

Docket No. 50-271

July 27, 1981

Mr. Robert L. Smith  
Licensing Engineer  
Vermont Yankee Nuclear Power Corp.  
1671 Worcester Road  
Framingham, Massachusetts 01701



Dear Mr. Smith:

By letter dated December 15, 1980 you requested additional clarification of TMI Action Plan requirement II.B.3. The information you requested is enclosed.

Sincerely,

ORIGINAL SIGNED BY

Vernon L. Rooney, Project Manager  
Operating Reactors Branch #2  
Division of Licensing

Enclosure

cc w/enclosure  
See next page

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Mr. Robert L. Smith

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Mr. Robert L. Smith

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Resident Inspector

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RESPONSE BY OFFICE OF NUCLEAR REACTOR REGULATION  
TO REQUESTS FOR CLARIFICATION OF THE POST-ACCIDENT  
SAMPLING REQUIREMENTS OF NUREG-0737, II.B.3  
FOR VERMONT YANKEE NUCLEAR GENERATING PLANT

VERMONT YANKEE NUCLEAR POWER CORPORATION  
DOCKET NO. 50-271

BACKGROUND

By letter dated December 15, 1980 the licensee has committed to meet the post-accident sampling requirements of NUREG-0737, II.B.3, with the exception of chloride analysis. For the chloride analysis the licensee has requested the staff to provide further clarification of our position and to suggest possible methods for performing accurate chloride analysis in the post-accident chemistry environment.

STAFF RESPONSE

II.B.3. Clarifications No. 2C and 5, Requiring Monitoring of Chloride in the Reactor Coolant

The licensee requests the staff to clarify the requirement for monitoring chloride in the post-accident reactor coolant because they contend performing the chloride analysis within the required time frame will result in excessive man rem exposure. Additionally, the licensee does not believe the chloride data will provide useful post-accident information and requests the staff to explain the need for chloride analysis and indicate acceptable analytical procedures.

The requirements of NUREG-0737 - II.B.3, clarifications Nos. 2C and 5; to monitor chloride within 24 or 96 hours (site dependent) is intended to provide information to the operator on the potential for chloride stress corrosion cracking (CSCC) of the reactor coolant stainless steel pressure boundary during the post-accident outage period. The two primary staff concerns are;

- a. CSCC during a long outage may affect integrity of a critical system.
- b. During recovery, an assessment will be made of chloride/oxygen/pH history to determine the extent of examination required for CSCC, prior to approving a restart.

Due to the multiple potential sources of chloride (plant cooling water, makeup water, chemical additives, resin degradation, etc.) we consider it likely that chloride contamination will exist at some point during the accident as is the case at TMI-2 where 2-6 ppm chloride exists in the reactor coolant system. Therefore, our only means of assessing its effect is to be able to monitor chloride.

The primary factors which influence CSCC are temperature, stress, time, pH, chloride and oxygen concentration. During an accident condition temperature,

stress and time are dictated by the accident. Therefore, to minimize the potential for and assess the possibility of CSCC we must monitor and control chloride, oxygen and pH. The verified absence of either chloride (<0.15ppm) or oxygen (<0.1ppm) in the reactor coolant system will practically eliminate concern for CSCC. Additionally, if pH is >7.0 the propensity for CSCC is further reduced.

Following an accident, the staff is interested in obtaining information on the potential for CSCC at the earliest opportunity, consistent with ALARA. Ideally, the capability to monitor oxygen and chloride with on line instrumentation will exist, with the capability to verify those analyses by grab sample when sufficient radioactive decay of the sample has occurred to meet ALARA.

Concerning analytical procedures which may be applicable for chloride analysis in the post accident environment, the staff believes that ion chromatography can provide an acceptable method. Also, automatic mercuric nitrate titration and specific ion electrode may be applicable if qualified. For whichever procedure is selected, it will be necessary to verify its accuracy and precision in the post-accident reactor coolant system environment.

We believe that to properly evaluate results, the procedure selected must be accurate to approximately  $0.1 \pm 0.05$  ppm chloride. To obtain accurate results at a concentration of 0.1 ppm chloride the analytical procedure selected will require an undiluted sample of reactor coolant. Therefore, it will be necessary to consider the effects of radioactivity associated with Reg. Guide 1.3 and 1.4 source terms on the analysis as well as man rem exposure. The three chloride procedures indicated above can all be performed remotely. Thus, man rem exposure can be minimized.

The staff considers minimization of the potential for chloride stress corrosion cracking subsequent to an accident in which there is core degradation to be a valid requirement during post-accident chemistry conditions. Therefore, Vermont Yankee should meet the requirement to monitor reactor coolant chloride concentration in the post-accident chemistry environment. Additionally, in the event chloride exceeds 0.15 ppm in the reactor coolant, verification that oxygen concentration in the reactor coolant, is less than 0.1 ppm will be required.