

DE/APPB/#15

From: Frank Grubelich > NRR
To: David Terao
Date: 2/6/02 8:57AM
Subject: PBMR Pre-application White Paper RAIs

In support the Office of Research's pre-application review my RAIs, with regard to the October 30, 2001 Exelon PBMR White Paper, are contained in the attached file .

Attachment 1 to the October 23, 2001 White Paper contains the PBMR graphite presentation dated October 9, 2001. Pages 19 and 20 of the attachment contains a description of a criteria for the design of HTTR components developed in Japan based on a modified version of the ASME code. The description also indicates that the US have also proposed an approached linked to the ASME code (although the details have not yet been obtained by PBMR). This information should be researched to determine if the ASME code approach provides a viable acceptable criteria for the design of graphite structures. If this approach is promising, its development should be encouraged and pursued.

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PBMR PRE-APPLICATION REQUEST FOR ADDITIONAL INFORMATION

Background

Attachment 1 to the Exelon White Paper, dated October 30, 2001, contains a summary of the PBMR Design Codes and Standards presentation of July 18, 2001. The first paragraph at the top of page 3 of the summary states, "The RPV Internal Core Barrel will be designed and fabricated in accordance with the ASME Code, Section III, Division 1, Subsection NG, *Core Support Structures*, 1988. ASME approved Code Case N-201 (1994), which permits temperatures up to 816 deg. C, (limited to pressures and durations) is used to address the higher temperatures experienced during a PLOFC event and a DLOFC event (720 deg.C)."

The 1988 Edition of the ASME Code, Section III, Division 1, Subsection NG, *Core Support Structures*, establishes the rules for materials, design, fabrication, and preparation of reports required in the manufacture and installation of core support structures. Subsection NG defines core support structures as those structures or parts of structures which are designed to provide direct support or restrain of the core within the reactor pressure vessel. Internal structures are defined as all structures within the reactor pressure vessel other than core support structures, fuel, blanket assemblies, control assemblies and instrumentation. The rules of Subsection NG apply to internal structures, when stipulated by the Certificate Holder manufacturing core supports. Subsection NG defines the loadings that shall be taken into account in the design of the core support structures, including seismic and the rupture of the main coolant pipe.

Based on the Subsection NG rules, the PBMR bottom and side graphite reflector structures are also core support structures, because they directly support or restrain the core. The Exelon report only identified the core barrel as being designed and fabricated in accordance with Subsection NG.

Exelon also proposes to use Code Case N-201 as an alternative to the rules of Subsection NG for the design of the core barrel to accommodate service at elevated temperature during PLOFC and DLOFC events. Code Case N-201 covers the rules for construction of Section III, Subsection NG, *Core Support Structures*, for elevated temperature service. Part A of the Code Case extends the rules for restricted service at elevated temperature without explicit consideration of creep and stress-rupture. Part B of the Code Case altered the rules for service at elevated temperature to account for creep and stress rupture effects.

Request for Additional Information

1) Clarification is requested on how, if, or the extent to which the rules of Subsection NG will be applied to the PBMR reactor vessel internals, with regard to identifying the core support structures and internal structures consistent with Subsection NG definitions, and describing how these rules will or will not be applied to each category.

2) The Code Of Federal Regulations authorizes the use of the 1988 Edition of the ASME Code, Section III, Division 1, Subsection NG, *Core Support Structures*, for the construction of a metallic core barrel as a core support structure in light water reactor applications. However, Subsection NG does not specifically address or prohibit the design and fabrication of graphite core support structures, nor does it provide the allowable physical properties for use in the design of structures with this material. If the licensee intends to use Subsection NG rules for

the design of all the defined core support structures, they must provide any alternative design rules or criteria for the graphite core support structures, and identify the material allowable physical properties that will be used and the basis of acceptability for the intended use.

3) Exelon proposes to use Subsection NG in conjunction with Code Case N-201 to accommodate service at elevated temperature during PLOFC and DLOFC events. In order for the staff to evaluate the use of the proposed alternative, Exelon is requested to provide information with regard to; 1) the identification the specific portions of the code case that will be used, 2) the level, extent and duration of the elevated temperature and stress, 3) the structure location of the application, and 4) justification for the acceptability of the alternative.

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