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SUMMARY/MINUTES OF A JOINT ACRS SUBCOMMITTEE
MEETING ON EXTREME EXTERNAL PHENOMENA/SEVERE ACCIDENT
SEPTEMBER 6, 1989
BETHESDA, MARYLAND

A Joint ACRS Subcommittee on Extreme External Phenomena/Severe Accident met on September 6, 1989 at Bethesda, Maryland, to review with the NRC Staff the IPEEE program or individual plant examination for external events program. The meeting was requested by L. Shao/G. Bagchi of the NRC Staff with approval by C. P. Siess, Chairman of the Subcommittee on Extreme External Phenomena.

Notice of the meeting was published in the Federal Register on August 18, 1989. The schedule of items covered during the meeting and a list of handouts are kept with the office copy. There were no written or oral statements received or presented from members of the public at the meeting. E.G. Igne was cognizant ACRS staff member for the meeting.

Principal Attendees:

ACRS:
C. P. Siess, Chairman
C. Wylie, Member
C. Michelson, Member
I. Catton, Member
P. Shewmon, Member

NRC:
R. Kenneally
A. Murphy
L. Abramson
J. Chen
W. Beckner
L. Reiter
G. Bagchi
D. Jeng
C. McCracken

Others:
K. Jamali, NUS
J. Stepp, EPRI
J. Whitcraft, NUMARC
K. Vaurek, Westinghouse
R. Murry, LLNL
W. Cross, STS

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Abstract of Meeting

On September 6, 1989 a Joint ACRS Subcommittee on Extreme External Phenomena Severe Accident met with members of the External Events Steering Group (EESG) to present a progress report on the development of IPEEE. The two areas discussed were seismic and other external events i.e., high wind, flood, transportation accidents, and other hazards. The ACRS Subcommittee on Auxiliary and Secondary Systems had met previously to discuss the status of fire related issues. In the seismic area, EESG was encouraged to proceed with the approach presented deemphasizing "bottom line numbers" e.g. core damage frequency, which can be both highly uncertain and misleading. In the area of high wind, flood and other hazard events, the Subcommittee was generally supportive of the Staff's approach but did express an interest in lightning as an initiator. Because this was a status report the staff did not request for an ACRS letter.

Meeting Highlights

1. C. P. Siess, Chairman of the Joint Subcommittee, in his opening comments disucssed the individual plant examination program in the context of the severe accident policy statement. One of its stated objective is the examination of each plant for plant unique vulnerability and outliers. He stated that this is not a seismic margin review but one of determining unique plant vulnerability. It was stated that vulnerability was not specifically defined, and

that the staff mentioned that the utility will define vulnerability later. C. P. Siess indicated that another meeting may be necessary to define vulnerability. The final package on the IPEEE program is still not available and this meeting will be a progress report. When the final draft package becomes available another subcommittee meeting will be held. No ACRS letter was requested by the NRC staff.

2. L. Shao, NRC and Chairman of the NRC External Events Steering Group (EESG) presented a brief overview of the treatment of external events in the severe accident program. He stated that the EESG mission is to make recommendations to senior NRC management regarding the role of external events within NRC severe accident policy, provide guidance for implementation of external events to individual plant examinations (IPEEEs), integrate all NRC external event programs, and define needed research for technical assistance programs.

Key external events were defined as earthquakes, internal fires, external floods, wind and tornados, transportation accident and others, such as aircraft crash. The matter of lighting was brought up as a possible initiator. The staff stated that lightning was being covered by the station blackout issue, but told the subcommittee that it will be further pursued because of our interest.

The EESG is made up of three subcommittees consisting of the seismic subcommittee (co-chairmen, L. Reiter and A. Murphy), fire subcommittee (chairman, C. McCracken) and high wind, flood and others (co-chairman, R. Jeng and W. Beckner), L. Shao stated that NUMARC also have a counterpart organization which is headed by W. Lindblad and C. Reed.

One major reason for external events consideration was due to PRA result indicating that certain external events e.g. earthquake and fire, poses high core melt risks. Of prime importance to this program is a quality walkdown of the plant performed by knowledgeable cognizant personnel.

3. A. Murphy, RES, presented an overview of the activities of the seismic subcommittee. The seismic IPEEE-proposed basic approach are as follows:

   - Evaluate plants seismic capacities to identify vulnerabilities to earthquake induced accidents. Acceptable methods are seismic PRA and seismic design margins program using either the NRC or EPRI approach.

   - Determine high confidence low probability failure (HCLPF) relative to a review level earthquake. Review level earthquake which should be high enough (beyond the design basis) to uncover plant vulnerabilities, if any, and low enough to minimize its scope. Things to consider are high

frequency problem for standardized ground-motion spectra, limitations of earthquake size in SDMP, and its relationship of plant HCLPF to hazard and core damage. The review levels will be established by the NRC. Criteria are still being developed but current thought are seismic margins review at 0.3g and at 0.5g, and a seismic margin quality walk down. It was stated that a seismic plant walk down is a major focus fo the IPEEE.

- Identification and correction of vulnerabilities will be incumbent upon the utility.

Further details on PRA issues were prescribed by N. Chokshi, RES. He stated that a PRA approach is consistent with and emphasizes the primary objective of the IPE which is a plant-specific examination to identify vulnerabilities and understand integrated plant response to a seismic event. For the IPEEE, an absolute precise CDF estimates accounting for full uncertainties are probably not needed. Point estimate type calculations are sufficient to provide needed insights. He stated that absolute numbers (particularly, mean) are poor indicator of need for plant modifications, as these numbers are dominated by uncertainty in the hazard curves.

R. Kenneally, RES, provided additional details on the seismic design margin methodology in order to assess the inherent capabilities of a nuclear power plant to withstand earthquakes above the design level. Current methods exists; they are the NRC methodology, defined in

NUREG/CR-4334, which uses the fault tree/event tree technique, and the EPRI methodology defined in EPRI NP-6041, which uses the success paths technique. Both of these methods are derived from early seismic PRA insights, and reduces the scope of the systems and components to be examined. But most important, it includes a quality plant walk down and provides insights to system interactions. No seismic hazard curves are used. Seismic design margin trial plant reviews have been performed on Maine Yankee, Catawba, and Hatch. This review is ongoing and is not yet complete.

N. Chokshi, RES, discussed the containment issues. Preliminary insights are as follows:

- For PWRs - for high consequence sequences resulting from seismic level greater than 0.5g the margin approach are not adequate to address these sequences.

- For BWRs - Some high consequences sequences can be captured by doing margins at a review level of 0.5g. More detail investigations of the capacity of the reactor core internals and reactor supports are needed.

- Containment structural and bypass failures need to be further investigated; so are containment isolation and heat removal functional failures.

L. Reiter, NRR, discussed the review level earthquake in more detail. He stated that there is no simple theoretical solution, but for insights we need to look at conclusion based on different criteria and parameters. They are currently looking at LLNL calculations which group and rank plants based on different hazard measures for both EPRI and LLNL hazard. For purpose of binning plants, relationships between hazard and core damage need only be very general. Deterministic information will be utilized as much as possible. He stressed the point that a single hazard curve is viable as long as uses of PRA are not "bottom line" oriented. If botton line numbers are required for some subsequent analysis, uncertainty factors need to be taken into account.

J. Jeng, NRR, co-chairmen of the High winds, Floods, and Other Subcommittee, presented a brief description of the activities of its subcommittee. The subcommittee mission are as follows:

- Make recommendations to EESG on IPEEE for high winds, floods and other hazards.

- Provide input to generic letter for IPEEE.

- Provide guidance to the NRC Staff for its implementation.

In addition to hazards caused by high winds, floods and others, the ACRS subcommittee stated that hazards caused by lightning should be investigated. The staff indicated that this matter was accounted for in

the station blackout issue, but will revisit this matter further at our insistent.

D. Jeng, stated that PRAs performed show that high winds/tornadoes and floods contribute significant risk to core damage at some plants and that in some older plants with OL reviews prior to the implementation of the SRP may not meet current criteria.

The NRC will evaluate the licensee IPEEE submittal to obtain reasonable assurance that the licensee has adequately analyzed the plant design and operations to discover instances of particular vulnerability to core damage or unusually poor containment performance given a core damage accident. The NRC assessment may lead to one of the following:

- If NRC assessments indicates that plant design and operation could be enhanced by substantial additional protection beyond NRC regulations, appropriate enhancement will be recommended and supported with backfit analysis in accordance with 10 CFR 50.109,

- Otherwise, enhancements would not be suggested unless significant new safety information becomes available.

Joint Subcommittee Action

No subcommittee report to the full ACRS was recommended at this time. We will monitor the NRC staff and when the final draft package on the IPEEE program is completed the subcommittee will meet again.

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NOTE: A transcript of the meeting is available at the NRC Puclic Document Room, Gelman Bldg., 2120 "L" St. NW., Washington, D.C. Telephone (202) 634-3383 or can be purchased from Heritage Reporting Corporation, 1220 L Street, NW., Washington, D.C. 20005, Telephone (202) 628-4888.