

DUKE POWER COMPANY

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HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

March 9, 1983

TELEPHONE
(704) 373-4531

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

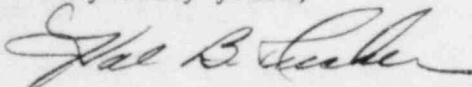
Re: McGuire Nuclear Station
Docket Nos. 50-369, 50-370

Dear Mr. Eisenhut:

Attached is Duke Power Company's response to NRC Generic Letter No. 82-28 concerning Inadequate Core Cooling Instrumentation System for McGuire Nuclear Station Units 1 and 2.

I declare under penalty of perjury that the statements set forth herein are true and correct to the best of my knowledge.

Very truly yours,



Hal B. Tucker

REH:jfw
Attachment

cc: Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 2900
Atlanta, Georgia 30303

Senior Resident Inspector
McGuire Nuclear Station

8303150317 830309
PDR ADOCK 05000369
PDR

NRR/DHFS/PTRB
BOZ1
ADD: J. SHCA

Response to Generic Letter Number 82-28

Attachment 1 - Subcooling Margin Monitor

Attachment 2 - Reactor Vessel Level Instrumentation System

Attachment 3 - Incore Thermocouples

McGuire Nuclear Station
Response to Generic Letter No. 82-28
Subcooling Monitor

A detailed description of the subcooling monitor is included in the "Duke Power Company, McGuire Nuclear Station, Response to TMI Concerns" which was submitted to the NRC on May 23, 1980 and revised on July 18, 1980, August 6, 1980, September 8, 1980, October 10, 1980, October 29, 1980, February 6, 1981, March 9, 1981, and June 18, 1982. NRC staff review and acceptance of the subcooling monitor is documented in the McGuire Safety Evaluation Report (SER), NUREG-0422, Supplement Nos. 4 and 5. Please note that the SER includes comparisons of the McGuire subcooling monitor to the NUREG-0737 recommendations.

The subcooling monitor as described in the above references is fully operational and no modifications are planned.

MCGUIRE NUCLEAR STATION
 RESPONSE TO GENERIC LETTER NO. 82-28
 REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM

	REFERENCE	DEVIATIONS
1. Description of the proposed final system including:		
a. a final design description of additional instrumentation and displays;	Items A,B	Functionally, None
b. detailed description of existing instrumentation systems.	Items H,I	Functionally, None
c. Description of completed or planned modifications.	Same as 1(a)	-----
2. A design analysis and evaluation of inventory trend instrumentation, and test data to support design in item 1.	Items A,B,C, D,E,F	Functionally, None
3. Description of tests planned and results of tests completed for evaluation, qualification, and calibration of additional instrumentation.	Items C,D,E,F	None
4. Provide a table or description covering the evaluation of conformance with NUREG-0737: II.F.2, Attachment 1, and Appendix B (to be reviewed on a plant specific basis)	Items G,K	None
5. Describe computer, software and display functions associated with ICC monitoring in the plant.	Items A,B	None
6. Provide a proposed schedule for installation, testing, and calibration and implementation of any proposed new instrumentation or information displays.	Items L,M	None
7. Describe guidelines for use of reactor coolant inventory tracking system, and analyses used to develop procedures.	Item J	None
8. Operator instructions in emergency operating procedures for ICC and how these procedures will be modified when final monitoring system is implemented.	Items J,N	None

	REFERENCE	DEVIATIONS
9. Provide a schedule for additional submittals required	N/A	

Explicit confirmation of conformance to the Appendix B (NUREG-0737) items listed below for the Reactor Vessel Level Instrumentation System.

	CONFIRMATION	DEVIATIONS
1. Environmental qualification	Item K	None
2. Single failure analysis	Item G	None
3. Class 1E power source	Yes	None
4. Availability prior to an accident	One channel (Per Techn. Spec.)	None
5. Quality Assurance	Yes, as described in Duke Power Company, Topical Report, Quality Assurance Program, Duke-1A	None
6. Continuous indications	Yes	None
7. Recording of instrument outputs	Yes (Single train)	None
8. Identification of instruments	Item A	None
9. Isolation	Yes	None

For the Westinghouse Differential Pressure (dp) system a detailed response to the plant specific items stated below is provided.

RESPONSE

A. Westinghouse dp System

- | | |
|---------------------------------------------------------------------------------|--------|
| 1. Describe the effect of instrument uncertainties on the measurement of level. | Item B |
| 2. Are the differential pressure transducers located outside containment? | Yes |
| 3. Are hydraulic isolators and sensors included in the impulse lines? | Yes |

REFERENCE ITEMS FOR REPLY TO
NRC GENERIC LETTER 82-28

REFERENCE ITEM A

SUMMARY REPORT

Westinghouse Reactor Vessel Level Instrumentation System
 for Monitoring Inadequate Core Cooling December, 1980.

Submittal Letter T. M. Anderson (W) to Darrell G.
 Eisenhut (NRC)
 NS-TMA-2358 of December 23, 1980

REFERENCE ITEM B

25 RESPONSES TO NRC REQUEST FOR ADDITIONAL INFORMATION

On the Westinghouse R.V.L.I.S. Summary Report

REFERENCE ITEM C

SUPPLEMENTARY INFORMATION

Submittal Letter E. P. Rahe (W) to L. E. Phillips (NRC)
 NS-EPR-2579 of March 19, 1982

REFERENCE ITEM D

W EVALUATION OF TESTS

S-UT-3, S-UT-6, S-UT-7, S-NC-2, S-NC-3, S-NC-8 Submittal
 Letter E. P. Rahe (W) to L. E. Phillips (NRC)
 NS-EPR-2526 of December 9, 1981

REFERENCE ITEM E

W EVALUATION OF TEST S-UT-8

Submittal Letter E. P. Rahe (W) to L. E. Phillips (NRC)
 NS-EPR-2542 of January 13, 1982

REFERENCE ITEM F

W EVALUATION OF TEST S-1B-1 AND FUNCTIONAL TEST

Submittal Letter E. P. Rahe (W) to L. E. Phillips (NRC)
 SED-SA-0081 of June 28, 1982

REFERENCE ITEM G

RESPONSE TO REQUEST TO WOG FOR ADDITIONAL INFORMATION

Submittal Letter E. P. Rahe (W) to Dennis M. Crutchfield
 (NRC) NS-EPR-2597 of May 14, 1982

REFERENCE ITEM H

RCS WIDE RANGE PRESSURE INSTRUMENTATION

Submittal Letter of E. P. Rahe (W) to R. C. Deyoung (NRC)
 NS-DPR-2586 of April 21, 1982

REFERENCE ITEM I

RELEVANT DRAWINGS OF EXISTING INSTRUMENTATION SYSTEMS

108D619 Revision 20 W Process Block Diagrams
 (See Sheet for W. R. RCS T_{HOT})

2326D48 Shts 1 to 5 Rev. 5 RVLIS Process Block Diagram

113E306 Sht. 1 Rev. 13 W Flow Diagram (PaID) for RCS
FSAR Fig. 5.1-1 RCS Flow Diagram

Note that W Process Block Diagram which shows W. R. RCS Pressure is not recommended as suitable interfacing instrumentation. Refer to Item H.

REFERENCE ITEM J

Critical safety function status trees for core cooling and system inventory volumes 1, 2, and 3 Emergency Response Guidelines (ERG) Developed by Westinghouse Owner's Group (WOG) Sections FR-C.1 and C.2, FR-I.3, FR-P.1

Refer also E20.26 (which is a new section to be added, for natural circulation cooldown regarding depressurization in the upper head. Although this shows the use of the RVLIS instrumentation, it is not specifically for inadequate core cooling (ICC) monitoring.

Volume 1 and 2 was under cover of OG-64, 11/30/81
O. Kingsley (WOG) to D. Eisehut (NRC)

Volume 3 was under cover of OG-83, 1/4/83, O. Kingsley (WOG) to D. Eisenhut (NRC)

All member utilities received copies under cover of letters:

WOG-81-235, 12/2/81

WOG-83-100, 1/4/83

REFERENCE ITEM K

ENVIRONMENTAL QUALIFICATION

(Note Various Equipment Data Qualification Packages)-
i.e., EQDP - for RVLIS instrumentation are submittals as supplements to the Environmental Qualification topicals WCAP-8587, non-proprietary (which provides summary EQDP-s) and WCAP-8687, proprietary (which provides detailed EQDP's).

EQDP References are as follows:

1. ESE-4 D/P Transmitters Outside Containment - Previously submitted (Note, this EQDP does not specifically reference transmitters to RVLIS, but this will be done by Westinghouse July, 1983)
2. ESE-13 7300 Process Electronics - Previously submitted (Note, this EQDP does not specifically reference to RVLIS, but this will be done by Westinghouse July, 1983)

Reference Item L

Facility Operating License NPF-9

McGuire Unit 1 OL Condition 2.C.11(f) as modified by Amendment Number 10 requires installation of a Reactor Vessel Level Instrumentation System before startup following the first refueling of the unit.

Reference Item M

Facility Operating License NPF-17

McGuire Unit 2 OL Condition 2.C.10(c) requires installation of a Reactor Vessel Level Instrumentation System before startup following the first refueling of the unit.

Reference Item N

ICC Operating Procedures

Duke Power plans to upgrade the McGuire emergency operating procedures based upon the Emergency Response Guidelines (ERG) developed by the Westinghouse Owners Group. The RVLIS will be incorporated into procedures according to these guidelines.

INCORE THERMOCOUPLE SYSTEMI. PRESENT DESIGN

The present incore thermocouple system has 65 T/C's (thermocouples) positioned to sense exit flow temperature of selected fuel assemblies. See Figure 1 for these selected assemblies. The T/C's penetrate the reactor vessel head in 5 locations known as instrument ports. Each instrument port has 13 T/C's. Electrical connection to the T/C's is made at the instrument ports by connectors. The T/C's are cabled from the instrument ports to reference junction boxes to allow transition to copper for the remainder of the cabling. Reference junction temperature is monitored by the plant computer. After leaving the reference junction boxes, the cabling runs through containment electrical penetrations to the Auxiliary Building. Cabling then enters the Control Room, terminating at the back up display. The back up display by use of push-to-read switches can display any desired T/C. All T/C's are input into the plant computer by running cables from the input side of the switches on the back up display to the computer input cabinets.

A. PRESENT SYSTEM CAPABILITIES (NUREG 0737 II.F.2 Attachment 1 format)

1. Core inlet temperature data is used with core exit temperature to give radial distribution of coolant enthalpy rise across the core. This is available to the operator via CRT or hard copy.
2. The plant computer via CRT is the operator's primary display having the following capabilities:
 - a. A spatially oriented core map is available on demand indicating temperature and enthalpy rise at each core exit thermocouple location.
 - b. The incore thermocouples are an input into the saturation monitor program to assist operator actions for inadequate core cooling procedures.

- c. Direct readout via CRT and hard copy print out capability is provided for all thermocouple temperatures. This readout range extends from 200 degrees F. to 2300 degrees F.
 - d. Trending of selected thermocouples to show temperature - time history is available on demand.
 - e. Alarm capabilities are provided thru the saturation monitor program.
 - f. To be addressed in the ongoing Control Room Design Review.
3. A back up display is provided to read any of the thermocouples. With push-to-read switches, readings can be taken well within the six minute time guidance. The range of this back up display extends from 200 degrees F. to 2300 degrees F.
 4. A human factors analysis will be part of the ongoing Control Room Review (A schedule for this review will be submitted in response to NUREG 0737 Supplement 1 by April 15, 1983).
 5. Not applicable to the present system.
 6. The primary and back up displays are electrically independent and are on separate highly reliable power systems. Isolation devices are not necessary in the present system as the back up display is not in the circuit until a push-to-read switch is used.
 7. Documentation is unavailable regarding the environmental capabilities of the present system, but all readouts are located in a mild controlled environment.
 8. Availability of the plant computer has been greater than 99%. This documentation has previously been submitted via NUREG 0578/TMI Action Plan response.
 9. QA provisions cited in Appendix B do not apply to the present system.

II. INCORE THERMOCOUPLE UPGRADE

An upgrade to the McGuire Incore Thermocouple System is planned in order to better meet the requirements of NUREG 0737 Item II.F.2 Attachment 1 and Appendix B. To ensure an expedient, orderly process, the system upgrade will be accomplished in two phases.

The first phase will consist of upgrading the in-containment connectors, cabling system, and penetrations to withstand harsh accident environments.

The second phase will consist of an upgrade of the outside containment portion of the system including backup display. This is integrated with the Control Room Review effort.

A. PHASE 1 UPGRADING

Please refer to the present design description to aid in understanding this upgrade.

Qualification of the existing thermocouples is assumed. At least 16 targeted T/C's will have their connectors at the instrument ports replaced. Mineral insulated thermocouple extension cable will replace the existing softline cable. The mineral insulated cable will continue all the way to the Containment liner with appropriate disconnects for refueling provided. A separate route will be used from the non-target T/C's. Separation criteria as defined in Chapter 8 of the FSAR, cannot be totally met on the Vessel Head because of the physical configuration of the area. Separation as practical will begin as the cables leave the Upper Reactor Head and will be fully separated from the Refueling Canal Wall to the Containment liner. At the Containment liner a separate electrical penetration will be provided for the targeted T/C's.

B. PHASE 2 UPGRADE

The Phase 2 upgrade will start at the Auxiliary Building side of the Containment Penetrations. The targeted T/C's cabling will be separated

from the other T/C's. An IE qualified back up display will be installed. The targeted T/C's will then be input into the Plant Computer as the primary display through a qualified isolation device. The display types and locations (both primary and backup) will be selected as part of the Control Room Review.

C. SCHEDULE

The Phase 1 Incore Thermocouple System upgrade will be accomplished during the first refueling shutdown of each of McGuire Unit 1 and 2. The Phase 2 Incore Thermocouple System upgrade will be an integrated part of the installation of changes from the Control Room Review. The schedule for this review will be submitted by April 15, 1983 in response to NUREG 0737 Supplement 1.

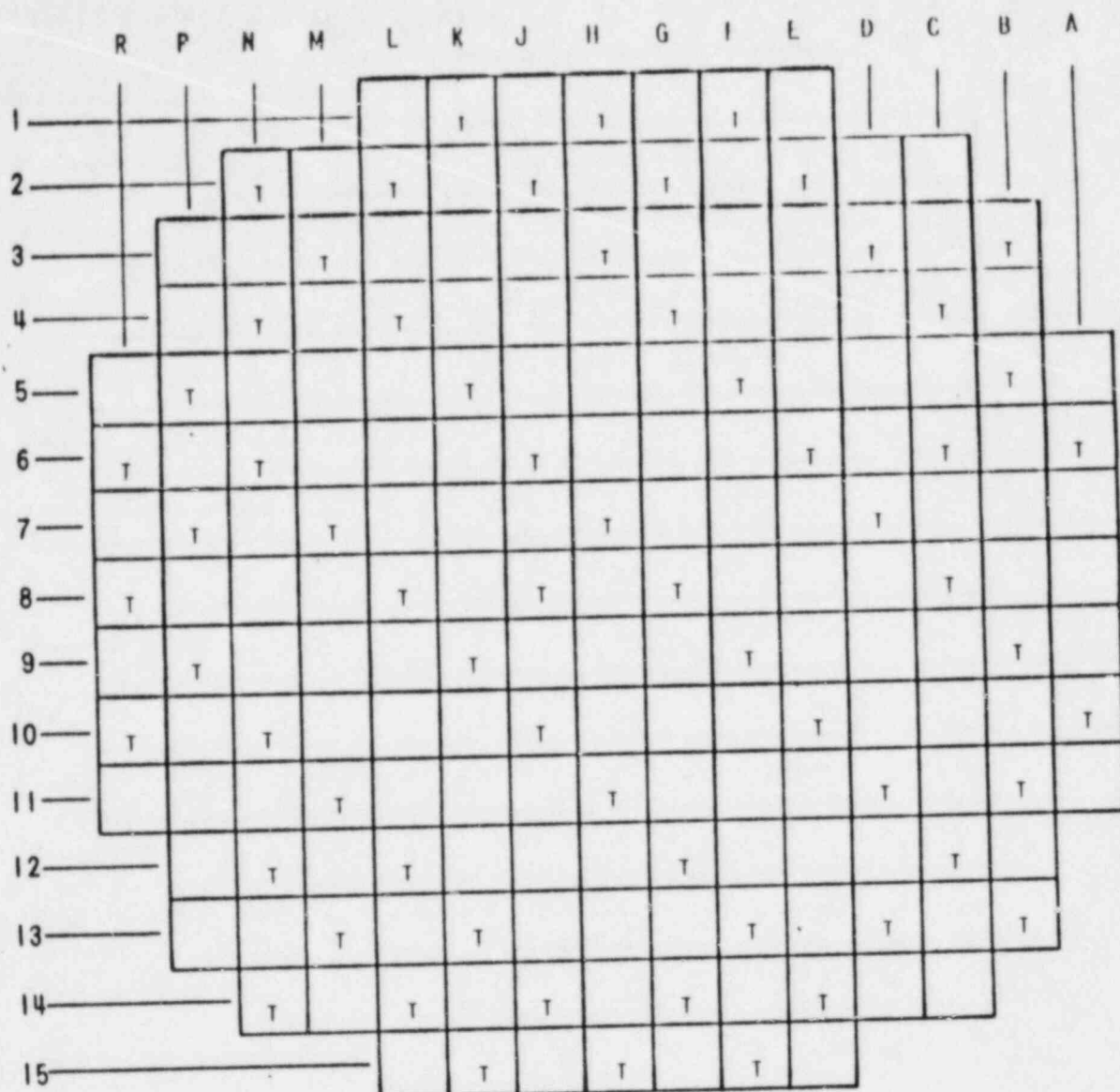
D. UPGRADED SYSTEM CAPABILITIES (NUREG 0737 II.F.2 Attachment 1 format)

Display capabilities will be the same as the present design description with exceptions listed below. Exception numbers correspond to original design numbers.

- 2(f) & 4 The control Room review will be completed and all operator display devices will be human factor designed.
- 5. System design and qualification criteria are explained in the appropriate sections of this response.
- 6. The primary and back up display will be energized from independent battery backed power sources. The back-up display and associated hardware will be on IE power. Separation as defined in Chapter 8 of FSAR will be met from the refueling canal to the isolation device.
- 7. The targeted T/C instrumentation (T/C qualification assumed) will be seismically and environmentally qualified up to and including the isolation device. Seismic qualification will be consistent with

the methodologies described in Section 3.10 of the McGuire FSAR. Instrumentation subject to a harsh environment will be environmentally qualified consistent with the Duke Power Company position on the Category II Guidelines of NUREG 0588 as detailed in the Duke submittal of June 30, 1982, Docket Nos 50-369, 50-370. The isolation device will be in an accessible area following an accident.

8. Quality Assurance provisions cited in Duke Power's QA program for nuclear safety related equipment will be met for all equipment installed except the primary display and hardware beyond the isolation device.



T - THERMOCOUPLE

Figure 1