PECO NUCLEAR
A Unit of PECO Energy

Nuclear Group Headquarters
200 Exelon Way
Kennett Square, PA 19348

January 9, 2001

Docket No. 50-353

License No. NPF-85

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: Limerick Generating Station, Unit 2
Updated Analysis of Core Shroud Structural Integrity

Reference: Letter from J. A. Hutton (PECO Energy Company) to Nuclear Regulatory Commission (NRC), dated October 27, 2000

Dear Sir/Madam:

In the Referenced letter, PECO Energy Company submitted plant specific analyses which updated previous evaluations of the LGS, Unit 2, core shroud structural margins by considering plant operation under Hydrogen Water Chemistry/Noble Metals Chemical Application conditions. These evaluations were the subject of conference calls on December 14, 2000, and January 3, 2001. Based on these conference calls, attached is a summary of the discussions.

Please contact us if you have any questions.

Very truly yours,

D. G. Helker /For

James A. Hutton
Director - Licensing

Attachments/Enclosure

cc: H. J. Miller, Administrator, USNRC, Region I (w/attach)
A. L. Burritt, USNRC Senior Resident Inspector, LGS (w/attach)

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ATTACHMENT

Letter From R. M. Horn (GE Nuclear Energy) to Tom Loomis (Exelon Corporation),
Dated January 4, 2001

GE Nuclear Energy

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January 4, 2001

Mr. Tom Loomis
Limerick Generating Station
Exelon Corporation

Subject: Summary of Discussion Points on Limerick Unit 2 Fluence for the NRC

The purpose of this letter report is to provide to Dr. Lambrose Lois of the NRC a better understanding of the significance of the fluence presented in the General Electric Nuclear Energy (GENE) Report GE-NE-B13-02080-00-03, August 2000. (Note: this report was transmitted as Attachment 2 by Limerick Generating Station, Unit 2 in Docket No. 50-353, October 27, 2000.) The first consideration is the motivation for including the fluence values in the report. The second important consideration is the fact that the fluence value assigned to the weld did not affect the inherent conservatisms behind the crack growth rate used in the Limerick H4 shroud weld evaluation. More detailed discussion is presented in the following paragraphs to provide documentation of these key points.

In section 3.3 of the GENE report (page 7), it was stated that *"the H4 weld was considered to be in the beltline region (estimated peak fluence greater than $3x10^{20}$ n/cm^2) and therefore, both a limit load and an LEFM evaluation was conducted for this weld. This methodology is consistent with the methodology described in the preceding section. The fluence at the end of cycle 6 is estimated to be 5.8×10^{20} n/cm^2 and is estimated to be at 7.3×10^{20} n/cm^2 at the end of cycle 7."* The reference to this fluence value was made in the report to establish that the H4 weld must be considered a high fluence weld thereby requiring the use of LEFM and the use of crack growth rates appropriate for a fluence above 5×10^{20} n/cm^2. The analyses that were presented in the report were consistent with this high fluence categorization.

The second important consideration was to understand the significance of the estimated fluence value to the crack growth rate assumptions used in the report. Key data from the GENE report's Appendix C can be used to highlight this significance. Specifically, the report established that the crack growth rate used in the crack growth assessment was applicable to fluences well beyond that value estimated for the H4 weld at the end of cycle 7. This applicability was supported by both the crack growth rate data from irradiated materials that were presented in the report and by the GE modeling assessment given. The key data given in the Appendix C were covered in Figures 1 through 3 (pages C-9, C-10 and C-11). These data were measured in irradiated materials that bound the fluence given in the report. Specifically, Figure 3 (page C-11) in Appendix C showed a strong effect of hydrogen water chemistry (HWC) in reducing the crack growth rate for material irradiated to a fluence of 9×10^{21} n/cm^2, a value greater than 10 times that estimated for the Limerick Unit 2 H4 shroud. The second key data was that developed using the GE Irradiated PLEDGE model. The modeling results are given in Figure 5 (page C-13). The modeling effort was performed up to a fluence of 2×10^{21} n/cm^2, well beyond the estimated value for the Limerick Unit 2 shroud H4 weld. The modeling data again showed a very large reduction in the crack growth rate in HWC. The factor of reduction was greater than 30 over the entire range of fluence modeled. The model results also showed that as the fluence increased beyond 1.5×10^{21} n/cm^2, the effects of irradiation were saturated producing only small changes in the growth rates. This establishes that the benefits at even higher fluence values would be very similar. Both the modeling as well as the crack growth data also established that the predicted and measured rates were well below the 1×10^{-5} in/hr rate used in the Limerick Unit 2 evaluation for HWC with NobleChem™. This information validates the large conservatisms in the engineering crack growth assessment.

In summary, this letter report provides clarification that the crack growth rates used in the GENE Limerick Unit 2 H4 weld evaluation are applicable to fluence levels well beyond the value presented in the report as an estimate of the H4 fluence at the end of cycle 7.

Sincerely,

R. M. Horn, Engineering Fellow: Materials Technology