**Omaha Public Power District**
1623 Harney Omaha, Nebraska 68102-2247
402/536-4000

March 15, 1988
LIC-88-154

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Reference:
1. Docket No. 50-285
2. NRC Generic Letter 87-12: "Loss of Residual Heat Removal (RHR) While the Reactor Coolant System (RCS) is Partially Filled", dated July 21, 1987
3. Letter from OPPD (R. L. Andrews) to NRC (Document Control Desk) dated September 21, 1987 (LIC-87-593)
4. Letter from OPPD (R. L. Andrews) to NRC (Document Control Desk) dated November 20, 1987 (LIC-87-777)

Gentlemen:

SUBJECT: Response to NRC Generic Letter 87-12 Items 5 and 9

In accordance with Reference 4, enclosed herewith is Omaha Public Power District's (OPPD) response to Generic Letter 87-12, items 5 and 9.

If you should need further information, please do not hesitate to contact us.

Sincerely,

R. L. Andrews
Division Manager
Nuclear Production

RLA/me

Attachments

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Ave., N.W.
Washington, DC 20036

R. D. Martin, NRC Regional Administrator
A. Bournia, NRC Project Manager
P. H. Harrell, NRC Senior Resident Inspector





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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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| In the Matter of | ) | |
| | ) | |
| Omaha Public Power District | ) | Docket No. 50-285 |
| (Fort Calhoun Station | ) | |
| Unit No. 1) | ) | |

AFFIDAVIT

R. L. Andrews, being duly sworn, hereby deposes and says that he is the Division Manager - Nuclear Production of the Omaha Public Power District; that as such he is duly authorized to sign and file with the Nuclear Regulatory Commission the response to NRC Generic Letter No. 87-12 Items 5 and 9, that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

R L Andrews

R. L. Andrews
Division Manager
Nuclear Production

STATE OF NEBRASKA)
) ss
COUNTY OF DOUGLAS)

Subscribed and sworn to before me, a Notary Public in and for the State of Nebraska on this 15th day of March, 1988.

Melva L. Evans
Notary Public

GENERAL NOTARY - State of Nebraska
MELVA L. EVANS
My Comm. Exp. 2-11-92

Enclosure

OPPD Responses to Generic Letter 87-12

Item 5

Reference to and a summary description of procedures in the control room of your plant which describe operation while the RCS is partially filled. Your response should include the analytic basis you used for procedures development. We are particularly interested in your treatment of draindown to the condition where the RCS is partially filled, treatment of minor variations from expected behavior such as caused by air entrainment and de-entrainment, treatment of boiling in the core with and without RCS pressure boundary integrity, calculations of approximate time from loss of RHR to core damage, level differences in the RCS and the effect upon instrumentation indications, treatment of air in the RCS/RHR system, including the impact of air upon NSSS and instrumentation response, and treatment of vortexing at the connection of the RHR suction line(s) to the RCS.

Explain how your analytic basis supports the following as pertaining to your facility: (a) procedural guidance pertinent to timing of operations, required instrumentation, cautions, and critical parameters; (b) operations control and communications requirements regarding operations that may perturb the NSSS, including restrictions upon testing, maintenance, and coordination of operations that could upset the condition of the NSSS; and (c) response to loss of RHR, including regaining control of RCS heat removal, operations involving the NSSS if RHR cannot be restored, control of effluent from the containment if containment was not in an isolated condition at the time of loss of RHR, and operations to provide containment isolation if containment was not isolated at the time of loss of RHR (guidance pertinent to timing of operations, cautions and warnings, critical parameters, and notifications is to be clearly described).

RESPONSE

Fort Calhoun's procedures were developed using the Design Lecture Series, a document provided by Combustion Engineering to support initial operator training, the original FSAR, and the Piping and Instrument Drawings as input. Over the years, these procedures have been modified to incorporate information gained through operating experience. OPPD is currently pursuing an effort to develop an analytical basis on the specific issues addressed in the Generic Letter regarding the loss of RHR event. This effort is described in our response to Item 9.

A summary description of procedures available in the control room which describe operations with the Reactor Coolant System (RCS) partially filled is provided below. A detailed description of the utilization of Procedures OI-RC-5, OI-RC-2A, and OI-SC-1, was provided in our response to Item 1 and submitted under Reference (3).

> Operating Instruction OI-RC-5, "Reactor Coolant System Draining," describes the activities necessary for draining of the RCS. A prerequisite of this procedure requires the plant to be in the cold shutdown condition (Mode 4 or 5). This procedure contains precautions to maintain RCS level above the middle of the hot leg to insure suction is available to the Low Pressure Safety Injection (LPSI) pumps, which are normally utilized for shutdown cooling.

Operating Instruction OI-RC-2A, "Reactor Coolant Fill Instruction," describes the activities necessary to increase the level of the RCS while operating with the RCS partially filled. This procedure utilizes borated water from the refueling water storage tank and injects the water with either a charging pump or a high pressure safety injection pump.

Operating Instruction OI-SC-1, "Initiation of Shutdown Cooling," describes the activities necessary to reduce the RCS temperature at a controlled rate from 300°F to the desired temperature (usually between 130°F and 82°F for refueling operations) and maintaining this temperature by establishing operation of the Shutdown Cooling (SDC) System.

Operating Instruction OI-SC-2, "Termination of Shutdown Cooling," describes the actions necessary to remove the shutdown cooling system from service in preparation for a reactor coolant system heat-up.

Operating Instruction OI-SC-3, "Alternate Shutdown Cooling Utilizing Containment Spray Pumps," describes the actions necessary to utilize any one of three containment spray pumps to provide the shutdown cooling functions in the event both of the low pressure safety injection pumps become inoperable.

Operating Instruction OI-SC-4, "Termination of Alternate Shutdown Cooling," describes the actions necessary to remove the containment spray pump from providing the shutdown cooling function and either returning to the normal operation of shutdown cooling as described in OI-SC-1 or preparing for a RCS heat-up as described in OI-SC-2.

Operating Instruction OI-SC-5, "Shutdown Cooling Purification," describes the actions necessary to establish or terminate purification flow using the Chemical and Volume Control System (CVCS). A prerequisite to this procedure requires that the SDC system be in service as described by OI-SC-1. A small percentage of the shutdown cooling flow is diverted to the CVCS, through the purification ion exchangers and/or the purification filters, to the volume control tank, and then reinjected into the RCS via the alternate high pressure injection piping. The purification flow can then be throttled with one or more high pressure safety injection isolation valves. This procedure can be used to help control the RCS level, in addition to OI-SC-1.

Operating Instruction OI-SC-6, "Shutdown Cooling," describes actions necessary to provide the shutdown cooling function should the normal flow path between the LPSI pumps and the reactor vessel become inoperable or otherwise unavailable. This procedure utilizes both a containment spray pump and a high pressure safety injection pump and its associated high pressure piping to provide an alternate flow path to the RCS.

Abnormal Operating Procedure AOP-19, "Loss of Shutdown Cooling," describes operator actions to be taken in the event the shutdown cooling function is lost. However, this procedure does not specifically address the situation of loss of SDC while operating with the RCS at mid-loop. OPPD will upgrade this procedure to include the appropriate information prior to the next use of OI-RC-5.

Also available to the control room operators is the Technical Data Book (TDB) which contains the following information pertaining to operation with the RCS partially filled.

A) Section III - 20 of the TDB provides a chart relating to plant elevations versus indication of RCS level from three sources. These sources of level indication are the Tygon Tube, LI-106, and LI-197. LI-197 is graduated from 0 to 100% which corresponds to approximately 1004' to 1024' elevation. The hot leg centerline is at an elevation of 1006'-4 1/2". LI-106 is also graduated from 0 to 100% and corresponds approximately to elevations 1024' to 1043', which are the bottom and top level instrument connections on the pressurizer. A detailed description of the RCS level instrumentation was provided in our response to Item 2, submitted under Reference (3).

B) Section III - 27 of the TDB provides two graphs, the first displaying decay heat in percent power versus time after shutdown, and the second displaying heat up rate of RCS, assuming a loss of the Shutdown Cooling System, in degrees F per hour versus time after shutdown. The latter graph has three curves plotted for different RCS volumes, with one corresponding to an RCS level at mid-loop.

Air entrainment in the SDC system along with vortexing at the SDC connection on the RCS hot leg has not been formally analyzed. To the best of our knowledge, Fort Calhoun has never lost suction and air bound an SDC pump due to a low level in the RCS and, therefore, has not considered this to be a major concern. However, there is currently a proposal before the Combustion Engineering Owners Group to evaluate the vortexing issue. Should this proposal be adopted by the Owners Group, OPPD will participate.

Fort Calhoun has not observed any noticeable effect upon RCS level instrumentation as a result of any SDC system transient, such as the starting or stopping of a SDC pump. This is probably due to the system configuration, which has the SDC suction connection installed on the opposite hot leg from the RCS level instrumentation. A detailed description of the RCS level instrumentation was provided in our response to Item 2, submitted under Reference (3).

At Fort Calhoun, the Shift Supervisor has control over activities involving direct operation of the plant. The operations staff operates plant systems and their components unless specific authorization has been given to other groups or personnel. An example of this is the chemistry group, who are authorized to operate certain valves in the sampling system. Maintenance activities that require plant components or systems to be taken out of service require the Shift Supervisor to be notified before work is authorized to begin.

Item 9

As a result of your consideration of these issues, you may have made changes to your current program related to these issues. If such changes have strengthened your ability to operate safely during a partially filled situation, describe those changes and tell when they were made or are scheduled to be made.

Response

The following actions have either been completed or are currently being pursued by OPPD as a result of our considerations of these issues.

1. OPPD participated in a Combustion Engineering Owners Group (CEOG) task entitled "Loss of RHR Scenarios - Detailed Qualitative Assessment," with the final report dated October 21, 1987. This report provides generic information for Combustion Engineering plants on issues pertaining to Generic Letter 87-12. A key conclusion stated in this report is that pressurization of the RCS will be limited if 1) a steam generator is provided for the removal of decay heat, or 2) RCS venting is such that significant pressurization cannot occur. The limiting of RCS pressurization will preclude any significant loss of RCS inventory through a postulated breach in a cold leg, such as a disassembled reactor coolant pump seal.

2. OPPD is participating in a CEOG task which involves reviewing participating utilities' SDC procedures. The CEOG will then produce a list of recommended practices for possible inclusion in these procedures.

3. OPPD is contracting with Combustion Engineering to perform the following Fort Calhoun specific analyses:

   a) The RCS hot leg vent area required to prevent RCS pressurization should the steam generators not be available for decay heat removal.

   b) The time scales associated with a postulated loss of SDC event to boiling in the core, time to core uncovery, and time to incipient core damage.

   c) Dose assessment associated with (b) above.

   d) An evaluation of the maximum interval allowed before containment closure is required based upon (b) and (c) above.

   e) Calculation of RCS injection capabilities to maintain core coverage assuming loss of SDC and 4 reactor coolant pumps disassembled (uncoupled) for seal replacement.

   f) An explanation of the basis for all recommendations and conclusions will be provided for the development of a training program on these issues.

4. OPPD will review procedures pertaining to operation with the RCS partially filled. These procedures will be upgraded, where necessary, to include information provided as described in (1), (2), and (3) above. This task will be completed prior to the next scheduled refueling outage.

5. OPPD will review Fort Calhoun's Technical Specifications that pertain to operation with the RCS partially filled. After considering the information provided through the tasks defined in (1), (2), and (3) above, OPPD will submit a Facility License Change, if warranted, by December 30, 1988.

6. OPPD is planning to install a modification that will provide for an RCS Low Level Alarm during the 1988 refueling outage, currently scheduled to begin in September, 1988.

7. In the interim, should it be necessary for Fort Calhoun to place the RCS in a partially filled condition, instructions are being developed and will be in place prior to March 31, 1988, to ensure the plant does not enter a condition where it would be vulnerable to potential core uncovery should the shutdown cooling function be lost. Specifically, these instructions will ensure that a reactor coolant pump will not be uncoupled unless; (1) a steam generator is available for the removal of decay heat, or (2) the RCS is vented sufficiently at the reactor head or pressurizer to preclude the possibility of pressurizing the RCS. Until the analysis defined in (3a) has been completed, OPPD will require that the minimum RCS vent be equivalent to the removal of the pressurizer manway opening.