Exelon Generation

4300 Winfield Road
Warrenville, IL 60555
630 657 2000 Office

RS-13-242

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October 8, 2013

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Supplemental Response to NRC HELB Audit Request for Information Supporting Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate

References:

1. Letter from Craig Lambert (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated June 23, 2011 [ML111790030]
2. Letter from J. S. Wiebe (U. S. NRC) to M. J. Pacilio (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2, and Braidwood Station, Units 1 and 2 - Request for Additional Information and Suspension of Review of License Amendment Request for Power Uprate (TAC Nos. ME6587, ME6588, ME6589, and ME6590)," dated December 6, 2012 [ML12271A308]
3. Letter from David M. Gullott (Exelon Generation Company, LLC) to U. S. NRC, "Additional Information Supporting Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated July 5, 2013 [RS 13-189] [ML13186A178]
4. E-Mail from J. S. Wiebe (U. S. NRC) to David M. Gullott (Exelon Generation Company, LLC), "Preliminary RAI Regarding TB Bldg HELB," dated August 29, 2013
5. Letter from David M. Gullott (Exelon Generation Company, LLC) to U. S. NRC, " Supplemental Response to NRC HELB Audit Request for Information Supporting Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated September 5, 2013 [RS 13-227] [ML13248A519]
6. E-Mail from J. S. Wiebe (U. S. NRC) to Leslie E. Holden (Exelon Generation Company, LLC), "B/B HELB Dampers and Jet Impingement," dated September 26, 2013

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66 for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, respectively. Specifically, the proposed changes revise the Operating License and Technical Specifications to implement an increase in rated thermal power of approximately 1.63% based on increased feedwater flow measurement accuracy.

In Reference 2, the NRC requested additional information (RAI) pertaining to the High Energy Line Break (HELB) analysis and an audit to complete their detailed review of the power uprate. The response to this RAI was provided in Reference 3. On July 17 and 18, 2013 the NRC conducted the audit. As follow-up to this audit, in References 4 and 5 NRC requested and EGC provided additional information regarding the assumed Turbine Building HELB break locations. The NRC requested (Reference 6) EGC to specifically address in further detail the following from the Reference 4 RAI:

> *"This justification should include, but is not limited to, consideration of a HE release near a HELB damper that would allow pressurization of room while the damper is closing while another room is not yet pressurizing because its damper is farther away from the HE release, thereby creating differential pressure across the wall that separates the two rooms."*

Attachment 1 to this letter provides EGC's additional response to that request as discussed during a call on October 2, 2013 between EGC (David Gullott, et.al.) and the NRC (Joel Wiebe, et.al.). Additionally, during the October 2, 2013 call, EGC agreed to provide the distances between the divisional HELB dampers for the Diesel Generator Rooms, Engineered Safeguards Feature (ESF) Switchgear Rooms, and the Miscellaneous Electrical Equipment Rooms (MEER); Attachment 2 provides this information.

EGC has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. Furthermore, the additional information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Leslie E. Holden at (630) 657-3316.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of October 2013.

Respectfully,

David M. Gullott
Manager - Licensing

Attachments:

Attachment 1: Supplemental Response to NRC Request for Additional Information (Non-Proprietary)

Attachment 2: Distances Between Divisional HELB Dampers [DG Rooms, ESF Switchgear Rooms, and MEERs] (Non-Proprietary)

ATTACHMENT 1

SUPPLEMENTAL RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

October 8, 2013

(NON-PROPRIETARY)

NRC Request

"This justification should include, but is not limited to, consideration of a HE release near a HELB damper that would allow pressurization of room while the damper is closing while another room is not yet pressurizing because its damper is farther away from the HE release, thereby creating differential pressure across the wall that separates the two rooms."

Response:

In addition to the information previously provided to the NRC (Reference A1.1) with regards to the above, ECG provides the following discussion to support utilizing a uniform Turbine Building (TB) environment (lumped volume GOTHIC approach) in assessing the pressure differential impacts from a TB High Energy Line Break (HELB) on the adjacent Auxiliary Building (AB) areas.

Jet Impingement Analysis

EGC performed a comprehensive jet impingement analysis as part of the overall efforts to address the HELB non-conformance in the TB. The purpose of this analysis was to determine the location and loading of potential TB HELB jet impingements on dampers and doors required to protect safe shutdown components in the adjacent Auxiliary Building (AB) areas. The dampers and doors that were determined to be potentially impacted by jet impingement were further analyzed and modifications were implemented if required. Included within the scope of this analysis were the Diesel Generator (DG) Room, Engineered Safeguards Feature (ESF) Switchgear Room, and Miscellaneous Electric Equipment Room (MEER) HELB dampers located on the L-wall (the L-wall that separates the TB from the adjacent AB).

The jet impingement analysis used the following approach to determine what components were impacted by fluid jets:

- The initial step was to identify the high energy lines requiring evaluation for potential jet impingement impacts. Those lines initially identified and reviewed were those high energy lines that were within 20 pipe diameters of a damper or door target.
- The analysis then evaluated each of these high energy lines to determine the location of potential breaks using criteria from the Updated Final Safety Analysis (UFSAR) Section 3.6.2.1. This included evaluation of both circumferential and longitudinal types of line breaks.
- The distance from each identified break location to the potential L-wall target was determined.
- Using the above information, a governing population of breaks was identified, based on pipe size, location relative to potential targets, and fluid conditions.
- The governing population of breaks was then evaluated to determine the jet zone of influence and the associated loadings due to the jet on any L-wall targets that were within its zone of influence.

The jet impingement analysis concluded that there were no pipe breaks within 20 pipe diameters of the DG Room, ESF Switchgear Room, and MEER HELB dampers that would result in a HELB fluid jet affecting the dampers.

Application of Jet Impingement Analysis to GOTHIC Modeling of Environmental Conditions

The results of the jet impingement analysis support the application of a lumped volume approach for the GOTHIC modeling for the TB HELB environmental analysis as follows.

EGC recognized that the jet impingement analysis is overly conservative with respect to environmental effects and would support the conclusion that a TB HELB would not produce a localized pressure effect (jet) that could affect any individual HELB damper of interest.

The key result from the jet impingement analysis is that none of the DG Room, ESF Switchgear Room, or MEER HELB dampers are impacted by, or are within the zone of influence of, a line break jet. Fundamentally, any jet created by a HELB would dissipate prior to reaching a HELB damper. Once the jet dissipates (zone of influence) the high energy fluid in the jet would immediately separate into flashed steam and liquid. The flashed steam would immediately mix with air in the TB area, causing relative humidity and pressure in the TB area to rise. Since air with a relative humidity of less than 100% behaves as an ideal gas, the TB area in front of the separate division dampers (distances in Att. 2) would pressurize uniformly. Therefore, the separate divisions' HELB dampers in the TB area would be subjected to the same pressure simultaneously. Additionally, the TB HELB dampers will close before the TB area reaches 100% relative humidity, therefore assuming uniform pressurization is valid for the timeframe being discussed. Due to the uniform pressurization of the TB area in front of the separate division dampers, and that there are no DG Room, ESF Switchgear Room, or MEER HELB dampers affected by a HELB jet, the lumped volume approach used in the GOTHIC analysis is justified.

Since the uniform pressurization of the TB area results in both rooms beginning to pressurize at the same time there is no differential pressure created across the walls separating the rooms due to one room beginning to pressurize before the other.

Evaluation of Divisional Wall Differential Pressure

EGC did evaluate and design the divisional walls for an induced differential pressure due to the possibility of one divisional HELB damper closing faster than the other. As the TB environment expands uniformly, entering each divisional room simultaneously at equally increasing pressure conditions, EGC considered that the HELB damper on one of the divisional rooms may close faster than the other division's room thereby inducing a differential pressure between the two rooms. Utilizing the vendor factory acceptance test results, the HELB damper on one division's room was assumed to close in the shortest test time while the damper on the other division's room was assumed to close at the longest test time. As the TB pressure continues to increase due to the HELB, the TB flow continues to increase the pressure in the division room with the slightly longer closure time until that damper closes; during this time the divisional room with the shorter damper closure time has been isolated at a lower pressure. The continuing increase in pressure of the other room creates a differential pressure across the divisional wall. To address this condition, the divisional separation walls were structurally modified to address the effects of this HELB induced differential pressure loading (including additional margin).

References

A1-1 Letter from David M. Gullott (Exelon Generation Company, LLC) to U. S. NRC, "Supplemental Response to NRC HELB Audit Request for Information Supporting Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated September 5, 2013 [RS 13-227] [ML13248A519]

ATTACHMENT 2

DISTANCES BETWEEN DIVISIONAL HELB DAMPERS
[DG Rooms, ESF Switchgear Rooms, and MEERs]

(Non-Proprietary)

October 8, 2013

(NON-PROPRIETARY)

Distances Between Divisional HELB Dampers

Room	Elevation		Braidwood/Byron	
			Unit 1	Unit 2
EDG Main Dampers	401'		40 feet	52 feet
ESF Swgr Main Dampers	426'		58 feet	56 feet
MEER	451'	Non-ESF Swgr Room and Div 2 MEER	25 feet	25 feet
		Non-ESF Swgr Room and Div 1 MEER	32 feet	32 feet
		Div 1 and Div 2 MEER	7 feet	7 feet

Distances are rounded up to the nearest foot.