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

March 23, 2009

LICENSEE: Tennessee Valley Authority

FACILITIES: Browns Ferry Nuclear Plant, Unit 1

SUBJECT: SUMMARY OF JANUARY 28, 2009, MEETING WITH THE TENNESSEE VALLEY AUTHORITY REGARDING PROPOSED FUEL TRANSITION AMENDMENT (TAC NO. ME0438)

On January 28, 2009 the U.S. Nuclear Regulatory Commission (NRC) staff met with Tennessee Valley Authority (TVA) and representatives of AREVA at NRC Headquarters in Rockville, Maryland. The objective of the meeting was to discuss the pending submittal of an amendment for Browns Ferry Nuclear Plant (BFN) Unit 1 requesting approval of a transition of fuel types from GE13 and GE14 to ATRIUM-10 blended low enriched uranium (BLEU) fuel. No members of the public were in attendance and no meeting feedback forms were received. Enclosure 1 contains a list of attendees. Enclosure 2 is a summary of information that should be included regarding the proposed fuel transition amendment. The licensee distributed a handout during the meeting (see the Agencywide Documents Access and Management System (ADAMS) Accession No. ML090330464).

DISCUSSIONS

On May 22, 2007, Unit 1 was restarted after being shut down over 20 years. At that time, the Unit 1 core was comprised of various generations of fuel assemblies provided by Global Nuclear Fuels, a joint venture of General Electric, Hitachi, and Toshiba. The other two BFN units began operating with ATRIUM-10 fuel provided by AREVA, then known as Framatome in 2004 for Unit 3 and 2005 for Unit 2. Back in 1997, TVA agreed to accept from the Department of Energy over 30 metric tons of highly enriched uranium (HEU). The HEU was converted to BLEU fuel assemblies by AREVA. These BLEU assemblies were first loaded into Unit 2 in April 2005 and Unit 3 in 2006. In 2008, TVA modified its agreement and added Unit 1 to their plants using ATRIUM-10 BLEU fuel. TVA intends to begin to transition Unit 1 to ATRIUM-10 BLEU fuel in 2010.

In support of this transition a revision to the Technical Specifications (TSs) will be necessary. The licensee discussed the specific sections of the TSs that will be affected. The NRC staff noted that TVA should ensure that any design bases changes made to the TS Bases and/or the Updated Final Safety Analysis Report, which trip the threshold in Section 50.59 to Title 10 to the *Code of Federal Regulations*, should also be submitted for review and approval.

The licensee provided a proposed schedule for the fuel transition licensing amendment request (LAR). This schedule indicated that a submittal would be made 1-year before it is needed. However, several of the required analyses would not be available until 3 to 6 months later. The NRC staff indicated that this proposal could be problematic as the existing guidance regarding acceptance reviews, recommends rejection of incomplete submittals. Several alternatives were discussed including waiting to submit the LAR 6 months prior to the need date and requesting a

waiver from NRC management for the acceptance review. The NRC staff cautioned that while the NRC staff would make every reasonable effort to complete an LAR submitted 6 months in advance, given the complexity of this type of request and staff workload, no certainty could be provided that the work could be completed within the requested timeframe.

It was discussed that the analyses used to support the LAR would be consistent with NRC approved methodologies. The NRC staff noted that there was no specific approved licensing topical report for ATRIUM-10 fuel. The fuel vendor indicated the intent to use ANF-89-98(P)(A), *Generic Mechanical Design Criteria for BWR [Boiling-Water Reactor] Fuel Designs*. The licensee provided an overview of the approved methodologies related to the mechanical, transient, and neutronic analyses, the critical power ratio, and loss-of-coolant accident, that would be referenced. The NRC staff questioned whether the approvals for the associated licensing topical reports for these topics were sufficient given recent reviews of these methodologies and existing Title 10, *Code of Federal Regulations*, Part 21 reports. A summary of the supplemental information that would need to be provided is enclosed.

The licensee also provided background regarding BLEU fuel. The presentation included a discussion of the material characteristics, reactivity characteristics and impact, and the operating experience (see ADAMS No. ML090330363). The NRC staff found the discussions useful in understanding the proposed LAR and communicating potential issues and concerns with the methodology and schedule proposed.

/RA/
Eva A. Brown, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-259

Enclosures: 1. List of Attendees
2. Summary of Concerns

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Meeting Participants
Meeting with Tennessee Valley Authority and AREVA
Regarding Proposed Fuel Transition Amendment
January 28, 2009

NRC	TVA	AREVA
Anthony Mendiola	Robert Birchell	Jerald Holm
Peter Yarsky	Greg Storey	David McBurney
Benjamin Parks	Tom Eichenberg	Ronnie Garner
Paul Clifford	James Emens	Alan Meginnis
Shih-Liang Wu		David Brown
Eva Brown		

Enclosure 1

SUMMARY OF INFORMATION THAT SHOULD BE INCLUDED

REGARDING PROPOSED FUEL TRANSITION AMENDMENT

(1) The Nuclear Regulatory Commission (NRC) staff mentioned the need for the licensee to address NRC staff concerns raised in previous request for additional information (RAI) for recent boiling-water reactor (BWR) fuel transition license amendment request and in previous RAIs regarding Browns Ferry Units 2 and 3.

(2) By letter dated January 30, 2009, AREVA confirmed an NRC staff identified concern regarding the Ohkawa-Lahey void quality correlation. This nonconservatism of the void-quality correlation bias for the Unit 1 American Society of Mechanical Engineers and anticipated transient without scram (ATWS) overpressure calculations should be addressed.

(3) As a result of recent reviews of Browns Ferry licensing requests, the NRC staff has had the opportunity to review some plant data from Unit 2 during its transition from GE to ATRIUM fuel. During its review, it was noted that operating experience could be used to justify the methods applied to ensure acceptably low traversing incore probes (TIP) root mean square differences. Additionally concerns exist regarding the approaches proposed to ensure that the core monitoring system is sufficiently accurate to be consistent with the conditions on MICROBURN-B2. Helpful information that should be provided include relevant operating data, such as TIP measurements for transition cores representative of Unit 1. These may include data collected at similar plants at extended power uprate (EPU) conditions with mixed cores of ATRIUM-10/GE14 fuel as well as data collected at the stretch power uprate conditions with mixed cores of ATRIUM-10/GE14 fuel at Units 2 and 3.

A discussion of the analysis options and core monitoring system inputs or refinements that were implemented to garner the degree of accuracy would be useful, as well as a description of those options, inputs, and refinements that will be implemented for Unit 1.

Additionally, a discussion of the impact on core simulation or core monitoring accuracy from operating strategy would be useful. A proposed discussion could include whether the methods challenged for maximum extended load line limit analysis operation or EPU operation.

(4) The NRC staff noted that a quantitative justification of the usage of reference analyses would be essential. If the Units 2 and 3 analyses are going to be heavily referenced, a justification would be needed supporting the applicability and a discussion of the relevant plant design differences should be included. Therefore, if the break spectrum for Units 2 and 3 will not be revisited for its applicability to Unit 1, then the break spectrum analysis should already account for transition core effects, and its applicability should be appropriately justified in concert with Title 10, *Code of Federal Regulations* (10 CFR) Section 50.46 and the appropriate loss-of-coolant accident (LOCA) methodology topical reports.

Additionally, the fact that AREVA does not have generically approved methods for the evaluation of ATWS was discussed. It was recommended that the submittal address how compliance with the applicable requirements (containment temperature and core coolability) will be demonstrated.

It was stressed that should LOCA analyses from the previous fuel type be referenced in the application, a quantitative justification for the continued applicability of the maximum average planar linear heat generation rate limit would be necessary. It will be necessary for differences in the fuel design in terms of stored energy and geometry to be addressed.

(5) The inputs for the fuel used in the nuclear core simulation as it relates to CASMO4/MICROBURN-B2 should be described along with the source of the isotopic and mass data.

(6) A description regarding how the thermal mechanical limits are evaluated for legacy fuel should be provided. A discussion will be necessary explaining how compliance with these limits will be demonstrated and monitored for the legacy fuel. If legacy vendor analyses are used to establish the limits, confirmation should be provided that these limits are consistent with the uncertainties in the core monitoring system in terms of assessing operational thermal margin.

(7) Information will be necessary regarding the legacy fuel similar to the type of information provided for other EPU fuel transitions. It will be useful if this information includes any nuclear and hydraulic data used in the safety analysis.

(8) Disposition of the 10 CFR Part 21 that indicated minimum critical power ratio (MCPR) nonconservatism when using erroneous additive constants in SPCB will need to be addressed, including how MCPR is evaluated for legacy fuel.

(9) Typically cold eigenvalue targets are established based on AREVA simulation of previous cycle operation between three and five cycles. Given the extended time Unit 1 was shut down and defueled, this degree of data does not exist for Unit 1. A description of the following would be useful: (1) how the cold eigenvalue target is established, and (2) any conservatism in the cold target eigenvalue that compensates for the absence of operational data.

(10) Analyses performed using the AREVA NP suite of analysis codes require that the core be nodalized. It is possible that the legacy fuel and ATRIUM-10 fuel will include differences in the axial geometric variation. Describe how geometry changes within a node are treated in the steady state and transient analyses. Justify the thermal margins based on any errors or biases observed when standard production analysis assumptions are applied to such instances.

(11) A description of any aspects of ATRIUM-10 BLEU fuel that would differentiate it from ATRIUM-10 fuel in terms of steady state or transient: neutronic, thermal hydraulic, or mechanical performance should be provided.

waiver from NRC management for the acceptance review. The NRC staff cautioned that while the NRC staff would make every reasonable effort to complete an LAR submitted 6 months in advance, given the complexity of this type of request and staff workload, no certainty could be provided that the work could be completed within the requested timeframe.

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