

# CERTIFIED

ACRS-1740

MEETING DATE: 4/24/80  
ISSUE DATE: 6/23/80

7/24/80

## MINUTES OF THE ACRS SUBCOMMITTEE MEETING ON METAL COMPONENTS OAK RIDGE, TN

A meeting of the ACRS Subcommittee on Metal Components met at the American Museum of Science and Energy, Oak Ridge, TN on April 24, 1980 to review the NRC research program on materials and metallurgy. Specifically the HSST program was discussed by its cognizant program engineers.

No oral or written statements were presented at the meeting and none were received. The schedule of the meeting, the attendee list, the Federal Register notice, and the handouts for the meeting are attached to the office copy of these minutes.

Mr. P. Shewmon, Chairman of the Subcommittee, convened the meeting at 8:45 a.m. on April 24, 1980. The other ACRS member present was Mr. M. Bender. The ACRS consultants present at the meeting were H. Corten, A. Pense, and M. Wechsler.

### C. Serpan, NRC

Mr. Serpan provided a brief overview of the topics that were covered during the meeting. The topics are listed below:

- Pressure Vessel Structural Integrity
- Irradiation Effects and Analysis
- Piping System Analysis

In response to a Subcommittee question, Mr. Serpan stated that with respect to interfacing with their clients, regular communications are held periodically to reflect changes of the licensing requirements and their effects on the research program. Modifications to the research programs are made to reflect these changes in licensing. The addition of a program on degraded piping system resulted because of continuing communications with the users of the research program.

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M. Vagins, NRC

Mr. Vagins discussed pressure vessel and piping structural integrity. The areas covered by Mr. Vagins are as follows:

- o Fracture toughness and vessel structural integrity, which include: (1) lower bound values for linear elastic fracture mechanics behavior, and (2) crack arrest methodologies and tests.
- o Pressure vessel embrittlement. In this area, the Staff is working closely with EPRI to determine if in-situ annealing occurs. If it does, the Staff stated that the question of radiation embrittlement may be moot. The effects of flux rate on test reactors and power reactors must be accounted for in this problem.

G. Whitman, ORNL

Mr. Whitman is program manager for the Heavy Section Steel Testing (HSST) Program. Mr. Whitman discussed the history, organization, and some of the current work that is ongoing. He stated that about 25% of the HSST budget has gone out to research and development subcontractors.

The primary objective of the HSST program is to evaluate the effects of flaws, variation of properties, stress ranges, and residual stress on the integrity of the light water reactor pressure vessel.

The Staff stated that expertise at the Oak Ridge National Laboratory exists, is recognized, and is used. The Oak Ridge National Laboratory HSST program is currently developing elastic-plastic methodology for vessel failure.

D. Canonico, ORNL

Mr. Canonico discussed properties of pressure vessel steels, and assessment of fracture toughness. He stated that the major difference between old pressure vessel steel and current requirements is the control of phosphorous, sulfur, and copper. These elements tend to degrade or embrittle the material properties upon radiation exposure.

Mr. Canonico next discussed irradiation embrittlement in pressure vessel steels, especially about loss of the material upper shelf energy with increasing exposure. With exposure in the range of  $1-3 \times 10^{19}$  Nvt with a range of 20-35% copper the material can lose up to 50% in upper shelf toughness.

Mr. Canonico stated that there seems to be a synergistic effect with the variation of nickel. Test results indicate that, for a material with the following variation of elements, e.g., .75% nickel and .2% copper and .15% nickel and .2% copper, the predictive material properties vary. The former alloy can be readily predicted by standard means whereas the latter alloy gave results 50% lower. It seems that the addition of nickel negates deleterious effects of copper. This effect is being studied.

Tests on materials with various copper contents up to .3% and fluences in the range of  $1 \times 10^{19}$  were run. Using Reg. Guide 1.99 losses in upper shelf energies were calculated. Results of tests indicate that energy losses in upper shelf were lower than predicted using the regulatory guide. Mr. Canonico stated that saturation effect may be the reason for the discrepancies. The materials tested were prototypical.

#### R. Cheverton, ORNL

Mr. R. Cheverton discussed the Thermal Shock Program. This program started several years ago when LOCA in a PWR followed by ECC could cause a severe thermal shock of the pressure vessel nozzles. The experiment essentially consists of a cylinder with various flow configurations being immersed in liquid nitrogen.

In summary, Mr. Cheverton stated that linear elastic fracture mechanics is indeed valid for both shallow and deep flaws under severe thermal shock loading conditions. Further thermal shock tests are planned to demonstrate warm prestressing. The NRC Staff stated that in the interim, the study performed thus far allows the Staff to say that the reactor vessel can accommodate a large LOCA and ECC injection. But the case of a small LOCA, combined with pressure in the vessel, is still an unresolved problem.

R. Bryan, ORNL

Mr. R. Bryan reviewed some of the results of the intermediate vessel testing. The main objective of the test program was to confirm by large-scale test, the behavior of flaws under various pressures and temperatures. The major result of this program was the confirmation that linear elastic fracture mechanics is valid at temperatures below the transition temperature. Above the transition temperature, LEFM is not valid due to the larger size of the plastic region at the crack tip. An important aspect of the program was the observation of the modes of fracture under the loading conditions and providing the basis which all LEFM analyses are done. These tests verify the leak before break concept.

G. Whitman, ORNL

Mr. G. Whitman concluded the discussion on the HSST Program by discussing its future plans which include programs in fracture mechanics, crack arrest, radiation effects, thermal shock, intermediate vessel testing, and pressurized thermal shock.

Fracture mechanics will be concentrated in complex analyses of corner nozzle flaws. Photoelastic and finite element analysis will be used. Standard method will be developed in obtaining crack arrest properties. Crack initiation methods will be developed for a wide range of material properties. In the irradiation effects area, the testing temperature will be closely controlled to the temperature range of operational plants. Prototypical materials will be used in future tests. Dosimetry will also be more carefully studied in conjunction with the radiation effects program. Kinetic studies according to the Subcommittee should also be performed in order to understand the saturation phenomena in materials.

Thermal shock tests will be performed to obtain data on crack initiation and arrest in the rising K field. The intermediate vessel testing program will address flaw behavior where the upper shelf energy will be about 50 ft-lbs and lower.

F. Loss, NRL

Mr. Loss described the program on fracture mechanics being done at the Naval Research Laboratory. Three areas of work being performed at Naval Research Laboratory for the NRC are fracture toughness, cyclic crack growth rates, and irradiation sensitivity.

In the fracture toughness area, the objective is to develop elastic-plastic methodology that can be used to analyze the fracture toughness of irradiated pressure vessels.

The program on cyclic crack growth in light water reactors at varying operating environments, e.g., 550°F and 2000 psi will be studied. The effects of radiation on crack growth rate will also be studied.

The program on radiation sensitivity will emphasize work on thermal annealing as a basis to extend vessel life that was degraded by irradiation.

The question of whether NRL will be performing work for NRC in 1981 and subsequent years was discussed. According to the Staff, the NRL may not be able to continue its work for NRC in these areas because of a high-level management decision. This unexpected event will be further studied by NRC.

Mr. Vassilaros, NSRDC

Mr. M. Vassilaros spoke in place of Mr. John Dudis who could not attend the meeting. The areas of work being performed at NSRDC are: (1) characterization of nuclear piping material, (2) piping material weldments, and (3) effects of specimen geometry on the J-Integral characterization.

One of the significant tasks being performed in this program is validation of the tearing instability concept on large 8-10 inch pipe. Previous tests have been run on small test specimens.

The topic of how 50 ft-lb upper shelf energy came to be chosen for use in Appendix G of 10 CFR 50 was brought out by an ACRS consultant before the meeting was adjourned. According to Mr. S. Pawlicki of the NRC Staff, the value chosen was a reasonably high value that could readily be achieved by the technology in metallurgy at that time. It was stated that Welding Research Council Report 175 issued in August 1972 covered details of the 50 ft-lb selection.

Dr. Shewmon stated that, for the next meeting of the Metal Components Subcommittee, Technical Assistance Programs from the Staff should be covered. The setting of the frequency of inspection for Austenetic Steels as in BWRs where stress corrosion is a problem should also be addressed.

The meeting was adjourned at 4:45 p.m.

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NOTE: For additional details, a complete transcript of the meeting is available in the NRC Public Document Room, 1717 H St., NW, Washington, DC 20555 or from International Verbatim Reports, Inc., 422 South Capitol St., SW, Washington, DC 20002, Suite 107.

TENTATIVE SCHEDULE

ACRS SUBCOMMITTEE MEETING ON METAL COMPONENTS  
OAK RIDGE, TN  
APRIL 24, 1980

<u>TIME</u>	<u>SPEAKER</u>	
8:30 a.m. 8:30	M. Vagins (NRC)	Present activities and future plans for research in the areas of fracture mechanics and pressure vessel and piping structural integrity.
9:07 9:30 a.m.	G. Whitman (ORNL)	HSST Program - objectives, scope, and status.
10:00 a.m.	D. Canonico (ORNL)	Materials
10:45 a.m.	Break	
11:00 a.m.	R. Cheverton (ORNL)	Thermal Shock
12:00 noon	Lunch	
1:00 p.m.	R. Bryan (ORNL)	Intermediate Test Vessel Program
2:00 p.m.	G. Whitman (ORNL)	HSST - future plans and directions
2:30 p.m.	F. Loss (NRL)	Pressure Boundary Integrity Program - irradiated fracture toughness, annealing studies, cyclic crack growth.
3:30 p.m.	Break	
3:45 p.m.	J. Gudas (USNSRDC)	Elastic-plastic fracture testing, specimen development, J-R data, tearing instability, rate effects verification, degraded pipe testing.
4:45 p.m.	C. Serpan (NRC)	Dosimetry Program Overview
5:15 p.m.	ACRS Subcommittee	Caucus and Discussion with Participants
5:30 p.m.	Adjournment	

Attachment A

ACRS SUBCOMMITTEE MEETING ON METAL COMPONENTS  
OAK RIDGE, TN  
APRIL 24, 1980

ATTENDEE LIST

ACRS

P. Shewmon, Chairman  
M. Bender  
A. Pense, ACRS Consultant  
H. Corten, ACRS Consultant  
M. Wechsler, ACRS Consultant  
E. Igne, Designated Federal Employee

NAVAL RESEARCH LABORATORY

F. Loss

NSRDC

M. Vassilaros

NRC STAFF

C. Serpan, Jr.  
M. Vagins  
S. Pawlicki  
R. Johnson

OAK RIDGE NATIONAL LABORATORY

S. Bolt  
W. Corwin  
P. Holz  
G. Slaughter  
J. Bryson  
R. Berggren  
R. Nanstad  
W. Stelzman  
H. Trammell  
G. Whitman  
R. Cheverton  
R. Bryan  
D. Canonico  
J. Merkle  
G. Robinson



Room 336, National Science Foundation, Washington, D.C. 20550, telephone (202) 632-7317.

**Purpose of subcommittee:** To provide advice and recommendations concerning support for research in population biology and physiological ecology.

**Agenda:** To review and evaluate research proposals as part of the selection process for awards.

**Reason for closing:** The proposals being reviewed include information of a proprietary or confidential nature, including technical information, financial data, such as salaries, and personal information concerning individuals associated with the proposals. These matters are within exemptions (4) and (6) of 5 U.S.C. 552b(c), Government in the Sunshine Act.

**Authority to close meeting:** This determination was made by the Committee Management Officer pursuant to provisions of Section 10(d) of Pub. L. 92-463. The Committee Management Officer was delegated the authority to make such determinations by the Director, NSF, on July 6, 1979.

M. Rebecca Winkler,

Committee Management Coordinator,

April 4, 1980.

[FR Doc. 80-10443 Filed 4-8-80; 8:45 am]

BILLING CODE 7550-01-M

## NUCLEAR REGULATORY COMMISSION

### Advisory Committee on Reactor Safeguards, Subcommittee on Metal Components; Meeting

The ACRS Subcommittee on Metal Components will hold an open meeting on April 24-25, 1980, at the Oak Ridge National Laboratory (ORNL), Oak Ridge, TN to review the Heavy Section Steel Technology (HSST) Program. Notice of this meeting was published March 19, 1980.

In accordance with the procedures outlined in the Federal Register on October 1, 1979, (44 FR 56408), oral or written statements may be presented by members of the public, recordings will be permitted only during those portions of the meeting when a transcript is being kept, and questions may be asked only by members of the Subcommittee, its consultants, and Staff. Persons desiring to make oral statements should notify the Designated Federal Employee as far in advance as practicable so that appropriate arrangements can be made to allow the necessary time during the meeting for such statements.

The agenda for this meeting shall be as follows:

Thursday and Friday, April 24 and 25, 1980

8:30 a.m. Until the Conclusion of Business Each Day

The Subcommittee may meet in Executive Session, with any of its consultants who may be present, to explore and exchange their preliminary opinions regarding matters which should be considered during the meeting.

At the conclusion of the Executive Session, the Subcommittee will hear presentations by and hold discussions with representatives of ORNL, the NRC Staff, their consultants, and other interested persons.

In addition, it may be necessary for the Subcommittee to hold one or more closed sessions for the purpose of exploring matters involving proprietary information. I have determined, in accordance with Subsection 10(d) of the Federal Advisory Committee Act (Public Law 92-463), that, should such sessions be required, it is necessary to close these sessions to protect proprietary information See 5 U.S.C. 552b(c)(4).

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted for the presentations can be obtained by a prepaid telephone call to the cognizant Designated Federal Employee, Mr. Elpidio G. Igne (telephone 202/634-3314) between 8:15 a.m. and 5:00 p.m., EST.

Dated: April 2, 1980.

John C. Hoyle,

Advisory Committee Management Officer.

[FR Doc. 80-10477 Filed 4-8-80; 8:45 am]

BILLING CODE 7590-01-M

### Advisory Committee on Reactor Safeguards, Ad Hoc Subcommittee on Natural Circulation and Feed and Bleed Heat Removal; Meeting

An ACRS Ad Hoc Subcommittee on Natural Circulation and Feed and Bleed Heat Removal will hold a meeting on April 24, 1980 in Room 1046, 1717 H St., N.W., Washington, DC to continue its review of information presently available on natural circulation and feed and bleed heat removal systems. Also, areas where inadequate information exists will be examined, and planned NRC (or other) tests that will be run to obtain needed information will be studied and the possible need for other tests will be explored. Notice of this meeting was published March 19, 1980.

In accordance with the procedures outlined in the Federal Register on October 1, 1979, (44 FR 56408), oral or written statements may be presented by members of the public, recordings will be permitted only during those portions of the meeting when a transcript is being kept, and questions may be asked only by members of the Subcommittee, its

consultants, and Staff. Persons desiring to make oral statements should notify the Designated Federal Employee as far in advance as practicable so that appropriate arrangements can be made to allow the necessary time during the meeting for such statements.

The agenda for this meeting shall be as follows:

Thursday, April 24, 1980

8:30 a.m. Until the Conclusion of Business

The Subcommittee may meet in Executive Session, with any of its consultants who may be present, to explore and exchange their preliminary opinions regarding matters which should be considered during the meeting.

At the conclusion of the Executive Session, the Subcommittee will hear presentations by and hold discussions with representatives of the NRC Staff, their consultants, and other interested persons.

In addition, it may be necessary for the Subcommittee to hold one or more closed sessions for the purpose of exploring matters involving proprietary information. I have determined, in accordance with Subsection 10(d) of the Federal Advisory Committee Act (Public Law 92-463), that, should such sessions be required, it is necessary to close these sessions to protect proprietary information. See 5 U.S.C. 552b(c)(4).

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted for the presentations can be obtained by a prepaid telephone call to the cognizant Designated Federal Employee, Dr. Andrew L. Bates (telephone 202/634-3267) between 8:15 a.m. and 5:00 p.m., EST.

Dated: April 2, 1980.

John C. Hoyle,

Advisory Committee Management Officer.

[FR Doc. 80-10476 Filed 4-8-80; 8:45 am]

BILLING CODE 7590-01-M

[Docket Nos. 50-262 and 50-306]

### Consideration of Proposed Increase in Spent Fuel Storage Capacity; Corrections

On February 28, 1980, a "Notice of Proposed Issuance of Amendments to Facility Operating Licenses" was published on page 45, FR 16059 without the name and address of the attorney of the licensee. The name and address of the licensee's attorney is Gerald Charnoff, Esquire, Shaw, Pittman, Potts and Trowbridge, 1800 M Street NW., Washington, D.C. 20036.

The Notice related to the proposed increase in spent fuel storage capacity at the Prairie Island and Nuclear

Attachment C