RELATED CORRESPONDENCE

GENERAL ELECTRIC

NUCLEAR POWER

SYSTEMS DIVISION

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MFN-044-81

March 17, 1981

M. Silberberg, Chief
Experimental Advanced Safety Technology Research Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Silberberg:

SUBJECT: COMMENTS ON DRAFT OF NUREG-0772

This letter provides General Electric Company comments on the draft of NUREG-0772, "Technical Bases for Estimating Fission Product Behavior during LWR Accidents" which was provided with your letter of March 6, 1981.

The report is represented as a compendium of the best technical information available for estimating the release of radioactive material during postulated severe accidents in light water reactors. General Electric considers that the draft report has helped to focus on areas of uncertainty regarding fission product behavior from reactor accidents. In general, however, the specific conclusions regarding fission product retention are based on incomplete information on accident sequences and plant design characteristics. The various sections of the report require better integration to insure consistent unambiguous support for the conclusions.

General Electric considers that the draft report does not present technically supportable conclusions based on factual inputs, but instead presents results based on specific input assumptions. The following three assumptions appear to have the greatest impact on the report results:

1) Similar behavior of iodine and iodide for severe accident conditions

2) The magnitude of the decontamination factors utilized in accident scenarios

3) Characteristics of dominant accident sequences.

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GE believes that iodine and iodide behave differently in the suppression pool under accident conditions and that the predominate iodine form (iodide) will be effectively retained in the pool water. Further, it is GE's belief that the decontamination factors assumed are overly conservative and do not reflect current data. Finally, assumptions on the transport pathways, time to containment failure and low pressure emergency cooling system performance are in error. Additional information is provided in the attachment.

The information relating to the Boiling Water Reactor (BWR) is not complete and results in misleading conclusions on the BWR capability to contain and attenuate fission product release. Specifically, the following areas have not been adequately addressed:

1) The BWR geometry was not appropriately considered in assessing potential attenuation of fission product release. The multi-compartments in the various BWR containment designs and the capability of the BWR suppression pool were either neglected or only superficially treated. The suppression pool is expected to provide scrubbing capability to capture fission products released from degraded core accidents for dominant BWR containment failure modes. The internal design of the BWR containments with their multiple barriers for fission product release (i.e. system piping, drywell, primary containment) provide significant surface area for fission product removal by natural processes.

2) The experimental data relative to pool scrubbing was not utilized. The draft report cited only a single reference for pool scrubbing data. Additional references are provided in the attachment to this letter. These references support the use of decontamination factors decades higher than those documented in the draft report.

3) The evaluation of BWR dominant accident sequences is misleading. The report subjectively assesses three categories of accidents and makes assumptions on plant conditions, containment failure modes and resulting fission product transport and release. As demonstrated by the most recent BWR probabilistic risk assessment studies, this subjective consideration does not properly consider the BWR capability to prevent severe core degradation and mitigate the consequences of such degradation.

Based on the concerns addressed herein, it is recommended that the draft report be modified to include a more representative analysis of fission product retention based on the use of realistic decontamination factors. If current available data is found to be lacking in a specific area, an assessment should be made to identify the potentially attainable decontamination factors and the requisite test programs necessary to

define them. If the draft report is presented to the Commission in its current state, appropriate characterization of its incomplete status must be highlighted. It is GE's concern that the report misrepresents current LWR fission product retention capability.

It is General Electric's intent to provide the NRC with comments on the draft of NUREG-0772 in the peer review meetings March 17 and 18, 1981 in Washington, D.C. GE will provide additional comments prior to April 1, 1980. We would be pleased to provide further details on the information provided herein. Specific questions may be addressed to Mr. K. W. Holtzclaw (408) 925-2506 or Mr. J. M. Smith (408) 925-5722 of my staff.

Very truly yours,

RHBuchholz

R. H. Buchholz, Manager
BWR Systems Licensing

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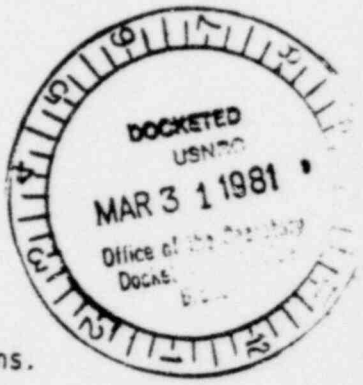
Attachment

RELATED CORRESPONDENCE

Attachment to
GE Letter MFN-044-81



GENERAL ELECTRIC COMPANY COMMENTS
ON
NUREG-0772 (DRAFT)

I. GE COMMENTS ON REPORT CONCLUSIONS

CsI or HI dominant form, but some I_2 in some situations.

GE agrees - except we do not agree that I_2 (elemental) is a likely form in any BWR accident scenario.

Iodine chemical form does not have a major influence on consequences.

GE disagrees - even under saturated conditions the pool DF for iodide is much higher than elemental I. If proper credit had been given for the saturated pool iodide DF, this conclusion would not have been reached.

Consequences have not been overestimated by orders of magnitude.

GE disagrees - since this conclusion is based on the assumption that the pool is only worth a factor of 1 to 10 for the worst accident scenarios. The factor of 1-10 is based on a saturated pool and elemental iodine; however, as noted in the report, I_2 is not the dominant form. Also as noted in Appendix E, even for a saturated pool and for elemental iodine, the DF is at least 100 for BWR accident conditions.

Additional Comments

The report in a number of areas indicates a general lack of understanding of the BWR barriers, geometries, and compartmentation. Everything is in terms of release from fuel or RPV directly to "the containment", as if all containments were open, dry containment designs. No understanding is apparent that Mark III has extra barrier (drywell and pool) within primary containment.

II. GE COMMENTS ON REPORT ASSUMPTIONS

The above conclusions are based on the following assumptions which are not supported by the data given in the report draft:

Behavior of iodine and iodide in the suppression pool is similar under severe accident conditions.

Iodine and iodide behave differently in saturated pools. Partition coefficients for Iodine are $\geq$ 100 and for iodide are orders of magnitude greater, approaching infinity for some cases (see report p. 5.26 and E.4). This means that essentially all iodide will be scrubbed from small noncondensing bubbles for the calculated bubble rise times.

Assumed decontamination factors (DFs):

The DF's assumed for the saturated pool accident scenarios are far too conservative and do not reflect current data. The values used for the analysis are 1-10 whereas information presented in Chapter 5 and Appendix E support DF's greater than 100; other data (see attached references) support DF's as high as 10^4.

Modeling and assumptions used for dominant severe accident sequences:

The transport pathways were not adequately descriptive of the differences in the large dry containments and Mark I and Mark III designs. For example, sequences ended with transport to the drywell without mention of transport through the suppression pool (p. A. 13). The time to containment failure in Table 8.2 is too short for the Mark I AE sequence, it should be ~ 5 hours not .81 hours. Also, in the Mark I TW sequence the low pressure core cooling systems (LPCI/LPCS) for newer BWR/4 designs and all BWR/5 and BWR/6 designs will not cavitate under saturated conditions.

III. GE COMMENTS ON IMPACT ON RISK

General Electric calculates that the best estimate attenuation factors for the severe accident sequence show factors which are orders of magnitude greater than the 2-10 stated in the report conclusions. Using the proper DF's, the consequences of these accidents will be decades less than those presented in WASH-1400. For many sites, no acute fatalities are expected for these sequences.

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POOL SCRUBBING TEST REFERENCES

1. "Fission Product Entrainment Evaluation Tests for the Pressure Suppression System," GEAP-3206 (1959), General Electric Company.

2. McGoff, J.J., Rodgers, S.J., "Simulation of Container Venting Under Seawater," Technical Report 59, Contract NOBS-65426, Mine Safety Appliances Co., Gallery, PA (December 1957)

3. Siegwarth, D.P., Siegler, M., "Scale Model Fission-Product Removal in Suppression Pools," GEAP-13172, April 1971, General Electric Company.

4. Hillary, J.J., et.al, "Iodine Removal by a Scale Model of the S.G.H.W. Reactor Vented Steam Suppression System," TRG Report 1256 (1966).

5. Diffey, H.R., et.al, "Iodine Cleanup in a Steam Suppression System," CONF-650407 2 (1965) 776.

6. Malinowski, D.D., et.al, "Radiological Consequences of a Fuel Handling Assicent," WCAP-7828, December 1971, Westinghouse Electric Corporation.

7. "Energy Suppression and Fission Product Transport in Pressure Suppression Pools," Stanford, L.E.; Webster, C.C., ORNL-TM-3448, April 1972.

8. Geisse, G., "Diffusion of Iodine in Water," CEA-R-3199, AEC Lib. Trans 623 (April 1967).

9. Devell, L., et.al, "Trapping of Iodine in Water Pools at 100°C Containment and Siting of Nuclear Power Plants Proc. of Symposium IAEA 1967 (Vienna) CONF 670402.

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