Consumers Power Company

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July 1, 1983

Harold R Denton, Director
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

MIDLAND ENERGY CENTER PROJECT
MIDLAND DOCKET NOS 50-329, 50-330
CORE DAMAGE ASSESSMENT PROCEDURE
FILE: 0927.4 SERIAL: 23228

ENCLOSURE: TEN COPIES OF THE MIDLAND PLANT CORE DAMAGE ASSESSMENT PROCEDURE

Enclosed are ten (10) copies of Consumers Power Company's Midland Plant Core Damage Assessment Procedure for NRC Staff review. In addition, the information regarding post-accident analytical accuracies is attached as an approved FSAR Change Notice. This information will be incorporated into the next revision of the Midland FSAR. In conjunction with the summary of post-accident analytical procedures provided in the NUREG-0737 response section of the FSAR, this letter provides the information necessary to complete the review of Licensing Condition Six of the Midland Plant Safety Evaluation Report.

James W. Cook

JWC/JMT/bjb

CC RJCook, Midland Resident Inspector
JGKeppler, Administrator, NRC Region III
MAMiller, NRC

oc0683-0491a100

Boo!
1/1

CONSUMERS POWER COMPANY
Midland Units 1 and 2
Docket No 50-329, 50-330

Letter Serial 23228 Dated July 1, 1983

At the request of the Commission and pursuant to the Atomic Energy Act of 1954, and the Energy Reorganization Act of 1974, as amended and the Commission's Rules and Regulations thereunder, Consumers Power Company submits the Midland Plant Core Damage Assessment Procedure and an approved SAR Change Notice detailing the Post Accident Sampling System Accuracies.

CONSUMERS POWER COMPANY

By J W Cook
J W Cook, Vice President
Projects, Engineering and Construction

Sworn and subscribed before me this 5 day of July 1983.

Barbara R Townsend
Notary Public
Jackson County, Michigan

My Commission Expires September 8, 1984

oc0683-0491a100

QUALITY ASSURANCE PROGRAM
SAR CHANGE NOTICE

JOB NO. 7220 2. DISCIPLINE/COMPANY CPCo 1. ~~PQAR~~ FSAR 3. No. 4041

4. ORIGINATOR JAMES M TOZER 5. DATE 6/29/83

6. REFERENCED SECTIONS OF SAR — FSAR Cross Reference Index has been checked and affected FSAR pages are attached which reflect appropriate changes.

G+R -TMI 5

7. DESCRIPTION OF CHANGE — Is the purpose of this change for anything other than: Closing an ACRS/SER open item, correcting an editorial error or providing information already committed to in NRC correspondence? (Yes) No

If yes, provide furthur justification for the change in Block 9.

ADDED POST ACCIDENT SAMPLING SYSTEM ACCURACIES.

8. REFERENCED SPECIFICATIONS OR DRAWINGS

NONE

9. JUSTIFICATION

ADDED POST ACCIDENT SAMPLING SYSTEM ACCURACIES PER NRC REQUEST.

10. BECHTEL DISCIPLINE INTERFACE REVIEW:

- ☐ ARCH
- ☐ CIVIL
- ■ CONTROL SYS
- ☐ ELEC
- ■ NUCLEAR
- ☐ PLANT DSN
- ☐ PQAE
- ☐ STRESS
- ☐ OTHER

INTERFACING STAFF REVIEW:

- ☐ ARCH
- ☐ CIVIL
- ☐ CONTROL SYSTEM
- ☐ ELEC
- ☐ GEOTECH
- ☐ M & QS
- ☐ MECH
- ■ NUCLEAR
- ☐ PLANT DSN
- ☐ RELIABILITY
- ☐ STRESS
- ☐ OTHER

NA	-	M.J. Wh	6/30/83		
11. REVIEWED BY (Group Supervisor)	DATE	12. REVIEWED BY (SAR COORDINATOR)	DATE	13. REVIEWED BY (NUCLEAR ENGINEER)	DATE
for E M Hughes	6/30/83	S. P. Frantz	6/30/83		-
14. CONCURRENCE BY (PROJECT ENGINEER)	DATE	15. APPROVED BY (CPCo)	DATE	16. CONCURRENCE BY (NSSS SUPPLIER)	DATE

AA-G 10473 REV 9-79
MIDLAND

Response

1. The response to NUREG-0737, Item II.B.3 has been revised in response to this question. In addition, Section 9.3 has been revised to include a description of the post-accident sampling system (PASS). Selected analytical chemistry procedures with documentation demonstrating compliance with licensing conditions will be available on request for NRC audit 4 months prior to exceeding 5% power operation. 41

2. Sufficient shielding to meet the requirements of GDC-19, assuming a Regulatory Guide 1.4 release, will be provided. Regulatory Guide 1.4 source terms were chosen because Midland is a PWR. Regulatory Guide 1.3 applies to BWRs.

3. Midland has not committed to implementation of Regulatory Guide 1.97, Rev 2, as noted in Appendix 3A. However, the Midland design for post-accident sampling meets the intent of Regulatory Guide 1.97, Rev 2, as modified and clarified below.

   The Midland PASS uses a Sentry Model B sampling panel in conjunction with manual grab sample techniques. Post-accident sample analysis capabilities are provided as follows: 38

   For primary coolant and sump samples:

   a. Gross Activity - Sample gross activity will be analyzed over the range of 10 μCi/ml to 10Ci/ml by summation of gamma-emitting isotope activities determined during gamma spectrum analysis.
      INSERT 1 Here
   b. Gamma Spectrum - As noted above, a gamma spectrum isotopic analysis will be provided.

   c. Boron Content - Consistent with ALARA, boron concentration will be initially determined by analyzing a 1,000 to 1 diluted sample. Analysis of this diluted sample will provide a determination of boron content over a range of 500 to 6,000 ppm. The boron analytical technique proposed for this analysis is the generic procedure developed by NUS for Sentry Equipment Corp. The ANALYTICAL PERCENT ERROR FOR BORON MEASUREMENT IS ± 15%.
      It is noted that the 500 to 6,000 ppm range for determination of boron content is adequate for verifying maintenance of reactivity control, because 2,270 ppm is the boron content specified for cold shutdown. Furthermore, this sample analysis is confirmatory and not the primary method of verifying post-accident reactivity control. As noted in Section 7.5, safety grade neutron flux monitoring is provided as the primary and direct indication of reactivity control. In

addition, should the initial boron content analysis indicate boron concentrations below 500 ppm, the PASS has the capability of obtaining an undiluted sample for analysis below 500 ppm. A decision to analyze an undiluted sample for boron content would be made at that time based on ALARA and the need to obtain further information.

d. Chloride Content - Consistent with ALARA, chloride concentration will be initially determined by analyzing a 1,000 to 1 diluted sample. This analysis is capable of determining chloride content from 10 to 20 ppm and serves as an early indication that an extreme chloride condition exists. The chloride analytical technique utilized for this analysis is high pressure liquid chromotography (HPLC). THE ANALYTICAL PERCENT ERROR FOR CHLORIDES ~~SAMPLING~~ IS ±20% IN THE 10-20 ppb RANGE FOR A 1000 TO 1 DILUTION AND ±10% IN THE 10-100 ppm RANGE FOR AN UNDILUTED SAMPLE. 38

MEASUREMENT

In conjunction with the chloride analysis, a dissolved hydrogen gas analysis utilizing gas chromotography will be performed to assess the potential for long term chloride stress corrosion cracking. If this analysis verifies that hydrogen concentration in the reactor coolant system (RCS) is greater than 5 cc/kg, then it is reasonable to assume that oxygen will have been scavenged and no further immediate chloride analysis is required, because one of the required factors for stress corrosion cracking is not present. Additionally, an undiluted sample will be obtained through the PASS for later and more accurate confirmation of chloride content. This confirmatory analysis will be performed within 2 or 3 weeks dependent on ALARA considerations. 41

If hydrogen concentration in the reactor coolant system cannot be verified to be significantly above 25 cc/kg (i.e., normal operating range) for RCS isolatable accidents, then it can reasonably be assumed that a substantially smaller percentage core damage has occurred than is considered in the design for post-accident sampling and analysis. In that case, onsite chloride analysis of an undiluted sample should be possible consistent with ALARA. Such analysis would utilize the HPLC analytical technique for determination of chloride content from 0.15 ppm to 20 ppm within the 4 day time frame permitted by NUREG-0737. 38

e. Dissolved Hydrogen - Consistent with ALARA, a diluted sample will be analyzed for dissolved hydrogen within the 3 hour time constraint of the regulatory guide. This analysis, utilizing gas chromotography, will be capable of determining dissolved hydrogen over the range of at least 50 to 2,000 cc/kg at atmospheric pressure. Midland is in the process of determining the lowest practical analytical limit for dissolved hydrogen

concentration utilizing samples diluted consistent with ALARA consideration. THE ANALYTICAL PERCENT ERROR FOR HYDROGEN IS ±20% IN THE 50+1000 cc/kg RANGE AND ±10% FOR IN THE 1000 to 2000 cc/kg RANGE. 38 41

f. Dissolved Oxygen - Consistent with the above discussion of chloride analysis, dissolved oxygen will not be analyzed at part of the immediate accident response. Concern with oxygen in terms of its contribution to chloride stress corrosion cracking can be inferred by determination of hydrogen concentration. As discussed above, if hydrogen concentration is greater than 5 cc/kg, it can be reasonably assumed that oxygen is not present in detectable quantities. In the event that dissolved hydrogen cannot be detected at its minimum detectable level, the oxygen concentration will be assumed to equal its saturation concentration at the prevailing sump temperature. In addition, within 30 days following the accident, an online oxygen monitor will be installed in the system for oxygen analysis if necessary. 38 41

g. pH - Determination of pH is used in conjunction with oxygen and chloride analyses to estimate the potential for long-term chloride stress corrosion cracking. Consistent with ALARA, pH will be initially determined to within one pH number as an indication of whether an extreme pH condition exists. This analysis will be performed within the 3 hour time constraint of the regulatory guide. In addition, undiluted samples will be taken for later and more accurate confirmatory analyses consistent with the previous discussion on chloride analysis. 38

For containment air samples:

a. Gamma Spectrum - A grab sample capability is provided for analyzing gamma isotopic spectrum.

b. Hydrogen and Oxygen Content - A comsip Delphi analyzer is provided for hydrogen concentration measurement from 0 to 10%. Refer to Subsection 6.2.5.5.3 for more information on the Delphi analyzer. In addition, the capability to take a grab sample through the PASS is available.

4. Electrical components of the PASS, aside from containment isolation valves, will be powered from non-Class 1E, diesel backed, ac power. Power to these components will be administratively restored upon loss of offsite power. Power to the containment isolation valves will be from the Class 1E, ac power system. In order to sample and analyze within 3 hours, access to the PASS panels is required. It has been verified that the PASS liquid sample panel can be accessed 30 minutes after an accident and that the PASS 41

Insert 1

PEAK AREA DIFFERENCES, ~~CHANNEL SHIFT~~ PEAK SHIFT, AND PEAK BROADENING ARE UTILIZED FOR AN INDICATION OF THE ANTICIPATED ACCURACY OF GAMMA SPECTROSCOPY UNDER ACCIDENT CONDITIONS. HIGH COUNT RATE MIXTURES (BA-133 AT 30,000 to 40,000 CPS MIXED WITH CO-60 AT 2,000 CPS) HAVE BEEN MEASURED AND COMPARED WITH CO-60 ALONE. RESULTANT REPRESENTATIVE VALUES ARE AS FOLLOWS: THE DIFFERENCE BETWEEN THE TWO CO-60 PEAK AREAS IS LESS THAN 25%; THE ~~CHANNEL SHIFT~~ PEAK SHIFT IS WITHIN 0.06% OF FULL SCALE; AND THE PEAK BROADENING IS LESS THAN 25%. IT IS CONSIDERED THAT THIS RESPONSE IS REPRESENTATIVE OF GAMMA SPECTROSCOPY ACCURACIES UNDER ACCIDENT CONDITIONS.