GEEIGIAL USE MAY

RELEASED TO THE PDR 2-4-42 date Dinitials

November 5, 1968

D. Okrent, Chairman Reactor Safety Research Subcommittee

36

REACTOR SAFETY RESEARCH SUBCOMMITTEE MEETING, OCTOBER 12, 1968

Attached for your review is a draft of the minutes of the subject meeting. Copies of these minutes are also being provided to other members of the ACRS for information. Please forward any comments you may have so that corrections may be made, if needed.

> J. C. McKinley Staff Assistant

Attachment:

ACRS 2cm/cl 11/5/68

Minutes Reactor Safety Research Subcommittee Meeting October 12, 1968, Chicago, Illinois

9210120273 920520 PDR DRG NRCHIST

Chaps 8 FN 19

cc: ACRS Members w/attachments

ACRS Job 300 Box 5 Shelf 1915 Correspondence "168

UFFLETAL USE ONLY

OFFICIAL USE ONLY

November 5, 1968

REACTOR SAFETY RESEARCE SUBCOMMITTEE MEETING

OCTOBER 12, 1968 CHICAGO, ILLINOIS

Purposes

The purpose of this meeting was to review the priorities recommended for water reactor R&D by the Phillips Petroleum Company in their document "Water Reactor Safety Program Plan, Interim Report: Problem Area Importance Rating" dated May 1968.

SUMMERYI

The Subcommittee broadened its considerations to include discussions on how the ACRS might improve reactor safety through research. The need for an exchange of views with experts in various fields was cited.

It was agreed that a list of all unresolved items mentioned in ACRS letters over the past two years should be prepared. After this list is prepared them the action being taken by various groups to resolve these issues will be identified.

The discussions included the possibility of assigning consultants to various aspects of reactor development to keep themselves informed of current developments, findings, and their implications and to periodically brief the Subcommittee in detail in that perticular area. The Subcommittee could then present an abbreviated report to the full ACRS. It was agreed that a list of areas in which the consultants should maintain current knowledge should be developed.

It was agreed that Mr. Mangelsdorf would arrange a briefing preting for the Subcommittee on reactor fuel behavior and effects during a loss-of-coolant accident. It appeared that this briefing could not be scheduled before January 1969.

Dr. Hanauer agreed to put his thoughts on paper regarding R&D related to reliability analysis, diversity as a desirable alternate, and acceptable limits for the interconnection of protection and control functions.

WEFICIAL USE ONLY

The Subcommittee discussed the priorities proposed by Phillips in the document "Water Reactor Safety Program Plan, Interim Report: Problem Area Impertance Eating" dated May 1968. Dr. Okrent requested the Subcommittee members to assign priorities to the various areas for four site/reactor combinations and to indicate if the work should be done by the AEC or an industrial organization. Subcommittee members were requested to provide their recommendations to Dr. Okrent by November 2, 1968.

The Subcommittee was developing the opinion that the ACRS should prepare a letter on the Phillips document giving some opinions but noting that the document was not completely reviewed and the letter does not contain all comments. Dr. Okrent requested the members to prepare cryptic lists of items to be included in a draft letter. Dr. Monson was requested to be prepared to submit a paragraph regarding the integrity of the reactor primary system including relief valves, motor operated valves, pump seals, etc.

Attendees:

D. Okrent, Chairman S. H. Hanauer H. S. Isbin H. G. Mangeladorf H. O. Monson A. A. O'Kelly J. C. McKinley, Staff

Alter Alts

General Discussion

Dr. Isbin opened the discussion by broadening the topic to include consideration of how the ACES should proceed to improve reactor safety. He said that he felt the Committee was remiss in not doubting more attention to reactor safety research. He felt there was a need for the Committee to take advantage of experts in various fields. He sees a need for an open exchange of views and he did not feel that he has had an opportunity to exchange ideas with these experts. Dr. Isbin suggested that the Reactor Safety Research Subcommittee (ESES) select some topics and examine them in depth in order to save time for the full Committee. He did not believe the spontaneous identification of problems during full Committee meetings was fully effective. Dr. Isbin cited the Reactor Safety Research documents that are transmitted to all ACES members and stated that the RSRS should discuss the material presented.

Dr. Hansmer pointed out that time would not permit the RSRS to discuss all wf the documents that are sent out.

OFFICIAL USE ONLY

- 2 -

MERCHAL USE ONLY

All a second

Dr. Isbin was concerned that members, like himself, were trying to evaluate the reports individually and were not utilizing the help that might be available, such as the Staff and various experts.

Mr. Mangelsdorf believes there is a need for someone to be able to give a 10 minute summary of the significance and impact of the various XAD reports received by the Committee. He suggested that such reports be presented to the ESES and them the Subcommittee give an even more condensed report to the full Committee. Dr. Hanauer suggested that this might be done by the ACES Staff in a manner similar to the Category B and D summaries.

My. Mangelsdorf thought that someone should go through all of the ACRS letters for the last two years and list all of the unresolved questions, including astericked items, and then identify which organization is doing what to resolve what part of each. Dr's Hanauer and O'Kelly agreed that this sounded like a good idea.

Mr. Mangelsdorf mentioned that there had been a meeting with the Atomic Industrial Forum (AIF) in May 1968 at which ABC R&D programs were discussed. Dr. Hanauer noted that the AIF seems to have some objection to the AEC's R&D program but he did not know what the objection was. Other members of the RSRS suggested that it might be priorities or anticipated completion dates.

Dr. Okrent felt that sousetimes the AEC tries to schedule RAD too closely and this results in the waste of researchers' time. He thought that if the ACRS tried to tell the AEC tich was important RAD for fast reactor safety it will find a large number of difficulties. He noted that the AEC still has a Safety Research Committee but that it is nearly defunct. He had heard nothing of this group's activities recently.

Dr. Okreat believes that it would be very difficult for the ACRS to provide detailed guidance for the AEC's R&D programs. He noted that if the ACRS made detailed recommendations it would be wrong part of the time. At one time the General Advisory Committee had thought the ACRS should provide detailed guidance.

Mr. Mangelsdorf thought the ACES should follow-up on the unresolved items that it has identified and can make useful suggestions on R&D programs even though it cannot provide detailed guidance.

Or. Monson thought the Committee should limit its attention to a few areas which it considers to be the most important. He did not think that the Committee fully appreciated what happened when it identified an area of concern. The Committee does not know what specific action must be taken by what time in order to assure that an operating license can be granted on schedule.

Dr. Rensuer believed it to be an industry responsibility to assure that the mecessary R&D is completed on time. An operating license should not be gramted if it is not adequately supported by R&D results. He did not think it was an ACRS function to assure that R&D was done or that it was done on time.

QEEKSLAD USE ONLY

Dr. Isbim pointed out that there may be a difference between what the industry considers to be adequate and what the ACRS will accept. The ACRS must clearly /dentify what must be done. He noted that the Zion application identified the containment spray system as the only area requiring R&D. He believed that it was the ESRS responsibility to look at the R&D programe in depth to assure that what is proposed and done is adequate.

Dr. O'Kelly expressed his concern over statements made by applicants that their analysis include great conservatism to cover areas of ignorance or of inadequate understanding. He would prefer to be able to judge this conservatism by seeing numbers representing calculated and measured values. From this Dr. Hannuer draw the implication that there is R&D not being done that is being compensated for by conservative assumptions.

Dr. Monson did not believe that the ACRS should review all of the RAD details on each reactor but he conceded that the ACRS may not be delving deep enough to obtain reasonable assurance that the R&D will be performed.

Dr. Hansuer pointed out that a number of nuclear plants have been granted provisional operating licenses even though not all of the R&D items have been resolved.

Mr. Mangolsdorf felt the ACRS had a responsibility to assure that the R&D being performed is adequate to answer the questions posed.

Dr. Okrent said that, ideally, the ACRS could ask the Regulatory Staff to take on the job but at present they cannot do an adequate job due to staff limitations. He was looking for a vey to accomplish the objective without the stling the ACRS. He suggested that possibly the Committee could utilize expert consultants to maintain themcelves up to date on the various aspects of reactor safety research and periodically have them report to the KSRS. He suggested that possibly these consultants would spend up to 20% of their time keeping current. This proposal would result in more work for the RSRS but he thought it would still be manageable. Dr. Okrent pointed out that the Committee would be relying heavily on good consultants. When these consultants reported before the Subcommittee it would be at length and in detail. Subsequent to this report to the full Committee.

WHICHAN DISE ONLY

Dr. Okremet meted that there are many important questions in water, gas and liquid metal coeled reactors. The Subcommittee needs to have some basic understanding of these questions. The ACRS and the RSRS need an additional machanism by which to be kept informed.

Dr. Isbin suggested that the Subcommittee select an area of current interest, such as cled shattering, and make a trial run of a detailed presentation to and discussion with the Subcommittee. He was sucking a new format for Subcommittee presentations and discussions since he was not satisfied with prior efforts.

Mr. Mangelsdorf supported Dr. Isbin's suggestion of a trial run. He visualized a somewhat different time scale however. He was thinking in terms of a report to the Subcommittee of about an hour's duration by someone that is already systematically reading the literature and then about a ten minute report to the full Committee.

Dr. Monson cautioned the Subcommittee against trying to keep continuously current on a large number of topics. This could lead to a long series of reports at each Subcommittee meeting and result in confusion. He suggested the selection of a few topics and an in-depth report on each about once per year.

Dr. Hanausr pointed out another idvantage to Dr. Monson's suggestion was that such reports could provide the basis for ACRS action. He objected to information that did not result in some action. He hoped that some recommendation could be made on the basis of the informat'on presented, i.e., the RAD program is adequate or the reactor is not yet ready for a license.

Dr. Okrent pointed out that the RSRS had met for 8 days so far in 1968 and had not touched on the additional reports being proposed. The Subcommittee could easily spend 12 days per year on either water reactor or fast reactor safety.

The discussion turned to Dr. Paris' report on fracture mechanics and the potential for brittle failurs of reactor pressure vessels. Mr. Mangelsdorf asked if there was any way in which the Committee could obtain Naval Reactors comments on the Paris report. Dr. Okrent replied that comments could be requested or Naval Reactors could be requested to discuss radiation damage to and the potential for brittle failure of naval reactor pressure vessels.

Dr. O'Kelly felt that he needed to know the relationship of the vendor Subcommittees to the ESES with regard to asterisked items and other RAD. He was particularly concerned with the brittle fracture question and was considering follow-up visits to the vendors' RAD laboratories. He suggested that possibly the Chairmen of the various vendor Subcommittees should visit their vendors and assess the progress on RAD and report back to the RSR3.

WIFICIAL USE DANLY

It was noted that the vendor subcommittees were set up to provide a mechaniss to talk to the vendors without an applicant being present. Topics of such talks would include such things as the ice condenser concept.

Dr. O'Kelly used Combustion Engineering (C.E.) as an example of a group that thinks it is covering the asterisked items adequately. He thought that C.E. would not be happy to have to take time out regularly to brief ACRS members on the program and progress. Dr. O'Kelly suggested that the vendor subcommittees bring the progress reports to the RSRS. Dr. Isbin suggested that the G.E. Subcommittee could review the G.E. topical reports and discuss with the G.E. representatives.

Dr. Okrent moted that each vendor has problems unique to his reactor and there are problems of design that fall within the purview of the vendor subcommittees and are of no concern to the RSRS. The RSRS is not in a position to tell a vendor that he is or is not doing enough. Cossibly after a comprehensive examination the RSRS could advise the RSRS on a course of action. This would require the help of a number of consultance. Or. Okrent thought the Subcommittee should develop a list of topics on which consultants should maintain current knowledge. After the development of such a list the consultants should be selected. Dr. Okrent suggested that the list of topics

Mr. Mangelsdorf reported that the AEC Internal Study Group was finding a desire for stability in requirements and possibly the licensing of a standard reactor design. Any modifications to a standard design would require a review by the appropriate vendor subcommittee without an applicant being involved. The utilities, however, do not want the AEC and the reactor vendor reaching design agreements that will cost the utilities coney.

Dr. Okrent wanted the RSRS to provide the full Committee with timely, well considered summaries of current R&D developments.

The Subcommittee agreed to experiment with a meeting on fuel element failure modes during a loss-of-coolant accident. The Subcommittee will try new techniques of presentation, digestion, etc. The vandor subcommittee chairmen will study up on where their vendors stand on this matter. Dr. Isbin suggested that Mr. Rittenhouse (ORNL) be considered as a contribution this area. Mr. Mangelsdorf agreed to arrange the proposed meeting. It does not appear that this meeting can be held before January 1969.

Dr. Okrent agreed to talk to EDT (Mr. A. J. Pressesky) to express ACES interest in the RDT sponsored reactor safety research and to obtain a current status report on that RAD. He would not only try to obtain the results of the R&D but also try to determine how it relates to current reactors.

- 6 -

COEF. JAL USE ONLY

Problem Ares Importance Rating

Dr. Hansmer was not sure if the program discussed in 'Water Reactor Safety Frogram Plan Interim Report: Problem Area importance Rating' dated May 1968 was to be carried out by the AEC alone or in conjunction with the reactor venders. There was some doubt if the Committee should comment on the doeummant at all since it had come directly from the Phillips Petroleum Company and mot from DRL or EDT.

It was agreed to attempt to draft a letter offering some opinions but not a complete review or all of the comments made.

The Subcommittee reviewed the document to see if members agreed or disagreed with the "A" ratings given by Philips. ("A" " very urgent, key problem, the solution of which would have great impact, directly or indirectly, on the regulatory process.)

The first topic with an "A" rating was "Reactor Pressure Vessel Integrity". Dr. Okrent reviewed some of the history of the reactor vessel problem and noted that RDT had initiated the Heavy Section Steel Technology.program while an industrial group, Edison Electric Institute, was working on inservice inspection techniques.

.0

Dr. Hanauer was concerned with the integrity of the current generation of reactor vessels. He thought that information was needed on KIC and flaw detection. The work needs to be done now and he did not care about the opportioning between AEC and industry.

The Subcommittee speculated on the effect of terminating all RAD in this area and its effect on licensing of power reactors. Dr. donson believed that liceasing would continue but the nvt tolerance might be reduced thus reducing the life of the plant. An alternate would be to install internal shields to protect the reactor vessel walls. Dr. Monson observed that if the work is not dons in the next 5 years and evidence then indicates that nuclear plants must be shut down then the work will be done quickly and by the appropriate people.

Dr. Okreat stated that any R&D program must allow sufficient latitude for researchers to think about anomolies that may affect the conclusions drawn from the test results. Because if is difficult to get industry to fund this type thought, Dr. Okreat suggested that these inquisitive people be supported by the AEC.

Dr. Okromt suggested that the Subcommittee members look at the Phillips document to identify any areas that may have been omitted.

• 7 •

DEEKGIAL ISE DALLY



Dr. Hanswer noted that the document made no mention of interaction or common failure modes. He pointed out that his concern was broader than just instrumentation and control systems. He could not suggest any alternate to diversity. In the D. C. Cook case the vendor has made an analysis of systematic failures of the reactor protection system for two specific accident situations. This analysis has shown that if one systematic failure occurs, another parameter will terminate the excursion. Dr. Hanswer would like to see this approach extended to mechanical systeme (valves, pumps, etc.). He pointed out that not all research is experimental, some is analytical. He also stated that the efforts at reliability analysis were not producing satisfactory results that would be usefulcin safety evaluations. He was unsure of the allowab's extent of interconnection of protection and control equipment.

Dr. Eansuer agreed to put his thoughts on the matter of systematic failures on paper for consideration by the Subcommittee.

Dr. Okrent provided the Subcommittee with a form that listed the subject areas identified by Phillips. The form provided space for each member to place an importance rating on each area for four situations (current reactors at current sites, future reactors at current sites, current reactors at poorer sites, and Metropolitan sites), it also allowed space for members ao identify if they thought the AEC or industry should perform the work. The Subcommittee members agreed to complete the form and return it to Dr. Okrent by November 2, 1968.

The Subcommittee discussed a number of aspects of the Phillips document including such problems as core retention on the bottom head, melt through, hydrogen evolution, metal-water reactions, operation of mechanical and electrical equipment is a steam saturated accident environment, containment leak testing under accident conditions, pipe ruptures, industry vs RDT standards, blowdown forces on fuel pins, cavity design, steam explosions, degraded plant conditions, etc.

Dr. Morsson expressed his concern for the integrity of the entire primary coolant boundary. He noted the emphasis placed on pressure vessels and piping and them called attention to the apparent neglect of relief valves, motor operated valves, etc. He felt that any potential for significant primary system water loss should receive high priority attention. He agreed to draft paragraph regarding this matter for a future letter.

Dr. O'Kelly suggested that the nuclear vendors work on the R&D needed to Stalve Apprent or near future problems and have the AEC do the work on the the it tere problems.

or the close of the meeting, Dr. Okrent requested the Subcommittee members of prepare a cryptic list of items that might be included in an ACRS letter.

- 8 -

It was agreed that another meeting, of the Subconmittee would be needed to complete the review of the Phillips document.