Met-Ed / GPU

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Writer's Direct Dial Number

November 13, 1981
L1L 324

Office of Nuclear Reactor Regulation
Attn: John F. Stolz, Chief
Operating Reactors Branch No. 4
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Inadequate Core Cooling (NUREG 0737 II.F.2)

With the issuance of NUREG 0578 and 0737 GPU Nuclear began an evaluation of additional instrumentation which might be used to detect the existence of or the approach to Inadequate Core Cooling. In your letters of August 26, 1981 (L1L 246) and September 15, 1981 (L1L 261) we described our present program of evaluation and agreed to inform you of the results of our evaluation with the following results:

o Our evaluation began with a review of the nature of inadequate core cooling and how its approach could be detected with existing instrumentation.

  The approach to inadequate core cooling is potentially caused by Loss of Coolant Accidents (LOCA's) or overcooling transients which result in a reactor trip and initiation of the Emergency Core Cooling System (ECCS). The transient may be severe enough to result in saturated conditions in the Reactor Coolant System. The approach to saturation would be detected by the saturation margin monitors. Other indications of two phase flow with RCP's running would include a reduction in flow by the RCS flow meter, change in RCP motor currently resulting from 2 phase flow in the RCP's and a reduction in neutron attenuation as detected by the source range instrumentation. When the RCP's are turned off, and separation occurs, the approach to ICC will be further detected by the new extended range Hot Leg temperature indicators. As the inventory is reduced, the core begins to uncover and the core exit thermocouples (TC) provided direct indication of the core temperature. The TC's are displayed through the plant computer to the operator. Additionally, a backup incore thermocouple display will be provided for 16 (4 in each quadrant) thermocouples as described in our letter of August 23, 1981 (L1L 178).

o Our evaluation progressed to a more intensive review of the approach to Inadequate Core Cooling and what additional instrumentation/controls might be used to detect it.

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The evaluation revealed additional primary system level instrumentation would be useful in supporting RCS venting and providing confirmatory information to the principle indicators described above as they are used in confirming either natural circulation or conditions which may interrupt natural circulation. The instrument would also provide some additional data for diagnostic purposes. Such an instrument would necessarily be developed within the following constraints:

- oo the range should cover the area of concern
- oo the accuracy should be sufficient to measure refilling of the loops to support natural circulation
- oo the equipment should be redundant, single failure proof and environmentally qualified for post accident conditions
- oo the system should be capable of being retrofitted to TMI-1 and preserve the integrity of the pressure boundary
- oo the system is only used with RCS pumps off
- oo the system should be basically simple in design
- oo the system should be easily maintained
- oo the system should avoid the need for proof of principle testing if possible.
- oo the system could minimize the possibility of ambiguous or inaccurate information.

Following the extensive exploration discussions with all potential suppliers concerning the availability and adaptability of existing systems, a basic differential pressure system design to be incorporated into the RCS hot legs was developed. It is currently referred to as the Hot Leg Level Instrument System (HLLIS). The Hot Leg Level Instrument System which meets all the aforementioned conditions is described in enclosure 1 and shown in figure 1. Enclosure 2 provides a schedule for installation with milestones. Based on these projections, the HLLIS would be installed in the Cycle 6 refueling outage based on NRC concurrence with the technical approach by early January, 1982.

Should you have any questions concerning our evaluation or proposed Hot Leg Level Instrument System we are available to meet with members of your staff.

Sincerely,

H. D. Hukill
Director, TMI-1

HDH:LWH:vjf

cc: R. Jacobs
R. C. Haynes

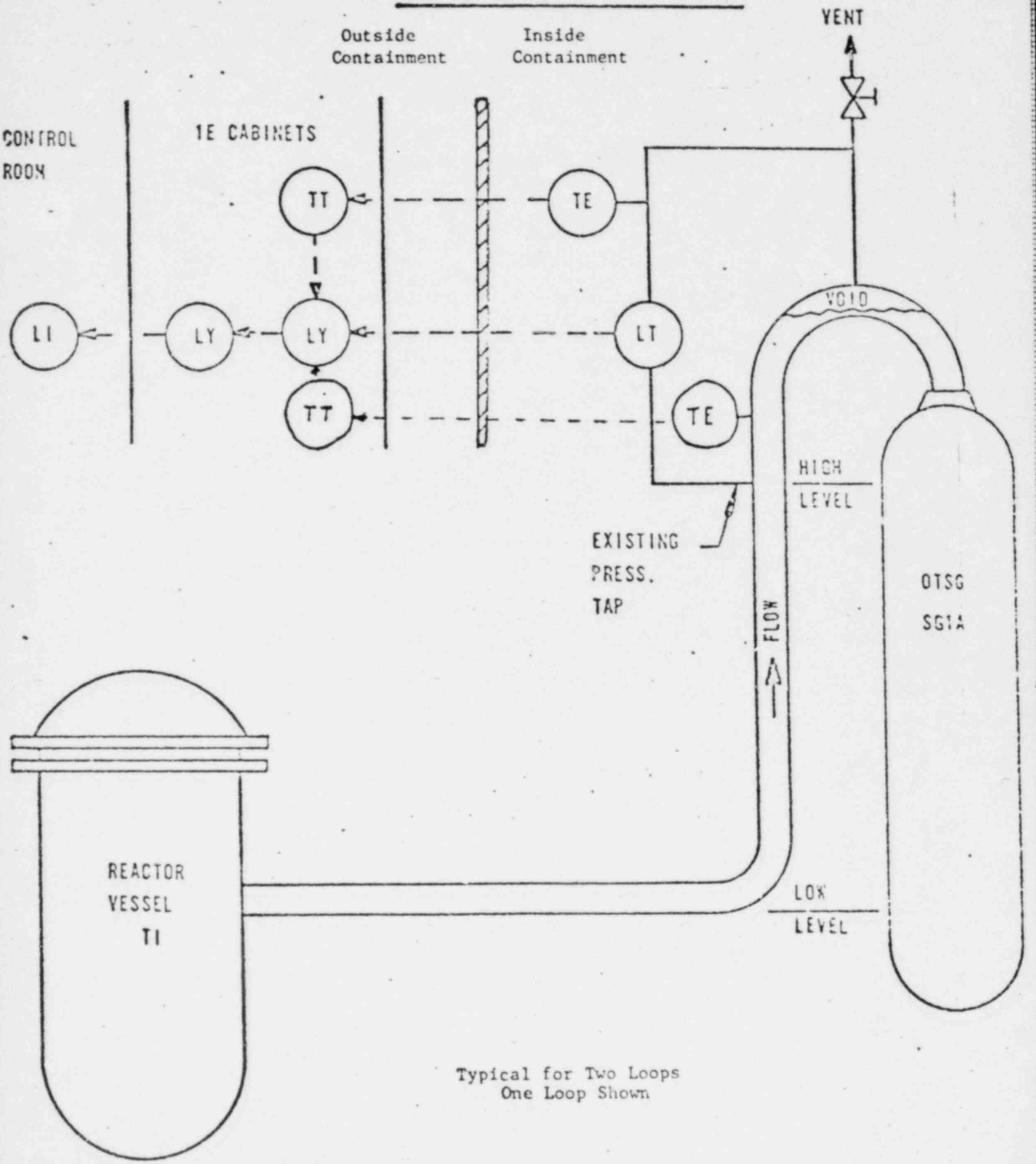
ENCLOSURE 1

Hot Leg Level Instrumentation System Description

The HLLIS system will consist of two Rosemount 1153D D/P transmitters mounted inside containment to measure the hot leg level. These transmitters are, currently, undergoing qualification testing to IEEE-323-1974 and IEEE-344-1975. The D/P transmitters will be connected to the vent connection on top of the hot leg (candy cane) on loop "A" and "B" for the high pressure connection. The low pressure connection will be connected 10 feet below the existing nozzles on loop "A" and "B". Valve manifolds at the transmitters will comply with ASME III Code Class 2 latest revision. The transmitters will be mounted on seismically designed racks inside containment. New piping will be seismically designed. System power will be from the vital instrument bus. Power for the transmitters and signal conditioning electronics will be from existing Foxboro "Spec 200" equipment racks which are fully qualified to IEEE-323-1974 and IEEE-344-1975. Output signals can be to any operator interface (i.e. recorder indicator, computer, etc.). The reference leg of the level tansmitters will be monitored by RTD's qualified to IEE-323-1974 and IEE-344-1975 and will automatically compensate the measurment for reference leg density variation. The existing RTD's in the hot legs will be used to compensate the level measurement for changes in hot leg density. Because the system is designed for a pumps off condition with the RCS in a quiescent state and the simplistic nature of the differentiate pressure system, proof of principle testing is not warranted.

ICC

HOT LEG LEVEL INSTRUMENT SYSTEM



Typical for Two Loops
One Loop Shown

Hot Leg Level Instrument System (HLLIS) Schedule

Project Plan

Activity	Duration	Target Completion Date
Prepare/Issue System Design Description	(6 wks)	December 15, 1981
Complete Preliminary Engineering Design	(8 wks)	February 15, 1982
Develop Procurement Specification and Place Order	(8 wks)	April 15, 1982
Hardware Delivery including New Electrical Penetrations Issuance of Construction Package	(44wks)*	February 15, 1983
Construction and Startup & Test	(6 wks)**	March 30, 1983

*Assumed

**First refueling after February 15, 1982 (commensurate with Cycle 6 refueling) based on NRC concurrence with the technical approach by early January, 1982.