

SEP 1 1981

289

MEMORANDUM FOR: Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

THRU: Harold L. Ornstein
Office for Analysis and Evaluation
of Operational Data

FROM: John Pellet
Office for Analysis and Evaluation
of Operational Data

SUBJECT: TMI-1 RESTART -- REACTOR WATER LEVEL
MONITORING

I attended a meeting on the above subject on August 10, 1981 between GPUN and NRC. Attached is an attendance list from that meeting. The purpose of the meeting was to discuss a GPUN draft letter proposing a program toward resolution of the vessel monitoring requirements for TMI-1 restart. Also attached to this memo are the above draft letter and the broad highlights of the meeting.

|s|

John Pellet
Office for Analysis and Evaluation
of Operational Data

Attachments:
As stated

XA PDR

8109090011

A89

ATTENDANCE LIST

NRC

Harley Silver, NRR

Rick Jacobs, NRR

Leo Rubenstein, NRR

John Stolz, NRR

Ernie Rossi, NRR

Larry Phillips, NRR

Lenny Olshan, NRR

James Shea, NRR

John Pellet, AEOD

Dom DiIanni, NRR

GPUN

Ed Wallace, Licensing

Bob Keaton, Systems Engineer

Dave Slear, Project Engineering

MEETING HIGHLIGHTS

GPUN initiated a general discussion of the letter by stating that they desired to get away from an "adversary" relationship with NRC on this issue and move toward a meeting of minds. GPUN is not refusing to add a level monitor but rather wishes to have a firm understanding of how to use one prior to attempting to install one. GPUN reiterated that the present ICC event guidelines are adequate for identified events and they felt NRC concurred with this position. However, GPUN now understands that level monitoring may be of some use for unidentified events where specific guidelines are not written. GPUN is in the process of discussing with the various users (CE, W, B&W, and EG&G) of level monitoring the uses of the various water level instrumentation systems to detect water level, inventory, etc. GPUN noted that the proposed program might conclude that no level monitoring was required but they recognized potential uses and the staff desires and intends for the program to select a vendor (noting the upper level GPUN management uncertainty on this issue). The earliest probable installation of such a system is the first refueling outage after restart (November, 1982 given current schedule).

NRC's response was generally in the area of scheduling and timing. NRC is very hesitant about slipping the dates (Rubenstein). Also, a "how to use" effort was regarded as being very late and it was felt that GPUN should be beyond the current point by now. The following comments or suggested modifications were offered on the GPUN draft letter:

- (1) the NRC staff witness referred at the top of page 2 was Ross
- (2) The last four lines of the "Activities" section stating that none of the current systems meet all criteria in NUREG-0737 was challenged by staff as incorrect and its deletion suggested (Phillips).

- (3) The staff rejected the position (second paragraph of page 2) that if level information was not required to preclude ICC there was no need to install level instrumentation (Phillips),
- (4) The possible uses described (third paragraph of page 3) are the types of applications intended by the staff, and
- (5) GPUN should reexamine NUREG-0737 section II.F.2 requirements of documentation especially with respect to restart.

August 1981
LIL 208

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 (II.F.2)

NUREG 0737, Section II.F.2 requires an evaluation of additional instrumentation which might be used to detect the existence of or approach to inadequate core cooling. It also requires that the evaluation include reactor water level indication. In response to this requirement, GPUN has been conducting an evaluation of such instrumentation to determine its usefulness and practicality. Our evaluation has included both in-house activities and participation in Owners Group activities. The purpose of this letter is to summarize briefly these activities to outline our planned program and to identify to you certain significant concerns which have arisen.

Activities

We believe we have been focusing our efforts on a long term problem that requires very carefully considered judgments. As discussed before the Atomic Safety and Licensing Board (ASLB) hearing on January 21 and 22, 1981 and documentation of prefiled testimony of September 15, 1980, GPUN has been actively engaged in the issue of inadequate core cooling instrumentation including the pursuit of uses and the evaluation of instrumentation for measurement of water level. On March 19 and 20, 1981 inadequate cooling instrumentation was further discussed by representatives of NRC through cross-examination before the ASLB. In Amendment 21 to the TMI-1 Restart Report dated October 3, 1980, GPUN provided an additional evaluation (by B&W) concerning inadequate core cooling. Finally, in meetings before the Advisory Committee on Reactor Safeguards (ACRS) on November 29 and December 4, 1980 and June 25 and July 10, 1981, GPUN provided additional updating of status of inadequate core cooling including water level. We have attempted to understand the potential benefits of improved information against the additional complexity and risk associated

with new instrumentation systems in process piping and in the control room. We have already achieved a significant short term improvement in this TMI-2 Lesson Learned item through the use of additional and modified instrumentation and procedures that have been verified by detailed analysis by both our staff, B&W, and the NRC staff. This is also supported by the ACRS Chairman's letters of December 12, 1980, June 9, 1981 and July 11, 1981 on this subject. Thus, our efforts support a deliberate process necessary at this stage to assure a proper decision. This deliberate process follows the normal engineering method of development of functional criteria, identification of alternatives, and selection of the preferred system prior to detailed engineering, procurement and installation. This approach is the same as that supported by an NRC staff witness appearing on this subject (see TMI-1 ASLB Tr. 15956-15959).

One major thrust of our evaluations has been an attempt to understand the basic criteria for the additional information. We used as a starting point the criteria given in NUREG 0737. We found, however, as discussed below, that these must be supplemented in order to arrive at a definitive set of criteria which could be used as a basis for existing or additional instrument selection. To this end, we participated in the evaluations. The intent has been to determine which events the additional instruments might be used to detect, confirm or diagnose the existence or approach to an ICC condition, to determine which portion of the operating crew (e.g., control panel operators, shift supervisors, STA, etc.) would use the information, and to define what actions would be taken or avoided based on the information.

In parallel with the development of criteria we have also undertaken an evaluation of available or proposed instruments which might be utilized. We have participated in the B&W Owner's Group evaluation as well as performing our own in-house evaluation. In addition, because of the continuing unanswered questions, we have recently initiated an independent review by an outside consultant, Dr. Vijay Dhir of UCLA, to define the advantages and disadvantages of existing and proposed systems and to consider whether additional, alternative, new approaches exist which warrant examination. We have furthermore agreed to consult in a proposed program expansion by Penn. State University to continue development of neutron detectors as a method of measuring reactor vessel water level. To date, our evaluation has concluded none of the systems currently under development meet all the NRC criteria for detection systems as listed in NUREG 0737. Additionally, combinations of instrumentation also do not appear to meet established NRC criteria as written.

Concerns

The status of our evaluations to date was presented to the TMI-1 Subcommittee of the Advisory Committee on Reactor Safeguards (ACRS) at

their meeting on June 25 and 26, 1981. At that time, we pointed out that certain key issues regarding the use of the suggested additional instruments remain unsettled.

Our major concern is how to meet the specific requirement of NUREG 0737 that instrumentation should "provide an unambiguous, easy to interpret, indication of inadequate core cooling (ICC)". We use the term ICC to refer to those core conditions at which the limits of 10 CFR 50.46 would be exceeded. It thus represents a non-mechanistic condition beyond the design basis. Its significance in the present operating procedures is that if such conditions are being approached (as indicated by the core thermocouple readings), the operator is directed to take extraordinary measures in order to improve core cooling.

We do not yet understand how water level could be used for an analogous purpose. The water level and its rate of change with time vary enormously for different size leaks and leak locations. The attached figure 1, for example, shows the calculated water level for different size small breaks. For large breaks the level drops even more quickly and results in temporary uncovering of the core. For all of these leak sizes and locations, however, the emergency core cooling systems will function to ensure that ICC does not occur. We have found no method by which water level information during a real accident could be interpreted to indicate that the emergency core cooling systems were not functioning as intended and/or that inadequate core cooling was being approached. We have scheduled meetings with each of the PWR vendors and plan to discuss this matter with them.

As we discussed during our recent presentation to the Advisory Committee on Reactor Safeguards, we have identified other possible uses for water level or related information. One possible use would be to determine whether venting the hot legs was necessary or desirable, and to guide any such venting operations. Another possible use, for example, would be in conjunction with the existing saturation meters to determine whether HPI flow could be reduced or terminated. We would appreciate your guidance as to whether these types of applications are consistent with the criteria as defined in NUREG 0737 requirement for detection of ICC.

Program

As exhibited in figure 2 of the GPU Nuclear Program for resolution of the Inadequate Core Cooling Instrumentation/Water Level (Item II.F.2) consists of a further evaluation of the three major areas:

1. The uses of the leading contenders (CE, (W), B&W and EG&G) water level instrumentation systems to detect water level, inventory, etc.

2. The adequacy of presently or soon to be available instrumentation (Reactor Vessel Differential Pressures, Heated Thermocouples, and R C Hot Leg Level) proposed by the NSSS Vendors (Westinghouse, Combustion Engineering and Babcock and Wilcox).
3. The new ideas being developed throughout the industry (Penn State University - Neutron Monitoring and a study by Dr. Vijay Dhir on ICC - Water Level Instruments).

The evaluation period will include meetings and discussions with vendors and consultants during the month of August to develop an integrated summary leading to a technical recommendation on inadequate core cooling instrumentation including evaluation of water level during the month of October. By November a submittal to NRC concerning our technical recommendation will be made.

Conclusion

GPUN is continuing its evaluation of possible instrumentation in accordance with the requirements of NUREG 0737. Furthermore, GPUN believes that the program delineated above represents reasonable progress, is responsive to the ACRS, and is capable of leading towards resolution of this issue with the staff.

Sincerely,

H. D. Hukill
Director, TMI-1

Enclosures

cc: H. Denton
B. H. Grier
L. Barrett
D. DiIanni
H. Silver

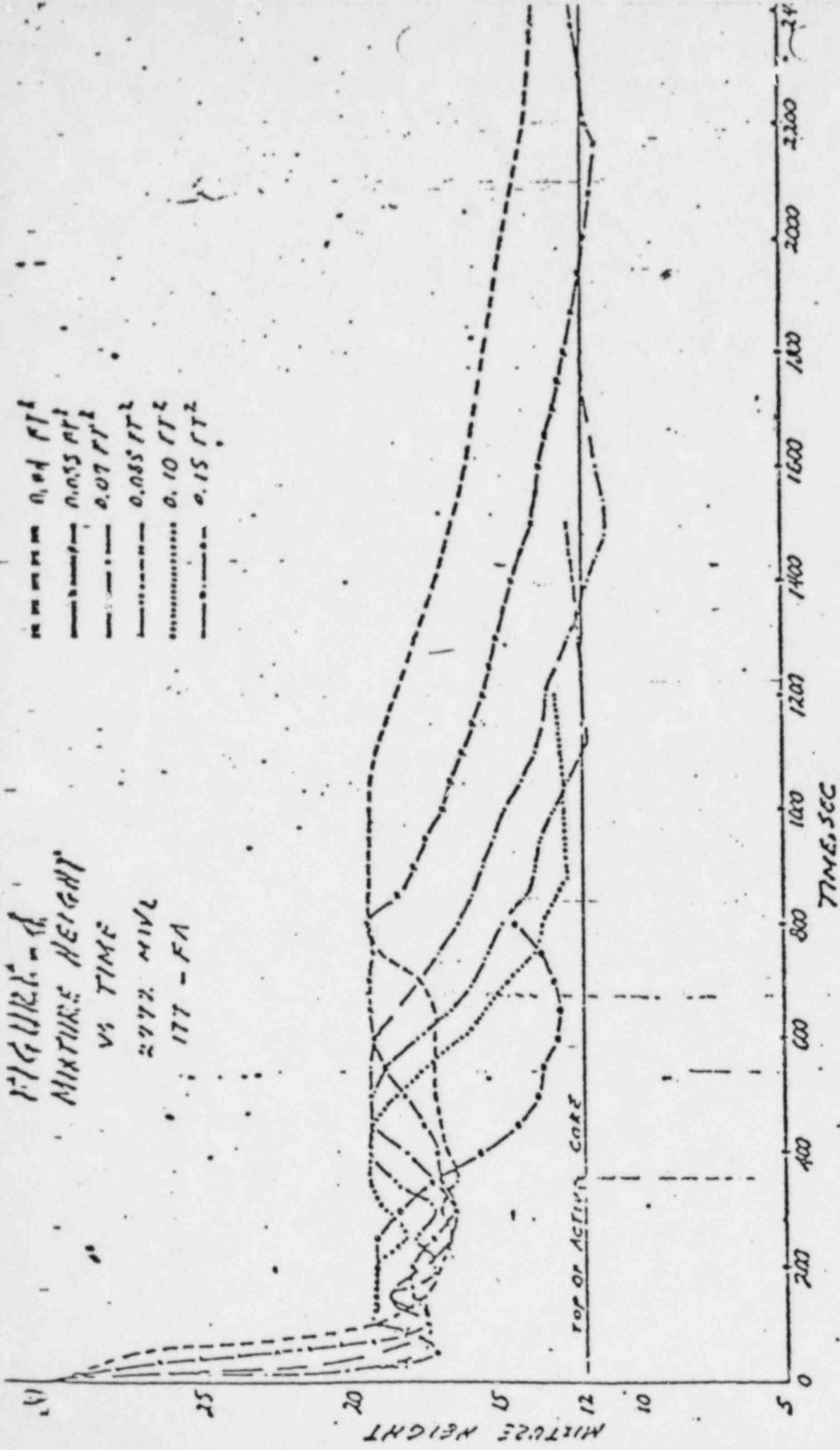
FIGURE - 1
MIXTURE HEIGHT

VS TIME

27% MIVL

177 - FA

- 0.04 FT²
- 0.055 FT²
- 0.07 FT²
- 0.085 FT²
- 0.10 FT²
- 0.15 FT²



11/18
 11/16
 10/1
 9/1

INFORMATION FROM OTHER UTILITIES.

TECH. REVIEW MEETING

CONTINUING TECH. EVAL. OF B+W. Sys.
B+W OWNERS GROUP ACTIVITIES

TECH. REVIEW MEETING

GPUN PREPARATION FOR TECH. REVIEW.

EG+G
Tech Review MTG.

OUTSIDE CONSULTANT EVALUATION (UCLA)

GPUN ENGINEERING & OPERATIONS EVAL.

GPUN INTEGRATED SUMMARY.

GPUN TECHNICAL RECOMMENDATION

Figure 2

EVALUATION SCHEDULE

INADEQUATE CORE COOLING