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GE Nuclear Energy

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James F. Klapproth

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ADJUDICATIONS STAFF

MFN-02-021

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001.

Subject: **GENE Comments on Robert H. Leyse Supplemental Petition for Rulemaking [PRM-50-73A] (Fed. Reg. Vol. 67, No. 19. 4214)**

Attention: Rulemakings and Adjudications Staff

The purpose of this letter is to provide GENE comments in response to the subject supplemental petition for rulemaking regarding the regulations for emergency core cooling system acceptance criteria. The supplemental petition specifically addresses the impact of heavy crud buildup on core coolability during normal reactor operation.

It is the GENE position that the supplemental petition holds no technical merit. The petition proposes revisions to plant analysis bases that are neither necessary to protect the public health and safety, nor would they enhance the existing level of protection even if the concern held technical merit. Primary points include:

1. The petition calls for a revision of the ECCS analysis bases and criteria to address a perceived concern with a condition that developed during normal steady state operation at one plant during one particular cycle of operation. This unique condition of heavy crud buildup has occurred only once in over 1000 reactor years of BWR operation. It is not appropriate to include such an infrequent condition as the basis for assessment of an even lower probability accident (LOCA).

2. The postulated scenario (rapid and uncontrollable fuel and core melt) is not a credible scenario based on the damage characteristics observed for the referenced unusual plant condition.

3. The postulated inability to effectively detect and mitigate the occurrence of a heavy crud-induced fuel damage condition during normal steady-state operation is invalid, such as was adequately demonstrated by the responsible and effective actions taken by the affected plant.

Additional specific responses to the primary contentions are provided in the attachment.

Sincerely,

J.F. Klapproth, Manager
Engineering and Technology

Cc: J. Donoghue (NRC)
M.T. Lesat (NRC)
G.A. Watford (GNF)
G.A. Potts (GNF)
D.C. Pappone (GENE)
G.B. Stramback (GENE)

Template = SECY-067

SECY-02

Attachment

Robert H. Leyse: Supplement to a Petition for Rulemaking
(USNRC Docket PRM-50-73A)
Response to Contentions

Contention:

The crud deposits during normal reactor operation could lead to a loss of coolability and substantial and rapid localized core melting while the LWR is at power.

Response:

The affected fuel at the plant referred to in this petition was examined, in detail, to characterize the nature and extent of any fuel rod damage or damage to the fuel assembly structure. Although an unusually heavy crud layer was observed, only a small number of fuel rod failures occurred and the nature of the damage was limited to pin-hole type perforations of the fuel rod cladding. Such pin-hole type perforations intermittently have been detected, investigated and addressed without structural failure since initial operation of LWRs. As expected, fuel rod clad melting did not occur in any cases and there was no attendant damage of any kind to the fuel assembly structural components.

The fuel rod failure mechanism (thermally accelerated cladding corrosion) is primarily caused by an increase in heat transfer resistance due to the effects of the unusually thick crud layer. First principles modeling of the mechanism accurately predicts the observed cladding corrosion performance, including the onset of failure. Analytical evaluations, using first principles modeling, allow quantification of the corrosion process to the point of an identified rate of corrosion progression. This rate of corrosion progression has been demonstrated to be sufficiently slow to be effectively detected and monitored during normal operation using existing plant equipment and procedures (i.e., normal offgas and coolant activity monitoring). The recent experience at the plant referred to in this petition is consistent with this conclusion. The failure occurrences at the affected plant were separated in time by several weeks. Therefore, the condition cannot be characterized as rapidly developing nor is there any information to support substantial and rapid localized core melting, rather the opposite is demonstrated by the available information. The condition is understood, has a predictable rate of progression and can be effectively mitigated during normal operation through normal means.

Contention:

When unusually heavy crud deposition on fuel bundles occurs during normal operation of an LWR, there are likely to be indications of fuel element cladding defects by increases in the offgas activity. However, this increase in the offgas activity is not regarded as an indicator of a heavy crud deposition. Therefore, rapid localized core melting will be initiated while the LWR is at power and will continue even though the LWR is shut down.

Response:

Fuel failures are readily detected through existing plant offgas and coolant activity monitoring. While the offgas and coolant activity characteristics of a crud-induced failure may not be distinguishable from a fuel failure caused by other means, the important point is that the fuel failure will be detected. As previously discussed, the failure mechanism is progressive in nature, at a slow rate that enables a clear identification of a failure condition and sufficient opportunity for mitigating actions. Some of the effective mitigating actions, such as were applied by the operators of the plant referred to in this petition, include determination of the failed fuel core location and local power suppression by inserting control blades, plant power reduction, or plant shutdown to remove the affected fuel.

Additional Comment:

Even with the heavy crud deposits observed at the plant referred to in this petition, plant performance indications were not significantly affected (e.g., the instrumentation confirmed that no significant change in core flow and core pressure drop occurred, and that there was no significant change in the general coolant flow characteristics). Also, it is concluded that during a postulated Loss of Coolant Accident (LOCA) the expected core coolant inventory and flow characteristics will be maintained. The primary effects of the heavy crud layer during a postulated LOCA would be an increase in the fuel stored energy at the onset of the event, and a delay in the transfer of that stored energy to the coolant during the blowdown phase of the event. However, it is noted that the axial elevation of the heavy crud deposits at the plant referred to in this petition was at the lower elevations of the fuel assembly, as is typical of crud deposition behavior in a BWR. The more limiting axial elevations during a postulated LOCA occur at the upper elevations of the fuel assembly, where even in the plant referred to in this petition, the crud characteristics were normal. Therefore, the heavy crud condition is expected to have no significant effect on the fuel response to a postulated LOCA.