.

The RBS licensee opened the meeting with a short presentation. Copies of handouts for the discussion are provided as Enclosure 2. The primary focus for the dialogue centered around the licensee's desire to implement the 105 percent power uprate, when and if ultimately approved by the NRC, in two phases. The first phase would be a "flow only" increase in power whereby feedwater and main steam flow would be increased without an increase in reactor vessel dome pressure. The RBS power uprate submittal included a proposed increase in pressure by 30 pounds per square inch (psi) in order to improve turbine inlet pressure control and turbine efficiency. The second phase would then consist of implementing the proposed 30 psi pressure increase.

The RBS power uprate project manager discussed various status and scheduling aspects summarized below:

- RBS desires a fall 2000 "flow only" power uprate implementation
- Plant modifications will be performed during refueling outage RF-9, starting March 2000
- General Electric Company (GE) expects to complete confirmatory analysis by March 15, 2000
- RBS expects to provide results of this analysis and other information by April 15, 2000
- Pressure increase and safety relief valve set point changes will be made during RF-10, or sooner, if an outage of sufficient duration occurs prior to that time

The licensee continued the meeting by discussing additional technical aspects of the uprate implementation. Their belief is that most of the 105 percent power increase (flow only) can be safely achieved while the plant is on-line. The licensee also stated that success will depend largely on whether the flow-only condition maintains turbine control design and reactor pressure control operating margin. To support this, the licensee is planning on modifying the inlet nozzle orifice in order to increase flow capability to the turbine. In addition, GE is reviewing its transient and accident analysis under "flow-only" conditions in order to confirm whether the

uprate analysis remains valid under the interim condition. The licensee is confident that the power uprate analyses remains bounding. An overview of the types of analysis is provided in Enclosure 2.

The licensee concluded the presentation with a discussion on licensing issues associated with the proposed phased implementation approach:

- 9 of the 15 licensing changes relate to the increase in allowable reactor pressure
- The 6 remaining changes can be implemented without the pressure change
- One additional change may be required in order to allow on-line implementation

The additional change contemplated by the licensee is associated with Technical Specification (TS) surveillance requirement (SR) 3.3.1.1.2 which compels the licensee to maintain its average power range monitors (APRM) to within 2 percent of rated thermal power. Implementation of a 5 percent increase in reactor power would automatically put the licensee in the position of being outside their TS SR. The licensee recommended that the NRC consider allowing a temporary condition whereby the APRMs be +2 to -7 percent of its licensed power during implementation.

Following the presentation, members of the NRC staff asked questions in order to clarify matters associated with the power uprate license amendment request. Issues included:

- Review of the proposed modifications necessary to implement power uprate
- The licensee needs to ensure review of the recommended ranges for instrumentation tolerances provided in Regulatory Guide 1.97
- Changes to motor/air-operated valves due to pressure increase
- Status of more detailed pressure-temperature curves information
- Verification of why the standby liquid control system requires an increase in concentration/enrichment
- Spent fuel pool cooling requirements. (Note: a detailed list of questions is provided as Enclosure 3 to the meeting summary.)

Following the question and answer period, the licensee and staff discussed the proposed license amendment change requesting a deferral to remove the first vessel surveillance capsule from RF-9 to RF-10. The request has the potential to impact certain aspects of the power uprate review. A summary of the issues discussed is provided in Enclosure 4.

/RA/
Robert J. Fretz, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-458

Enclosures: 1. List of Meeting Attendees
2. EOI Slide Presentation
3. Spent Fuel Pool Cooling Questions
4. Reactor Vessel Surveillance Capsule Issues

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DATED: February 25, 2000

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LIST OF ATTENDEES
NRC - EOI MEETING ON POWER UPRATE AND REACTOR VESSEL ISSUES
FEBRUARY 10, 2000

NRC Staff

Robert Gramm	Section Chief, Project Directorate IV, Section 1
Keith Wichman*	Section Chief, Component Integrity Section
Robert Fretz	RBS Project Manager, Project Directorate IV, Section1
George Thomas+	Reactor Systems Branch
Barry Marcus+	Electrical and Instrumentation Controls Branch
David Shum+	Plant Systems Branch
Matthew Mitchell	Materials and Chemical Engineering Branch
Andrea Lee	Materials and Chemical Engineering Branch
Allen Hiser*	Materials and Chemical Engineering Branch
Lambros Lois*	Reactor Systems Branch

Entergy Operations, Inc.

Joseph Leavines	Manager, RBS Licensing
Otto Bulich+	Power Uprate Project Manager
Tom Oliphant+	Senior Engineer
Dave Melear+	Mechanical/Systems Engineer
Barry Burmeister	Licensing Engineer
Erwin Zoch*	Engineer (via teleconference)

General Electric Company (GE)

George Nelson+	Project Manager
Hoa Huang+	Project Manager

Notes:
* Reactor vessel surveillance capsule meeting only
+ Power uprate meeting only

ENCLOSURE 1

ENCLOSURE 2

ENTERGY OPERATIONS, INC.

SLIDE PRESENTATION

River Bend Station Power Uprate Implementation

Joe Leavines

RBS Licensing Manager

Team/Introductions

- **EOI**
- **GENE**
- **NRC**

Meeting Purpose

- **Discuss Implementation of Flow Only Uprate**
  - **Agree on Phased Implementation Approach**
  - **Agree on feasibility of Online implementation**
  - **Discuss Time Table for LAR Approval**
- **Discuss Technical Assumptions**
  - **Submitted LAR and Analysis Bounds Flow Only Uprate**

Agenda

- **Purpose of Meeting**
- **Current Project Status**
- **Project Schedule**
- **Overview of Flow Only Implementation**
- **Analytical Evaluation Overview**
- **License Limits**
- **Open Discussion**

Current Project Status

- **On Track for a Fall 2000 Flow Only Implementation**
- **Turbine Mods Continue in RF 9**
  - **New HP Rotor Installed in RF 8**
  - **Larger HP Turbine Nozzle Plates RF 9**
- **Implementation Procedure in Development**
- **Modifications to Support On Line Implementation in Development**

Current Project Status

- **Confirmatory Analysis in progress**
  - **Results expected 3/15/00**
- **Request Flow Only Uprate**
  - **Submittal expected 4/15/00**
- **Pressure Increase and SRV Setpoint Changes**
  - **Outage of Sufficient Duration or RF 10**
    - **SRV Changeout 2-3 Week Outage**

Project Schedule

Task Name	2000 Qtr 3	2000 Qtr 4	2000 Qtr 1	2000 Qtr 2	2000 Qtr 3	2000 Qtr 4	2001 Qtr 1	2001 Qtr 2	2001 Qtr 3	2001 Qtr 4
NRC Submittal	8/1									
Refueling Outage 9			3/4							
HP Turbine Nozzle Replacement			3/4							
GE Flow Only Evaluation			3/15							
Letter to NRC Requesting Phased Implementation				4/15						
Implementation Procedure Approval					7/15					
NRC Approval of LAR					9/1					
Flow Only Uprate						11/15				
Refueling Outage 10									9/4	
Pressure Increase									9/4	

Overview of Flow Only Implementation

- **Flow Only Power Uprate**
  - **Increase Rx Power to near 105% (CTP)**
  - **No Plant S/D required**
    - **Setpoint changes can be done on-line**
    - **Necessary modifications complete prior to implementation**
  - **Flow Only Uprate Maintains Current Turbine Control Design and Reactor Pressure Control Margin**
  - **COLR ensures fuel design compliance**
    - **Revised for Flow Only Uprate**

Overview of Flow Only Implementation

- **Pressure Increase Supports full 105% (CTP) Uprate**
  - **Provides additional TCV margin**
    - **RF 9 HP Turbine Mod also Increases Margin**
  - **Requires shutdown to implement SRV setpoint change**
    - **Outage of Sufficient Duration after LAR Approval**
    - **No later than RF 10**
- **COLR continues to ensure fuel design compliance**

Analytical Overview

- **Review and Approval of Existing LAR**
- **Analytical Evaluation Overview**
- **GE Evaluation**

Analytical Evaluation Overview

- **Demonstrate Power Uprate Condition Bound "Flow Only" Uprate Condition**
- **Analyses Reviewed**
  - **Reactor Transients**
  - **ECCS/LOCA Analysis**
  - **Containment Analysis**
  - **High Energy Line Break (HELB) Analysis**
  - **Anticipated Transient Without Scram (ATWS) Analysis**

Analytical Evaluation Overview

- **Conclusion**
  - **Power Uprate Conditions Expected To Bound "Flow Only" Uprate**
  - **Review Feedwater System Inputs**
  - **Confirm Mass & Energy Releases Bounding At Higher Pressure**

Analytical Evaluation Overview

- **Reactor Transient Analysis**
  - **Reload Transients**
    - **Demonstrate Acceptable Thermal Limits & ASME Code Compliance**
    - **Actual Thermal Limits & ASME Code Compliance Determined From Cycle Specific Analysis**
  - **Loss Of One Feedwater Pump**
    - **Demonstrate Scram Avoidance On Reactor Water Level Low (Level 3)**
    - **Less System Head At "Flow Only" Uprate Conditions**
    - **Review Feedwater System Inputs**

Analytical Evaluation Overview

- **Reactor Transient Analysis (cont.)**
  - **Loss Of Feedwater Flow Analysis**
    - **Demonstrate Reactor Water Low Level (Level 1) Avoidance**
    - **Generic Analysis**
    - **Level Reduction Due To Boil Off Key**
    - **Heat Of Vaporization Less As Pressure Increases**
    - **Power Uprate Conditions Should Bound "Flow Only" Uprate Conditions**

Analytical Evaluation Overview

- **ECCS/LOCA Analysis**
  - **Current ECCS Analysis Bounds Power Uprate Condition**
  - **Break Mass & Energy Releases Should Be Less At "Flow Only" Uprate Conditions**
  - **Heat Of Vaporization Less As Pressure Increases**
  - **Less System Head At "Flow Only" Uprate Conditions**

Analytical Evaluation Overview

- **Containment Analysis**
  - **Break Mass & Energy Releases Should Be Less At "Flow Only" Uprate Conditions**
- **High Energy Line Break Analysis**
  - **Break Mass & Energy Releases Should Be Less At "Flow Only" Uprate Conditions**

Analytical Evaluation Overview

- **Anticipated Transient Without Scram Analysis**
  - **Core Cooling**
    - **Standby Liquid Control System Sufficient**
    - **Less System Head At "Flow Only" Uprate Conditions**
    - **Review Feedwater System Inputs**
  - **Reactor Vessel Integrity**
    - **Peak Pressure Limited By Safety Relief Valves**
    - **SRV Setpoints Unchanged**

Analytical Evaluation Overview

- **Anticipated Transient Without Scram Analysis (cont.)**
  - **Containment Integrity**
    - **Suppression Pool Temperature**
    - **Mass & Energy To Suppression Pool Via Safety Relief Valves Should Be Less At "Flow Only" Uprate Conditions**

License Limits

- **Changes to License/Technical Specifications**
  - **15 Changes in Current LAR Submittal**
  - **9 Changes Related to Increase in SRV Pressure Increase**
  - **6 Remaining Can be Implemented Without Pressure Change**
  - **1 New Change to Allow On-line Implementation of Flow Only Uprate**

License Limits

- **T.S. Changes Required for Flow Only Uprate (Phase One)**
  - **Rated Thermal Power 2894 to 3039 MWt**
  - **Thermal Power Safety Limit 25 to 23.8%**
  - **SLC Boron 10 Enrichment and Conc. Inc**
  - **High MSL Flow Isolation Trip**
  - **Thermal Power Single Loop Ops 83 to 79%**
  - **RCS P and T Limit Changes Due to Inc Neutron Flux**

License Limits

- **Temporary change to implement Flow Only Uprate**
  - **T.S. Surveillance 3.3.1.1.2 requires APRMs within 2% of RTP**
  - **Uprate implementation results in a 5% change in RTP**
  - **Propose an increase in tolerance to +2 -7% in license condition**
  - **Limit time to complete re-calibration**

Open Discussion

- **Approval Process**
- **Preliminary Technical Review**
- **License Discussion**
- **NRC Review Status**

QUESTIONS CONCERNING SPENT FUEL POOL COOLING FOR
TECHNICAL SPECIFICATION CHANGE TO REFLECT UPRATED POWER LEVEL
RIVER BEND STATION
DOCKET NOS. 50-458
(TAC NO. MA6185)

1. As a result of plant operations at the proposed uprated power level, the decay heat load for any specific fuel discharge scenario will increase. Please provide the following information:

   a. Provide the heat loads and corresponding peak calculated spent fuel pool (SFP) temperatures during planned refueling outages[1] and unplanned full core off-load.

   b. If the residual heat removal (RHR) system serves as a back-up system to the SFP cooling system, prior to a planned or unplanned full core offload event, how many trains of SFP cooling system and RHR system are required to be operable and available for SFP cooling?

   c. Discuss the provisions that have been established in the plant operating procedures to ensure that the RHR system will be aligned for SFP cooling.

   The above information is necessary to allow the staff to determine whether the analyses are consistent with the guidance described in Standard Review Plan, Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System."

2. As stated in the Updated Final Safety Analyis Report (UFSAR), the SFP cooling system is designed to maintain the SFP at or below 139.8 °F with a decay heat load of 16.62×10^6 Btu/hr from all the previously discharged Spent Fuel Assemblies (SFAs) and a freshly discharged partial (approximately 1/2) core. Also, as stated in the UFSAR, in an event of an unplanned (emergency) full core offload, the SFP temperature will be maintained below 155.6 °F with a decay heat load of 24.68×10^6 Btu/hr from all the previously discharged SFAs and a freshly discharged full core. As a result of plant operations at the proposed uprated power level, the decay heat load and its corresponding peak calculated SFP temperature for any specific fuel discharge scenario will increase slightly. Discuss the effects of the elevated pool temperatures during planned refueling outages and unplanned full core off-load events on SFP (i.e., structures, SFP linings, etc.) and the SFP cooling and cleaning systems.

   The above information is necessary to allow the staff to determine whether the design of the SFP (i.e., structures, SFP linings, etc.) and the SFP cooling and cleaning systems is consistent with the guidance described in Standard Review Plan, Section 9.1.3.

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[1] If an entire core off-loaded to the SFP is the normal practice during planned refueling outages at River Bend Station, a single failure of the SFP cooling system should be assumed in the SFP thermal analysis for the planned refuling outages. A single failure of the SFP cooling system need not be assumed for the unplanned full core off-load events.

3. In the unlikely event that there is a complete loss of SFP cooling capability, the SFP water temperature will rise and eventually will reach boiling temperature. Provide the time to boil (from the pool high temperature alarm caused by loss-of-pool cooling to boiling) and the boil-off rate (based on the highest heat load from the planned or unplanned full core off-load). Also, discuss sources and capacity of make-up water and the methods/systems (indicating system seismic design Category) used to provide the make-up water.

   The above information is necessary to allow the staff to determine whether the analyses are consistent with the guidance described in Standard Review Plan, Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System."

REACTOR VESSEL SURVEILLANCE CAPSULE REMOVAL
DEFERRAL REQUEST ISSUES

Background

By letter dated October 25, 1999, Entergy Operations, Inc. (the licensee), submitted a request to defer withdrawal of the first River Bend Station (RBS) reactor vessel surveillance capsule from 10.4 effective full power years (EFPY) to 13.4 EFPY (approximately three cycles). Under the existing surveillance capsule withdrawal schedule, RBS must withdraw the first capsule during refueling outage 9 (RF-9), scheduled to begin March 4, 2000. The first surveillance capsule removal had previously been deferred from 6 to 10.4 EFPY in accordance with License Amendment No. 92, approved by the Nuclear Regulatory Commission (NRC) on February 13, 1997. During a teleconference on January 5, 2000, the licensee indicated that the request for deferral should have been for one cycle (not three cycles). One cycle corresponds to approximately 11.5 EFPY (RF-10 in fall 2001). The licensee stated that their intention was to amend the October 25, 1999, submittal with a letter requesting a one-cycle deferral. By letter dated January 12, 2000, the licensee submitted a letter to amend the original submittal.

The staff has reviewed the licensee's request to defer withdrawal of the first RBS surveillance capsule, and has the following concerns:

- The General Electric Company (GE) report that was cited as technical justification for deferral of the first capsule withdrawal (GE-NE-B1301807-02) used surveillance data from other Boiling Water Reactors (BWRs) to draw conclusions regarding RBS's embrittlement. Specifically, the report compared the RBS shift predicted from Regulatory Guide (RG) 1.99, Revision 2, to the measured shifts from other BWRs. The conclusion was that, on average, the measured shifts from other BWRs are less than the RG-predicted shift plus margin value for RBS. This report was considered as supporting information for the first deferral of this capsule withdrawal; however, the report was not submitted for review and approval. Therefore, the staff did not perform an in-depth evaluation of the report to determine the validity of the other BWR surveillance data for comparison to the RBS shift value. The main technical justification for the first deferral was to ensure a shift value that could be differentiated from the data scatter. The GE report stated that "removal of the capsule at the specified EFPY [10.4] will obtain the most credible data for fracture toughness predictions." Therefore, the GE report does not provide sufficient technical justification for a second deferral of this capsule. In addition, 10 CFR 50, Appendix H, incorporates by reference American Society for Testing and Materials (ASTM) E 185-82. ASTM E 185-82 requires that the first capsule be withdrawn early in the vessel life to verify the initial predictions of the surveillance material response to the actual radiation environment. ASTM E 185-82 also states that the first capsule should be removed when the predicted shift exceeds the expected scatter by sufficient margin to be measurable. As stated above, a measurable shift value was predicted by the GE report to be obtained at 10.4 EFPY.

- The supplemental surveillance program (SSP) is referenced as containing the limiting RBS weld material. The SSP is, as the name indicates, a supplemental program that is not part of RBS's 10 CFR 50, Appendix H surveillance program. The licensee's submittal states that a capsule containing the RBS limiting weld material was pulled in 1997, and is scheduled to be tested this year. Currently, there are no other data from

ENCLOSURE 4

the SSP. Reference to future results of the SSP assumes that the RBS can rely on the SSP to defer pulling their first surveillance capsule. Use of the SSP for the RBS vessel would require prior approval by the NRC for an integrated surveillance program (ISP). However, since results are not currently available, the validity of the data cannot be verified at this time.

The ISP that the BWR Vessel and Internals Project (BWRVIP) submitted on December 22, 1999, includes the SSP as part of the overall program; however, the ISP is currently under review by the staff. The ISP submittal includes RBS as part of the program with the first capsule withdrawal at 10.4 EFPY. The BWRVIP did not attempt to go beyond the current withdrawal schedules for the units currently included in the ISP program (i.e., did not attempt to capture future deferral requests for individual licensees). The BWRVIP considers the current withdrawal schedules outlined in the program adequate, but the BWRVIP expects to revise the program through a series of meetings with the staff. It should be noted that before the ISP was submitted, the staff had discussions with the BWRVIP regarding requests for deferral for one cycle for BWR capsule withdrawals while the ISP was being developed. All BWRs that were granted a one-cycle deferral had pulled the first capsule. The RBS case differs because the first capsule has not been pulled, and has been deferred once already.

In the January 12, 2000, submittal, the licensee stated that "Flux and fluence calculations for RBS are performed in accordance with accepted industry standards." The statement is not true with respect to current knowledge and practice. Review of the related Final Safety Analysis Report sections (i.e., 4.1.4.5, 4.3.2.8 and 5.3.1.6) indicates that the method used will underestimate the fluence for the following reasons:

- For the scattering cross sections, the P_1 approximation of the Legendre Polynomial expansion was used. This has been shown to be inadequate to represent the strongly forward distribution of the flux for E > 1.0 MeV and resulted in a lower value of the (flux) fluence at the pressure vessel.

- The assumed neutron energy spectrum is 1/E. This is not a realistic spectrum. This approximation was used when the computational capabilities were limited, which is no longer the case. The effect of the 1/E spectrum put a larger weight on the lower energies of interest (1 - 3 MeV) and under-weighted the higher energies (3 - 10 MeV).

- The submittal states that the fluence estimate "...is based on RBS actual first cycle flux wire measurements." Experience has shown that plant specific dosimetry is subject to significant uncertainties and cannot be relied upon for the estimation of pressure vessel fluence.

- Conversion of the dosimeter wire activation into fluence requires an accurate knowledge of the neutron energy spectrum at the location of the irradiation. However, the licensee stated that a 1/E spectrum was used, which is known not to be accurate.

- From the time the RBS methodology was first used to the present, a number of cross section changes have been made, adopted by the staff, and are recommended in the fluence draft regulatory guide DG-1053. The staff would expect licensees to incorporate these changes and update fluence calculations in submittals affecting these estimates.