



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

May 10, 2016

LICENSEE: Exelon Generation Company, LLC

FACILITY: Peach Bottom Atomic Power Station, Units 2 and 3

SUBJECT: SUMMARY OF APRIL 26, 2016, MEETING WITH EXELON GENERATION COMPANY, LLC TO DISCUSS A POTENTIAL FUTURE MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE LICENSE AMENDMENT REQUEST FOR PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 (CAC NOS. MF7532 AND MF7533)

On April 26, 2016, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Exelon Generation Company, LLC (Exelon, the licensee) at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The purpose of the meeting was to discuss a potential future measurement uncertainty recapture (MUR) power uprate license amendment request (LAR) for the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The meeting notice and agenda, dated April 11, 2016, are available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML16102A104. A list of attendees is enclosed.

Background

Nuclear power plants are licensed to operate at a specified maximum core thermal power, often called rated thermal power (RTP). Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," formerly required licensees to assume that the reactor had been operating continuously at a power level at least 1.02 times the RTP level when performing loss-of-coolant accident (LOCA) and ECCS analyses. This requirement was included to ensure that power measurement uncertainties were adequately accounted for in the safety analyses. In practice, many of the design bases analyses assumed a 2 percent power uncertainty, consistent with 10 CFR Part 50, Appendix K.

A revision to 10 CFR Part 50, Appendix K, effective on July 31, 2000, allowed licensees to use a power level less than 1.02 times the RTP for the LOCA and ECCS analyses, but not less than the RTP, based on the use of state-of-the-art feedwater flow instrumentation that reduces the degree of uncertainty associated with the feedwater flow measurement. The reduced uncertainty provides a more accurate calculation of the thermal power level. Licensees can use a lower uncertainty in the LOCA and ECCS analyses, provided the licensee has demonstrated that the proposed value adequately accounts for the instrumentation uncertainties. Because there continues to be substantial conservatism in other Appendix K requirements, sufficient margin to ECCS performance in the event of an LOCA is preserved.

However, the final rule, by itself, did not allow increases in licensed power levels. Because the licensed power level for a plant is contained in the plant's operating license, proposals to raise

the licensed power level must be reviewed and approved under the license amendment process. MUR power uprate license amendments increase the licensed power level by less than 2 percent. They are achieved by implementing improved techniques for calculating reactor power by using more accurate feedwater flow measurement instrumentation.

Meeting Discussion

The licensee presented information as shown in the slides provided at the meeting (ADAMS Accession No. ML16106A279).

The licensee noted the following during its presentation:

- 1) PBAPS, Units 2 and 3, were originally licensed at a power level of 3,293 megawatts thermal (MWt). Both units have previously been approved for a 5 percent stretch power uprate, a 1.62 percent MUR uprate, and a 12.4 percent extended power uprate (EPU). The current power level for both units is 3,951 MWt, which is 20 percent above the original licensed thermal power (OLTP) level. The proposed MUR would increase the licensed power level by about 1.6 percent. The resulting power level of 4,016 MWt would be about 22 percent above OLTP.
- 2) PBAPS, Units 2 and 3, were recently approved to operate in the Maximum Extended Load Line Limit Plus (MELLLA+) operating domain. The current licensing basis ECCS and LOCA analyses, including EPU and MELLLA+, were performed at 1.02 times the currently licensed power level of 3,951 MWt (i.e., 4,030 MWt), consistent with Appendix K to 10 CFR Part 50. Although PBAPS, Units 2 and 3, currently have a Caldon CheckPlus Leading Edge Flow Meter (LEFM) installed (to support the first MUR amendment), the current licensing basis analyses do not credit the increased accuracy of the LEFM. The current analysis assumes a 2 percent uncertainty on the RTP measurement. The proposed new MUR would credit the increased accuracy of the LEFM in order to justify an increase in the power level.
- 3) The General Electric (GE) licensing topical report (LTR) for MURs states that the generic applicability of the LTR is limited to a maximum RTP of 120 percent of OLTP. The LTR also states that plants seeking to apply a power uprate that would result in an RTP level above 120 percent of OLTP must provide plant-specific evaluations for those evaluations not performed at 102 percent of RTP. Since PBAPS, Units 2 and 3, will propose a new power level of approximately 122 percent of OLTP, the licensee will be performing plant-specific evaluations for those evaluations not performed at 102 percent RTP.
- 4) The safety analysis report included in the proposed PBAPS MUR will be formatted such that the section numbers will align with the section numbers in the GE LTR for MURs.
- 5) The EPU made plant modifications to eliminate the need to credit containment accident pressure (CAP) for the ECCS pumps net positive suction head requirements. The proposed MUR will not need to credit CAP.
- 6) The MUR LAR will include the results of a reanalysis of the MELLLA+ analyses for anticipated transients without scram (ATWS) and ATWS with instability at the higher power level.

- 7) The MUR LAR will provide a technical evaluation of revised stress analyses for the steam dryers. The evaluation will use an extrapolation of the data gathered during the EPU power ascension process (i.e., extrapolation of data from 100 percent RTP to 102 percent RTP).
- 8) The licensee does not anticipate that the MUR will require any plant equipment modifications other than instrumentation calibration and setpoint changes.
- 9) The licensee does not anticipate that the MUR will require any new operator actions from those implemented as a result of the MELLLA+.
- 10) The licensee stated that the EPU alternative source term radiological consequence analyses were performed at 102 percent of RTP. As such, the MUR will not impact these analyses.
- 11) The license stated that the MUR will require a revised grid stability analysis.
- 12) The licensee will review recent MUR precedent regarding the technical specification requirements (e.g., allowed outage times) for when the LEFM is not in service and the plant is using the venturi for feedwater flow measurement.
- 13) The licensee forecasts submittal of the MUR LAR in September 2017 and would request NRC approval by September 2018. The licensee would like a post-submittal meeting in October 2017. Amendment implementation is planned for September through November 2018. The amendments can be implemented online (i.e., do not need to be implemented during a refueling outage).

The NRC staff made the following comments:

- 1) The NRC staff requested Exelon to confirm the applicability of the TRACG code for analyses above 120 percent of OLTP.
- 2) The NRC staff stated that it would be helpful if the MUR LAR would include a redline/strikeout version of the safety analysis report similar to the examples on pages 17 through 21 of its presentation. This would be in addition to a clean copy of the report.
- 3) The NRC staff indicated it had communicated with the NRC's Advisory Committee on Reactor Safeguards (ACRS) regarding the MUR. ACRS indicated it did not want to review this LAR. The staff noted that although ACRS does not normally review MURs, it has requested it be provided the opportunity to review any power uprate, regardless of the level of the individual LAR, if it would result in a cumulative power increase greater than 7 percent of OLTP. The staff indicated that after the MUR LAR was submitted, it would confirm whether ACRS review was required.
- 4) The NRC staff stated that the timeliness goal for review of MUR power uprates is 9 months after acceptance. However, given the first-of-a-kind nature of this LAR (i.e., greater than 120 percent of OLTP), the review schedule is likely to exceed 9 months after acceptance.

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

Please direct any inquiries to me at 301-415-1420 or Rick.Ennis@nrc.gov.

A handwritten signature in black ink, appearing to read 'RBE', with a long horizontal flourish extending to the right.

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosure:
List of Attendees

cc w/enclosure: Distribution via Listserv

LIST OF ATTENDEES

APRIL 26, 2016, MEETING WITH EXELON GENERATION COMPANY, LLC

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

POTENTIAL FUTURE MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE

LICENSE AMENDMENT REQUEST

Name	Organization
Rick Ennis	NRC
Kevin Borton	Exelon
John Rommel	Exelon
David Henry	Exelon
Steve Minnick	Exelon
Jim Armstrong	Exelon
Marvin Lohmann	Exelon
William McDonald	Exelon
David Neff	Exelon
Jim Harrison	GE-Hitachi Nuclear Energy (GEH)
John Hannah	Global Nuclear Fuel
Larry King	GEH
George Paptzun	GEH
Jerry Dozier	NRC
Alex Chereskin	NRC
Matt Yoder	NRC
Curt Robert	GEH
Andy Olson	Exelon
George Thomas	NRC
Muhammad Razzaque	NRC
Shavon Edmunds	NRC
Russ Haskell	NRC
Diego Saenz	NRC
Ahsan Sallman	NRC
Eric Oesterle	NRC
Molly Keefe-Forsyth	NRC
Swagata Som	NRC
Chakrapani Basavaraju	NRC
Alan Huynh	NRC
Margaret Chernoff	NRC
Rich Stattel	NRC
Eugene Eagle	NRC
Lisa Schichlein*	GEH
Bruce Hagemeyer*	GEH

* via telephone

Enclosure

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Please direct any inquiries to me at 301-415-1420 or Rick.Ennis@nrc.gov.

/RA/

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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ADAMS Accession Nos.: Package: ML16119A372

Meeting Notice: ML16102A104 Meeting Summary: ML16119A357 Slides: ML16106A279

OFFICE	DORL/LPL1-2/PM	DORL/LPL1-2/LA	DORL/LPL1-2/BC	DORL/LPL1-2/PM
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DATE	5/10/16	5/10/16	5/10/16	5/10/16

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