September 14, 2001

Mr. Alex Marion, Director
Engineering
Nuclear Energy Institute
1776 I Street, N.W., Suite 400
Washington, D.C. 20006-3708

SUBJECT: REQUEST FOR MEETING TO DISCUSS POTENTIAL INDUSTRY ACTIVITIES RELATED TO CRDM TGSCC LEAKAGE FOUND AT PALISADES

Dear Mr. Marion:

On June 21, 2001, while shut down to investigate the source of a primary leak at Palisades, the licensee (Nuclear Management Company or NMC) found a through-wall axial crack on the #21 control rod drive mechanism (CRDM) housing. This crack was located several feet above the nozzle head penetration through the upper head. The licensee has made a preliminary root cause determination for this crack as being initiated by trans-granular stress corrosion cracking (TGSCC). The licensee performed further investigations of the remaining 44 CRDM housings at Palisades and has reported indications in 39 housings, axial and some circumferential, none of which are through-wall. At this time, the plant remains shut down and is procuring replacement CRDM housings.

This is the second such reported instance of through-wall cracking in CRDM housings caused by TGSCC and the first where circumferential cracking was reported. The first instance was of axial through-wall cracking in two spare penetrations at Fort Calhoun in December 1990. These cracks were found at a different location than at Palisades in an internal weld overlay above the housing. The licensee removed and capped these spares.

TGSCC is characterized by cracking through the matrix of the grains, and is not necessarily limited to the heat affected zone (HAZ) around weldments. It is different from primary water stress corrosion cracking (PWSCC) which has been observed in CRDM vessel head nozzle penetrations and associated J-grove welds at Oconee Units 1, 2 and 3 and at Arkansas Nuclear One Unit 1 (ANO1). The cracking mode of PWSCC is intergranular in nature and occurs in a low oxygen environment, whereas TGSCC is generally associated with the presence of contaminants (e.g., chlorides) and dissolved oxygen in the operating environment. While the licensee identified chlorine in the area of the motor housing, the concentration was reported to be within acceptable limits.

It should be noted that the CRDM housings were fabricated of Types 347 or 304 stainless steels. Of the four most common types of stainless steel used in the industry (304, 316, 321, and 347), the stabilized types (321 and 347) have been demonstrated to be more resistant to intergranular stress corrosion cracking (IGSCC), and would be expected to be at least as

resistant to TGSCC as the Type 304 and Type 316 materials. The housing with a through-wall crack at Palisades was fabricated of Type 347 stabilized stainless steel, while the cracking observed at Fort Calhoun was reported to be in Type 304 material. Based on this, there is a potential generic concern related to TGSCC in these materials.

Of further concern to the NRC staff is that the Palisades licensee experienced significant difficulty in performing non-destructive examinations (NDE) of their CRDM housings. NDE should consistently identify and characterize potential crack indications; however, at Palisades, several methods were utilized and did not give uniform results. Additionally, while the ASME Code in-service inspection (ISI) requirements for the CRDM housing welds (Table IWB-2500-1, Examination Category B-O, "Pressure Retaining Welds in Control Rod Housings") offer the option of either volumetric or surface examination of 10-percent of peripheral housings each 10-year interval, such limited number and scope of surface exams have been shown to not be useful in identifying this cracking mechanism, since the cracking initiates from the inside. The prudent licensee should consider what, if any, effect this will have on the continued safe operation of their plant.

In accordance with the policy stated in SECY-99-143, "Revisions to Generic Communication Program," dated May 26, 1999, the staff believes that early and more frequent interactions with representatives of the nuclear power industry on emergent issues will lead to more efficient and effective use of industry and NRR resources. There is an additional advantage to be gained by interacting with the industry on emerging issues, and that is the public will have additional opportunity to follow their evolution in public meetings. Therefore, the staff has identified this as an emerging issue, and has received the approval of senior NRR management to pursue this matter further.

Therefore, the staff proposes to discuss with the nuclear industry potential actions that could be taken in the near term to address the above concerns. The NRC requests that the Nuclear Energy Institute (NEI), as the regulatory interface for the EPRI Materials Reliability Program (MRP), and representatives from the nuclear industry, meet with the staff the week of October 8, 2001, to discuss an industry-wide response to the potential generic implications arising from the above instances. In particular, the staff is primarily concerned that plants have not inspected their CRDM housings in an effective manner for evidence of cracking, especially that initiated by TGSCC. Further, investigations into the potential need for augmenting NDE methodologies and/or tooling to more readily locate such indications in the CRDM housings should be discussed.

If you have any question regarding this request, please contact Jack Strosnider of my staff at 301-415-3298.

Sincerely,

/ra by JRStrosnider f/

Brian Sheron, Associate Director
Project Licensing & Technical Analysis
Office of Nuclear Reactor Regulation

Project No. 689

cc: See next page

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