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SUBJECT: SUMMARY OF MEETINGS HELD ON AUGUST 24 AND 25, 1977 WITH REPRESENTATIVES OF THE MARK I OWNER'S GROUP

On August 24 and 25, 1977, meetings were held in Bethesda, Maryland with representatives of the Mark I Owner's Group and the General Electric Company (GE). The purpose of the meetings was to discuss (1) the results and bases for Decision Point No. 2 in the Mark I Owner's Long Term Program (LTP) (this Decision Point involved an assessment of the need to develop potential load mitigating devices), (2) proposed changes in the scope or direction of the LTP due to the results of Decision Point No. 2, and (3) the status of the analytical and testing programs being conducted as part of the LTP. Enclosures 1 and 2 are lists of the attendees of the August 24 and 25 meetings, respectively.

Summary

After introductory remarks by R. Logue, Chairman of the Mark I Owner's Group, R. Buchholz, GE, discussed the meeting agenda and provided an overview of the results of Decision Point No. 2. He emphasized that Decision Point No. 2 was a programmatic decision for all facilities with the Mark I containment system. He further stated that the Mark I Owner's Group had concluded that a balance of load mitigation and structural modifications is optimum and that the optimum balance will vary from plant to plant. Enclosure 3 contains the slides used in Mr. Buchholz's presentation.

B. Kohrs, GE, provided a more detailed discussion of the bases for the Decision Point No. 2 conclusions. Enclosure 4 contains the slides used in his presentation. He stated that the decision was based on (1) generic programmatic efforts related to load definition and the establishment of structural acceptance criteria and (2) plant-unique assessments of the costs of load mitigation and structural modifications. He indicated that the loads utilized for the purpose of making this assessment represented extensions of the STP loads, as updated by the ongoing testing program results. He further stated that the plant-unique assessments involved ratioing techniques (back to the STP baseline results), rather than precise analytical analyses. He indicated that, as a result of Decision Point No. 2, the following areas of load mitigation will continue to be investigated:

1. Safety-Relief Valve Line Mitigating Devices
2. Downcomer (LOCA/Chugging) Mitigating Devices
3. Vent Header Impact Mitigating Devices
4. Drywell to Wetwell Differential Pressure Control
5. Reduced Downcomer Submergence

He concluded by reemphasizing that a balance of load mitigation (SRV, LOCA/Chugging) and structural modifications is optimum and that they do not yet know what mix of the two will be appropriate for particular facilities.

B. Kohrs, GE, then discussed Revision 2 to the Program Action Plan (PAP) which was submitted to the NRC on August 11, 1977. He stated that the PAP was revised (1) to reflect the program direction and new tasks which resulted from Decision Point No. 2, and (2) to provide a general program update which reflects modified tasks and/or task schedules. He stated that the PAP would be next revised following the results of Decision Point No. 3 (October 1977). Enclosure 5 contains the slides used in his presentation, which included a description of each of the specific changes in the PAP effected by Revision 2.

B. Kohrs, GE, discussed ongoing activities which are designed to facilitate Decision Point No. 3 (this Decision Point involves the selection of load mitigating devices for further testing and, ultimately, for installation in Mark I BWR facilities).

He indicated that the selection of a downcomer load mitigating device involved optimizing pool swell load mitigation, vent header impact mitigation, and chugging load mitigation characteristics. He stated that it was the goal of the Mark I Owner's Group to identify, at Decision Point No. 3, a single downcomer configuration (i.e., the existing design or a load mitigating device) for steam testing in the Full Scale Testing Facility (FSTF).

He stated that the FSTF is scheduled to be ready for the commencement of steam testing in February 1979. The activities leading to the selection of the downcomer design for testing in the FSTF include:

1. definition of condensation oscillation loads
2. conduct of small scale pool swell mitigation testing
3. conduct of small scale chugging mitigation testing
4. conduct of small scale vent header impact mitigation testing

It was noted that, should it be impossible to select a single downcomer design for testing in the FSTF, the additional testing required in the FSTF would have the effect of extending the LTP.

He stated that small scale testing of a T-quencher safety-relief valve discharge device had demonstrated promising results and that such a device would be tested, in-plant at Monticello, later this year (October/November 1977).

Enclosure 6 contains the slides used in his presentation.

B. Smith, GE, provided a description of the Mark I FSTF, including the objectives of the FSTF program, the key features of the facility, the test matrix, the status of construction, and the integrated schedule for the FSTF program. Enclosure 7 contains the slides used in his presentation.

W. McConaghy, GE, provided status reports on (1) the 1/4 scale testing program, (2) the flexible cyclinder analytical and testing programs, (3) the 1/12 scale 3-D testing program, and (4) the pool swell analytical model development program. Enclosure 8 contains the slides used in his presentation. He indicated that the 1/4 scale "scaling evaluation tests" had been completed and that good agreement had been obtained between the results of the 1/12 scale and 1/4 scale testing programs. A

full report on the results of this phase of the 1/4 scale testing program will be submitted to the NRC in September 1977. He indicated that "facility sensitivity tests" to evaluate the effect of facility stiffness on 1/4 scale test program results had been completed and that a report will be submitted to the NRC. He indicated that testing of 7 potential load mitigating devices in the 1/4 scale facility had been completed, with the following results:

a. all mitigators seem to mitigate upload
b. several mitigators produce significant reductions in peak vent impact pressure
c. devices mitigate some loads better than others
d. utilization of a 3 ft. submergence with full or partial ΔP is an effective mitigator
e. the "shroud" device appears to be the best mitigating device for pool swell

A series of films of 1/4 scale tests using potential downcomer load mitigating devices were shown.

Mr. McConaghy briefly described the status of the EPRI sponsored activities related to flexible cyclinder analysis. He stated that additional "drop tests" will be performed to determine the effect of internal pressure within the vent header at the time of pool swell impact. He stated that plastic deformation had been observed in tests without internal pressure in the cylinder at velocities of approximately 17 fps. A final report on this program is scheduled for submittal in December 1977. (The Mark I Owner's Group is also planning to perform flexible cylinder testing in the 1/4 scale test facility in December 1977).

Mr. McConaghy discussed the status of the EPRI sponsored 1/12 scale 3-D testing program. He stated that no "quick look" data has been issued at this time, but that a "quick look" report is anticipated in October 1977. He indicated that two new subtasks have been added to this program: (1) a feasibility study to determine submerged velocity in the suppression pool photographically, and (2) conduct of asymmetric tests. (He also noted that the Mark I Owner's Group have initiated a program to qualitatively assess comparative open tank pool swell hydrodynamic behavior between a cylinder and a 360° torus).

Mr. McConaghy discussed the status of the EPRI sponsored pool swell analytical model development. He stated that 1/4 scale testing program data is being used to qualify the 2-D model. He further stated that, in the event that a downcomer load mitigating device is utilized, the analytical models would require modification.

B. Smith, GE, discussed the status of the LTP tasks related to the definition of steam condensation loads. Enclosure 9 contains the slides

used in his presentation. He indicated that the analytical model development for predicting chugging loads on the torus shell (wall) was essentially complete. He further indicated that: (1) the current intention of the Mark I Owner's is to rely on the empirical model, as qualified by the FSTF results, to arrive at LTP load definition, (2) the model will be used to develop sensitivity factors for use in plant-unique implementation of the FSTF results, and (3) it is a strong possibility that the Mark I Owner's may elect to use a "bounding load" approach for chugging loads on the torus shell. He also discussed the results of the recently-conducted Mark I submergence chugging tests (single downcomer) at a foreign facility, the most significant of which is that dynamic pressure loads decreased with decreasing submergence. This program also included tests on a "teeth and crown" downcomer mitigating device and demonstrated a 30% reduction in peak loads.

B. Smith also discussed the status of Mark I LTP chugging load mitigation testing efforts. He indicated that small-scale scoping (qualitative) tests had been performed on six mitigating device designs, which indicated that it was appropriate to perform further quantitative testing. Such quantitative testing is currently in progress and is scheduled for completion in September 1977.

M. Tanner, GE, discussed Mark I LTP activities related to safety-relief valves. Enclosure 10 contains the slides used in his presentation. He indicated that the analytical model development program for the ramshead device has been revised and that these revisions would be documented in October 1977 in a topical report which would include a comparison of the model predictions with the Monticello in-plant test results. He provided a summary of the Monticello test results and described the resolution of previously-identified discrepancies, i.e., torus pressure distribution, leaking SRV/hot pool conditions, and strain gage errors.

M. Tanner also discussed the program for development and testing of an SRV load mitigating device (T-quencher device) including confirmatory in-plant testing in the Monticello facility and the development of an analytical model for such a device.

A brief discussion summarizing Decision Point No. 2 and the activities underway to arrive at Decision Point No. 3 was held with V. Stello and D. G. Eisenhut. Subsequent discussions included (1) schedule for implementation of modifications/installation of mitigating devices, and (2) the potential for slips in the completion of the generic portion of the LTP. These discussions highlighted the necessity for an early resolution of the LTP structural acceptance criteria.

At the conclusion of the meeting, the NRC staff provided the following comments:

1. A meeting should be scheduled in mid-September to discuss certain technical considerations which are of vital importance to Decision Point No. 3, i.e., the viability of drywell to wetwell differential pressure control and reduced submergence as LTP solutions, and NRC requirements related to the SRV/DBA pool swell load combination. Such a meeting would also be an appropriate time to further discuss, in detail, the design features of the FSTF.

2. Activities related to the establishment of the LTP structural acceptance criteria should be accelerated to provide a meaningful input to Decision Point No. 3. The NRC staff requested a detailed schedule for the development of such criteria, particularly as it effects Decision Point No. 3, within one week. The staff expressed its willingness to meet and work with the Mark I Owner's Group on this matter as often as is required to accomplish this task.

3. The staff requested improvements in the timeliness of report submitalls related to the various LTP tasks and requested an updated list of reports to be submitted, including the revised submittal dates.

4. The staff re-stated a previous request that each utility performing voluntary modifications to the containment system of its facility provide, for information purposes, to the NRC advance information related to such modifications. In addition, the staff identified a need for further discussions related to post-modification test requirements for modifications involving a breach in the containment boundary.

5. The staff expressed their concerns regarding the activities related to investigation of hydrodynamic/structural interaction, i.e., that such activities may become a critical path item in the load definition process.

6. The staff requested that further interaction take place regarding the Monticello SRV-mitigator test program before the conduct of testing. It was agreed that such interaction could take the form of a submittal describing the details of the test program or could be accomplished by means of another meeting on this subject. The staff identified two specific areas of concern related to this test program: (1) instrumentation to measure SRV pipe wall temperature rather than the temperature of the fluid in the SRV discharge line itself, and (2) the lack of instrumentation to measure loads on the SRV piping in the drywell.

7. The staff identified the need for a separate meeting to discuss the Monticello Final Test Report (Ramshead device). Of particular

concern is the question as to how a "leaky valve" will be considered for SRV load combinations.

8. The staff stated that it would be reinvestigating torus temperature limits whether part of the Mark I program or not. (The Mark I Owner's Group stated that this matter should be addressed to the individual utilities).

9. The staff requested that the Mark I Owner's Group submit 1/4 scale testing program information as it becomes available, rather than compiling it in one final report.

10. The staff requested that the September 1977 report on the 1/4 scale "scaling studies" program include a discussion of the upward load impulse observed in the 1/4 scale tests (as compared to the impulse observed in the 1/12 scale tests).

John C. Guibert
Technical Assistant
Division of Operating Reactors

Enclosures:
As stated

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Enclosure 1

MARK I OWNERS GROUP/NRC
MEETING, AUGUST 24, 1977

ATTENDANCE LIST

Name	Organization
J. C. Guibert	NRC/DOR
C. I. Grimes	NRC/DOR
R. Stuart	NRC/DOR
A. A. Sonin	MIT (for BNL)
J. Ranlet	BNL
G. Maise	BNL
K. Herring	NRC/DOR
S. Hosford	NRC/DOR
K. A. Hoedeman	NUTECH
L. O. DelGeorge	Com. Ed.
G. R. Edwards	NUTECH
M. A. Connor, Jr.	Carolina Power & Light
K. A. Meyer	Iowa Electric
L. V. Sobon	GE
R. F. Reedy	NUTECH
R. N. Smart	NUS Co.
R. P. Lovci	N.P.P.D.
L. D. Steinert	GE
R. E. Rogers	TVA
B. W. Smith	GE
B. Kohrs	GE
R. H. Buchholz	GE
M. G. Mosier	NMPC
G. E. Wade	GE
R. B. Swenson	PASNY
B. Bauer	PSE&G
F. E. Gregor	DECO
H. S. Yao	NSC
J. A. Zwolinski	NRC/DSS
W. E. Cooper	Teledyne
J. R. Jordan	GPCo
T. T. Robin	SCSI
D. M. Crowe	SCSI
K. R. Iyengar	SCSI
D. L. Whitt	CBI
W. R. Mikesell	CBI
L. Slegers	NRC/RSR
C. Anderson	NRC/DSS
G. Bagchi	NRC/DOR

Name	Organization
A. Hafiz	NRC/SEB
C. Hofmayer	NRC/DOR
G. H. Neils	NSP
C. W. Sullivan	EPRI
W. J. McConaghy	GE
J. A. Kudrick	NRC/DSS
G. Lainas	NRC/DSS
R. H. Logue	PECo
G. E. O'Connor	YAEC

Enclosure 2

MARK I OWNERS/NRC
MEETING
AUGUST 25, 1977

ATTENDANCE LIST

NAME	ORGANIZATION
J. Guibert	NRC/DOR
C. I. Grimes	NRC/DOR
A. A. Sonin	MIT (For BNL)
J. Ranlet	BNL
K. Herring	NRC/DOR
S. Hosford	NRC/DOR
C. Hofmayer	NRC/DOR
L. Slegers	NRC/RSR
B. Kohrs	GE
J. Humphrey	GE
L. J. Sobon	GE
R. F. Reedy	NUTECH
R. N. Smart	NUTECH
K. A. Meyer	Iowa Electric
R. P. Lovci	NPPD
L. D. Steinert	GE
W. J. McConaghy	GE
R. E. Rogers	TVA
B. W. Smith	GE
R. H. Buchholz	GE
R. H. Logue	PECo
M. E. Tanner	GE
George Maise	BNL
G. H. Neils	NSP
K. A. Hoedeman	NUTECH
C. W. Sullivan	EPRI
G. R. Edwards	NUTECH
L. O. DelGeorge	Com. Ed.
M. G. Mosier	NMPC
R. B. Swenson	PASNY
O. Mallon	PASNY
G. E. O'Connor	YAEC
H. S. Yao	NSC
W. F. Bauer	PSE&G
F. E. Gregor	DECo
W. E. Cooper	TES
G. E. Wade	GE
J. R. Jordan	GPCo

NAME	ORGANIZATION
T. T. Robin	SCSI
D. M. Crowe	SCSI
M. A. Connor, Jr.	CP&L
D. L. Whitt	CBI
W. R. Mikesell	CBI
A. Hafiz	NRC/SEB
C. Anderson	NRC/DSS
J. Kudrick	NRC/DSS
D. C. Jeng	NRC/SEB
R. J. Stuart	NRC/DOR
L. C. Shao	NRC/DOR