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ACRS SUBCOMMITTEE ON CESSAR  
WINDSOR LOCKS, CONNECTICUT  
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## INTRODUCTION

The ACRS Subcommittee on CESSAR held a meeting on October 19, 1981 in Windsor Locks, Connecticut. The purpose of the meeting was to review the Combustion Engineering Inc. (CE) application for a Final Design Approval (FDA) of the System 80 standard nuclear steam supply system. Notice of this meeting was published in the Federal Register on Tuesday, November 3, 1981 and the entire meeting was open to the public. A meeting schedule, a list of participants, and selected handouts are included as Attachments 1-3. A complete set of handouts is contained in the ACRS office files. Attachment 4 is a list of documents provided for the Subcommittee's use. There were no statements by members of the public.

## Attendees

ACRS

- M. Bender, Subcommittee Chairman
- J. Ehersole, Subcommittee Member
- W. Mathis, Subcommittee Member
- P. Shewmon, Subcommittee Member
- T. Theofanous, Consultant
- G. Quittschreiber, Designated Federal Employee
- S. Beal, Senior Fellow

Principal  
Speakers: C. Grimes, NRC Staff  
E. Scherer, CE

## Subcommittee Chairman's Remarks

Mr. Bender noted that this is the first FDA the ACRS has been asked to review, and that the design should be one that could interface with a number of architect/engineering designs for the balance of plant. He noted that the FDA should represent a fixed design that is well documented, reviewed by the staff, and that further review, except for new safety

questions, is not required. Mr. Bender then expressed some reservations that many of the documents were simply marked up for changes and that eventually the package should be put in final form. Mr. Grimes of the NRC Staff noted that the SER for CESSAR will have revisions, rather than supplements, because it is considered that the document should be complete. Mr. Bender noted that the CESSAR document is being used as part of the Palo Verde review and that this is first.

NRC Presentation - Overview and Review of Open Issues

Mr. Grimes noted that CESSAR\* is the first FDA and that the Staff and everyone is apprehensive about the limits on referenceability and applicability of a standard nuclear steam supply system. He stated that the Staff would like to get feedback from the ACRS on what they view these limits to be. Mr. Grimes noted that the staff review of CESSAR was made easier by the fact that NSSS designs have tended toward becoming more standard for many years. The Preliminary Design Approval (PDA) was issued on December 31, 1975, and because of the licensing backlog after TMI-2, the CESSAR and Palo Verde reviews were done in parallel, rather than doing CESSAR first. The cutoff date for changes to System 80 was August 1974, but CESSAR was reviewed to current regulatory standards, including NUREG 0737. Mr. Grimes noted that CE had originally done the accident analysis on a probabilistic basis as permitted in Regulatory Guide 1.70, but the Staff requested CE to use the standard design basis approach. He said the staff had reviewed in depth the interfaces between System 80 and the balance

\* CESSAR refers to the Safety Analysis Report for the CE Standard Nuclear Steam Supply System design known as System 80.

of plant (BOP). In their review of the instrumentation and control interfaces the Staff used the independent design review process. Mr. Grimes also noted that the Staff used experience from reviewing recent CE Plants to help them review CESSAR. He then discussed the open issues from the Safety Evaluation Report (SER).

Dr. Shewmon asked about the open issue on fuel rod design pressure and Mr. Grimes replied that CE has not yet set a pressure limit. Mr. Bender asked how the Staff decides whether the conservatism in the design are appropriate. He used DNBR as an example. Mr. Grimes replied that the staff will review DNBR margins on a case-by-case basis and require that set points be adjusted to give the proper margin. Mr. Ebersole said he was interested in conservatism in a broader context, and cited the possible damage to equipment as a result of the environment created by the accident. Mr. Grimes replied that as regulators, the staff does not dictate to see if it is adequate. Mr. Bender noted that the Staff can require that the licensee do more, and that the "more" may be in the BOP. Mr. Grimes said that the Staff has identified additional interface requirements, but in some cases the scope was outside System 80 and within the BOP scope. Mr. Ebersole noted that the rules governing design result in a bandwidth of conservatism and that one need only look in a few areas to judge whether the design tends toward the lower or upper end of the band.

Mr. Grimes then discussed the Confirmatory Issues. Mr. Bender asked if Mr. Grimes could present these to the Full Committee in the form of a table showing which had

to be confirmed by analysis, which by experiment, and which by in-service operation. Mr. Grimes agreed to do this.

Mr. Bender asked the Staff to tell the Subcommittee about the potential options in the use of the FDA. Mr. Grimes said that the FDA-1, which CE applied for, is good for three years with an automatic extension of two years for new construction permits. He also stated that the Staff needed a way to get new requirements factored into System 80 and a policy position as to whether the FDA should be limited to those plants which have applied System 80 already and consider new applications on a case-by-case basis. In addition, it has not been decided to what degree plants referencing CESSAR can change the System 80 design. Mr. Bender said the Staff needs to define what is meant by re-opening and Mr. Grimes replied that the Staff wanted to bring CESSAR to a position where they had to review as little as possible. Dr. Theofanous asked how much independent accident and transient analysis the staff did in evaluating CESSAR and Mr. Grimes replied that they spent about twice as much time analyzing as they did reading CE's analyses.

Dr. Theofanous then asked about why the Staff did not use CE's PRA and Mr. Grimes said it would have taken too long to perform the review using PRA as a basis. Dr. Theofanous suggested that because CESSAR is going to be referenced for a long time, a PRA would be very useful.

Mr. Ebersole asked about the independence of the core protection calculator and

the supplementary protection system and Mr. Grimes said he believed they were independent.

#### Introduction by Combustion Engineering

Mr. Lyons, Vice President of CE Power Systems Group made some opening remarks and was followed by Dr. McGill, Vice President of Nuclear Licensing for CE. In his remarks he noted that the System 80 design represents something over a million man hours of effort. He then introduced Mr. Scherer who continued the CE presentation.

Mr. Scherer reviewed the schedule for the meeting. Then there followed a discussion on fuel rod design pressure, the gist of which was that CE used clad lift off as the limiting condition while the Staff uses the criterion that internal pressure should not exceed system pressure. The discussion ended by noting that CE was doing more analysis and would resolve the matter with the staff. Dr. Theofanous asked if CE were going to higher burnups with System 80 fuel and Mr. Scherer said yes, and the fuel was being tested in demonstration assemblies. Mr. Grimes noted that the Staff had put a limit on burnup.

#### CE Approach to Standardization

Mr. Scherer then discussed the CE approach to standardization and the review of CESSAR. He pointed out that the review was thorough and the marked-up copies referred to earlier were a result of the review methods and did not reflect upon the quality of the review. Dr. Theofanous asked if during the

presentations CE would show where System 80 represents an improvement over previous designs. Mr. Scherer replied yes.

Mr. Scherer went on to point out that CESSAR was currently being used to license 13 units with four BOP's and 5 sites. He noted that these plants will reference CESSAR. Mr. Bender asked, if simply referencing CESSAR leads to the owner's not having as much knowledge about their plants as they would otherwise. Mr. Scherer replied no, that for non standard plants the NSSS vendor supplied that material anyway, and in the case of System 80, the users have participated heavily in the design.

Mr. Scherer then pointed out that going to a standard design emphasized interface requirements, so that they get a more thorough review. Because of this, he said, the utilities have to understand them better. Mr. Bender noted that this was certainly part of what he was referring to, but that he still had some concern that the education process may be degraded somewhat by standardization. Mr. Scherer did not agree and pointed out that with a standard plant the utility will know well in advance what the system will be and not have to try to keep up with a lot of revisions. Mr. Bender said that was an advantage. Mr. Ebersole asked Mr. Grimes to what extent the utility reviewed the design, and Mr. Grimes replied that while they had utility participation in the review, there was no clearly defined NRC requirement for how much of the design basis the utility must understand.

Mr. Scherer continued to discuss the applicability of CESSAR and stated that it was CE's view that it would be referenceable for construction permits until the expiration of the FDA. Mr. Scherer then discussed the policy of making changes to the System 80 design. He said the design should remain fixed for some period at which point changes would be made as necessary. Mr. Bender asked for a clarification and Mr. Scherer replied that if a safety issue were to arise that required a modification to a System 80 plant, all such plants would be modified. Mr. Scherer said that keeping all the plants identical is a major benefit. Mr. Ebersole asked how far down into the design standardization extended; i.e., did a given relay have to be exactly the same in one plant as in another. Mr. Scherer replied no, that they had to be the same functionally, but could come from different manufacturers.

Mr. Davis of CE then discussed the licensing scope of CESSAR. He described the systems making up the System 80 design, the interfaces with the balance of plant, and the compliance of System 80 with the NRC requirements. With regard to the NRC requirements he said that, in CE's view, System 80 meets all current NRC requirements. Mr. Knapp of CE then gave an overview of the design, a description of the unique features, and a comparison with other CE Plants. Dr. Theofanous asked about details of the effect of the differences in design of the control rod shrouding and lower core support upon the loss of coolant accident analysis and CE agreed to provide an answer to him after the meeting. Mr. Bender asked about the possibility of vibration in the economizer section of the steam generator and Mr. Scherer said that the CE has done extensive testing

to show that vibration is not a problem. Mr. Ebersole asked about the supplementary protection system and Mr. Scherer replied that the design has redundant and diverse circuit breakers with both shunt and undervoltage trip. Mr. Bender asked if the new features of the System 80 design raised any new or unique safety questions and Mr. Scherer replied no.

#### Decay Heat Removal

Mr. Turks of CE discussed decay heat removal. Mr. Ebersole asked about the effect of a break in the chemical volume control system upon equipment outside the containment. Ms. Kerrigan of the NRC Staff indicated this was an open item for Palo Verde and would be discussed there. Mr. Ebersole asked if the auxiliary feed system could keep up with blowdown and Mr. Turk said yes. In addition, Mr. Bevilacqua of CE said that the high blowdown system is used only during shutdown.

#### Selected Features of System 80 Design

Mr. Natan of CE described selected features of the System 80 design. Mr. Bender asked if the reactor coolant system had any mirror images and Mr. Scherer said no. Mr. Bender asked if CE looked into the architect's seismic analysis and Mr. Natan said no. Mr. Scherer said that CE examines the results and if they look reasonable CE does not look further.

#### Accident Monitoring System and Transient Analysis

Mr. Pucok described the accident monitoring system. Mr. Bender asked if the critical function monitoring system is a part of System 80 and Mr. Pucok said



it is optional. There was some discussion about this system and how much information it provided and should provide. CE's philosophy is that it should tell the operator whether or not certain key parameters are getting worse or better during an accident.

Mr. Kling of CE then discussed transient and accident analysis, including pressurized thermal shock. Mr. Ebersole asked for the rationale CE used to eliminate power operated relief valves (PORV) in the System 80 design. Mr. Corcoran of CE said that CE wanted to maximize primary system integrity. Mr. Ebersole then asked how they would depressurize the plant to get water in. Mr. Corcoran replied they rely on the secondary system. Mr. Turk of CE added that the original function of the PORV was to reduce challenges to the safety valves and that PORV's were removed from CE designs past 1970 because CE felt they did not offer substantial advantages. He went on to say that the auxiliary feedwater systems were upgraded in designs with no PORV's. Dr. Shewmon asked about the end-of-life neutron fluence with the higher power in the System 80 design. Mr. Harding of CE replied that the criterion is that it be less than  $4 \times 10^{19}$ , and that CE estimated the actual fluence to be  $3.15 \times 10^{19}$ . Mr. Bender asked the basis for the limit of  $4 \times 10^{19}$ . Mr. Bender asked what CE has done to show the vessel can tolerate these fluences and Mr. Scherer said that CE could provide the evidence to the Committee. Mr. Kling then went on to describe the transients leading to thermal shock. Mr. Ebersole asked, in the event of a steam line break, how would they avoid a containment explosion. Mr. Kling replied that there are two lines, each

with a valve. Mr. Ebersole asked if the valves were tested under the conditions of a steam line break and Mr. Kling replied no, they were analyzed to assure they would close. There then was a discussion of how the user of System 80 would know to put the proper valves in.

#### Concerns in ACRS Letter on Preliminary Design Approval

Mr. Caruthers of CE discussed several issues raised by the ACRS in its letter on the CESSAR PDA. Dr. Shewmon asked about the cobalt content of the stainless steel and received the reply that it is 0.02 percent. In response to another question from Dr. Shewmon, Mr. Caruthers said that CE has specifications for initial flushing and cleanliness of the primary systems. Mr. Bender asked if there are differences in the practices for System 80 compared to previous designs and Mr. Caruthers said no, nothing major. Mr. Ebersole asked about whether one could fix one disabled decay heat removal pump if the redundant pump was circulating highly radioactive water. Mr. Calaghan of CE said that the pumps are in different rooms and that clean water can be routed through them to clean them up. Mr. Grimes of the NRC Staff pointed out that CE and the Staff currently disagreed on the allowable level of radioactivity in the primary coolant. Mr. Bender asked CE if they had designed the plant for decommissioning and CE replied they had not, but they had looked to see if there was anything in the design which precluded it. CE concluded there was not. Mr. Bender then asked the staff about decommissioning. Their reply was that there are generic efforts underway and they did not want to hold up to review the CESSAR while these were being developed. Dr. Shewmon asked the staff if they had any requirements on in-place annealing of the pressure vessel and Mr. Grimes said he would have to defer any answer.

Improvements in ECCS Models

Mr. Lango of CE discussed improvements in ECCS models and best estimate analysis in design. In response to questions from Dr. Theofanous he gave several examples of how the best estimate methods differed from the methods prescribed in Appendix K to 10CFR50.

The Subcommittee then agreed to bring CE's application to the Full Committee on December 10, 1981, and the meeting was adjourned at 2:50 p.m.

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NOTE: ADDITIONAL DETAILS CAN BE OBTAINED FROM THE TRANSCRIPT LOCATED IN THE PUBLIC DOCUMENT ROOM, 1717 H STREET, N.W., WASHINGTON, D.C. 20555 OR FROM ALDERSON REPORTING, INC., 400 VIRGINIA AVENUE, S.W. WASHINGTON, D.C. (202) 554-2345.