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

Limerick Generating Station, Units 1 & 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Supplement to the Request for License Amendment Related to Application of Alternative Source Term, dated February 27, 2004

References: (1) Letter from M. P. Gallagher (Exelon Generation Company, LLC) to US NRC, "Request for License Amendments Related to Application of Alternative Source Term," dated February 27, 2004

(2) Letter from R. Guzman (U. S. Nuclear Regulatory Commission) to C. Crane (Exelon Generation Company), "Limerick Generating Station Unit Nos. 1 and 2 – Request for Additional Information Regarding Proposed Use of Alternative Source Term," dated April 3, 2006

(3) Letter from P. B. Cowan (Exelon Generation Company, LLC) to US NRC, "Supplement to the Request for License Amendment Related to Application of Alternative Source Term," dated April 27, 2006

In Reference 1, Exelon Generation Company, LLC (Exelon) submitted a request for a change to Appendix A, Technical Specifications (TS), of Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (LGS). Specifically, the proposed change is requested to support application of an alternative source term (AST) methodology, in accordance with 10 CFR 50.67, "Accident source term."

In Reference 2, the NRC requested additional information. Exelon provided the response to the request for additional information in Reference 3. Attachment 1 to this letter provides supplemental information to the Exelon response to Question 3 in the Reference 3 letter. Attachment 2 to this letter provides an updated copy of the Limerick

A001

Loss-of-Coolant Accident Analysis, and Attachment 3 provides a copy of the LGS RERS Design Analysis M-76-07 to support the NRC review.

There is no adverse impact to the No Significant Hazards Consideration submitted in the Reference 1 letter. If you have any questions or require additional information, please contact Doug Walker at (610) 765-5726.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

6-16-06
Executed On

Ron DeGregorio
Vice President
Limerick Generating Station
Exelon Generation Company, LLC

Attachments:
1. Supplemental Information for the Limerick AST License Amendment Request
2. Limerick Loss-of-Coolant Accident (LOCA) Analysis, LM-0646, Revision 2
3. LGS RERS Design Analysis, M-76-07, Revision 5

cc: S. J. Collins, Regional Administrator, Region I, USNRC w/Attach 1 only
S. Hansell, USNRC Senior Resident Inspector, LGS w/Attach 1 only
J. Kim, Project Manager [LGS], USNRC w/Attachments
R. R. Janati - Commonwealth of Pennsylvania w/Attach 1 only

ATTACHMENT 1

LIMERICK GENERATING STATION
UNITS 1 AND 2

Docket Nos. 50-352
50-353

License Nos. NPF-39
NPF-85

Supplement to License Amendment Request for
"LGS Alternative Source Term Implementation"

Supplemental Information for the Limerick AST License Amendment Request

Supplemental Information for the Limerick AST License Amendment Request

By letter dated April 27, 2006, Exelon Generation Company, LLC submitted a response to an NRC request for additional information (RAI) dated April 3, 2006 regarding an amendment to the Technical Specifications for Limerick Generating Station, Unit Nos. 1 and 2 (LGS) to implement the Alternative Source Term (AST) Methodology. This supplement provides additional information regarding the following question #3 of the RAI.

3. In the submittal, credit is taken for a 50-percent mixing efficiency in the reactor enclosure building during the drawdown period. The SRP does not allow credit for mixing during the drawdown period, thus additional justification to support a non-standard review is required. Although mixing does begin when the RERS starts at 3 minutes, the mixing is not instantaneous and the time it takes to assure sufficient dilution of the primary containment leakage in the secondary containment has not been established. In addition, only a portion of the volume of the reactor enclosure is processed by the RERS during the drawdown. Please provide additional information to justify the assumption that a credit for 50 percent mixing during drawdown in the reactor enclosure building is conservative and acceptable.

EXELON SUPPLEMENTAL RESPONSE

Background

The following information supplements Exelon's April 27, 2006 response to NRC's April 3, 2006 RAI question #3, which addresses taking credit for the LGS Reactor Enclosure Recirculation System (RERS) mixing and filtration function following a postulated Loss-of-Coolant Accident (LOCA) event.

In a teleconference with NRC Staff on May 25, 2006, Exelon discussed additional analysis that takes a more limited mixing credit than was used in the submitted LOCA design analysis as a result of concerns expressed by the NRC. Exelon has subsequently revised LOCA calculation LM-0646 (Attachment 2). As opposed to assuming the post-LOCA release into secondary containment is 50% mixed at 3 minutes following the initiation of the LOCA, the revised analysis assumes a stepwise mixing credit for RERS starting at 3 minutes up to a maximum of 50%. The basis for calculating this mixing percentage is the LGS RERS Design Analysis M-76-07, provided as Attachment 3, which conservatively calculates the time dependent percent mixing of the secondary containment air volume.

As this would result in an increase in calculated post-LOCA doses, the Control Room (CR) unfiltered inleakage value was reduced by 50 cfm in the Attachment 2 calculation, resulting in 225 cfm total, in order to provide additional CR dose margin.

Discussion

LGS Design Analysis M-76-07 provided as Attachment 3 conservatively calculates the percentage of secondary containment air mixing as a function of time. It provides the following effective equation for mixing percentage as a function of recirculation flow, volume, and time:

$$M = \left[1 - \left(1 - \frac{R}{V}\right)^{n}\right] \times 100$$

where:

M = percent of mixing
R = recirculation flow (cfm)
V = volume of secondary containment (ft^3)
n = time after mixing begins (minutes)

For the Attachment 2 analysis, this equation was applied following the RERS initiation time at 3 minutes after the onset of the postulated LOCA, or 1 minute after the onset of gap release. No credit is assumed for mixing for the first 3 minutes of the LOCA event. For recirculation flow, 54,000 cfm was used (60,000 cfm –10%) for conservatism. Eight time steps were used to simulate this stepwise mixing credit. Each step was taken at 2.5 minutes, with 50% finally being reached at 22.75 minutes of mixing. No increase in the percentage of mixing is taken after this step to 50%. The following table shows the stepwise mixing credit, taken as a function of time:

Time After Mixing Begins (minutes)	Time After Onset of Gap Release (minutes	Time After LOCA (minutes)	Credited Mixing Percentage (%)
0.0	1.0	3.0	0.00
2.5	3.5	5.5	7.33
5.0	6.0	8.0	14.13
7.5	8.5	10.5	20.42
10.0	11.0	13.0	26.26
12.5	13.5	15.5	31.66
15.0	16.0	18.0	36.67
22.75	23.75	25.75	50

The CR dose that results from primary containment leakage into secondary containment, using this stepwise approach with 275 cfm unfiltered CR inleakage, would be an increase of 0.0773 rem TEDE. Therefore, this approach conservatively limits the post-LOCA analysis credit for the mixing effect of the RERS system during the secondary containment drawdown period.

To provide additional dose margin, the total unfiltered inleakage (including 10 cfm for ingress/egress) is reduced in LM-0646 Rev. 2 to 225 cfm, as noted in the above Background section. This change results in a dose from this pathway equal to 2.517 rem TEDE. When this CR inleakage reduction is made for all other pathways, the new

CR LOCA dose from all pathways, not including the CR Gamma Shine Dose contribution, totals 3.08 rem TEDE, or 0.02 rem TEDE less than the calculated LM-0646 Rev. 1 dose.

The total CR dose in LM–0646, Rev 2 is 4.78 Rem TEDE. This includes the conservative RERS mixing approach described above, the reduced CR allowable inleakage to 225 cfm total (including 10 cfm for ingress/egress), and the revised gamma shine contributions described in Attachment C to LM-0646, Rev 2. Attachment C has been revised to include a minor dimensional adjustment for the reactor enclosure Core Spray pipe position relative to the CR wall and Post-LOCA Hydrogen Recombiner cabinet position, and to include a more conservative consideration of reactor enclosure cloud shine doses to the CR.

ATTACHMENT 2

LIMERICK GENERATING STATION
UNITS 1 AND 2

Docket Nos. 50-352
50-353

License Nos. NPF-39
NPF-85

Supplement to License Amendment Request for
"LGS Alternative Source Term Implementation"

Limerick Loss-of-Coolant Accident (LOCA) Analysis, LM-0646, Rev. 2