



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

September 30, 2019

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2; BRAIDWOOD STATION, UNITS 1 AND 2; AND BYRON STATION, UNITS 1 AND 2 - AUDIT SUMMARY IN SUPPORT OF THE LICENSE AMENDMENT REQUEST TO ADOPT RISK INFORMED COMPLETION TIMES TECHNICAL SPECIFICATION TASK FORCE-505, REVISION 2, "PROVIDE RISK-INFORMED COMPLETION TIMES – RITSTF INITIATIVE 4B" FOR EXELON GENERATION COMPANY (EPID L-2018-LLA-0567 AND EPID L-2018-LLA-0727)

Dear Mr. Hanson:

By letters dated December 13, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML18347B366 and ML18352B063), as supplemented by letters dated February 14, 2019 (ADAMS Accession Nos. ML19045A011 and ML19050A399), Exelon Generation Company, LLC (the licensee) submitted license amendment requests to revise the technical specifications to adopt Technical Specifications Task Force (TSTF) Traveler TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times – RITSTF [Risk-Informed Technical Specifications Task Force] Initiative 4b" (ADAMS Accession Nos. ML18183A493 and ML18269A041) for Limerick Generating Station, Units 1 and 2 (Limerick); Braidwood Station, Units 1 and 2 (Braidwood); and Byron Station, Units 1 and 2 (Byron).

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the licensee's submittal and determined that a regulatory audit would assist in the timely completion of the licensing review process. The NRC staff issued the regulatory audit plan on May 20, 2019 (ADAMS Accession No. ML19133A086).

The NRC staff conducted the regulatory audit from June 17 - 21, 2019, at the licensee's headquarters in Kennett Square, Pennsylvania. The results of the regulatory audit will be used by the NRC staff to finalize requests for additional information.

The audit summary report is provided as an enclosure to this letter.

If you have any questions regarding Limerick, please contact V. Sreenivas at 301-415-2597 or via email at V.Sreenivas@nrc.gov. If you have any questions regarding Braidwood and Byron, please contact Joel Wiebe at 301-415-6606 or via email at Joel.Wiebe@nrc.gov.

Sincerely,

/RA/

V. Sreenivas, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353 (Limerick)
50-456 and 50-457 (Braidwood)
50-454 and 50-455 (Byron)

Enclosure:
Audit Summary

cc: Listserv

AUDIT SUMMARY

ADOPT TSTF-505, REVISION 2

EXELON GENERATION COMPANY, LLC

LIMERICK GENERATING STATION, UNITS 1 AND 2

BRAIDWOOD STATION, UNITS 1 AND 2

BYRON STATION UNITS 1 AND 2

DOCKET NOS. 50-352 AND 50-353 (LIMERICK), DOCKET NOS. 50-456 AND 50-457

(BRAIDWOOD), AND DOCKET NOS. 50-454 AND 50-455 (BYRON)

JUNE 17 – 21, 2019

1.0 INTRODUCTION

By letters dated December 13, 2018 (Reference 1 and Reference 2), as supplemented by letters dated February 14, 2019 (Reference 3 and Reference 4), Exelon Generation Company, LLC (Exelon, the licensee) submitted license amendment requests (LARs) to adopt Technical Specifications Task Force (TSTF) Traveler TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times – RITSTF [Risk-Informed Technical Specifications Task Force] Initiative 4b" (Reference 5 and Reference 6) for Limerick Generating Station, Units 1 and 2 (LGS, Limerick); Braidwood Station, Units 1 and 2 (Braidwood); and Byron Station, Units 1 and 2 (Byron).

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the licensee's submittal and determined that a regulatory audit would assist in the timely completion of the licensing review process. The NRC staff issued the regulatory audit plan on May 20, 2019 (ADAMS Accession No. ML19133A086).

The NRC staff conducted the regulatory audit from June 17 - 21, 2019, at the licensee's headquarters in Kennett Square, Pennsylvania. The results of the regulatory audit will be used by the NRC staff to finalize requests for additional information (RAIs).

The regulatory audit was performed consistent with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195).

2.0 AUDIT ACTIVITIES AND OBSERVATIONS

The purpose of the audit was to understand the calculations, analyses, and bases for the LAR, and to develop RAIs, as needed. The NRC staff's discussions with the licensee focused on internal events and fire probabilistic risk assessment (PRA) quality, PRA functionality, implementation of the risk informed completion time (RICT) program, TS limiting conditions for operation, and associated RICT program guidance documents. The licensee provided a demonstration of how it would implement the RICT. The NRC staff reviewed the applicable program documents.

Enclosure

The following are the specific presentation and discussion topics discussed during the audit:

- The licensee's presentation on an overview of the risk-informed completion time (RICT) program.
- The licensee's presentation on Limerick (LGS) unit dependencies including common power sources and essential service water features.
- LGS Limiting Conditions for Operation (LCOs) inclusion in program scope, design criteria, and Probabilistic Risk Analysis (PRA) success criteria.
- LGS PRA facts and observations (F&O) closures.
- LGS PRA modeling of uncertainties.
- LGS potential credit for diverse and flexible coping strategies (FLEX) equipment or actions.
- Instrumentation and Controls and electrical engineering topics related to plant configuration and operations pertaining to systems related LCOs.
- The licensee's presentation on the real time risk PARAGON tool, with examples of RICT calculations and derivation of risk management actions (RMAs) from PRA insights.

Discussion of common audit questions between LGS and Byron and Braidwood (B/B) to support the NRC staff's draft RAI development:

- Discussion of LGS audit questions to support the NRC staff's draft RAI development.
- The licensee's presentation of B/B reactor unit dependencies.
- Discussion of B/B potential Loss of Function LCOs.
- Internal events and fire PRA modeling for B/B.
- Disposition of PRA assumptions and sources of uncertainties for B/B.

Audit Exit:

The NRC staff discussed each question/discussion topic in the Audit plan, and shared preliminary thoughts on any changes to the original set of questions/discussion topics. There were no regulatory decisions made regarding the final set of questions. The NRC staff stated that they planned to issue a formal RAI within 30 days of the Audit. The RAIs were issued on July 10, 2019 (ADAMS Accession No. ML19192A031).

3.0 AUDIT PARTICIPANTS

NRC Participants:

Biro, Mihaela	PRA Licensing Reviewer, DRA/APLA
Brimfield, Terrence*	Reactor Systems Reviewer, DSS/SRXB
Bucholtz, Kristy	Technical Specifications Reviewer, DSS/STSB
Curran, Gordon*	Balance of Plant Reviewer, DSS/SBPB
de Messieres, Candace	PRA Licensing Reviewer, DRA/APLA
Dinsmore, Stephen*	PRA Licensing Reviewer, DRA/APLA
Evans, Jonathan	PRA Licensing Reviewer, DRA/APLA
Matharu, Gurcharan	Electrical Systems Reviewer, DE/EEOB
Matthew, Roy	Electrical Systems Reviewer, DE/EEOB

Li, Ming	I&C Technical Reviewer, DE/EICB
Singh, Gursharan	I&C Technical Reviewer, DE/EICB
Suber, Gregory	Deputy Division Director, DORL
Tetter, Keith	PRA Licensing Reviewer, DRA/APLB
Tjader, Theodore	Technical Specification Reviewer, DSS/STSB
Vasavada, Shilp	PRA Licensing Reviewer, DRA/APLB
Wu, De	PRA Licensing Reviewer, DRA/APLB
Rosenberg, Stacey	Branch Chief, DRA/APLA
Sreenivas, V	Project Manager, DORL
Mehta, Shivani	Project Manager, DRA/APLB
Kodali, Hari	Observer, DRA/APLA
Joel Wiebe	Senior Project Manager, DORL
Smith, Cassandra	Observer, DRA/APLA

Pacific Northwest National Lab Team

Coles, Garill	PRA Reviewer
Short, Steve	PRA Reviewer

* Participated remotely via conference line.

Acronyms:

APLA – PRA Licensing Branch A; APLB – PRA Licensing Branch B; DE – Division of Engineering; DORL – Division of Operating Reactor Licensing; DRA – Division of Risk Assessment; DSS – Division of Safety Systems; EEOB – Electrical Engineering Operating Reactor Branch; EICB – Instrumentation and Controls Branch B; SBPB – Containment and Plant Systems Branch; SRXB – Reactor Systems Branch; STSB - Technical Specification Branch

Licensee Participants:

Exelon:

Jeffrey Stone	Thomas Cole
Shannon Rafferty-Czincila	Giovanni (John) Panici
Eugene Kelly	Jonathan Cunzeman
James Landale	Terrence Myelle
Philip Tarpinian	Kevin Passmore
Mark Gift	Jimmy Boleware
Gregory Curtin	Tony Ziegelbauer
Robert Mandik	Edward Englert
Lisa Simpson	Burt Runde
Philip Raush	David Smith
Darrel Riedinger	

Jensen Hughes:

Don Vanover	Gregory Zucal
Barry Sloane	Jonathen Facemire

Nick Sternowski
Vicki Warren
Brian Albinson
Michael Saunders
Arthur Holtz
Leo Shanley

Eric Thornsbury
Jeffery Schappaugh
Edward Parsley
Usama Farradj
Andrew Nigh

4.0 DOCUMENTS REVIEWED

1. Procedures

Common

- ER-AA-600-1014, R8 Risk Management Configuration Control
- ER-AA-600-1015, FPIE PRA Model Update
- ER-AA-600-1016, R12 Configuration Risk Model (PARAGON) Update
- ER-AA-600-1023, R9 PARAGON Model Capability
- ER-AA-600-1052, R0 Risk Management Support of RICT
- ER-AA-600-1053, R0 Calculation of RMAAT and RICT
- ER-AA-600-1061, R5 Fire PRA Model Update and Control
- OP-AA-108-104, Rev 002, Technical Specification Compliance
- OP-AA-108-117, Rev 005, Protected Equipment Program
- OP-AA-108-118, R0 RICT Program
- OP-AA-201-012-1001, Rev 002, Operations On-line Fire Risk Management
- WC-AA-101-1006, Rev 002, On-line Risk Management and Assessment

2. PRA Documents

LGS

- 1984 PRA (NUS-4507): Limerick Generating Station (LGS) – Ultimate Heat Sink Extreme Wind Hazard Analysis
- LG-LAR-009 – REV 001: RICT Estimates for TSTF-505 (RICT) Program license amendment request (LAR) Submittal
- LGS FPRA EPRI 1026511 Evaluation: Key Assumptions and Sources of Uncertainty (DRAFT)
- RICT program Enclosure 9 Support Application DRAFT Rev 1: Assessment of Key Assumptions and Sources of Uncertainty for RICT
- Limerick PSA 1998 Peer Review
- Gap analysis that compared the LGS PRA to the requirements of the U.S. Nuclear Regulatory Commission (NRC)-endorsed ASME PRA Standard, 2003
- Limerick PRA model NRC RG 1.200 pilot assessment, July 2004
- “Limerick Generating Station PRA Peer Review Using ASME PRA Standard Requirements,” November 2005
- “Limerick Generating Station Internal Flood PRA Peer Review Using ASME PRA Standard Requirements,” August 2008
- Peer review of Limerick Fire (FPRA) model, November 2011
- Jensen Hughes Report 032156-RPT-00, “Limerick Generating Station PRA Finding Level Fact and Observation Technical Review,” August 2016

- 1BTI32299.005.044.100, Limerick Generating Station Fire PRA Focused Scope Peer Review Report: Use of THIEF, 2017
- Limerick Generating Station, "PRA Focused-Scope Peer Review & Finding Level Fact and Observation Independent Assessment," Revision 0, October 2018

B/B

- BWD Fire PRA Peer Review PWROG-15058-PBYR BWD F&O Closure Report_Rev2 Signed
- BYR BWD IE IF PRA Peer Review OG-13-449 Enclosure LTR-RAM-II-13-067 Rev 1
- Byron Fire PRA Peer Review PWROG-15088-P

3. Systems

LGS

- 4.16 KV AC Distribution Familiarization Rev000 (Extracts)
- Emergency Service Water System Rev002 (Extracts)
- Residual Heat Removal Service Water System (RHRSW) Rev 002 (Extracts)
- Secondary Containment heating, ventilation, and air conditioning 076-01 Rev 003
- SIM-M-0012, Sheet 0001, Rev 013, Emergency Service Water RHR Service Water Overview

4. Instrumentation

LGS

- Revised Instrumentation TS Markups

5. References

LGS

- UFSAR Revision 19, September 2018
- Limerick Vacuum Breakers Amendment Nos. 46 and 9 (ML011550302)

B/B

- BB TSTF-505 LAR Supplement with Attachments (2-14-19)
- BB UFSAR Rev 17 Dec 2018
- Correction to NRC SE dated 4-9-12 – Associated with TSTF-418
- NRC SE dated 1-29-08 – TSTF-411 and TSTF-418
- NRC SE dated 3-30-12 – Revision to 3.3.1 and 3.3.2 Associated with TSTF-418

6. Drawings

LGS

- E-0001, Sheet 0001, Rev 031, Single Line Diagram Station
- E-0015, Sheet 0001, Rev 030, Single Line Meter and Relay Diagram 4KV Safeguard Power Systems
- E-0016, Sheet 0001, Rev 026, Single Line Meter and Relay Diagram 4KV Safeguard Power Systems
- M-0011, Sheet 0001, Rev 088, P&ID Emergency Service Water
- M-0012, Sheet 0001, Rev 092, P&ID Residual Heat Removal Service Water – SGST 076-01 Rev 003
- SIM-E-0001, Sheet 0001, Rev 003, Simplified Single Line Diagram 66KV, 220KV and 500KV Subs
- SIM-M-0012, Sheet 0001, Rev 013, Emergency Service Water Residual Heat Removal (RHR) Service Water Overview
- Instrumentation Drawings (35 drawings)

5.0 REFERENCES

1. Letter from James Barstow, Director, Licensing and Regulatory Affairs, Exelon Generation Company, LLC, to U.S. Nuclear Regulatory Commission, “Limerick Generating Station Units 1 and 2, License Amendment Request to Revise Technical Specifications to Adopt Risk-Informed Completion Times TSTF-505 Revision 2, ‘Provide Risk-Informed Extended Completion Times -RITSTF Initiative 4b,’” dated December 13, 2018 (ADAMS Accession No. ML18347B366).
2. Letter from David M. Gullott, Director, Licensing and Regulatory Affairs, Exelon Generation Company, LLC, to U.S. Nuclear Regulatory Commission, “Application to Revise Braidwood Station and Byron Station Technical Specifications to Adopt Risk-Informed Completion Times TSTF-505 Revision 2, ‘Provide Risk-Informed Extended Completion Times -RITSTF Initiative 4b,’” dated December 13, 2018 (ADAMS Accession No. ML18352B063).
3. Letter from David P. Helker, Manager, Licensing and Regulatory Affairs, Exelon Generation Company, LLC, to U.S. Nuclear Regulatory Commission, “Supplement to License Amendment Request to Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, ‘Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b,’” dated February 14, 2019 (ADAMS Accession No. ML19045A011).
4. Letter from Patrick R. Simpson, Manager, Licensing and Regulatory Affairs, Exelon Generation Company, LLC, to U.S. Nuclear Regulatory Commission, “Supplement to Application to Revise Braidwood Station and Byron Station Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, ‘Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b,’” dated February 14, 2019 (ADAMS Accession No. ML19050A399).
5. Comments on Draft Safety Evaluation for Technical Specifications Task Force (TSTF) Traveler TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b,” dated July 2, 2018 (ADAMS Accession No. ML18183A493).
6. Letter from U.S. Nuclear Regulatory Commission to Technical Specifications Task Force, “Final Revised Model Safety Evaluation of Traveler TSTF-505, Revision 2,

'Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4B,'" dated November 21, 2018 (ADAMS Package Accession No. ML18269A041).

7. U.S. Nuclear Regulatory Commission, NRR Office Instruction, LIC-101, Revision 4, "License Amendment Review Procedures," dated May 22, 2012 (ADAMS Accession No. ML113200053).
8. U.S. Nuclear Regulatory Commission, NRR Office Instruction, LIC-111, "Regulatory Audits," effective date December 29, 2008 (ADAMS Accession No. ML082900195).
9. Nuclear Energy Institute, NEI 06-09, Revision 0-A, "Risk-Informed Technical Specification Initiative 4b Risk-Managed Technical Specification Guidelines," dated November 2006 (ADAMS Accession No. ML12286A322).
10. U.S. Nuclear Regulatory Commission, "Final Safety Evaluation for Nuclear Energy Institute Topical Report 06-09, 'Risk-Informed Technical Specification Initiative 4b Risk-Managed Technical Specification Guidelines'," Revision 0, dated May 17, 2007 (ADAMS Accession No. ML071200238).
11. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," dated March 2009 (ADAMS Accession No. ML090410014).
12. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, Revision 3, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated January 2018 (ADAMS Accession No. ML17317A256).
13. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.177, Revision 1, "An Approach for Plant-Specific, Risk-Informed Decision-Making: Technical Specifications," dated May 2011 (ADAMS Accession No. ML100910008).

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2; BRAIDWOOD STATION, UNITS 1 AND 2; AND BYRON STATION, UNITS 1 AND 2 - AUDIT SUMMARY IN SUPPORT OF THE LICENSE AMENDMENT REQUEST TO ADOPT RISK INFORMED COMPLETION TIMES TECHNICAL SPECIFICATION TASK FORCE-505, REVISION 2, "PROVIDE RISK-INFORMED COMPLETION TIMES – RITSTF INITIATIVE 4B" FOR EXELON GENERATION COMPANY (EPID L-2018-LLA-0567 AND EPID L-2018-LLA-0727) DATED SEPTEMBER 30, 2019

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*concurrence by e-mail

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