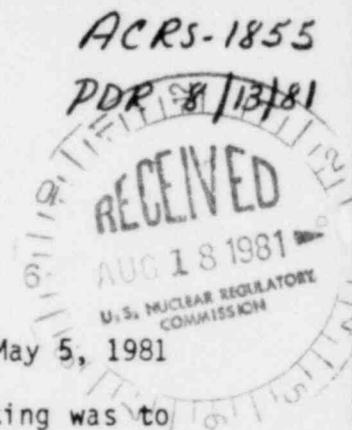


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6/24/81

MINUTES OF THE MAY 5, 1981
AD HOC SUBCOMMITTEE ON DECAY HEAT REMOVAL SYSTEMS



The ACRS Ad hoc Subcommittee on Decay Heat Removal Systems met on May 5, 1981 at 1717 H Street, N.W., Washington, D.C. The purpose of this meeting was to formulate a response to Commissioner Gilinsky's questions on possible improvements to the North Anna #2 RHR and LPI systems and to discuss the NRC-sponsored work at Sandia alternate decay heat removal systems. A copy of the notice for this meeting is included as Attachment A. A list of attendees is included as Attachment B. A schedule for this meeting is included as Attachment C. The handouts for this meeting are included in the ACRS files. Selected handouts are included as Attachment D. The meeting was begun at 1:00 pm with a short executive session in which Mr. Ward, the Subcommittee chairman summarized the objectives for the day's meeting. The meeting was adjourned at 5:00 pm. The meeting was conducted entirely in open session. The subcommittee heard presentations from NRC Staff, BNL, Sandia, and VEPCO. The meeting was attended by D. Ward, Subcommittee Chairman; J. Ebersole, H. Etherington, and J. Ray, Subcommittee members; R. Savio, ACRS Staff; A. Acosta, E. Epler, and P. Davis, Subcommittee consultants.

INTRODUCTION

Mr. Ward held a short executive in which he discussed the purpose of the day's meeting. He noted that it was the Subcommittee's intention to develop a response to Commissioner Gilinsky's concerns about the decay heat removal systems in the North Anna plant and to provide comments or any critique of the Staff's long range program for generic improvements to decay heat removal systems. He noted that the matter was to be brought to the ACRS at the May

meeting for consideration. Mr. Ward stated that Commissioner Gilinsky had requested that the ACRS reexamine the desirability of adding a heat exchanger to the LPI system on North Anna 2 and environmentally qualify the RHR system. Mr. Ward proposed that the following questions be addressed:

1. Is it desirable to require these modifications for the North Anna plant and for all similar plants?
2. Is the existing RHR system in its present state capable of functioning in harsh containment environments such as would result from a LOCA or core damage event?
3. Are these cost-effective improvements and do they represent major vulnerabilities in the North Anna decay heat removal systems?
4. Does this matter immediate resolution or is resolution within the scope of the generic programs proposed by the Staff sufficient?
5. Are the goals proposed in TAsk A-45, "Shutdown Heat Removal Requirements", appropriate and is the work being given the appropriate priority and level of resources?

SUMMARY OF STAFF POSITION ON COMMISSIONER GILINSKY'S COMMENTS AND THE STATUS OF TAP-45, F. ORR, NRC STAFF

Mr. Orr of the NRC Staff described the North Anna LPI recharge systems and summarized the NRC Staff's position on Commissioner Gilinsky's questions. The RHR is the two-pump, two heat exchanger system located inside the containment

with the single hot leg suction. The LPI injects directly into the reactor cold leg does not utilize a separate heat exchanger. Heat removal must be accomplished through the break or the containment sprays. The system is similar to the Surry (WASH-1400 system), differing in that the initial suction is provided to the containment spray pumps through a storage tank) as opposed to from the containment sump in Surry. This protects against damage to the pumps cavitation in small break scenarios. Commisisoner Gilinsky requested that the NRC Staff evaluate the advantages of adding a heat exchanger to the LPI system and environmentally qualify the RHR system. Mr.Orr indicated that the North Anna system as designed meets the NRC requirements and that, within the NRC review guidelines, the suggested modifications do not significantly improve the system. Mr. Orr indicated that the NRC review is limited to a application of the single failure criteria. A NRC staff sponsored study was performed by the BNL to examine issues extending beyond a single failure criteria. The study used risk oriented and utilized the WASH-1400 study in that it examined the North Anna plant in context of the fault trees developed for Surry plant. The study concluded that the addition of heat exchangers to the PPI system probably did not significantly reduce the probability of core melt. The issue of the environmental qualification of the RHR was not addressed in this study. Mr. Orr noted that Commissioner Gilinsky's concerns would also be applicable to the Surry 1 & 2, Beaver Valley 1&2, and North Anna 1 plants. Mr. Ebersole asked a number of questions relating to the details of the piping design and to the ability of the RHR system to withstand unusual events. The VEPCO representatives participated in this discussion. It was noted that all electrical switch gear for the RHR system was located external to the containment and would not be affected by LOCA environments. The pump

motors are the only electrical apparatus that are installed within the containment. The motors are not subjected to direct containment spray but would be exposed to LOCA environments. The degree to which these motors would resist LOCA environment would be established in this discussion. Procedures have been established for removing decay heat in a refueling/head-off configuration failure of the RHR system.

BROOKHAVEN NATIONAL LABORATORY RISK ASSESSMENT EVALUATION - A. BUSLIK

Mr. Buslik described a NRC sponsored study performed at BNL which was directed towards evaluating reliability improvements that might be gained by adding heat exchangers to the LPI system. The study utilized results of the WASH-1400 study (the Surry plant). The study concluded that the addition of the heat exchanger to the LPI system probably would significantly reduce the probability of a core melt. The study did not address less severe events.

TASK A-45, SHUTDOWN HEAT REMOVAL REQUIREMENTS - A. MARCHESE, NRC STAFF

Mr. Marchese of the NRC Staff summarized the work that had been performed on the Task A-45 (Shutdown Heat Removal Requirements) since the April 10, 1981 ACRS briefing. It is expected that a first draft of the Task Action Plan will be completed by May 8, 1981 and an approved draft would be available to the Subcommittee by May 22, 1981. The current plans call for the use of WASH-1400 and RSSMAP to assess the decay heat removal system reliability of the six plants which were treated in the studies and the extrapolation of this information to the extent possible of other operating LWRS as a first step. The current plans call for the resolution of this unresolved safety issue by the end of 1984, with the implementation of the study recommendation after this

period. In response to a question from Mr. Ebersole, Mr. Marchese estimated that the fraction of the core melt accidents which are attributable to the failure of the shutdown heat removal systems is about fifteen percent. There was some discussion as to when plant modifications, if required, would be implemented on existing plants. Mr. Marchese estimated that modest backfits could be accomplished by 1986. He stated that he envisioned that there may well be three classes of plants; those that had sufficiently reliable decay heat removal systems, those that would have sufficiently heat removal systems with modest backfits, and those which would require some sort of add-on alternate decay heat removal system. The Subcommittee indicated that they believed that the work should not place an undue reliance on the results of risk assessment studies and noted that the six plants considered may not cover the full range of decay heat removal design configurations.

DISCUSSIONS ON NUREG/CR-1556, "STUDY OF ALTERNATE DECAY HEAT REMOVAL CONCEPTS FOR LIGHT WATER REACTORS/CURRENT SYSTEMS AND PROPOSED OPTIONS"- M. TAYLOR, NRC/RES AND D. BERRY, SANDIA

Mr. Taylor and Mr. Berry summarized the NRC sponsored at Sandia on alternate decay heat removal concepts. The work performed to date has identified the important transients, evaluated the U.S. and some foreign decay heat removal systems as selected alternate decay heat removal concepts for more detailed study, and has developed basic design criteria for these concepts. The AFWS and HPIS for PWRs and the suppression pool cooling and high pressure service water systems for BWRs have been identified as the important systems in the DHR process. The design criteria which have been identified for the alternate concepts which are believed to be sufficient to reduce reliable systems

be self contained, be testable and maintainable, and be automatically initiated if less than 30 minutes is available for operator action. The systems are required to have the capability to operate for 10 hours without operator intervention. Some examples of the devices which are being considered are add-on HPI and AFWS trains and high pressure RHR systems. The benefits associated with system modification will be measured by the reduction in the core melt probability. Cost estimate in conceptual design will be obtained by subcontractors.

Practice for decay heat removal systems for foreign plants was compared to U.S. practice for six PWRs and six BWRs. Additional information was also obtained from the Swiss AE who acted as consultants for Sandia. Mr. Berry noted that in the opinion of the Sandia investigators the Europeans have overemphasized redundancy in the decay heat removal systems. Bunkered systems have been used some European designs. These systems provide advantages both from the standpoint of sabotage protection.

The evaluation of decay heat removal improvements will be performed for a PWR and a BWR. The Oconee and Grand Gulf plants have been selected (RSSMAP studies exist for both of these plants). When this part of the work has been completed the study will be ended to the evaluation of several PWR and BWR designs. The WASH-1400 and remaining RSSMAP plants will be among those selected.

Mr. Epler and Mr. Ebersole stressed the importance of the capability of on-line testing, establishing a high system reliability. They noted that a

system which could be tested without disabling parts of the plant eliminated much of the chance for maintenance/testing error. They additionally noted that bunkered systems provided a decreased vulnerability to sabotage, and a high degree of independence. Mr. Berry was asked to comment on the safety improvement that might be provided by the addition of the heat exchanger to the LPI system in the North Anna plant. Mr. Berry noted that such a heat exchanger could be provided from the engineering standpoint but it was not clear to him that this would improve the overall system reliability.

DISCUSSION AND SUBCOMMITTEE CONCLUSIONS

Discussions were held in which Mr. Ward solicited comments from members of the Subcommittee. Mr. Ebersole stated that in evaluating improvements to specifically the North Anna decay heat removal systems and more generally to all decay heat removal systems one should not overemphasize the large accident and should also consider small break accidents and their impact on both plant operation and the public health and safety. It was generally agreed that Commissioner Gilinsky's concerns were best addressed within the context of the Task Action Plan A-45 and that the deficiencies in the North Anna system, if any, did not require any more immediate action. Mr. Ebersole commented that the probabilistic risk assessment on which Task Action Plan A-45 appeared to be placing a great deal of reliance does not consider details of the design and field installation and that in many cases the reliability of a system is highly dependent on these features. Mr. Ward requested that VEPCO and the NRC be prepared to address the Full Committee on May 7, 1981 and gave VEPCO instructions as to what areas need to be addressed in their presentations.