Exelon Generation

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RS-15-282

10 CFR 50.90

October 30, 2015

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. 50-456 and 50-457

Subject: Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink"

References:

1) Letter from D. M. Gullott (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, 'Ultimate Heat Sink,'" dated August 19, 2014 (ML14231A902)

2) Letter from D. M. Gullott (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink," dated April 30, 2015 (ML15120A396)

3) Email from J. Wiebe (NRC) to J. Krejcie (Exelon Generation Company, LLC) Additional RAI Regarding Containment Analysis for Braidwood UHS LAR (MF4671 and MF4672), dated July 22, 2015

4) Email from J. Wiebe (NRC) to J. Krejcie (Exelon Generation Company, LLC) Need Clarification Conference Call Regarding Your April 30, 2015 Response to SCVB-RAI-1(a), dated August 12, 2015 (ML15224B548)

5) Email from J. Wiebe (NRC) to J. Krejcie (Exelon Generation Company, LLC) Additional RAIs Regarding Braidwood Ultimate Heat Sink Temperature Amendment, dated September 29, 2015

6) Letter from D. M. Gullott (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, 'Ultimate Heat Sink,'" dated October 9, 2015

In Reference 1, Exelon Generation Company, LLC, (EGC) requested an amendment to the Technical Specifications (TS) of Facility Operating License Nos. NPF-72 and NPF-77 for Braidwood Station, Units 1 and 2. The proposed amendment would modify TS 3.7.9, "Ultimate

Heat Sink (UHS)," by changing the maximum allowable temperature of the UHS from 100 °F to a maximum UHS temperature of 102°F. The U. S. Nuclear Regulatory Commission (NRC) requested additional information related to its review of Reference 1 and additional information was provided in Reference 2.

Subsequent to submittal of Reference 2, the NRC requested additional information to support the review of the subject License Amendment Request (i.e., Reference 1) in References 3 and 4. Reference 6 provided the response to the Reference 3 and 4 requested information but indicated that the response to Reference 3 SCVB-RAI-11 would be provided at a later date. Just prior to issuance of the EGC response in Reference 6, the NRC requested additional information in Reference 5 with two additional questions. Attachment 1 of this transmittal provides the response to the Reference 5 requested information. The response to Reference 3 SCVB-RAI-11 will be provided at a later date.

EGC has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Attachment 1 of Reference 1. The information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), a copy of this letter and its attachment is being provided to the designated State of Illinois official.

Should you have any questions concerning this letter, please contact Ms. Jessica Krejcie at (630) 657-2816.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of October 2015.

Respectfully,

David M. Gullott
Manager – Licensing
Exelon Generation Company, LLC

Attachment 1: Response to Request for Additional Information
Attachment 2: Drawing M-900 Sh. 1Y, Revision K, Outdoor Piping Arrangement Units 1 and 2

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector, Braidwood Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1

Response to Request for Additional Information

ATTACHMENT 1
Response to Request for Additional Information

In Reference 1, Exelon Generation Company, LLC, (EGC) requested an amendment to the Technical Specifications (TS) of Facility Operating License Nos. NPF-72 and NPF-77 for Braidwood Station, Units 1 and 2. The proposed amendment would modify TS 3.7.9, "Ultimate Heat Sink (UHS)," by changing the maximum allowable temperature of the UHS from 100 °F to a maximum UHS temperature of 102°F. The U. S. Nuclear Regulatory Commission (NRC) requested additional information related to its review of Reference 1 and additional information was provided in Reference 2.

Subsequent to submittal of Reference 2, the NRC requested additional information to support the review of the subject License Amendment Request (i.e., Reference 1) in References 3 and 4. Reference 6 provided the response to the Reference 3 and 4 requested information but indicated that the response to Reference 3 SCVB-RAI-11 would be provided at a later date. Just prior to issuance of the EGC response in Reference 6, the NRC requested additional information in Reference 5 with two additional questions. Attachment 1 of this transmittal provides the response to the Reference 5 requested information. The response to Reference 3 SCVB-RAI-11 will be provided at a later date.

SCVB-RAI-11 (from Reference 3)

The NRC staff is aware of Westinghouse's InfoGram IG-14-1, dated November 5, 2014, which states that the loss-of-coolant accident (LOCA) containment mass and energy (M&E) release analysis methodology was found to use the reactor coolant system (RCS) stainless steel volumetric heat capacity value lower than the ASME values. The staff has received information which indicates that the impact on the LOCA peak containment pressure in the current licensing basis would be significant if the analysis would use ASME values for the RCS metal volumetric heat capacity. Provide an update to your application dated August 19, 2014 (ADAMS Accession Number ML14231A902), that contains the results of the containment pressure, containment temperature, sump temperature responses and net positive suction head (NPSH) analysis using the ASME published volumetric heat capacity for the RCS metal. In your supplement dated April 30, 2015 (ADAMS Accession No. ML15128A186) you stated that, "All issues related to the subject Nuclear Safety Advisory Letters (NSALs) (NSAL-06-6, NSAL-11-5, and NSAL-14-2) were explicitly addressed (and subsequent corrections in the loss-of-coolant (LOCA) mass and energy (M&E) release analysis were made) in support of the Ultimate Heat Sink (UHS) analysis." Confirm, in your update, that these NSALs continue to be addressed in the requested updated analysis.

SCVB-RAI-11 Response:

EGC is aware that this is an outstanding request for additional information and will provide a response at a later date. Per discussion with NRC Project Manager Joel Wiebe, a response date will be determined after discussion with the applicable NRC technical review staff for this RAI response.

SCVB-RAI-14

In Exelon's letter dated April 30, 2015, refer to response to SCVB-RAI-2(d), Table 4 which provides the limiting NPSH margins versus sump fluid temperatures for RHR and CS pumps at UHS temperature of 102°F.

Clarify how the sump temperatures provided in the first column of Table 4 were obtained. At what UHS temperature is the required NPSH of the RHR and CS pumps based on for comparing with the available NPSH to calculate the NPSH margin (available NPSH minus required NPSH). The introduction to Table 4 gives the impression that a UHS temperature of 102°F was used. The sump temperatures given in Figure 4 (in response to SCVB-RAI-4) is based on a UHS temperature of 104°F.

SCVB-RAI-14 Response:

The Reference 2 Table 4 header (i.e., 102°F) refers to the maximum UHS initial temperature at the start of the event. The UHS temperature analysis supporting this submittal shows that the UHS temperature increases, post-LOCA, from the initial temperature of 102°F. This is in contrast to the existing analysis of record which demonstrates that the UHS temperature does not increase above the initial temperature.

As described in Reference 1, the revised accident analyses supporting this submittal assume the UHS temperature increases to 104°F and reactor containment fan cooler (RCFC) heat removal performance is determined based on a UHS temperature of 104°F. The containment mass and energy (M&E) analyses utilize the RCFC heat removal performance which is based on a UHS temperature of 104°F. The output of the containment M&E analyses is used to determine the containment response, including the containment sump water temperature. The sump temperature used in the NPSH analysis listed in Table 4 was calculated using the RCFC heat removal performance based on a UHS temperature of 104°F. The introduction to Table 4 was intended to indicate the UHS temperature assumed at the start of the event.

General-RAI-1

In Exelon's August 19, 2014, submittal, Attachment D to calculation ATD-0109, a stratification review (MES-11.1) is provided to verify the applicability of LAKET-PC computer program to Braidwood UHS. In Attachment D, Table 1, which provides parameters used in the calculation, the width of the discharge structure is identified as 7.1 ft. and the depth is identified as 3.5 ft. The width and depth of the discharge structure along with the discharge velocity is used to determine the jet or plume effect on the Fraction of Lake Volume Below the upper layer depth and ultimately to determine if the lake is stratified. Based on observations during an audit conducted at the Braidwood site on June 11, 2015, the NRC staff believes that the discharge is straight up and above the lake level.

Provide a description of the SX discharge configuration, including a drawing if available. Provide an explanation of why the use of the Table 1 parameters for width and depth of the discharge structure and discharge velocity is appropriate.

General-RAI-1 Response:

The Braidwood Station SX discharge consists of two 48" vertical pipes discharging SX water at elevation of 597'-9" (or 7'-9" above UHS elevation of 590' per Reference 10 (Attachment 2)). This is different than the typical horizontal discharge configuration addressed by Attachment D of Reference 1 (i.e., MES-11.1, Stratification Review). MES-11.1 discharge configuration is based on the typical configuration presented in the widely accepted MIT Report 202 by Watanabe, Harleman, and Connor (Reference 8). Table 1 of MES-11.1 uses the approximate

depth and width dimensions of 3.5' and 7.1' respectively to simulate effective discharge area of two 48" pipes discharging into the UHS. This results in the Table 1 horizontal discharge velocity being equal to the actual discharge velocity from two 48" pipes (~4.26 ft/sec with 2 SX pumps in operation).

However, as noted in the RAI, the actual return flow to the UHS will be flowing vertically down to the water surface with a velocity of approximately 22 ft/sec (V = sqrt (2*g*h) = sqrt (2*32.2*7.75) = ~22 ft/sec, where g = 32.2 ft/sec^2 and h = 7.75 ft, since the discharge pipes are 7'-9" above the UHS water surface). The vertical downward flow actually results in significant mixing in the entry region and less stratification in the UHS. Based on NUREG-1026 (Reference 9), for the Braidwood cooling pond, temperature stratification is expected to occur only in those areas that are deeper than 10 feet. Since the Braidwood UHS is a shallow man-made structure with an average depth of approximately 6 feet (as described in UFSAR 2.4.1.1), its design is not prone to stratification. Therefore, although the Braidwood Station configuration differs from the MES 11.1 standard, the conclusions regarding the applicability of the LAKET-PC program are appropriate.

REFERENCES:

1) Letter from D. M. Gullott (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, 'Ultimate Heat Sink,'" dated August 19, 2014 (ML14231A902)
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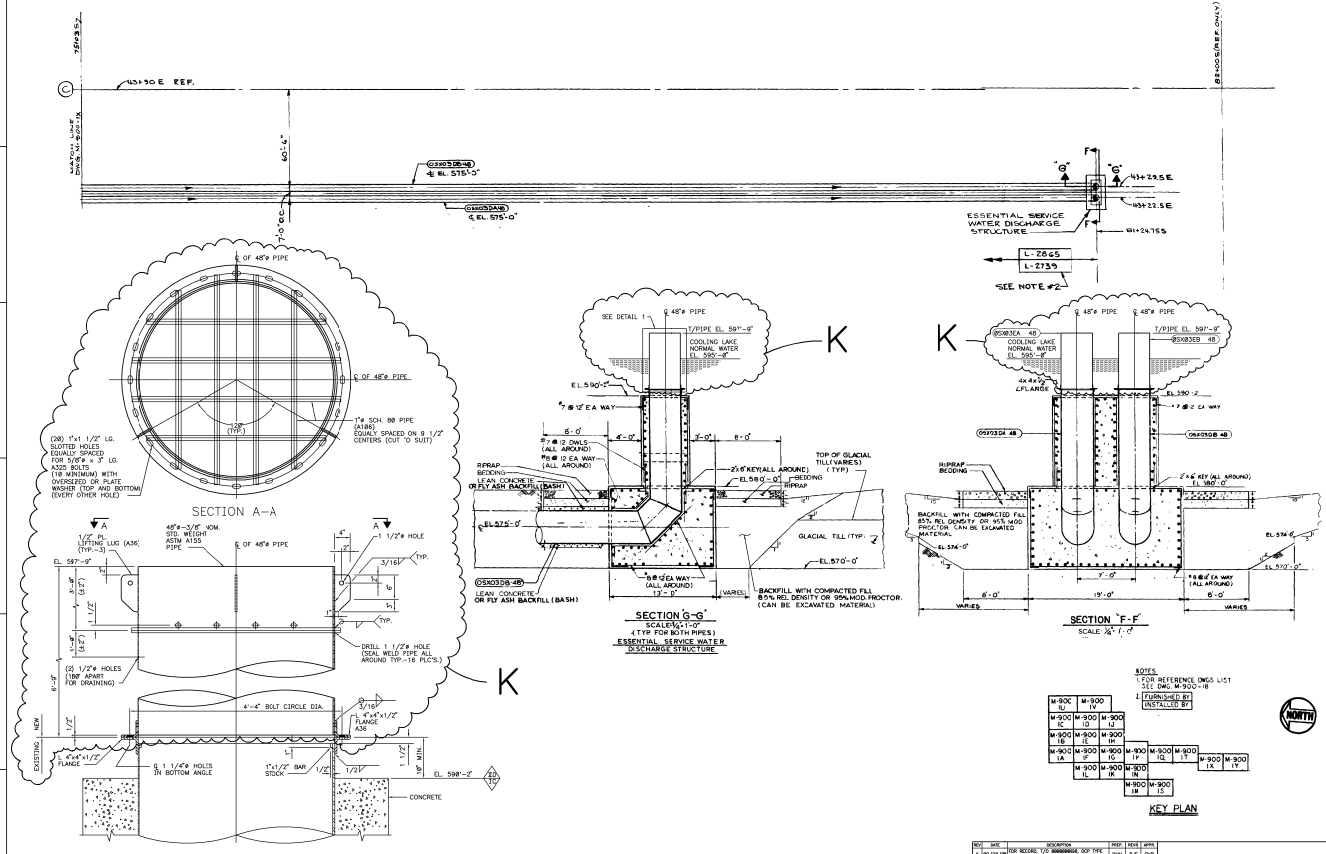
7) Westinghouse InfoGram 14-1, "Materials Properties for Loss-of Coolant Accident Mass and Energy Release Analyses," dated November 5, 2014
8) Watanabe, Harleman, and Connor, "Finite Elements Model for Transient Two Layer Cooling Pond Behavior," Report 202, Ralph Parson Laboratory, MIT July 1975.
9) NUREG-1026, "Final Environmental Statement Related to the Operation of Braidwood Station, Units 1 and 2," June 1984
10) Drawing M-900 Sh. 1Y, Revision K, Outdoor Piping Arrangement Units 1 and 2

ATTACHMENT 2

Drawing M-900 Sh. 1Y, Revision K, Outdoor Piping Arrangement Units 1 and 2


SECTION A-A
DETAIL 1
SCALE: 1 1/2"=1'-0"
SECTION G-G
SCALE: 1/4"=1'-0"
(TYP FOR BOTH PIPES)
ESSENTIAL SERVICE WATER DISCHARGE STRUCTURE
SECTION F-F
SCALE: 1/4"=1'-0"
ESSENTIAL SERVICE WATER DISCHARGE STRUCTURE
SEE NOTE #2
COOLING LAKE NORMAL WATER EL. 595'-9"
BACKFILL WITH COMPACTED FILL 85% REL DENSITY OR 95% MOD. PROCTOR. (CAN BE EXCAVATED MATERIAL)
GLACIAL TILL (TYP)
TOP OF GLACIAL TILL (VARIES) (TYP)
RIPRAP
BEDDING
LEAN CONCRETE OR FLY ASH BACKFILL (BASH)
CONCRETE
KEY PLAN
NOTES:
1. FOR REFERENCE DWGS LIST SEE DWG. M-900-1B
2. FURNISHED BY / INSTALLED BY
NORTH
OUTDOOR PIPING ARRANGEMENT
M-900
SHEET NUMBER: 1Y
SIZE: F
ComEd
Chicago, Illinois
Braidwood Station
NUCLEAR SAFETY RELATED EQUIPMENT IS SHOWN ON THIS DRAWING
L-2722 & L-2739 FOR INSTALLATION (FCR-L-23761)