



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

July 7, 2015

LICENSEE: Tennessee Valley Authority

FACILITY: Browns Ferry Nuclear Plant, Units 1, 2, and 3

SUBJECT: SUMMARY OF JUNE 9, 2015, MEETING WITH TENNESSEE VALLEY AUTHORITY REGARDING PRE-SUBMITTAL OF EXTENDED POWER UPRATE LICENSE AMENDMENT REQUEST - FLOW INDUCED VIBRATION MONITORING PROGRAM FOR BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 (TAC NOS. MF4851, MF4852, AND MF4853)

On June 9, 2015, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) staff and representatives of Tennessee Valley Authority (TVA, the licensee) at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. This was part of a series of public meetings held to discuss a variety of topics related to a forthcoming extended power uprate (EPU) license amendment request (LAR) for Browns Ferry Nuclear Plant, Units 1, 2, and 3 (BFN). Specifically, the purpose of this meeting was to discuss TVA's flow induced vibration (FIV) monitoring program." The meeting notice and agenda dated May 22, 2015, are available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML15148A305. The licensee provided presentation slides prior to the meeting, which are available in ADAMS at Accession No. ML15147A057. A list of attendees is enclosed.

TVA presented an overview of the slides and its purpose for the meeting, reiterating that a new consolidated EPU LAR would supersede previous submittals dated June 25, 2004, and June 28, 2004 (ADAMS Accession Nos. ML041840301 and ML042800186, respectively), which TVA withdrew on September 18, 2014 (ADAMS Accession No. ML14265A487). TVA stated that it would employ knowledge gained through the previous EPU LAR submission process (including content generated through NRC staff requests for additional information and lessons learned from the industry). TVA noted that the forthcoming EPU LAR submittal will 1) supersede previous BFN EPU submittals and address the current BFN conditions and licensing basis, 2) conform to NRC Review Standard-001, Revision 0, "Review Standard for Extended Power Uprates" (ADAMS Accession No. ML033640024), and 3) apply an improved submittal verification process internal to TVA to ensure completeness and accuracy. TVA gave an overview of its proposed schedule, indicating its planned LAR submittal in October 2015 with implementation in 2018 and 2019, if NRC approves the LAR by October 2017.

TVA also provided background for the FIV program. The licensee indicated that the vibration level of the mainsteam (MS) and feedwater (FW) piping are expected to increase by approximately 35 percent, based on the flow increases of up to 16 percent. Flow rates in portions of condensate, extraction steam, and heater drains systems increase similarly to MS and FW and are susceptible to increased vibration at EPU conditions. The licensee added that other possible sources of increased vibration, such as instabilities and acoustic resonance as a result of increased flow velocities, may contribute to EPU vibration levels. Acoustic vibration suppressors

have been installed on the MS system at BFN to reduce vibration susceptibility of piping and components. The licensee stated that during initial power ascension to EPU conditions, a confirmatory test program will be implemented to monitor piping and attached component vibration levels. The licensee clarified that vibration studies associated with steam dryer replacement will be addressed as part of steam dryer vibration. It was noted that a meeting specific to the steam dryer replacement was held on April 22, 2015 (meeting summary available in ADAMS at Accession No ML15141A342). In response to the NRC staff question regarding installation of any vibration reduction device, the licensee stated that some of the vent pipes are capped at the end, similar to Quad Cities Nuclear Power Station (Quad Cities).

Further, TVA discussed previous vibration monitoring and vibration data collection at current licensed thermal power (CLTP) as part of BFN, Unit 1, restart in 2007 with additional data in 2008 for BFN, Unit 1, MS and FW piping and components. The results show that the frequencies were outside the baseline monitoring that led to the installation of acoustic resonance suppressor on all three units. The NRC staff questioned whether these results were expected though modeling of vibration and how the results were verified. TVA responded that a vibration model provided the expected results. The model was modified after measurements were done.

TVA also discussed the MS and FW piping location selection that included hydraulic and structural models of the MS and FW piping, selection of the vibration monitoring locations where significant displacements occurred, and the measurement locations, so that the significant vibration would not be missed. The licensee further presented development of acceptance criteria. The licensee stated that the primary acceptance criteria are in terms of displacement, which is directly proportional to pipe stress. The secondary acceptance criteria in terms of acceleration were determined for locations where accelerometers are used for monitoring. Additional details regarding acceptance criteria monitoring are presented in slide 9 of TVA's handouts. The licensee stated that acceptance criteria used during previous vibration monitoring will be applied to EPU monitoring.

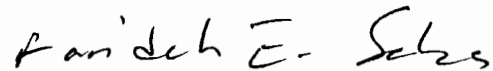
TVA presented the industry operating experience that includes EPU lessons learned, operating experience at Quad Cities, the NRC staff's recent finding at the Dresden Nuclear Power Station, and Institute of Nuclear Power Operations Reports 13-22 and 12-81 regarding failures due to vibration at the Waterford Steam Electric Station and the St. Lucie Plant. The licensee also discussed BFN component-specific evaluations based on operation experience related to fatigue and wear related to solenoid valves and pilot assemblies, temperature elements, limit switches, and valve operators. The licensee indicated that BFN operating experience related to jet pumps is similar to what the industry has seen. In response to the NRC staff's question related to the existence of any vibration monitoring device on the relief valves, the licensee stated that these monitoring instruments (devices) will be installed during the EPU outage for each unit.

TVA continued its presentation by discussing MS and FW monitoring scope inside and outside the containment, component monitoring scope, balance of plant systems monitoring scope, and small bore piping susceptibility evaluation. The licensee concluded that CLTP vibration levels are well within acceptable limits, vibration of piping and components will not be adversely affected by EPU operation, piping and attached systems with significant flow increases will be

included in the monitoring program, and small bore piping assessment will be performed to identify potentially susceptible configurations, and any necessary modifications will be done prior to EPU ascension.

Members of the public were not in attendance. Public Meeting Feedback forms were not received.

Please direct any inquiries to me at 301-415-1447 or farideh.saba@nrc.gov.

A handwritten signature in black ink that reads "Farideh E. Saba". The signature is written in a cursive style with a large initial 'F' and 'S'.

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, and 50-296

Enclosure:
List of Attendees

cc w/enclosure: Distribution via Listserv

LIST OF ATTENDEES

JUNE 9, 2015, MEETING WITH TENNESSEE VALLEY AUTHORITY

REGARDING PRE-SUBMITTAL OF EXTENDED POWER UPRATE LICENSE AMENDMENT

REQUEST - FLOW INDUCED VIBRATION MONITORING PROGRAM

FOR BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

<u>U.S. NUCLEAR REGULATORY COMMISSION STAFF AND CONTRACTORS</u>	<u>TENNESSEE VALLEY AUTHORITY STAFF AND CONTRACTORS</u>
Shana Helton Tim Lupold Kamal Manoly Chakrapani Basavaraju Farideh Saba Michael Breach Ian Tseng	Peter Donahue Gerard Doyle Dan Green Gordon Williams Brian Volls * (TVA consultant from Sargent and Lundy) Ed Quidley * (TVA consultant) Eric Frevold * (TVA consultant)

* By phone

Enclosure

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/RA/

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
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**ADAMS Accession Nos.: Mtg Summary ML15182A259
Handout ML15147A057**

**Mtg. Notice ML15148A305
*by e-mail**

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