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MIDDLE SOUTH UTILITIES SYSTEM

August 12, 1985

W3P85-2611
A4.05

Director of Nuclear Reactor Regulation
Attenton: Mr. G.W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford SES Unit 3
Docket No. 50-382
Reactor Coolant System Pump Trip

REFERENCE: Letter dated July 16, 1985
from Knighton (NRC) to Leddick (LP&L)

Dear Sir:

By your referenced letter you transmitted four questions concerning the post-LOCA status of reactor coolant pump seal cooling. Enclosed please find LP&L's response to the questions.

Should you require further information on this matter please contact Mike Meisner at (504) 595-2832.

Yours very truly,

K.W. Cook
Nuclear Support & Licensing Manager

KWC/MJM/pcl

Enclosure

cc: B.W. Churchill, W.M. Stevenson, R.D. Martin, J. Wilson T.A. Flippo

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LP&L RESPONSE TO NRC QUESTIONS

ON REACTOR COOLANT SYSTEM PUMP TRIP

REFERENCE: W3P84-0405 dated February 16, 1984, "Changes to Component Cooling Water System to Enhance Availability of Cooling to Reactor Coolant Pump Seals"

Question

(1) Does any containment isolation signal result in the termination of systems essential for continued operation of the reactor coolant pumps? If so, identify the signals and systems effected.

Response

The original design for Waterford 3 provided for interruption of Component Cooling Water (CCW) to the RCP seal coolers upon receipt of either a Safety Injection Actuation Signal (SIAS) or a Containment Isolation Actuation Signal (CIAS). Both SIAS and CIAS are actuated via a low pressurizer pressure or a high containment pressure signal.

As described in the referenced letter, LP&L implemented hardware changes to substitute the Containment Spray Actuation Signal (CSAS) for the previous SIAS/CIAS in isolating CCW to the RCPs. The CSAS is actuated on high high containment pressure coincident with SIAS. As a result, CCW isolation to the RCPs does not occur upon receipt of a low pressurizer pressure signal or CIAS. Non-spurious actuation of CSAS, and therefore isolation of CCW, would occur only for a large LOCA or main steam line break in containment.

Question

(2) If essential water services are terminated, provide a description of the operator guidelines, training, and procedures in place (or to be implemented) which assure that these services are restored in a timely manner to prevent seal damage or failure, once a non-LOCA situation has been confirmed.

Response

As noted above, by limiting CCW interruption to CSAS, CCW would be lost during only two separate and quite distinct events - a LOCA or main steam line break in containment.

LP&L is a charter participant in the CE Owners Group (CEOG) work to develop emergency procedure guidelines (EPGs). The guidelines, as documented in CEN-152, Revision 2, will be used as the basis for implementation of the RCP "trip two/run two" strategy (see LP&L response to Generic Letter 83-10a dated April 8, 1983, W3P83-1078).

LP&L is confident that this guidance, in combination with associated training materials and operating procedures, will meet the operators' information needs concerning RCP seal protection.

For example, the following excerpt was obtained from CEN-152 training material prepared for the CEOG:

> "...the RCP operating strategy results in tripping the final two RCPs if RCP operating limits are not satisfied. The RCPs may be operating in a pressure-reduced RCS and, in some cases, degraded containment conditions are also possible. This could result in the loss of vital RCP auxiliaries. The operator must continuously monitor RCP operating limits (e.g., temperatures, seal flow, oil pressures, NPSH, motor amperage, vibration) and trip the remaining two RCPs if concerned about RCP operating equipment integrity. Plant specific RCP operating limits should appear in this step, either directly or by referencing the applicable operating instruction."

Thus, if the RCP operating limits are not satisfied the operator is instructed to trip the remaining RCPs. This step is performed continuously. Plant specific RCP operating limits include a specified time period (three minutes) during which CCW may be unavailable for seal cooling. If seal cooling cannot be reestablished, the pumps are tripped to preclude any potential impact on future seal performance. Plant specific operating limits are developed from, and consistent with, guidelines provided by CE and the pump manufacturer.

If all RCPs were stopped, the EPGs provide guidance for RCP restarts, provided all restart criteria are satisfied. To assure RCP seal integrity, the pump is not restarted if CCW is lost for more than 10 minutes. The effect of not restarting the RCPs is bounded by the FSAR safety analyses.

In summary, in the context of the RCP "trip two/run two" strategy, if the operator is unable to maintain or restore RCP measured parameters within operating limits (e.g., seal temperature), the RCPs will be tripped or remain tripped. The effects of this situation are addressed in the EPGs and are bounded by FSAR safety analyses which do not credit RCP operation. Sufficient guidance is therefore provided to the operator to preclude pump operation outside the pump operating limits. In addition, CE plant operating experience and pump tests support assurance of seal integrity in the event of loss of CCW to an idle pump. In operating CE plants, there has never been a complete loss of seal function. Complete loss of seal function is defined as failure of all three full pressure seals and the vapor seal, the result being the inability of the multi-stage seal package to hold system pressure, and is not considered to be a credible event.

Question

(3) Provide confirmation, including the technical basis, that containment isolation with continued RCP operation will not lead to seal or pump damage or failure.

Response

As discussed in the response to Question 1, CCW isolation to the RCPs occurs on CSAS rather than CIAS. As discussed in the response to Question 2, operator instructions in the EPGs and associated training materials preclude a situation where a plant would be operating its RCPs outside the RCP operating limits. However, in the highly improbable event that the operator inadvertently fails to follow RCP operating instructions and maintains RCP operation outside operating limits (e.g., without seal cooling), it should be realized that these limits were developed with the intent of being conservative with respect to seal reliability and performance. Operating experience and the results of a thirty-minute loss of seal cooling water test with the pump running (see response to FSAR Question 010.15) substantiate the position that the RCPs can operate without loss of seal function for time periods significantly in excess of the time periods defined in plant specific RCP operating limits.

Question

(4) Since RCP trip will be required for LOCA events, assurance must be provided that RCP trip, when required, will occur. To address this concern, provide the following information:

(a) Identify the components required to trip the RCPs. Include relays, power supplies and breakers. Address reliability and alternate trip methods.

(b) If necessary, as a result of the location of any critical component, include the effects of adverse containment conditions on RCP trip reliability. Describe the basis for the adverse containment parameters selected.

Response

(a) The reactor coolant pumps can be tripped as required by the operator through a control switch in the control room. The control switch energizes a trip relay which has a contact in series with the target relay and trip coil of the circuit breaker. The control power supply for the breaker is 125V DC.

Should the control switch fail, the following alternate trip methods exist:

i. If the control switch or the trip relay fail, a local electrical trip at the 6.9KV switchgear will trip the pump.

ii. If the target relay, the trip coil, the control power supply, or the local control switch fail, a local mechanical breaker trip can be initiated.

iii. In the event that (i) and (ii) cannot be achieved locally, the 6.9KV bus can be de-energized by tripping the incoming supply breaker. The incoming breaker has an independent DC power supply, an electrical and mechanical trip feature, and is located in the same room as the feeder breakers.

The RCP trip circuit is of standard design. Based on industry experience, such circuits are highly reliable. Given the multiple alternatives for manual tripping upon failure of a circuit component LP&L is confident that reactor coolant pumps can be tripped as required.

Finally, in CEN-268, "Justification of Trip Two/Leave Two RCP Strategy During Transients" a best estimate analysis is performed for the worst case SBLOCA with two HPSIs available. (Note: LBLOCA events are bounded by the worst case SBLOCA.) This analysis demonstrated that, in the unlikely event that all four RCPs fail to trip, core uncovery does not occur. In other words, the time period in which the pumps are required to be tripped is infinite.

(b) No active components required for RCP trip are located in a harsh environment.