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Docket No.: 50-382

Mr. L. V. Maurin
Vice President - Nuclear Operations
Louisiana Power & Light Company
142 Delaronde Street
New Orleans, Louisiana 70174

Dear Mr. Maurin:

The NRR staff has performed an evaluation in response to the ACRS concerns regarding the lack of a rapid direct depressurization capability in the System 80 design. This new information relates to all CE facilities without this capability including Waterford 3.

Since the staff evaluation was completed prior to the Ginna incident, and since other preliminary information concerning the System 80 design has been recently generated within the NRC staff, this Supplemental Safety Evaluation Report (Enclosure 1) is a draft, and does not complete our review in this area. The staff review of Feed and Bleed capability in the System 80 design will be finalized at a later date.

The enclosures to this letter represent the present status of the NRC staff's review of this issue, which are provided for your information. We encourage you to join the CE Owners Group investigation of feed and bleed. If you have any questions concerning this matter, please contact the project manager, Suzanne Black on (301) 492-7119.

Sincerely,

Original signed by
Robert L. Tedesco

Robert L. Tedesco, Assistant Director
for Licensing
Division of Licensing

Enclosures:
1. Memo fm. RJMattson to DGEisenhut dtd. 2/4/82
2. Ltr. fm. DGEisenhut to CE

cc: See next page.

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DATE	2/17/82	2/17/82	2/17/82				

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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cc: See next page.

WATERFORD

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ENCLOSURE 1

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 04 1982

MEMORANDUM FOR: Darrell G. Eisenhut, Director, Division of Licensing, NRR

FROM: Roger J. Mattson, Director, Division of Systems Integration, NRR

SUBJECT: TRANSMITTAL OF DRAFT PALO VERDE AND CESSAR SER SUPPLEMENT

Enclosed are copies of our draft SER Supplements for Palo Verde and CESSAR. They address the concerns raised by the ACRS letters of December 15, 1981 involving the need for a reliable heat removal capability in view of the lack of a direct means to rapidly depressurize the primary system. The CESSAR and Palo Verde designs do not include PORVs to permit the feed and bleed method of cooling the way it is provided in other PWRs.

Our SER Supplements were prepared before the Ginna steam generator tube rupture incident of January 25, 1982 and represent our position at that time.

The Ginna incident has resulted in renewed consideration being given to the possibility of simultaneous steam generator tube ruptures in both steam generators. We are also reconsidering accident scenarios that could lead to simultaneous loss of coolant in the primary and secondary systems. These considerations require us to reexamine the possibility of feed and bleed as an alternate method of providing core cooling. We are also interested in the use of the PORV to gain control of primary system pressure to avoid challenges to the safety valves on a faulted steam generator, thereby reducing the frequency of releases of radioactivity following steam generator tube ruptures.

In addition, since the preparation of our draft SER Supplements for Palo Verde and CESSAR we have been provided with new information by the Office of Nuclear Regulatory Research. The new information is in a memorandum on CE system reliability that bases its analysis on the Accident Sequence Precursor Program. The techniques used in this program are somewhat controversial, and we are currently reviewing both the techniques and conclusions. The memorandum prepared by Frank Rowsome and Joe Murphy of RES is dated January 29, 1982 and concerns the feed and bleed issue for CE reactor designs without PORVs. It makes two conclusions concerning the reliability of the auxiliary feedwater system which are at variance with our draft SSERs. We have these differences under review.

Contact:
R. Lobel
X29463

DUPE-8202250357 01
pdr

In view of the concerns discussed above we have evaluated the potential consequences of operation of San Onofre Units 2 and 3 at low power for the purpose of startup testing. We conclude that the risk of such operation is negligible because even if feedwater were lost to the steam generator, boiling of the remaining steam generator inventory and heat transfer to the containment atmosphere and structures would be sufficient to prevent overheating of the core.

Should a steam generator tube rupture event occur during this low power testing period, three factors would contribute to substantially reducing the risk to the public. First, there is sufficient time available for the operators to correct the loss of important safety systems needed to mitigate the event or to take alternate courses of action. Second, the fission product inventory during low power operation is very much less than during full power operation. Third, there is a reduction in required capacity for mitigating systems at low power.

We suggest that the applicants of CESSAR System 80 and Palo Verde 1, 2 and 3, (perhaps in conjunction with other CE owners) perform a special study of the utility and competing risks of PORVs in the various accident scenarios and propose system modifications as appropriate to the concerns summarized in this memorandum.

Roger J. Mattson

Roger J. Mattson, Director
Division of Systems Integration

ENCLOSURES:
Attachment 1 - SSER for CESSAR
Attachment 2 - SSE for Palo Verde
Attachment 3 - Memo fm Tedesco to Rowsome dtd 1/29/82
Attachment 4 - Memo fm Bernero to NRR Div. Dirs dtd 1/22/82

ATTACHMENT 1

SUPPLEMENTAL SAFETY EVALUATION
FOR CESSAR (SYSTEM 80) FDA
AUXILIARY SYSTEMS BRANCH

ACRS CONCERN REGARDING RELIABILITY OF SHUTDOWN HEAT REMOVAL SYSTEM

In the CESSAR Letter, the ACRS stated:

"In recent years, the availability of reliable shutdown heat removal capability for a wide range of transients has been recognized to be of great importance to safety. The System 80 design does not include capability for rapid, direct depressurization of the primary system or for any method of heat removal immediately after shutdown which does not require use of the steam generators. In the present design, the steam generators must be operated for heat removal after shutdown when the primary system is at high pressure and temperature. This places extra importance on the reliability of the auxiliary feedwater system used in connection with System 80 steam generators and extra requirements on the integrity of the steam generators. The ACRS believes that special attention should be given to these matters in connection with any plant employing the System 80 design. The Committee also believes that it may be useful to give consideration to the potential for adding valves of a size to facilitate rapid depressurization of the System 80 primary coolant system to allow more director methods of decay heat removal. The Committee wishes to review this matter further with the cooperation of Combustion Engineering and the NRC Staff."

In order to fully respond to the concern, the staff position is presented in three parts as follows: (1) auxiliary feedwater system reliability, (2) steam generator integrity and (3) the need for additional primary system valves to facilitate direct rapid system depressurization for decay heat removal.

In regard to the ACRS concern for "extra importance on the reliability of the auxiliary feedwater system used in conjunction with System 80 steam generators", we will require that Combustion Engineering include an auxiliary feedwater system unavailability acceptance criterion as an interface in CESSAR to be satisfied by referencing applicants for their auxiliary feedwater system designs. The criterion will be the same as that identified in the Standard Review Plan (NUREG-0800), Section 10.4.9 for meeting General Design Criteria 34, Residual Heat Removal, and 44, Cooling Water as follows:

"An acceptable AFWS should have an unavailability in the range 10^{-4} to 10^{-5} per demand based on an analysis using methods and data presented in NUREG-0611 and NUREG-0635. Compensating factors such as other methods of accomplishing safety functions of the AFWS or other reliable methods for cooling the reactor core during abnormal conditions may be considered to justify a larger unavailability of the AFWS."

We conclude that this interface adequately addresses auxiliary feedwater system reliability for CESSAR reference plants.

In regard to the ACRS concern for "extra requirements on the integrity of the steam generators", the following is the staff position.

The System 80 steam generators incorporate multiple design features to minimize the instance of problems which have been identified to date in operating plants steam generators. These features inlcude improvements in material of construction and fabrication techniques. We note that there is no operating experience associated with the Sytem 80 steam generators. Therefore, we know of no reason to impose additional requirements at this time for assuring their integrity. If operating experience indicates that additional requirements are warranted, we will incorporate them as necessary.

It should also be noted that the CESSAR SER (NUREG-0852) includes discussion and staff conclusion on steam generator integrity and certain aspects of steam generator performance as follows:

(a) Materials and fabrication and their acceptability against applicable ASME Codes and General Design Criteria are addressed in SER Section 5.4.2.1.

(b) Design features for prevention of damaging water hammer is addressed in SER Section 10.4.

(c) Secondary water chemistry is addressed in SER Section 10.3.1.

Based on the above, we conclude that the integrity of the System 80 steam generators is adequate to assure their availability for decay heat removal and that further requirements in this area are not necessary.

In regard to the ACRS concern for "consideration to the potential for adding valves of a size to facilitiate rapid depressurization of the System 80 coolant system to allow more direct methods of decay heat removal," the following is the staff position in this matter.

BACKGROUND

In some pressurized water reactors, an alternate method of decay heat removal has been identified in the event all feedwater to the steam generators is lost. This method of decay heat removal, termed "feed and bleed," involves coolant addition to the primary system via the HPI pumps, and liquid discharge via either safety or relief valves. To date, the loss of all feedwater is not an event required to be designed for by NRC regulations.

In order for feed and bleed to be avviable decay heat removal mechanism, the HPI system must be capable of injecting a sufficient quantity of coolant at the prevailing system pressures.

For plants without a manual depressurization capability (i.e., PORV system with enough relief capability to sufficiently depressurize the primary system), the prevailing system pressure following a loss of all feedwater will be the safety valve set pressure (usually 2500 psi). Thus, in order to have a viable feed and bleed capability in plants without PORVs, the HPI pumps must be capable of injecting sufficient quantities of coolant at the safety valve set pressure. This implies the need for an HPI pump shutoff heat considerably above the safety valve set pressure.

For plants with HPI pumps that do not have shutoff heads above the safety valve set pressure, a means to manually depressurize the primary system to a pressure sufficiently below the HPI pump shutoff pressure in an acceptable amount of time would be necessary.

PORVs would typically be relied upon to provide this manual depressurization for viable "feed and bleed" capability.

CE SYSTEM 80 DESIGN

The present Combustion Engineering (System 80) standard plant design does not include power-operated relief valves (PORVs). The HPI system employs the pumps with a shutoff pressure of 1750 psig. Thus, in the

event of a loss of all feedwater, the System 80 design does not have the capability to depressurize the primary system to below the HPI shutoff pressure. Thus, in this design, reliance cannot be placed on "feed and bleed" for decay heat removal.

STAFF POSITION

While the staff recognizes the potential benefits of a feed and bleed capability, there are presently no design requirements or criteria which would require CE system 80 plants to install an alternate decay heat removal system independent of the steam generator system. The staff has recognized the need for reliable decay heat removal. The staff acceptance criterion for auxiliary feedwater system (AFWS) reliability (as identified in SRP Section 10.4.9) is based on an acceptance of the mean value of the probability of core melt from feedwater transients that was derived in WASH-1400. The staff recognizes the limitations in WASH-1400 as delineated in previous statements. However, in using the study, we have taken the applicable component part which has an adequate data base for purposes of comparison and applied a generally accepted fault tree technique uniformly to determine weaknesses in the AFWS design when compared with other plants. The staff decision on acceptability is not strictly based on meeting an absolute value. The staff has not discarded the deterministic acceptance criteria and requires that they also be satisfied. This criterion has been required of Palo Verde (the first System 80 design to be licensed) and will be satisfied

by all future System 80 plants (refer to Part 1 above). Additional mitigating features available to satisfy the core melt risk probability would be evaluated on a plant specific basis. This is discussed further in the Palo Verde SER Supplement addressing similar ACRS concerns.

Notwithstanding the present reliability requirements for AFW systems and overall decay heat removal capability, the staff has initiated work on the unresolved safety issue of decay heat removal reliability (USI A-45). A key element of this program will be an evaluation of risk reduction that would be afforded by a viable "feed and bleed" capability. If it is concluded that a cost beneficial reduction in risk could be achieved by incorporating a "feed and bleed" capability in operating plants that presently do not have such a capability, then a backfit order would be considered.

However, until this study is completed, the staff concludes there is no need to require a "feed and bleed" capability be installed in System 80 plants since adequate heat removal system reliability will be assured by the AFWS reliability criterion as an interface requirement in CESSAR. It is the staff position that the present AFW reliability criterion must be met by applicants of the CE System 80 design. Meeting this position provides a sufficiently low probability of core melt for this design, and further assures a reliable decay heat removal capability.

In summary, we conclude that the CESSAR System 80 design for decay heat removal conforms to applicable General Design Criteria and guidance and is sufficiently reliable to assure safe shutdown.

SUPPLEMENTAL SAFETY EVALUATION

FOR PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2 AND 3

AUXILIARY SYSTEMS BRANCH

ACRS CONCERN REGARDING RELIABILITY OF SHUTDOWN HEAT REMOVAL SYSTEM

In the Palo Verde letter, the ACRS stated:

"In the Palo Verde design the primary system does not include capability for rapid, direct depressurization when the plant has been shut down. This places extra importance on the reliability of the auxiliary feedwater system and makes it necessary that the NRC Staff and the Applicant assure the availability and dependability of this system for a wide variety of transients. It also places extra requirements on the continued integrity of the two steam generators as the only method of heat removal immediately after shutdown. The ACRS recommends that the NRC Staff and the Arizona Public Service Company give additional attention to the matter of shutdown heat removal for Palo Verde and develop a detailed evaluation and justification for the position judged to be acceptable. The Committee wishes to be kept informed."

The following is the staff position on the above concern.

In regard to the ACRS concern for extra importance placed on the reliability of the AFWS in view of the lack of a rapid, direct depressurization capability for the primary

system, and the ACRS recommendation for a detailed evaluation and justification for the position judged to be acceptable, the following is the staff position on this matter.

In the Section 22 of the Palo Verde SER (NUREG-0857) under Item II.E.1.1 of the TMI-2 Requirements, we have identified the fact that the applicant submitted an AFWS reliability study in accordance with staff guidance. The staff reviewed the study and determined that the AFWS met the system unavailability acceptance criterion (10^{-4} to 10^{-5} per demand) for a loss of all feedwater as a result of a feedwater transient or loss of offiste power initiating events. We also determined that the AFWS design met all deterministic criteria of Section 10.4.9 of the Standard Review Plan (NUREG-0800).

In addition, as the AFWS unavailability acceptance criterion is derived from a risk of core melt frequency of 5×10^{-6} per reactor year (Reactor Safety Study, WASH-1400) consideration was given to additional plant features available to bridge the gap from the AFWS system unreliability acceptance criterion (10^{-4} to 10^{-5} per demand) to the core melt frequency (5×10^{-6} per reactor year). These mitigating features include a stable grid and long steam generator boil dry time (approximately 20 minutes) which allows for operator recovery. The grid and offsite power supply line arrangement at Palo Verde is comparable to most operating nuclear power plants. Thus, the frequency of occurence of a loss of offsite

power should be equivalent to the average assumed in past analyses, approximately 0.2 to 0.4 per reactor year. Further, the 20 minutes of steam generator water inventory after a loss of main feedwater allows time for plant operators to restore the AFWS should it fail initially, or restore offsite power and main feedwater. Previous estimates indicate approximately a 40% chance of restoring offsite power within 20 minutes. These features provide additional confidence that the risk of core melt probability of 5×10^{-6} is not exceeded for an extended loss of feedwater condition.

Based on the above, we conclude that the Palo Verde AFWS meets the staff reliability acceptance criterion and further that it is unlikely that the risk of core melt probability of 5×10^{-6} will be exceeded as a result of feedwater transients.

In regard to the ACRS concern for "extra requirements on continued integrity of the two steam generators as the only method of heat removal immediately after shutdown," the following is the staff position.

The integrity of the System 80 steam generators has been reviewed by the staff and found to be acceptable. Refer to the CESSAR SER Supplement addressing ACRS concerns on this subject. Further, the Palo Verde SER (NUREG-0857) includes discussion on the acceptability of the following relative to steam generator integrity:

a) The steam generator inservice inspection program is addressed in SER Section 5.4.2.1;

b) The secondary water chemistry monitoring and control program is addressed in SER Section 10.3.3; and

c) Preoperational testing for steam generator/feedwater waterhammer prevention is addressed in SER Section 10.4.7.

Based on the above, we conclude that the Palo Verde steam generators provide a reliable means for shutdown decay heat removal without the need for additional requirements for assuring their continued integrity.

In summary, we conclude that the Palo Verde shutdown heat removal capability is sufficiently reliable and conforms to applicable General Design Criteria and guidance without further requirements.