

CERTIFIED

June 3, 1980

MINUTES OF THE ACRS SUBCOMMITTEE MEETING
ON
CONCRETE AND CONCRETE STRUCTURES
April 22 & 23, 1980
Washington, D. C.

The ACRS Subcommittee on Concrete and Concrete Structures held a meeting on April 22 and 23, 1980 in Room 1167, 1717 H St., N.W., Washington, D.C. The purposes of this meeting were to review the NRC research program, technical assistance programs, and seismic safety margin program (SSMRP) in the area of Structural Engineering. The notice for the meeting appeared in the Federal Register on Monday, April 7, 1980. A copy of the notice is included as Attachment A. A list of meeting attendees and a meeting schedule are included as Attachments B and C. No written statements or requests for time to make oral statements were received from members of the public.

INTRODUCTION

Dr. Siess, Subcommittee Chairman, opened the meeting by indicating that it was being conducted in accordance with the Federal Advisory Committee Act and the Government in the Sunshine Act. Mr. Elpidio Igne was the Designated Federal Employee for the meeting.

The structural engineering research programs that are either part of or are in support of the SSMRP will be discussed at this meeting. There will be other reviews of the remaining SSMRP programs by the ACRS Subcommittee on Extreme External Phenomena.

RESEARCH PROGRAM - L. Shao, NRC Staff

Mr. Shao, Assistant Director of General Reactor Safety Research of the NRC, stated that, in the past, structural engineering research programs provided assistance to NRR and Standards Development. In the future, however, the Structural Engineering Research Branch should also address the needs of I&E.

The new organization of the Office of General Reactor Safety Research and the Structural Engineering Research Branch were presented. The Structural Engineering Research Branch scope of review encompasses the design of plants structures from the base of the foundation to the point where safety systems, components and equipment are attached. Seismic analysis of piping systems is performed in the Mechanical Engineering Branch of NRR.

The NRC's role in performing audits and performing confirmatory research was discussed. PWR LOCA and inplane-shear in reinforced concrete containments were cited as examples where the NRC supported all research. BWR large LOCA research, however, is primarily funded by industry. Attendees at the meeting did not propose that all research be done by industry or the NRC but that some strong justification for government funding be provided for each program. Criteria should be established in order to determine who shall fund research programs. In cases where the NRC is calling for something that may be too conservative, government funding of research to quantify safety margins should be required. The NRC should be up-to-date on research so that they are able to ask good questions in order to review and assess possible research areas. Program areas mentioned included the shaker table tests in Japan and the core ladle for FNP. Dr. Siéss and Dr. Zudans indicated that AEs do very little in the way of supporting research except in developing their own tools. Mr. Shao added that AEs usually do not want to do research unless it is for big generic problems like those sponsored by owner's groups. Mr. Shao stated that the Structural Engineering Research Branch programs are classified into three major areas -- engineering definition of loads, prediction of structural response, and criteria for structural performance. The

engineering definition of loads includes items like load factors and the so-called effective SSE. Structural response includes structure dynamics analysis and soil-structure interaction analysis. Structural performance includes the capacity of a structure and the margin for that structure in resisting loads. These three programs supply information and tools for evaluation of safety-related structures. The major goal of the Branch is evaluation not design.

Dr. Siess indicated that one goal of the Seismic Safety Margin Research Program (SSMRP) is a knowledge of where and how large the uncertainties are in seismic analysis. Mr. Shao stated that two major methods are used to determine uncertainty in structural engineering programs. The first approach is safety margin (a deterministic evaluation of capacity against design load.) The second approach employs methodology using probabilistic-based assessments in the determination of structural adequacy.

TECHNICAL ASSISTANCE PROGRAMS

Mr. Schauer, NRC Staff, described the technical assistance program (TAP) on the buckling behavior of steel containment shells. This is a 2-year (\$300,000) analytical program to study overturning forces that may cause local buckling of the containment shell due to asymmetric pressure loads created during LOCA blow-down. This analytical study will extend buckling into the non-linear range of deformation. One of the products of this particular program will be a computer code that can be used by the NRC to check applicant calculations. This program will analyze a BWR Mark III and PWR ice-condenser containments. Dr. Hafiz, NRC Staff, indicated that one- and two-dimensional analyses will be compared in order to better understand buckling load. The effect of penetrations on buckling load, the knock-down factor, and the sensitivity of these parameters will also be studied. It was questioned whether this program should be considered technical assistance or research.

Mr. Lipinski, of the NRC Structural Engineering Branch, presented a TAP to develop an analytical model to evaluate resistance and ductility of concrete slabs under biaxial-tension, bending, and shear. The report, written by SRI International, has been rejected twice for breach of contract. The contractor failed to develop a simplified model that may be used by the NRC Staff for independent evaluations. The analytical model should have been verified by comparisons with actual tests results. The contractor did not report any tests with inplane tension. Dr. Zudans and Dr. Siess pointed out that tests had been performed and that the NRC may have picked the wrong consultant.

Structural engineering case reviews (Byron/Braidwood, Grand Gulf, South Texas, Midland) are being performed as part of a two-part TAP. Consultants are performing a review to include independent calculations of structural design integrity, seismic inputs, missile resistant barriers and subcompartment pressure. Dr. Shewmon wanted to know if the NRC Staff would use the consultants again after the consultants had developed expertise in this type of review. Mr. Schauer indicated that this was a one-time program but could be continued if the Staff did not have sufficient manpower to complete additional reviews.

The seismology/seismic design review of Seabrook is a \$10,000 TAP contract awarded to Dr. N.M. Newmark to expand on his work at Seabrook and to comment on intervenor contentions. The Kennedy-Newmark criteria for piping are being extended into the structures area for the technical assistance program dealing with the evaluation of load and load combination problems for BWP Mark II and Mark III containments and drywell structures. The upcoming presentation to the ACRS on soil-structure interaction is planned for June 4, 1980.

A review of nuclear plant structural design (ultimate strength of steel containments) is being performed for several ice condenser plants (Sequoyah, McGuire, Cook). Dr. Siess indicated that best estimate (with uncertainties) analyses for containment capability are needed. Areas such as penetrations, and as-built containment geometry may be governing and must be considered.

The post-earthquake inspection requirement is an effort to put together a systematic plan in order to inspect a plant and make an assessment of plant structural integrity following an OBE or SSE. The NRC Staff does not have procedures for post-earthquake inspection at this time. The need for this program and the determination of the level of seismic activity before requiring inspection were mentioned.

The Structural Engineering Branch Technical Assistance Programs in structural areas consist also of seismic review of SEP plants by Lawrence Livermore Laboratory and the seismic consultant services of Dr. Newmark.

Mr. Herring of the Engineering Branch of the Division of Operating Reactors, presented the TAP to evaluate masonry design. This program was initiated because of design deficiencies found at Trojan and the use at other plants of masonry (concrete block) walls to support safety-related piping systems. The contract for the program is administered by Brookhaven National Laboratory and subcontracted to Dr. Goldvil at the University of Maryland. The NRC will issue criteria on the use of masonry walls currently being used to support safety-related large pipes and other components. Mr. Herring indicated that the La Crosse and Zimmer plants had 315 unreinforced masonry walls. The NRC wants the nuclear industry to resolve this problem; for example, Trojan is already committed to several long-term test programs. The NRC needs to gain expertise in the area of masonry design.

Mr. Martore, of the Engineering Branch of the Division of Operating Reactors, presented the TAP on seismic input and analysis techniques. The basic objective is to provide the NRC Staff with assistance in the review of ongoing seismic analysis of design issued on a need basis. The contractor is Lawrence Livermore Laboratory.

The evaluation of the margin of safety in the seismic design of El Centro steam plant was discussed. The El Centro Unit No. 4 (oil fired-80 MWe) experienced 0.5 to 0.6 g. peak accelerations during the Imperial Valley earthquake of October 1979. The plant experienced minor damage but went back into operation about one hour after the earthquake. Mr. Martore perceives the final result of this program as a table listing various locations in the structure and various pieces of equipment with their calculated accelerations and the actual accelerations received during the earthquake.

SEB RESEARCH PROGRAM

Mr. Bagchi of the NRC Staff presented the research programs for the NRC Structural Engineering Research Branch. Each of these programs is described in the handouts. The total research budget is \$2170K for FY80 and \$4900K for FY81.

Mr. Bagchi indicated that large penetrations (e.g. the equipment hatch and the personnel access hatch) were expected to be modeled in computer studies of containments but that the details had not been finalized. Dr. Siess suggested that the probability of over-pressure in a containment is a lot higher than that of a major seismic event. Dr. Pickel indicated that research considering the buckling of steel containments was addressed in many programs. Mr. Bagchi noted that the buckling of steel containments is contained in the safety margins and performance of Category I structures. Mr. Bagchi indicated that the results of structural tests showed that there is a very large reduction in fundamental frequency due to non-linear foundation behavior.

The funding of the flood hazards and flooding effects program (\$50K for FY80) is only for the structural engineering branch. This program may assess the probability of damage to nuclear plants due to flooding but the present scope of work is to determine probabilistic methods of determining flood levels. The NRC probabilistic analysis staff (PAS) will perform the probability studies while the structural engineering branch will examine the effects of flooding. PAS is being funded separately for this project.

Dr. Siess said that the proposed water hammer research program in structural engineering did not come under the cognizance of this subcommittee. This program is not funded for FYs 1980 through 1982.

A study to determine the effects of hydrogen explosion and the behavior of containments under internal hydrogen explosion is being performed by MIT.

The determination of load combinations for the design of structures is a part of the SSMRP. Some of the input for this program will come from the NRC LOCA program. The expected results of the SSMRP will form a basis for formulating load combinations and acceptance criteria.

Dynamic testing programs for nuclear power plants were discussed. Damage assessment criteria based on changes in frequency spectrum were considered as possible criteria for the determination of the amount of damage occurring as a result of seismic activity. The size and amount of the cracks in structures can be correlated for damage assessment. The need for baseline (original) dynamic testing for specific frequency spectrum analysis was considered. Dr. Siess felt that dynamic testing to determine and verify predicted natural frequencies for structures was very important. These types of analysis can be used to benchmark computer codes. Dr. Siess said that the ACRS has recommended that benchmark programs for structural codes and the testing of vendor codes be

designed to use many of the existing experiments and that an experimental program not be developed as part of this effort. If existing experiments are not available, the NRC Staff should inform the ACRS. It was noted that the Japanese, HDR, and San Onofre tests could be used to start a code validation program. Structural computer code modeling sensitivity and mathematical algorithms require additional study.

Sandia National Laboratories will be examining containment structure safety margins under extreme loads (seismic and LOCA loads). This program is primarily concerned with concrete structure. The failure criteria for a containment were discussed. Leakage from the containment but not bursting of the containment was considered the most prominent failure mode.

Dr. Siess requested a detailed breakdown of the budget between safety margins of category I structures program and the buckling program. Mr. Bagchi of the NRC Staff said that he would provide the budget breakdown.

The research program dealing with the effectiveness of QA and inspection procedures will focus on construction procedures. This program will determine the effectiveness of the present requirements. Dr. Siess felt that this program did not have enough research content to belong in the research budget. It could be accomplished as a technical assistance contract on specific items.

The procurement of research programs was discussed. Dr. Siess commented on his observation that the NRC research staff seemed to be insulated from the detailed cost breakdown of research programs. Mr. Bagchi stated that some SSMRP contracts are sub-contracted out by Lawrence Livermore Laboratory without input from the NRC Staff. The NRC Staff only sees the winning proposal. Direct access to the actual researchers performing the contract was discussed. It was felt that the process of subcontracting should be influenced by those who have the ultimate responsibility for the project. DOE (in their water reactor

safety program) has turned over the management of the entire program to a national laboratory; the responsibility for the results, however, remain with DOE.

The subcommittee considered the degree of control available to supervisory panels in directing large research programs. Since money is obligated yearly, a great degree of control is available. Concerns were expressed in redirecting large research programs toward the changing needs of the users. The redirection of LOFT toward small scale breaks was presented as an example of the difficulties in redirecting projects.

Funding for SSMRP was discussed. Studies on the adequacy of codes and standards, computer code benchmarking, and safety margins may be reduced if supplemental funding for FY80 is not forthcoming.

Dr. Costello, NRC Structural Engineering Research Branch, outlined the current SSMRP projects related to structural engineering. The first project, soil-structure interaction (SSI), will identify sources of uncertainty in state-of-the-art SSI methods and estimate the effects of these uncertainties on plant safety calculations. Task 1 of the SSI project (a review and critique of present methods) has been completed. The additional tasks (implementation of analytical tools, definition of soil properties, and sensitivity studies) are still in progress. An interim report on the definition of soil properties will be released soon.

The second project, structural building response, will evaluate state-of-the-art analysis techniques for major structures and develop structural analysis packages for SSMRP calculations. The third project will develop SMACS software and perform selected best estimate vs evaluation studies for structural building and subsystem responses.

NOTES:

- (1) For additional details a complete transcript of the meeting is available in the NRC Public Document Room, 1717 H St., N.W. Washington, D.C. 20555 or from International Verbatim Reporters, Inc., 499 South Capitol St., S.W., Suite 107, Washington, D.C. 20002.
- (2) Materials provided to the Subcommittee at this meeting are on file in the ACRS Office. In general, these materials include:
 - a. Research Programs and Budgets for the Structural Engineering Research Branch.
 - b. SSMRP Projects
 - c. Technical Assistance Requirements for Seismic Input and Analysis Techniques.
 - d. Systematic Evaluation Program (SEP) Technical Assistance Programs in Structural Areas.
 - e. Structural Engineering Branch Technical Assistance Programs.
 - f. Proposed FY 1982 Budget NRC Structural Engineering Research Branch.

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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 subject meeting shall be as follows:

Tuesday, April 22, 1980, 1:00 p.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, the nuclear industry, various utilities, and 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 (Pub. L. 92-463), that, should such sessions be required, it is necessary to close these sessions to protect proprietary information. See 5 U.S.C. 552(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 therefor can be obtained by a prepaid telephone call to the cognizant Designated Federal Employee, Mr. Peter Tam (telephone 202/634-1413) between 8:15 a.m. and 5:00 p.m., EST.

Dated: April 1, 1980.

John C. Hoyle,

Advisory Committee Management Officer.

(FR Doc. 80-10300 Filed 4-4-80; 845 a.m.)

BILLING CODE 7580-01-02

Advisory Committee on Reactor Safeguards; Subcommittee on Concrete and Concrete Structures; Meeting

The ACRS Subcommittee on Concrete and Concrete Structures will hold a meeting on April 22-23, 1980 in Room 1167, 1717 H St., N.W., Washington, DC to review "user needs" in structural engineering and the way in which these needs have been and are being met. 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:

Tuesday and Wednesday, April 22 and 23, 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 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 (Pub. L. 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 1, 1980.

John C. Hoyle,

Advisory Committee Management Officer.

(FR Doc. 80-10301 Filed 4-4-80; 845 a.m.)

BILLING CODE 7580-01-02

[Docket No. 50-220]

Niagara Mohawk Power Corp.; Issuance of Facility License Amendment

The U.S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 36 to Facility Operating License No. DPR-63 to Niagara Mohawk Power Corporation

(the licensee) which revised the License and Technical Specifications for operation of the Nine Mile Point Nuclear Station, Unit No. 1 (the facility) located in Oswego County, New York. The amendment is effective as of its date of issuance.

The amendment consists of changes to the Technical Specifications to modify the power-to-flow curve and allow additional operational flexibility during plant load changes. In addition, corrections have been made to the license to reflect the present power limitations at the end of cycle.

The applications for the amendment comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR 51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated June 28, 1979, (2) Amendment No. 36 to License No. DPR-63, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C. and at the Oswego County Office Building, 46 E. Bridge Street, Oswego, New York 13128. A copy of items (2) and (3) may be obtained upon request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 28th day of March 1980.

For The Nuclear Regulatory Commission,
Thomas A. Ippolito,

Chief, Operating Reactors Branch No. 3,
Division of Operating Reactors.

(FR Doc. 80-10303 Filed 4-4-80; 845 a.m.)

BILLING CODE 7580-01-02

ACRS SUBCOMMITTEE MEETING ON CONCRETE
AND CONCRETE STRUCTURES
April 22 & 23, 1980
Washington, D. C.

ATTENDEES:

ACRS

C. Siess, Chairman
P. Shewmon
W. Mathis
T. Pickel, ACRS Consultant
M. White, " "
Z. Zudans, " "
J. G. Stampelos, ACRS Fellow
T. McCreless, Staff
E. Igne

OTHERS

Richard Orr, W. Offshore Power Systems
J. W. Klingelhoffer, IEEE
N. Nunley, IURI
Noel T. Winter, IURI
James P. Allen, III, Stone & Webster
Bruce J. Mann, Sen. Subcom. on N.R.

NRC

B. S. Browzin, RES
Carolyn Butler, RES
J. F. Costello,
J. J. Burns, RES, MERB
C. W. Burger, RES
Goutam Bagchi, RES, SRB
Larry Shao, RES
S. P. Chan, NRR, SEB
H. E. Polk, NRR/SEB
John C. Lane, NRR/SEB
H. W. Lee, SEB
R. E. Lipinski, SEB
P. T. Kuo, NRR, SEB
S. Kim, SEB
D. C. Jeng, NRR/DSS/SEB
G. P. Tan, NRR/DSS/SEB
Frank Rinaldi, NRR/DSS/SEB
John S. Ma, NRR/ DSS/SEB
J. Martore, NRR/DOR
A. Hafiz, DSS
F. Schaver, NRR
T. Murphy, NRR
K. S. Herring, NRR
Howard Wong, IE/TP
Gunter Arndt, OSD

ACRS SUBCOMMITTEE MEETING ON CONCRETE AND CONCRETE STRUCTURES
 APRIL 22 and 23, 1980
 WASHINGTON, DC

APRIL 22, 1980

APPROXIMATE TIME

I. INTRODUCTION	8:30 a.m.
II. RESEARCH PROGRAM PLAN	
● Overview and Individual Programs	9:00 a.m.
***** BREAK *****	10:25 a.m. - 10:40 a.m.
III. TECHNICAL ASSISTANCE PROGRAM	
● Structural Engineering Branch	10:40 a.m.
● Engineering Branch	12:10 p.m.
● Inspection and Enforcement	12:40 p.m.
***** LUNCH *****	1:10 p.m.
● Systematic Evaluation Program Branch	2:10 p.m.
IV. BUDGET - 1982	3:00 p.m.
***** BREAK *****	3:45 p.m. - 4:00 p.m.
V. ACRS COMMENT ON FUTURE DIRECTION	4:00 p.m.
VI. ADJOURNMENT	4:30 p.m.

APRIL 23, 1980

I. CHAIRMAN'S COMMENT	8:30 a.m.
II. SSMRP - STRUCTURAL PORTION	9:00 a.m.
III. ACRS CAUCUS and DISCUSSION WITH STAFF	11:00 a.m.
IV. ADJOURNMENT	no later than - 12:00 noon