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U.S. Nuclear Regulatory Commission
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Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
Docket Nos. 50-325 and 50-324
License Renewal Commitment Completion
Evaluation of Operating Experience at Extended Power Uprate Conditions

Reference:

1. NUREG-1856, Safety Evaluation Report Related to the License Renewal of the Brunswick Steam Electric Plant, Units 1 & 2, published June 2006, ADAMS Accession Nos. ML061730123 and ML061730129

Ladies and Gentlemen:

On June 26, 2006, the NRC approved the renewal of the of the operating licenses of the Brunswick Steam Electric Plant (BSEP), Units 1 and 2, for an additional 20 years. The Safety Evaluation Report (i.e., Reference 1) associated with this renewal included the following commitment (i.e., Commitment Number 31 in Appendix A of NUREG-1856).

> An evaluation of plant and industry operating experience will be submitted for NRC review at least one year prior to the period of extended operation. The purpose of the evaluation will be to assure that relevant aging effects caused by operation at power uprate conditions are adequately addressed by aging management programs.

BSEP Unit No. 2 will enter the period of extended operation on December 28, 2014.

Duke Energy Progress, Inc. has performed the required operating experience (OE) review and evaluation to ensure that operating experience at extended power uprate (EPU) levels is properly addressed by the aging management programs (AMP) at BSEP Unit Nos. 1 and 2. This submittal provides the results of this OE evaluation. There are no regulatory commitments in this submittal. The method of review and a summary of results are presented below.

Method of Review

The following items were reviewed in performance of this OE evaluation.

a. Boiling Water Reactor Owner's Group (BWROG) Report NEDO-33159, "Extended Power Uprate (EPU) Lessons Learned and Recommendations," Revision 2, which

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provided a detailed OE review, evaluation, and recommendations from industry events related to EPU from 1992 to December 2008.

b. "Evaluations of OE at EPU Levels Prior to Period of Extended Operation" that were completed for Dresden Unit Nos. 2 and 3 and Quad Cities Unit Nos. 1 and 2. The results of the Exelon reviews were communicated to the NRC in submittals dated November 18, 2009, for Dresden (i.e., NRC Accession Number ML093340052) and October 18, 2012, for Quad Cities (i.e., NRC Accession Number ML12319A410).
c. Events applicable to boiling water reactor (BWR) plants from the Electric Power Research Institute (EPRI) Plant Uprate Database and the events listed in the Boiling Water Reactor Vessel & Internals Project (BWRVIP) OE Index potentially related to EPU.
d. Events listed in the Institute for Nuclear Power Operations (INPO) Operating Experience (OE) database from October 2012 to August 2013.
e. BWRVIP Review Visit recommendations by INPO from 2010 to 2012 for relevant aging caused by operation at EPU conditions.

The results of the OE review were evaluated with respect to existing aging management programs (AMPs) for those systems, structures and components (SSCs) within the scope of License Renewal. Any OE not adequately addressed by existing programs at BSEP was entered into the site's Corrective Action Program (CAP) for implementation prior to the period of extended operation.

Results of Review

Based on the comprehensive review of industry OE since BSEP EPU implementation, approved by the NRC on May 31, 2002 (i.e., NRC Accession Number ML021430551), the current AMP for reactor internals and other SSC within the scope of License Renewal at BSEP is adequate to assure that relevant aging effects caused by operation at EPU conditions have been and will continue to be addressed.

BSEP has an established in-vessel visual inspection (IVVI) program to monitor the structural integrity of the steam dryer, core shroud head assembly and steam separator, jet pumps and feedwater sparger brackets. These were identified during the OE review as the major reactor internals components, within the scope of License Renewal, where industry OE has indicated significant flow induced vibration and fatigue cracking likely due to EPU.

The BSEP steam dryers were modified for EPU conditions as a result of the Dresden and Quad Cities OE. The Unit 1 steam dryer was modified during the spring 2004 refuel outage and the Unit 2 steam dryer was modified during the spring 2005 outage. Both units have experienced intergranular stress corrosion cracking (IGSCC) and apparent fatigue cracking in the steam dryer assemblies, typical of what has been observed in the industry. The most severe cracking occurred in the dryer bank vertical welds. Most of the existing cracks have been weld repaired. Unrepaired areas are monitored during refueling outages for growth assessment. During the spring 2004 refueling outage for Unit 1 and the spring 2005 refuel outage for Unit 2, 100 percent of the exterior welds were examined during IVVIs. Additionally, the following modifications to the steam dryers were implemented:

a. Cover plates to upper support rings were weld overlaid to achieve a minimum 3/8 inch fillet weld.
b. Manhole cover welds were overlaid in several areas.

c. Large gussets were added to the exterior bank hoods and cover plates.
d. Ten tie-bars on the top of the dryer were replaced with a new, low stress tie-bar design (i.e., for Unit 2 only).

The IVVI results, as of March 2013, identified some minor new cracking in steam dryers on both Units 1 and 2. Based on recent OE of IGSCC and fatigue cracking on newly replaced steam dryers at Susquehanna, the NRC issued Information Notice (IN) 2013-10 to inform the industry of the importance of establishing programs to monitor the structural integrity of BWR steam dryers. Although no specific action or written response was required, BSEP Engineering reviewed the OE information contained in this IN for applicability and considered actions, as appropriate, to avoid similar issues. It was determined that there was a gap between what is suggested in IN 2013-10 and the current BSEP inspection program for monitoring steam dryer structural integrity. A program enhancement to assure corrective actions are implemented that will prevent the generation of loose parts in the reactor vessel and attached steam lines due to steam dryer cracking was identified. This AMP will be enhanced to include a re-inspection of existing IGSCC and/or fatigue cracking and newly found relevant indications in steam dryer components every refuel outage until the absence of crack growth can be confirmed and/or repairs are implemented.

Inspection and flaw evaluation guidelines, based on EPU related OE, have been implemented for both BSEP Unit No. 1 and Unit No. 2 for the core shroud head assembly and steam separator, jet pumps and feedwater sparger brackets.

Please refer questions regarding this submittal to Mr. Lee Grzeck, Manager – Regulatory Affairs, at (910) 457-2487.

Sincerely,

for

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cc:

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