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December 26, 1992
Revised January 14, 1993

Dr. David L. Morrison, Chairman
Nuclear Safety Research Review Committee
The MITRE Corporation
7525 \ Drive
McLean, Virginia 22102

MEETING OF THE SUBCOMMITTEE ON AGING
SEPTEMBER 16, 1992

Dear Dr. Morrison,

This is to report on the meeting of the Subcommittee on Aging held in Rockville, Maryland on September 16, 1992 pursuant to notice in the Federal Register of August 31, 1992. All members of the Subcommittee, Drs. Boulette, Bush, Uhrig and the undersigned, were present together with NSRRC Member Isbin.

The enclosed Minutes of the Meeting were distributed to NSRRC members by DFO George Sege on October 5. These Minutes include the agenda that was followed and a full list of participants and attendees. The Subcommittee was particularly helped by the active participation of Director of Research Eric Beckjord.

The entire meeting was open to the public. However, no information was presented to the Subcommittee by members of the public during the meeting nor in the extended period provided for this purpose.

BACKGROUND

The purpose of this Subcommittee meeting was to expand the recent review of the NSRRC by focusing on the NRC current philosophy in respect to treatment of aging phenomena and on a specific example of how this philosophy was being implemented. The NRC staff selected the subject of nuclear plant valves for this illustration.

During his opening remarks, the Director of Research asked the Subcommittee to address the quality and relevance of aging research work presently underway, the issues related to closure identified by the NSRRC in its earlier review, and the emphasis on initial and extended license operating periods. The Subcommittee's responses to these items, as reviewed at this meeting, are contained within this report.

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PHILOSOPHY

The staff presented a background description of the overall RES purpose and function, its approach to identifying proactive and reactive research needs, and the place of aging research within this structure. A comprehensive description of the organizations dedicated to the Aging Research Program was provided. The attached chart describes how the RES Engineering Division relates to other branches and institutions in carrying out its work in this area. The Subcommittee believes this arrangement should provide an effective structure assuring an interactive process for managing aging research.

The Subcommittee believes that the RES has given aging research appropriate and balanced emphasis that is relevant to user and industry needs. On several occasions, reference has been made to Nuclear Plant Aging Program funding limitations. The Subcommittee confirms the NSRRC conclusion that the necessary resources are being properly allocated to high priority issues, and in a manner to assure high quality work.

The Subcommittee is aware of the closure schedules identified in Enclosure 2 of Director Beckjord's reply to the NSRRC of April 13. It did not receive any further information in this regard. While several closure targets have been proposed for specific topics, the continuing influence of "new information" keeps extending these completion dates, suggesting that a more disciplined approach to these scheduler concerns has not yet been effective. The Subcommittee concurs that as the present aging research programs are completed, it will be essential that RES maintain a level of awareness and competence to deal with future events. The extent of this maintenance level within the NRC and at six independent "Centers of Expertise" requires diligence to avoid excesses. The Subcommittee understood that these matters are receiving the personal attention of the Director and his senior staff and that the NSRRC will be kept informed of program evolutions toward a "maintenance" status.

The Subcommittee agrees that an appropriate strategy for RES includes the following:

1. Complete each research project per current schedule and estimated cost
2. Document the research results in appropriate reports
3. Assure results are distributed to users and industry
4. Maintain awareness and technical vitality

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Significant time of the Subcommittee's review was devoted to the relationship of aging research to license renewal. Present aging research activities are said to be responsive to NRC rules on maintenance and license renewal. However, the Subcommittee was given to understand that the justification for much of the aging research program was based on the importance attached to aging issues as phenomena unique to license renewal. Indeed, it was stated that the aging research is largely funded under overall license renewal categories.

The Subcommittee did not express any position as to where these Aging Research Program efforts are identified or under which budget category they may appear. The Subcommittee directed its attention to the level and schedule of effort, the competence and pertinence of the program organization and scope, and the assurance that aging degradation mechanisms are understood and managed wherever and whenever necessary to maintain safety objectives.

Progress in the development of guidance for license renewal applications was described by the staff. Included in the draft regulatory guide DG-1024 are topics covering age-related degradation effects unique to license renewal. Despite substantial probing, the Subcommittee could find no instance where an age-related degradation concern was special, singular or specific to license renewal with the possible exception of components whose design life is 40 years or less. The Subcommittee believes that the greatest value will be derived from the aging research program if its emphasis and application is directed to resolving operating plant problems. A tendency to emphasize aging degradation in the context of license renewal does not appear to be sufficiently comprehensive and may miss issues of significance to current plants.

The NSRRC commented on the implementation of aging research results into operating plant maintenance activities in its February 24, 1992 report. The Subcommittee did not discuss the Director's reply of April 13 that cites some failures by utilities to utilize aging research results effectively. The Subcommittee believes such failures seem to be enforcement matters that should not affect the RES research direction. NUREG/CR-5643 Insights Gained From Aging Research dated March, 1992 presents a good summary of aging research results applicable to operating plant SSC's.

The staff presented a comprehensive description of the utilization of aging research results in rulemaking activities, the development of regulatory guides and the maintenance rule,

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resolution of generic safety issues, implementation of generic letters and input to codes and standards developments. The Subcommittee believes these practical demonstrations provide strong evidence of the applicability of the Aging Research Program to manifold regulatory activities.

RELATED MATTERS - MAINTENANCE AND LICENSE RENEWAL

During the initial meeting session, discussions were also held on maintenance of primary system integrity, aging of structures and the identification of other systems and components requiring analyses of their sensitivity to aging degradation. As previously mentioned, the Subcommittee believes the present prioritized funding levels are appropriate, but suggests it may be prudent for RES to reevaluate its schedule for these license renewal issues in light of recent utility application delays.

Another significant discussion concerning the effect of age-related degradation on risk took place during the first session. SANDIA Report SAND91-7093 issued in February, 1992 critically reviewed three risk-related NUREG documents dealing with identification and prioritization of aging components, evaluation of core melt frequencies due to aging effects and licensing renewal rule analyses. RES provided to the Subcommittee a contractor's response to SAND91-7093 that would result in no change to the NUREG reports.

The Subcommittee did not pursue these differences between RES and SANDIA in detail but notes there are other areas where RES and others do not agree on research results or their interpretation. The Subcommittee suggests that RES give appropriate consideration to methods of resolving differing analyses.

The Subcommittee encourages RES to continue work on development of suitable risk assessments involving aging dependencies, particularly where directed toward reducing uncertainties in data bases. RES stated that for a nuclear plant having an effective maintenance program, the use of plant specific data in its Individual Plant Evaluation obviates the need to include age-related dependencies in its IPE. The Subcommittee concurs.

EXAMPLE

The Subcommittee agreed that the subject of nuclear plant valves was an appropriate example to illustrate how the NRC approach to effects of age-related degradation was being implemented, particularly for existing plants. The staff described the

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importance of the 30,000 odd valves of varying designs and functions installed in operating reactors in the USA and presented a sampling of their operating histories. The Subcommittee noted the NRC methods of determining the importance of valve performance to safety rely on both risk-based and deterministic evaluations.

Results of RES valve research conducted mainly at ORNL and at INEL have established the technical bases for information bulletins, staff training materials and input to code/standards revisions. These are appropriate techniques to implement aging research results into current operating plants but their effectiveness needs to be evaluated in the future.

The Subcommittee received particularly detailed and vivid descriptions of check valve operating failures, analyses of their root causes, and development of inspection and diagnostic techniques to improve monitoring programs. A review of the motor-operated valve research programs at EPRI and at ORNL was also presented.

The Subcommittee concluded that aging degradation mechanisms affecting the primary pressure boundary are becoming well understood. This improving understanding allows for the establishment of realistic inspection and maintenance programs to avoid or minimize failures with potentially severe consequences. There appears to the Subcommittee to be adequate understanding by RES of the consequences of functional failures of components like valves. The Subcommittee is less confident that current proposals on how to determine and deal with such functional degradation due to aging will prove adequate.

While pursuing these activities, the staff has also become involved in addressing other valve problems, not related to aging effects, such as design deficiencies. Such revelation of related research needs are bound to occur and it is expected that RES would maintain its alertness to such findings.

The Subcommittee concluded that the valve research program is an appropriate and relevant response to observed valve operating problems and is faithful to the general philosophy in dealing with effects of age-related degradation mechanisms. The valve research work appeared to be of high quality.

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ADDITIONAL OBSERVATIONS

The Subcommittee noted that significant discussions are taking place between NRC staff, industry and others regarding environmental effects, fatigue and other aging concerns. The Subcommittee encourages RES to continue these discussions and believes that most differences in expert judgments identified in these dialogues can be resolved by relatively modest additional research.

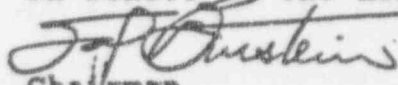
The RES staff reported briefly on its participation in some international aging research programs. The Subcommittee noted the existence of aging data from sources other than the nuclear industry in this and other countries. The inclusion of aging research results from these origins should prove technically beneficial and cost effective.

Discussions took place on the difficulties of communicating, coordinating and transferring information among the many participants concerned with age related phenomena. RES is encouraged to continue and expand its activities toward resolution of these impediments.

The Subcommittee understood that effects of aging are not required to be considered in current PRA's. The Subcommittee is concerned that such an omission may leave substantial gaps in risk analyses whose significance is not defined. The Subcommittee believes it is important that the NRC determine how aging degradation is to be treated in these assessments in order not to delay or repeat the analyses required of all plants.

The Subcommittee appreciates the substantial efforts expended by the staff and their contractors in making for a meaningful and comprehensive review of the subjects treated.

On behalf of the Subcommittee,


Chairman,
Member of the NSRRC

Enclosures.



DE NUCLEAR PLANT AGING RESEARCH PROGRAM

AGING RESEARCH STRUCTURE

