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January 5, 1989

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Docket No. 50-206
Loss of Decay Heat Removal (Generic Letter 88-17)
San Onofre Nuclear Generating Station
Unit 1

The enclosed information is provided in response to expeditious actions (1) through (8) of Generic Letter No. 88-17, dated October 17, 1988, regarding loss of decay heat removal during nonpower operation, as applicable to San Onofre Unit 1. Except where a future commitment is stated, the actions described in the enclosure have already been implemented during the present refueling outage which began on November 28, 1988, and during which entry into mid-loop occurred on December 6, 1988. These actions will continue to be implemented as described herein, unless the NRC is notified differently by letter. SCE's response to the programmed enhancements will be submitted under separate cover by February 1, 1989.

If you have any questions, please let me know.

Respectfully submitted,

By: M O Medford

M. O. Medford
Manager of Nuclear Regulatory Affairs

Subscribed and sworn to before me this 5th day of January 1989.

Agnes Crabtree

Notary Public in and for the County of Los Angeles, State of California

OFFICIAL SEAL
AGNES CRABTREE
Notary Public-California
LOS ANGELES COUNTY
My Comm. Exp. Sep. 14, 1990

cc: J. B. Martin, Regional Administrator, NRC Region V
F. R. Huey, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3
C. M. Trammell, NRR Project Manager, San Onofre Unit 1

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SCE'S RESPONSES TO EXPEDITIOUS ACTIONS (1) THROUGH (8) OF GENERIC LETTER 88-17 SAN ONOFRE UNIT 1

Action (1)

Discuss the Diablo Canyon event, related events, lessons learned, and implications with appropriate plant personnel. Provide training shortly before entering a reduced inventory condition.

Response

Prior to entering a reactor coolant system (RCS) reduced inventory condition, each operating shift and equipment control personnel receive training which covers plant operation while in such a condition. The purpose of this training is to increase awareness of the complexities involved while operating with the RCS at mid-loop. The training includes a discussion of related industry events (including the April 10, 1987 Diablo Canyon loss of residual heat removal (RHR) event), containment closure control, methods of adding inventory to the RCS, establishing a hot leg vent path, indications for monitoring RCS level and temperature, and the necessity of maintaining control over those types of activities which could perturb stability of the RCS. This training is accomplished within 30 days prior to entering an outage during which entry into a reduced inventory condition is planned but may be waived if training has been completed within the previous six months. The training material will be periodically updated as the need occurs.

In addition, selected maintenance personnel and other support personnel as applicable, are trained in the requirements and methods of containment closure. The frequency of this training is the same as that for plant operators.

San Onofre Unit 1 has completed the actions detailed above for the current mid-loop operations.

Action (2)

Implement procedures and administrative controls that reasonably assure that containment closure will be achieved prior to the time at which a core uncovery could result from a loss of DHR coupled with an inability to initiate alternate cooling or addition of water to the RCS inventory. Containment closure procedures should include consideration of potential steam and radioactive material release from the RCS should closure activities extend into the time boiling takes place within the RCS. These procedures and administrative controls should be active and in use:

(a) prior to entering a reduced RCS inventory condition for NSSSs supplied by Combustion Engineering or Westinghouse, and

(b) prior to entering an RCS condition wherein the water level is lower than four inches below the top of the flow area of the hot legs at the junction of the hot legs to the RV for NSSSs supplied by Babcock and Wilcox,

and should apply whenever operating in those conditions. If such procedures and administrative controls are not operational, then either do not enter the applicable condition or maintain a closed containment.

Response

Procedures have been developed and are implemented prior to entering a reduced RCS inventory condition with irradiated fuel in the reactor vessel to ensure containment closure is achieved prior to core uncovery as a result of a loss of RHR. The maximum time allowed is 2.5 hours from the loss of RHR. The time limit is 30 minutes if openings totaling > 1 square inch exist in the cold legs, reactor coolant pumps and crossover pipes of the RCS, but may be extended to 2 hours provided a valid hot leg vent is established. However, if a future analysis (including a 10 CFR 50.59 review) demonstrates that longer time limits can be safely tolerated, then the longer time limits will be used. Closure mechanisms (plugs, plates etc.) are evaluated on a case by case basis, using engineering judgement. The equipment hatch is sealed by bolting it with a sufficient number of bolts to ensure no visible gaps exist in the sealing surface.

The steam/feedwater systems along with all other systems that penetrate containment are administratively controlled to ensure that, if containment integrity is deliberately broken (for example, manways are removed at the same time as work is being performed on RCS containment isolation valves), then these valves or openings that caused loss of containment integrity and the organizations responsible for their closure are documented on the "Containment Closure Control Form." This form is maintained to provide the current containment status in the event containment closure may be required.

Action (3)

Provide at least two independent, continuous temperature indications that are representative of the core exit conditions whenever the RCS is in a mid-loop condition and the reactor vessel head is located on top of the reactor vessel. Temperature indications should be periodically checked and recorded by an operator or automatically and continuously monitored and alarmed. Temperature monitoring should be performed either:

(a) by an operator in the control room (CR), or

(b) from a location outside of the containment building with provision for providing immediate temperature values to an operator in the CR if significant changes occur. Observations should be recorded at an interval no greater than 15 minutes during normal conditions.

Response

Whenever the RCS is in a mid-loop condition, at least two core exit thermocouples are maintained in service. If the temperature indicators do not have a (permanent or temporary) high temperature alarm*, then temperature is monitored and recorded at least once every hour. If fewer than two temperature indicators are available in the Control Room, readings on at least two out of the remaining thermocouple(s) and other representative temperature indications are taken every 15 minutes. Readings taken every hour upon loss of the temperature alarm provide assurance that a slow trend in RCS temperature is identified, while other indicators such as the low level alarm on the C-loop narrow range level indicator, RHR loop inlet temperature, low RHR flow, low component cooling water (CCW) flow, high CCW temperature, CCW pump auto-starts, low saltwater cooling (SWC) flow, low SWC pressure, and SWC pump auto-starts provide positive indication of an imminent loss of decay heat removal capability. (All temperature monitoring is performed from the Control Room.)

* Presently the temperature indicators do not have a permanent high temperature alarm. However, a temporary Control Room alarm, common to the two thermocouple channels, was installed to support the current outage.

Action (4)

Provide at least two independent, continuous RCS water level indications whenever the RCS is in a reduced inventory condition. Water level indications should be periodically checked and recorded by an operator or automatically and continuously monitored and alarmed. Water level monitoring should be capable of being performed either:

(a) by an operator in the CR, or

(b) from a location other than the CR with provision for providing immediate water level values to an operator in the CR if significant changes occur. Observations should be recorded at an interval no greater than 15 minutes during normal conditions.

Response

Whenever the RCS is in a reduced inventory condition, two independent level indications are maintained in service. The refueling water level indication (RWLI) is presently the only permanently installed wide level indication. Additional wide range level indication is provided by use of a Tygon level indication system in conjunction with an installed wide range sight glass, associated with the above RWLI. This sight glass is not a continuous glass in that it does not include a span between the vessel flange and the top of the hot leg. To provide accurate narrow range water level information to the Control Room during mid-loop operation, a narrow range level indicator is installed in place of the RCS C loop flow transmitter. This level indicator is located in the Control Room, indicates between the bottom and top of "C" hot leg, has a low level alarm at 40% level and is not affected by pressure differences between the reactor vessel and the pressurizer. Since the wide range level indicators do not have a level alarm and are not both located in the Control Room, level is monitored and recorded every 15 min. when the level is between "Reduced RCS Inventory" and the top of the hot leg. When the level has dropped to mid-loop, the level transmitter and alarm on the "C" hot leg are placed in service. When the level is within the hot leg, no logging occurs, only periodic monitoring. If for some reason the installed narrow range level indicator does not have a low level alarm available, level is monitored and recorded at least once every hour. The justification for logging at one hour intervals if a level alarm is not available is the same as the justification for temperature logging with no temperature alarm available. If less than two level indications are available in the Control Room then level is recorded at least once every 15 minutes.

The use of Tygon tubing has been determined to be acceptable as a short term measure, i.e. for operations conducted prior to the Cycle XI refueling outage. Program enhancements will include an evaluation for providing level indication without reliance on Tygon tubing.

Action (5)

Implement procedures and administrative controls that generally avoid operations that deliberately or knowingly lead to perturbations to the RCS and/or to systems that are necessary to maintain the RCS in a stable and controlled condition while the RCS is in a reduced inventory condition.

If operations that could perturb the RCS or systems supporting the RCS must be conducted while in a reduced inventory condition, then additional measures should be taken to assure that the RCS will remain in a stable and controlled condition. Such additional measures include both prevention of a loss of DHR and enhanced monitoring requirements to ensure timely response to a loss of DHR should such a loss occur.

Response

We currently tag the first isolation valve off the RCS/RHR System which could potentially drain the RCS. Each tag states that misoperation of this valve may result in a loss of RCS inventory. We review (tailboard) evolutions which have the potential to perturb the RCS including: draining/filling the RCS, RCS eductor operations, integrated leak rate testing, and evolutions which have the potential to impact reduced inventory or mid-loop instrumentation. Activities (maintenance and testing) which require a lowered RCS inventory are minimized to the degree possible and attempts are made to schedule these activities to times when decay heat load is low. Additionally, procedures have been modified to provide guidance on starting a second RHR Pump. Work Authorization evaluations and approval processes have been modified to include measures that would aid in preventing a loss of RHR and would also enhance monitoring to ensure timely response to a loss of RHR. These measures cover activities which may result in RCS perturbations with the RCS in a reduced inventory condition. As an additional feature, management level approval is required for all work authorizations which may impact reduced RCS inventory or mid-loop operation.

Action (6)

Provide at least two available or operable means of adding inventory to the RCS that are in addition to pumps that are a part of the normal DHR systems. These should include at least one high pressure injection pump. The water addition rate capable of being provided by each of the means should be at least sufficient to keep the core covered. Procedures for use of these systems during loss of DHR events should be provided. The path of water addition must be specified to assure the flow does not bypass the reactor vessel before exiting any opening in the RCS.

Response

San Onofre Unit 1 RHR pumps are dedicated to the RHR system. Operations procedures have been enhanced to include the following:

Maintain at least one charging pump (high pressure) in service. Maintain at least one additional pump(s) as follows: one refueling water pump, OR one primary makeup pump with the boric acid injection pump, OR another charging pump.

All of the selected pumps are based on the ability to pump $\geq$ 50 gpm, which is sufficient to keep the core covered 3 days after shutdown assuming mid-loop operations. Generally, the RCS is taken to a mid-loop condition only after 120 hours or more have elapsed since shutdown. Actual selection of the make-up source depends on plant conditions and available flow paths. The normal charging path and the cold leg injection paths both inject coolant into the RCS cold legs, and therefore, flow from these paths does not bypass the reactor vessel. Abnormal operating instructions that support a loss of RHR have been modified to enhance the use of the makeup systems. Prior to breaking the integrity of ANY RCS cold leg loop penetration by actions such as steam generator cold leg primary manway removal and reactor coolant pump seal removal, at least one RCS primary hot leg vent path must be provided.

Action (7)

Implement procedures and administrative controls that reasonably assure that all hot legs are not blocked simultaneously by nozzle dams unless a vent path is provided that is large enough to prevent pressurization of the upper plenum of the RV. See references 1 and 2.

Response

San Onofre Unit 1 does not use nozzle dams in the RCS. However, "Foreign Material Exclusion (FME) covers" are installed across the steam generator nozzles during mid-loop operations when maintenance activities are being performed in the SG channel heads. The purpose of the FME covers is to prevent tools or debris from falling into the RCS loops. The covers are 1/4" thick cylindrical aluminum lids which are placed over the nozzles and are held by the force of gravity and are not pressure-retaining. Hence, the covers are not considered nozzle dams which typically have test pressures of 26 psig. If an extended loss of RHR occurs, no significant pressurization of the upper plenum and hot leg would occur and steam would be vented through the open steam generator hot leg manway or the pressurizer manway. Plant procedures specifically do not allow ANY cold leg breach without having either a steam generator hot leg manway or the pressurizer manway open. Hence, no special precaution or procedures applicable to the FME covers relative to the loss of RHR event are required.

Action (8)

(applicable to NSSSs with loop stop valves) Implement procedures and administrative controls that reasonably assure that all hot legs are not blocked simultaneously by closed stop valves unless a vent path is provided that is large enough to prevent pressurization of the RV upper plenum or unless the RCS configuration prevents RV water loss if RV pressurization should occur. Closing cold legs by nozzle dams does not meet this condition.

Response

This action does not apply to San Onofre Unit 1, which does not have loop stop valves in the nuclear steam supply system.

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