



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

June 9, 2011

LICENSEE: Exelon Generation Company, LLC

FACILITY: Byron Station, Unit Nos. 1 and 2, (Byron) and Braidwood Station, Units 1 and 2 (Braidwood)

SUBJECT: SUMMARY OF MAY 18, 2011, MEETING WITH EXELON GENERATION COMPANY, LLC, PRE-APPLICATION DISCUSSION ON FORTHCOMING BYRON AND BRAIDWOOD MEASUREMENT UNCERTAINTY RECAPTURE (MUR) LICENSE AMENDMENT REQUEST (LAR) (TAC NOS. ME4815, ME4816, ME4817, AND ME4818)

On May 18, 2011, a Category 1 public meeting teleconference was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Exelon Generation Company, LLC (EGC, the licensee). The purpose of the meeting was to discuss project updates to a forecasted June 2011, LAR submittal for a MUR power uprate of approximately 1.63 percent to 3645 megawatts thermal. A prior pre-application meeting was held at NRC headquarters November 4, 2010, as discussed in a meeting summary dated November 29, 2010 (Agencywide Document Access and Management System (ADAMS) Accession No. ML103260212).

The licensee's presentation (see Enclosure 2) summarized the regulatory and technical bases for the planned application, as well as key analyses and potential modifications planned for inclusion in the planned application. Key discussion points between the NRC staff and the licensee include:

1. The licensee plans to submit a MUR LAR with a 12-month review schedule. The MUR request will include additional analyses in the areas of margin-to-overfill (MTO) analyses for the steam generator tube rupture (SGTR) accident, and VIPRE code correlation updates to enhance departure from nucleate boiling (DNB) analysis margins (see Slide 5).

The licensee and NRC staff discussed Regulatory Issue Summary (RIS) 2002-03, "*Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications*," in the filling of MUR requests. RIS 2002-03 contains templates for the content of MUR applications and advised licensees that MUR reviews would be completed in 6 - 8 months for typical applications and 1 - 2 years for MUR applications which contained other requests.

2. The NRC staff provided feedback in several technical areas based on the proposed request and recent NRC experience with similar reviews. These include:
  - a. NRC staff reiterated the need for EGC to address the specific limitations and conditions associated with NRC approval of any Topical Reports utilized in any new or updated analysis methodologies (e.g., VIPRE).

- b. Ensure justification for duration of revised and new operator manual actions is provided (e.g., SGTR MTO analysis). The justification should include demonstration of timed operator actions and key tasks. The staff noted similar reviews where NRC has conducted site audits to verify analysis assumptions.
    - c. Ensure that revised dose analysis inputs and assumptions are well documented within the LAR.
    - d. Ensure licensing basis review of the planned steam generator power operated relief valve power supply modifications is conducted. Licensee should evaluate how changes to the electric power supply affect the facilities Updated Final Safety Analysis Report and ensure these are reflected in the MUR LAR as appropriate. NRC staff suggested that the licensee explain the interface between the MUR LAR and the EGC's response to the NRC verification inspection report letter containing several regulatory commitments dated March 2, 2011 (ADAMS Accession No. ML110620089).
3. The NRC staff discussed several best practices when developing power uprate licensing submittals:
  - a. The NRC staff recommended that the licensee identify all related/supporting Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59 reviews prior to submission of the LAR to prevent unplanned changes to the NRC staff review.
  - b. The NRC staff recommended that the licensee seek prior review and approval of complex analyses (e.g., best-estimate loss-of-coolant accident [as approved in December 2010, for Braidwood and Byron], DNB analysis). This best practice minimizes the potential of NRC staff questions, resulting in reanalysis being performed during NRC staff review. When similar situations have occurred, applications are often delayed or withdrawn.
  - c. The NRC regulations at 10 CFR Part 50, Appendix B, Criterion XVI, require that licensees complete corrective actions promptly. The NRC staff noted that disposition of present facility corrective actions are most effectively addressed in NRC reviews independent of a LAR for power uprate.
  - d. The NRC staff discussed recent power uprate reviews where licensees had requested power uprates which included multiple dependent safety analyses which complicated NRC staff reviews (e.g., Point Beach extended power uprate LAR, approved on May 3, 2011 (ADAMS Accession No. ML111170513).
4. The licensee inquired into the NRC staff concerns associated with the planned Braidwood and Byron MUR application. The NRC staff noted that NRR resources assume a MUR application typically requires 6 months to review (following NRC staff acceptance of the application). Additional analyses make the proposed MUR request more complex, requiring additional resources, and introduces uncertainty into review templates and schedules.

The NRC staff noted that no regulatory decisions were made during this meeting. The NRC staff will perform an acceptance review of the licensee's application in accordance with NRC regulation and agency procedures when received.

No members of the public were in attendance. No public meeting feedback forms were received.

Please direct any inquiries to me at 301-415-1115, or [nicholas.difrancesco@nrc.gov](mailto:nicholas.difrancesco@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Nicholas J. DiFrancesco". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Nicholas J. DiFrancesco, Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. STN-456, STN-457,  
STN 50-454, and STN 50-455

Enclosures:

1. List of Attendees
2. Licensee Handout

cc w/encl: Distribution via ListServ

LIST OF ATTENDEES

MAY 18, 2011, PUBLIC MEETING TELECONFERENCE

WITH EXELON GENERATION COMPANY, LLC,

PRE-APPLICATION DISCUSSION ON FORTHCOMING BYRON AND BRAIDWOOD

MEASUREMENT UNCERTAINTY RECAPTURE LICENSE AMENDMENT REQUEST

<b>Name</b>	<b>Affiliation</b>
J. Lehning	NRC/NRR
J. Zimmerman	NRC/NRR
S. Sun	NRC/NRR
T. Alexion	NRC/NRR
S. Gardocki	NRC/NRR
T. Mossman	NRC/NRR
D. Duvigneaud	NRC/NRR
T. Tate	NRC/NRR
N. DiFrancesco	NRC/NRR
E. Brown	NRC/NRR
J. Purciarello	NRC/NRR
J. Rommel	Exelon
D. Benyak	Exelon
K. Borton	Exelon
J. Wilson	Exelon
L. Dworakowski	Exelon
J. Bauer	Exelon
D. Baran	Exelon
A. Wong	Exelon
J. DeLaRosa	Exelon
L. Schofield	Exelon
D. Spitzer	Exelon

LICENSEE HANDOUT

MAY 18, 2011, PUBLIC MEETING WITH EXELON GENERATION COMPANY, LLC,  
PRE-APPLICATION DISCUSSION ON FORTHCOMING BYRON AND BRAIDWOOD  
MEASUREMENT UNCERTAINTY RECAPTURE LICENSE AMENDMENT REQUEST

Enclosure 2



## **Byron and Braidwood Stations**

**NRC Pre-Application Public Meeting**

**Analyses Supporting  
Measurement Uncertainty Recapture  
(MUR) Power Uprate**

**May 18, 2011**

### **Introductions**

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#### **Exelon Participants**

- ✓ John Rommel – Engineering Director, Power Uprate
- ✓ Darin Benyak – Licensing Director, Corporate
- ✓ Kevin Borton – Licensing Manager, Power Uprate
- ✓ Jeff Wilson – Manager of Projects, Power Uprate
- ✓ Joe Bauer – Principal Regulatory Engineer, Power Uprate
- ✓ Dave Baran – Lead Engineer, Power Uprate
- ✓ Annie Wong – Lead Analyst, Power Uprate
- ✓ Jessica DeLaRosa – Lead Dose Analyst, Power Uprate
- ✓ Lisa Schofield – Sr Regulatory Engineer, Licensing
- ✓ Lydia Dworakowski – Braidwood, Regulatory Assurance
- ✓ Doug Spitzer – Byron Station, Regulatory Assurance



## **Purpose and Agenda**

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### **PURPOSE:**

- ✓ Review the Basis for the Exelon Forthcoming MUR Application

### **AGENDA:**

- ✓ Summary of Nov 4, 2010 Pre-application Meeting
  - LAR Development and Objective
  - Key Analyses
  - Modifications
  - Nov 4 Meeting Conclusion
  - Submittal and Power Ascension Schedule
- ✓ Confirm Need for Related VIPRE and SGTR/MTO Analyses
- ✓ NRC Feedback

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## **Summary of Nov 2010 Meeting**

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### **MUR LAR Development and Objective**

- ✓ Combined MUR amendment request for Byron and Braidwood Stations Units 1 and 2 to increase power approximately 1.63% (3586.6 MWth to 3645 MWth)
- ✓ 10 CFR 50 Appendix K, ECCS Evaluation Models
- ✓ Regulatory Issue Summary (RIS) 2002-03 "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications"
- ✓ Cameron Check-Plus Leading Edge Flow Meter (LEFM) LTR (ER-80P, ER-157P)
- ✓ NRC LIC-109, "Acceptance Review Procedures"
- ✓ LAR will be formatted similar to the North Anna and Prairie Island MUR submittals addressing previous NRC MUR Industry Requests for Additional Information (RAI)

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## Summary of Nov 2010 Meeting

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### Key Analyses (supporting MUR)

- ✓ VIPRE Computer Code; ABB-NV and WLOP Correlations
  - These NRC-approved codes are necessary to demonstrate adequate DNB margin under MUR conditions (NOTE: inadequate DNB margin results under MUR conditions using the current DNB correlations)
    - VIPRE is a thermal-hydraulic code used by Westinghouse for DNBR analysis
    - ABB-NV is a critical heat flux correlation applicable to the non-mixing vane grid region
    - WLOP is a critical heat flux correlation for low pressure applications
- ✓ Revised Steam Generator Tube Rupture (SGTR) Analysis
  - Westinghouse re-analysis is necessary and the associated core heat transfer coefficients are power dependent which will result in a reduction in MTO of approximately 20 ft<sup>3</sup> at MUR conditions
  - Current SGTR MTO analysis assumptions resulted in insufficient margin
  - LAR will present revised dose consequences (based on AST methodology)
  - Westinghouse analysis uses an NRC-approved method (WCAP 10698-P-A and Supplement 1)

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## Summary of Nov 2010 Meeting

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### Modifications

- ✓ Modifications Supporting MUR
  - HP Turbine Modifications
  - BOP Modifications
  - LEFM Modification
    - Initial calibration at Alden Research Laboratory using site specific piping model
    - Final commissioning on site after installation confirms system performance
    - NRC criteria for utilizing LEFM technology will be addressed in the LAR
    - LEFM installation
  - SGTR/MTO-Related Modifications
    - Add AFW valve instrument air accumulators (Unit 1 and Unit 2)
    - Replace SG PORV trim to increase steam flow (Unit 1 only)
    - Add Uninterruptible power supplies for SG PORVs
    - Install High Head Safety Injection system manual isolation valves

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## **Current Schedule**

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### **Submittal and Power Ascension Schedule**

- ✓ LAR Submittal Target Date: June 2011
- ✓ LAR Approval Target Date: June 2012
- ✓ LEFM Installation and Power Ascension Schedule

<u>Site/Unit</u>	<u>Install LEFM</u>	<u>Power Ascension</u>
BYR U1	03/11 Complete	11/12 (post outage)
BYR U2	09/11	09/12 (mid-cycle)
BRW U1	04/12	11/12 (mid-cycle)
BRW U2	04/11 Complete	12/12 (post outage)

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## **Summary of Nov 2010 Meeting**

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### **Meeting Conclusion**

- ✓ Conclusions taken from NRC Meeting Summary Letter, dated November 29, 2010

The licensee's presentation (see Enclosure 2) summarized the regulatory and technical bases for the planned application, as well as key analyses and potential modifications planned for inclusion in the planned application. Key discussion points between the NRC staff and the licensee:

1. The licensee plans to provide revised dose and margin-to-overfill analyses for the steam generator tube rupture accident (see Slide 9). The NRC stated that the review of these analyses could not be performed within the target 6-month review schedule for a MUR, and would likely require 12 months. The licensee noted that they anticipate a 12-month review.
2. The NRC staff reinforced the need for the licensee to address the specific limitations and conditions vs. approved Topical Reports for any new or updated analysis methodologies.
3. The NRC staff noted that its approval of the prerequisite ASTRUM/BELOCA amendment (see Slide 7) would likely occur before the April 2011, MUR application submittal.

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## **Need for VIPRE and SGTR/MTO Analysis**

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### Required for MUR Operations

- ✓ **VIPRE Computer Code; ABB-NV and WLOP Correlations**
  - NRC-approved codes are necessary to demonstrate adequate DNB margin under MUR conditions
  - Vogtle MUR LAR included VIPRE - approved in 6 months
- ✓ **Steam Generator Tube Rupture (SGTR) Revised Analysis**
  - Westinghouse re-analysis is necessary and the associated core heat transfer coefficients are power dependent which result in a reduction in MTO at MUR conditions
  - LAR will present revised dose consequences (based on AST methodology)
  - Surry MUR LAR included SGTR and MSLB dose analysis - approved in 9 months
- ✓ **Exelon will be requesting a MUR LAR 12 month approval**

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## **Discussion**

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**Feedback**

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Sincerely,

*/RA/*

Nicholas J. DiFrancesco, Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. STN-456, STN-457,  
STN 50-454, and STN 50-455

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DATE	6/08/11	6/08/11	6/8/11	6/9/11

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