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OG-155

July 9, 1985

Mr. Cecil O. Thomas, Chief
Standardization & Special Projects Branch
Division of Licensing
U.S. Nuclear Regulatory Commission
Phillips Building, 7920 Norfolk Avenue
Bethesda, MD 20014

Subject: WOG SGTR Subgroup Responses to NRC Request Number 1 for Additional Information on WCAP-10698

Reference: Letter from Cecil O. Thomas (NRC) to Alan Ladieu (WOG SGTR Subgroup), Dated May 13, 1985

Dear Mr. Thomas:

The referenced letter requests additional information from the Westinghouse Owners Group (WOG) SGTR Subgroup for the NRC review of WCAP-10698. The purpose of this letter then is to transmit this information.

The NRC questions and the respective WOG SGTR Subgroup responses are presented in the attachment. The responses to these questions have been previously discussed with NRC representatives in a meeting between the WOG SGTR Subgroup and the NRC at Bethesda, Maryland, on June 6, 1985.

If you have any additional questions regarding WCAP-10698, or the attached responses, please contact me.

Sincerely yours,

Alan E. Ladieu

Alan E. Ladieu, Chairman
SGTR Subgroup
Westinghouse Owners Group

Attachment
cc: D. H. Moran, NRC
V. Nerses, NRC
B. Mann, NRC
WOG SGTR Subgroup Members
R. N. Lewis, W
T. A. Lordi, W

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WOG SGTR SUBGROUP
RESPONSES TO NRC REQUEST
FOR ADDITIONAL INFORMATION ON WCAP-10698

NRC QUESTION 1

Static Load Analyses- It is our understanding that these will be submitted on a plant-specific basis. However, consideration must be given as to whether the analysis is carried out for the entire steamline up to the turbine, or to the main steam isolation valves (MSIVs) only. This involves consideration of MSIV reliability, assurance that timely operator action would be taken to isolate the damaged SGs, and the capability of the MSIV's to close when subjected to liquid or two-phase flow.

Response

The analysis to demonstrate margin to steam generator overfill for a design basis SGTR was presented in WCAP-10698. The analysis was based on the simulation of the SGTR recovery actions using operator action times obtained from the simulator validation of the Westinghouse Owners Group (WOG) Emergency Response Guidelines. This analysis demonstrated that steam generator overfill would not occur for a design basis SGTR using conservative assumptions and initial conditions and assuming the worst case single failure. It is expected that steam generator overfill would only occur if the operator action times are significantly longer than those observed during the simulator validation runs. Thus, for the evaluation of the consequences of steam generator overfill, the overfill transient will be analyzed assuming extended operator action times which result in steam generator overfill. Since it has been shown that steam generator overfill will not occur as a result of any single failure, it is not considered appropriate to consider equipment failures in addition to the extended operator action times.

It is noted that isolation of the ruptured steam generator, which involves closing of the associated MSIV, is performed early in the SGTR recovery procedure. Since it is expected that the MSIV will be closed significantly before any liquid or two-phase flow could potentially occur in the steamline, it is not necessary to evaluate the capability of the MSIV to close when subjected to liquid or two-phase flow. The closure of the MSIV on the ruptured steam generator results in less available volume for the accumulation of water on the secondary side of the steam generator. This will result in filling of the steamline and the release of water to the atmosphere through the safety valve at an earlier time which tends to maximize the offsite doses. If failure to close the MSIV for the ruptured steam generator is assumed, isolation could still be accomplished by closing the MSIVs for the intact steam generators, and closing the other valves between the MSIV on the ruptured steam generator and the turbine stop valves. However, this assumption will increase the available secondary volume which will increase the time to fill the

steamline. This may delay the time when discharge of water to the atmosphere occurs and reduce the offsite doses.

In summary, the evaluation of the consequences of steam generator overfill will be performed assuming that the MSIV for the ruptured steam generator is closed at the appropriate time during the recovery operation. This will restrict the accumulation of water to the portion of the main steamline up to the MSIV, and will represent a worst case for the calculation of the resulting offsite doses. A static load analysis for the steamlines will be performed on a plant-specific basis for this case and will be submitted separately by the responsible utility.

NRC QUESTION 2

Dynamic Load Analyses - In our discussions with Westinghouse on this subject, there appears to be some question on how this subject would be handled, e.g., it was not certain whether these analyses would be carried out for several plant-specific steamline layouts, or one "bounding" steamline geometry. Additional discussions on this item appear necessary.

Response

The dynamic load analysis will consist of an evaluation of the potential for waterhammer and steam volume collapse in the main steamline and in the vicinity of the tube rupture, and for excessive loading of the steam generator safety valves. An analysis will be performed to define the thermal and hydraulic conditions for the reference plant during the overfill transient. A review of the steam piping design and arrangements for the plants in the SGTR Subgroup will be performed to select the limiting configurations. The transient conditions will be evaluated to determine the potential for waterhammer and excessive loading of the safety valves for the limiting configurations. An assessment will be made to relate the results to other plant configurations to assure that the conclusions are applicable to all of the plants in the WOG SGTR Subgroup.

NRC QUESTION 3

Safety Valve (SV) Reliability - If liquid relief occurs, there is a potential for the SVs to stick open. Our understanding, after discussions with Westinghouse, is that the analyses would assume that any SV subjected to liquid relief would stick open. Offsite doses would be calculated accordingly. Please inform us whether any additional analyses on this subject are contemplated.

Response

It will be assumed that the safety valve fails open after water relief through the safety valve occurs. After this occurs the transition from the E-3

guideline to the ECA-3.1 guideline will be simulated to complete the SGTR recovery actions. With the failure of the safety valve, the primary to secondary leakage and the releases to the atmosphere will continue until cold shutdown conditions are reached. The recovery actions in the ECA-3.1 guideline will be simulated using operator action times developed from the ERG validation studies. The offsite doses will be calculated using best estimate methodology based on the mass releases to the atmosphere during the period from accident initiation until cold shutdown is achieved.

NRC QUESTION 4

Effect of Liquid Flow On AFW Turbine - The ACRS has expressed concern regarding the effect of introducing liquid into the AFW steam supply lines, including the effects of water hammer on valves and piping, and the effect of liquid on AFW turbine operability. This concern should, therefore, be addressed in either the WCAP supplement or plant specific submittals.

Response

One of the early actions in the E-3 guideline for SGTR recovery is the isolation of the ruptured steam generator. As part of the isolation procedure, the steam flow from the ruptured steam generator to the turbine - driven AFW pump is isolated by closing the steam supply valves from the ruptured steam generator. The steam supply valves for the turbine-driven AFW pump can be manually isolated from the main control room. Since there are two valves in series for the reference plant, failure of one valve will not prevent isolation. As an alternative, the turbine inlet governor valve for the pump could be closed. Since the turbine-driven AFW pump will be isolated early in the transient which is significantly before water could potentially enter the steamlines and there are redundant means for isolation, it is not considered credible that liquid will be introduced into the AFW steam supply lines. Therefore, it is not planned to evaluate the effect of waterhammer on the AFW steam supply piping and valves and the effect of liquid on the AFW turbine operability.