1149 Regency Dr.
Columbus, Ohio 43220

January 3, 1983

Mr. Vinctor Benaroya, Chief
Chemical Engineering Branch
Division of Engineering
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Review of GPUN Topical Report 008, Rev.1, "Assessment of TMI-1 Plant Safety for Return to Service after Steam Generator Repair," and Request for Additional Information.

Dear Mr. Benaroya,

I have reviewed the above report, which was submitted to NRC by GPNU in support of their recommissioning activities on TMI-1 OTSGs. In order that I may complete my TER by the target date of 1/28/83, I have requested below additional information regarding GPNU's recommisioning activities.

1. Regeneration of Polythionic Species

Throughout the above report, it is assumed that the aggressive polythionic species that gave rise to the problem in the first place will not be regenerated during subsequent cold lay-up, particularly when the system is open to air. In previous communications, I have emphasized that metal sulfides, such as iron sulfide ($Fe_{1+x}S$, FeS, $Fe_{1-x}S$, FeS_2) and nickel sulfide, may undergo oxidation to form polythionates. The reaction involved, e.g.

$$2MS + H_2O + 2O_2 \longrightarrow 2MO + S_2O_3^{2-} + 2H^+ \qquad (1)$$

are well known in inorganic chemistry, and the sensitivity of many sulfides to oxidation is amply demonstrated by the fact that many tend to be pyrophoric. The scenario that I raised previously was that the polythionates, which were initially present, will have reacted with the metal surface to form sulfides, e.g.

$$M + S_2O_3^{2-} \longrightarrow MS + SO_3^{2-} \qquad (2)$$

during lay-up or HFT, but might then be regenerated during subsequent exposure to oxygen according to Reaction (1). Whether or not this process actually occurs will have an important bearing on the clean-up procedures which should be adopted. Accordingly, I wish to request GPNU to supply details of any experimental work which has been performed to date with regard to the oxidative regeneration of polythionic species.

XA

XA Copy Has Been Sent to PDR

XE02

2. Desulfurization Procedures

GPUN's plans for desulfurization of the TMI -1 RCS are still unclear. Accordingly, I request additional information on the circumstances under which they consider desulfurization to be necessary and, more importantly, the circumstances under which they consider that it is not.

3. Intergranular Corrosion

The latest submission from GPUN indicates that they are able to detect intergranular attack on the ID surfaces with a correlation approaching 100%. If so, this is indeed a considerable improvement in the sensitivity of ECT over that indicated in previous submissions by their technical people. In my view, the value of ECT would be greatly enhanced if ID IGA can be detected, since it is possible (probable?) that cracks may nucleate at sites of IGA. Accordingly, I request that full details be provided of the tests that were carried out to qualify ECT as a mean of detecting IGA.

4. Stress Corrosion Cracking Tests

Many of the stress corrosion cracking tests that have been carried out employed 10% NaOH as the test medium. However, our principal concern is with cracking due to sulfur species of intermediate oxidation state (e.g. polythionates), which may be regenerated by, for example, reaction (1) above. GPU personnel should provide a rationale for the choice of sodium hydroxide as the test medium.

In a related matter, a test carried out at Oak Ridge indicates that the critical concentration of thiosulfate for cracking of sensitized I-600 lies between 1 and 5 ppm (page 22). However, in the Repaired Tubing Corrosion Tests (RTCTs) described on page 23, it is stated that the tests were conducted in a solution containing 1 ppm thiosulfate plus 1 ppm chloride. Because thiosulfate is the active agent, it appears that the negative result obtained by GPUN in their RTCTs may merely reflect the fact that they did not have a sufficiently high thiosulfate concentration to render the test meaningful. GPU's comments on this matter would be most helpful.

5. Reactivation of SCC

At various points throughout the report, GPU states that "corrosion tests indicate that the cracking mechanism has been arrested and does not reactivate in low sulfur water chemistry "(e.g. p5). This claim does not appear to be adequately supported by the tests described in the report. Accordingly, a request is made of GPU to supply details of <u>all</u> tests that they have carried out to support their position.

I look forward to receiving the information requested above so that I can complete my TERs early in February. In the meantime, I will be in New Zealand, where I can be reached by telephone at 64-9-479-5195 or by addressing mail to:

Dr. D.D. Macdonald
c/o Mr. L.G. Macdonald
34 Oban Road
Brown's Bay
Auckland
New Zealand

Yours sincerely,

D.D. Macdonald

Request for Additional Information for PNL to Complete Review of GPUNC Topical 008, Rev. 1

1. On page 13, discussion on sulfur's role in the overall cracking problem is not clear. Under what conditions does sulfur cause this type of cracking?

2. On page 18, a table should be provided to compare the temperature, pressure, chemistry of RCS in the core and the S/G. i.e. what are the conditions which lead to S/G tube cracking?

3. Whate are the effects of radiation on oxidation of sulfur?

4. What are the nature of all tests related to critical path and how long are these tests?

5. On page 10, reduced sulfur species were the factors which caused the tube to crack, why is sodium thiosulfate itself excluded?

6. Where is carbon observed, the tube I.D. or the cracking surface?

7. What is the stability of sulfur species as a function of ph?

8. Are there any records on O_2 concentration during S/G layup?

9. Provide a table chronologically listing all sulfur species and their oxidation states throughout the sequence of the incident.

10. Was the core barrel assembly bow immersed in the reactor coolant?

11. Have any fuel assemblies been examined or inspected since the cracking incident?

12. On Table 3-1, sulfur analysis will be once a month, what is the rational?

13. Page 23, all test related to tubing repair task, who will do three tests? What is their previous experiences (i.e. are they qualified)?

14. Suggest a meeting to discuss entire desulfurization issue.

Request for Additional Information for BNL to from BNL complete review of GPUNC Topical 008, Rev. 1

1. Provide all latest results regarding sulfur cleanup?
2. Describe the nature and techniques to be used for sulfur cleanup? Who will do it? What is their experience?
3. What are the accuracy and validity of sulfur analyses in the report?
4. Request Ref. 28 GPUN-TDR-359.
5. Provide reports on all supporting systems inspections.
6. Suggest a meeting to discuss entire desulfurization issue.

INFORMAL TECHNICAL COMMUNICATION

Date January 7, 1983

To: Jai Rajan/Conrad McCracken

U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

From: Ted Shook

Franklin Research Center
Philadelphia, PA 19103

(TO BE OPENED BY ADDRESSEE ONLY)

Reference: NRC Contract NRC-03-81-130
NRC TAC No. _____
Plant TMI-1

FRC Project C5506, Assignment 10
FRC Generic Topic TMI-1
FRC Task(s) _____

Title: _____

Attachment: List of references from Licensee Final Report

Message: The request for the above references is hereby submitted as a result of the review of the Licensee final report. We feel that a review of these references is necessary for the preparation of our TER. The request is made in accordance with C. McCracken's memo of December 20, 1982.

Copy of message form XXXXXX plus attachments to:

NOTE TO SENDER: Include attachments if information is pertinent to program management.

S. S. Bajwa
NRC Performance Monitor Herbert Brammer
NRC Lead Project Manager Conrad McCracken

FRC Distribution: SPC, SP, TAS, LL, BS, VL, CD, ____, ____

Revised 4/20/82

Franklin Research Center
A Division of The Franklin Institute

ATTACHMENT TO INFORMAL TECHNICAL
COMMUNICATION DATED 1/7/83 TO
JAI RAJAN/CONRAD McCRACKEN
OF NRC RE NRC-03-81-130,
ASSIGNMENT #10, TMI-1

We hereby request the following references given in GPU Topical Report #008, Rev. 1:

(1) OTSG Repair Safety Evaluation Report, Aug. 1982.

(19) GPUN SP-1101-22-009 OTSG Kinetic Tube Expansion Process Monitoring and Inspection. Rev. 2

(23) Three Mile Island Unit-1 - Once Through Steam Generator Repair Kinetic Expansion Technical Report - November 1, 1982 - Draft.

(48) B&W Document, Engineering Criteria for Tube Repair at TMI-1 #51-1137529-00.

BEFORE THE
NUCLEAR REGULATORY COMMISSION

DOCKET NUMBER
PETITION RULE PRM 40-24

Re: Petition for Rulemaking by Union Carbide Corporation, 47 Fed. Reg. 53889 (Nov. 30, 1982).	)

Comments on Petition for Rulemaking
Filed by Union Carbide Corporation

January 1983

Kerr-McGee Corporation
Kerr-McGee Nuclear Corporation