REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8709250006 DOC. DATE: 87/09/21 NOTARIZED: YES DOCKET #
FACIL: 50-261 H. B. Robinson Plant, Unit 2, Carolina Power & Light C 05000261

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SUBJECT: Forwards response to Generic Ltr 87-12, "Loss of Residual RHR While RCS Partially Filled."

DISTRIBUTION CODE: A061D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 18
TITLE: OR/Licensing Submittal: Loss of Residual Heat Removal (RHR) GL-87-12

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SEP 21 1987

SERIAL: NLS-87-194
10CFR50.54(f)

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
RESPONSE TO GENERIC LETTER 87-12

Gentlemen:

Carolina Power & Light Company hereby submits information in response to Generic Letter 87-12, "Loss of Residual Heat Removal (RHR) while the Reactor Coolant System is Partially Filled," for the H. B. Robinson Steam Electric Plant, Unit No. 2 (HBR2). The attached information responds to the specific questions contained in Generic Letter 87-12. This information is submitted pursuant to 10CFR50.54(f) as requested by Generic Letter 87-12.

If you have any questions concerning the attached responses or require additional information, please contact Mr. Sherwood Zimmerman at (919) 836-6242.

Yours very truly,

L. W. Eury
Senior Vice President
Operations Support

JHE/lah (5283JHE)

Attachment

cc: Dr. J. Nelson Grace
Mr. K. Eccleston
Mr. H. Krug

A061
0110

L. W. Eury, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, contractors, and agents of Carolina Power & Light Company.

Ruby R. Morgan
Notary (Seal)

RUBY R. MORGAN NOTARY PUBLIC WAKE COUNTY, N.C.

My commission expires: 11/27/89

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NRC Question 1

Provide a detailed description of the circumstances and conditions under which your Plant would be entered into and brought through a drain-down process and operated with the RCS partially filled, including any interlocks that could cause a disturbance to the system. Examples of the type of information required are the time between full-power operation and reaching a partially filled condition (used to determine decay heat loads); requirements for minimum steam generator (SG) levels; changes in the status of equipment for maintenance and testing and coordination of such operations while the RCS is partially filled; restrictions regarding testing, operations, and maintenance that could perturb the nuclear steam supply system (NSSS); ability of the RCS to withstand pressurization if the reactor vessel head and steam generator manway are in place; requirements pertaining to isolation of containment; the time required to replace the equipment hatch should replacement be necessary; and requirements pertinent to re-establishing the integrity of the RCS pressure boundary.

HBR2 Response:

An RCS drain-down evolution would be required in the event that maintenance or inspections are required on components that cannot be isolated from the reactor coolant piping and require that the Reactor Coolant System (RCS) pressure boundary be broken. Examples of these activities include steam generator (SG) eddy current inspections, SG tube leak repair, repair of RTD bypass loop isolation valves or piping, and reactor coolant pump disassembly. The RCS is also drained to at least the reactor vessel flange during any extended outage at cold shutdown. This is intended to prevent suspended solids from entering the Control Rod Drive Mechanism assemblies.

An average time required to shut down, cool down, and commence drain down under normal circumstances is approximately 50 hours.

No requirements are placed on steam generator levels while the RCS is drained down.

The initial conditions for draining the RCS are as follows:

a) RCS temperature is ≤ 200°F (≤ 140°F in practice).

b) The RCS is water-solid.

c) The Residual Heat Removal (RHR) System is in service.

d) All pressurizer heaters are de-energized.

e) All charging pumps are stopped, two charging pump breakers are racked out, and the third charging pump breaker is racked in.

f) Normal letdown is isolated.

g) The temporary standpipe for monitoring vessel level has been connected to a drain line on RCS loop "B" cold leg.

h) The Source Range Nuclear Instrument Statistical Reliability Test has been performed.

i) RCS pressure is at approximately 50 psig.

The Reactor Coolant System is drained down in the following manner:

a) The pressurizer spray valves are opened.

b) The RCS is depressurized.

c) The pressurizer relief tank is drained to approximately 10% to allow a flow path for nitrogen to the pressurizer.

d) Both pressurizer PORVs and block valves are opened.

e) The RHR discharge to letdown line valve (HCV-142) is opened to establish a controlled drain rate.

f) When pressurizer level decreases, the pressurizer safety valve loop seal drains are opened to vent the RCS to the containment atmosphere, and the pressurizer PORVs are closed and placed in automatic with the Low Temperature Overpressure Protection (LTOP) System in service.

g) The temporary RCS standpipe is placed in service.

h) The reactor vessel head vent valves are opened when reactor vessel level is four inches below the flange.

i) Drain down may be continued up to 72 inches below the reactor vessel flange when fuel is in the reactor vessel. Seventy-two inches below the flange corresponds to a vessel level approximately 10 inches above mid-plane of RCS loop piping.

While the RCS is drained down, the following restrictions apply to Plant operations:

a) Both residual heat removal loops are required to be maintained operable.

b) One flow path for boric acid injection to the RCS is required to be operable at all times when fuel is in the reactor vessel. The capability for boric acid injection must be equivalent to that available from the refueling water storage tanks (RWST). Normally, this requirement will be met by maintaining at least one charging pump operable with a makeup water source from blended makeup from the boric acid storage tanks and the primary water storage tank or from the RWST. If no charging pumps are operable, an SI pump is kept available, with suction aligned to the RWST, to satisfy this requirement.

When the RCS temperature is less than 350°F and the RCS pressure boundary is met (i.e., the reactor vessel head and steam generator manways are in place) and the RCS is not adequately vented to the containment atmosphere, the LTOP system is required to be in service. This system consists of two pressurizer power-operated relief valves connected to the station instrument air system, a backup nitrogen supply, and associated electronics. When this system is in service, it will actuate to mitigate the consequences of an RCS pressure increase when pressure approaches 400 psig.

When the RCS is ≤ 200°F and fuel is not being moved, no requirements for containment integrity exist unless the vessel head is removed. If the vessel head has been removed, a shutdown margin greater than 10% $\Delta K/K$ must be maintained. No fuel movement in the containment is allowed if containment integrity is not established.

Coordination of maintenance and testing while the RCS is drained down is oriented towards ensuring the above requirements are met. In cold shutdown with fuel in the reactor vessel, maintenance activities involving the portions of the Service Water (SW), Component Cooling Water (CCW), and Residual Heat Removal Systems that directly support core cooling are controlled per Operating Work Procedures (OWPs). These procedures are part of the Plant Operating Manual (POM) and are controlled per the review and approval requirements of the Technical Specifications. Surveillance testing procedures are also part of the POM. Both OWPs and surveillance testing procedures include initial conditions for the work and precautions to be followed during the work. Other activities to be conducted during an outage are planned through a series of meetings conducted by the on-site planning and scheduling organization. For an unscheduled outage, a planning meeting is held as soon as possible after the need for the outage is identified. These meetings are attended by well-qualified persons from the affected work groups, including Operations. The Operations representative is usually one or more of the following: The Manager - Operations, the Operating Supervisor, the Operations Support Supervisor, an Operations Shift Foreman, the Operations Engineer, or a Shift Technical Advisor. During a significant outage (any outage requiring RCS drain down would be considered significant), an Outage Manager is designated, and shift outage meetings are held immediately prior to each shift. These meetings discuss the scheduled work for the upcoming shift and are attended by the Operations Shift Foreman. Overall outage schedules and daily schedules are made available to the Control Room staff. The "Local Clearance and Test Request" Procedure, which is administered by the on-shift operators, is intended to ensure personnel and equipment safety and that adequate post-maintenance testing is performed. This procedure is followed in addition to the work activity controls previously described.

In the event it is necessary to quickly isolate containment while the RCS is drained, the containment penetration most difficult to isolate is the equipment hatch. The equipment hatch can be installed in approximately three hours based on previous experience with normal reinstallation. (This time assumes that transporting tracks for moving equipment into the containment through the equipment hatch are not installed.)

No requirements exist to establish the integrity of the RCS pressure boundary upon loss of cooling. The requirements for this situation stress the necessity to add makeup water in order to keep the core covered and to establish containment integrity prior to exceeding 200°F. It would be up to the operation's management discretion to establish RCS integrity if necessary.

No interlocks exist which would automatically remove the RHR system from service once it has been placed in the core cooling mode (vice low head injection mode). Protective interlocks do exist to prevent incorrect RHR system alignment and loss of inventory while aligning RHR to the core cooling mode and while in the core cooling mode. These interlocks are as follows:

a) The RHR suction valves from the loop "B" hot leg cannot be opened unless:

(1) RCS pressure is less than 465 psig,

(2) the RHR suction valves from the RWST are closed, and

(3) the RHR heat exchanger outlet valves and the safety injection (SI) pumps suction line are closed.

b) The valves listed in (2) and (3) above cannot be opened when RHR pressure is above 210 psig.

The RHR system relief valve setpoint is 600 psig. It relieves to the pressurizer relief tank (PRT) which is inside the containment. The LTOP system is also in service (as previously described) when RCS temperature is less than 350°F and the RCS is not adequately vented.

NRC Question 2

Provide a detailed description of the instrumentation and alarms provided to the operators for controlling thermal and hydraulic aspects of the NSSS during operation with the RCS partially filled. You should describe temporary connections, piping, and instrumentation used for this RCS condition and the quality control process to ensure proper functioning of such connections, piping, and instrumentation, including assurance that they do not contribute to loss of RCS inventory or otherwise lead to perturbation of the NSSS while the RCS is partially filled. You should also provide a description of the ability to monitor RCS pressure, temperature, and level after the RHR function may be lost.

HBR2 Response

Instrumentation

Instrumentation available to the control operator to monitor:

a) RCS temperature - 47 bottom-mounted incore thermocouples (0 - 2300°F)

b) RCS pressure

   (1) 1 wide-range pressure trend recorder (PR-444)

   (2) 1 narrow-range pressure indicator (0-1000 psig) PI-403

c) RHR System

   (1) pump breaker status

   (2) 1 RHR system flow indicator (0-8500 gpm)

   (3) RHR heat exchanger outlet temperature for each of two heat exchangers on trend recorder

The only temporary connection used in the drain-down condition is the vessel level standpipe. This standpipe consists of a vertical length of clear tygon tubing connected to "B" loop cold leg and prior to placing the standpipe in service, it is thoroughly checked for leakage, kinking, etc. A level transmitter (LT-403, connected to "B" loop cold leg) is also placed in service which indicates vessel level on the Reactor Turbine Generator Board (RTGB) down to 125" below the vessel flange.

If Maintenance requires "B" reactor coolant pump to be uncoupled so that the ability to monitor reactor vessel level from "B" loop is inhibited, the temporary standpipe is moved to "A" or "C" loop. The level transmitter (LT-403) cannot be moved.

While the RCS is being drained, an operator is stationed in containment to monitor standpipe level. The standpipe level is compared to the level transmitter reading to ensure its accuracy. This check is performed initially when the standpipe is placed in service and once per shift thereafter. Hourly readings are recorded on shift operating logs from LT-403 while the RCS is in a partially drained condition.

In the event the operator in containment or the control room notice any abnormality in vessel level during RCS filling or draining, the evolution is discontinued until the cause is determined.

Alarms

No alarms exist which directly relate to reactor vessel level. In the event of system overpressurization, an alarm occurs at 400 psig and actuates the LTOP system, which opens at least one pressurizer PORV to mitigate the pressure transient. Separate alarms also exist which actuate when an RHR pump trips.

NRC Question 3

Provide identification of all pumps that can be used to control NSSS inventory. Include: (a) pumps you require to be operable or capable of operation (include information about such pumps that may be temporarily removed from service for testing or maintenance); (b) other pumps not included in Item a (above); and (c) an evaluation of Items a and b (above) with respect to applicable TS requirements.

HBR2 Response

At all times when fuel is in the reactor vessel, at least one path for boric acid injection to the RCS must be operable. The capability for boric acid injection must be equivalent to that available from the RWST.

Normally this requirement is satisfied by maintaining one charging pump operable with its suction from the RWST available. In the event it is necessary to remove all three charging pumps from service, another method of boric acid injection will be kept readily available; such as, one of the three safety injection pumps with its suction aligned to the RWST. (If RCS temperature is less than 350°F and it is not vented to the containment atmosphere, the SI pump breakers are required to be racked out. The breakers can be quickly racked back in should use of the SI pumps be necessary.)

Additional sources of makeup may be available (but are not required) from the boric acid storage tanks via the boric acid transfer pumps and the primary water storage tank via the primary water pumps. If necessary, an RHR pump may be aligned to the RWST if RHR is lost due to loss of level.

NRC Question 4

Provide a description of the containment closure condition you require for the conduct of operations while the RCS is partially filled. Examples of areas of consideration are the equipment hatch, personnel hatches, containment purge valves, SG secondary side condition upstream of the isolation valves (including the valves), piping penetrations, and electrical penetrations.

HBR2 Response

With RHR operable and no fuel movements in progress in the containment, containment integrity is not required in cold shutdown unless the shutdown margin is less than 10% $\Delta K/K$ and the reactor vessel head is removed. If both RHR loops become inoperable during cold shutdown, penetrations providing direct access from the containment atmosphere to the outside atmosphere must be closed prior to the reactor coolant average temperature exceeding 200°F.

Containment integrity is required when reactor core components are being moved. In practice, this requirement is applied to the reactor vessel head removal and reinstallation, upper internals removal and reinstallation, and to actual fuel movements inside the containment. Once the vessel head and upper internals have been placed in their storage location, containment integrity is not required if fuel is not being moved and the shutdown margin requirement is met.

NRC Question 5

Provide 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 drain down 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).

HBR2 Response

Procedures describing operation with the RCS partially filled:

a) General Procedure GP-008, "Draining the Reactor Coolant System" - Delineates the normal procedure for draining the RCS starting at cold shutdown and a water-solid condition and leading to drain down to the desired level.

b) General Procedure GP-001, "Fill and Vent of the Reactor Coolant System" - Procedure for filling the reactor coolant system after drain down.

c) Abnormal Operating Procedure AOP-20, "Loss of Residual Heat Removal (Shutdown Cooling)" - Contains the procedure for operator response to loss of residual heat removal while drained down.

GP-008 begins with the following initial conditions:

a) RCS temperature is ≤ 200°F (≤ 140°F in practice).

b) The RCS is water-solid.

c) The RHR system is in service.

d) All pressurizer heaters are de-energized.

e) All charging pumps are stopped, two charging pump breakers are racked out, and the third charging pump breaker is racked in.

f) Normal letdown is isolated.

g) The temporary standpipe for monitoring vessel level has been connected to a drain line on RCS Loop "B" Cold Leg.

h) The Source Range Nuclear Instrument Statistical Reliability Test has been performed.

i) RCS pressure is at approximately 50 psig.

The drain-down evolution is performed as follows:

a) The pressurizer spray valves are open.

b) The RCS is depressurized.

c) The Pressurizer Relief Tank is drained to approximately 10% to allow a flow path for Nitrogen to the pressurizer.

d) Both Pressurizer PORVs and Block Valves are opened.

e) The RHR Discharge to Letdown Line Valve (HCV-142) is opened to establish a controlled drain rate.

f) When pressurizer level decreases, the Pressurizer Safety Valve Loop Seal Drains are opened to vent the RCS to the containment atmosphere, and the pressurizer PORVs are closed and placed in automatic with the LTOP system in service.

g) The temporary RCS standpipe is placed in service.

h) The Reactor Vessel Head Vent Valves are opened when reactor vessel level is four inches below the flange.

i) Drain down may be continued up to 72 inches below the reactor vessel flange when fuel is in the reactor vessel. Seventy-two inches below the flange corresponds to a vessel level approximately 10 inches above mid-plane of RCS loop piping.

Although no prior analysis exists, a study is currently being performed (as described in response to Item 9) to model the RCS under a loss of RHR situation in order to determine the time available for operator action prior to core uncovery.

Procedures were based on piping system layout and required water levels for stable RHR pump operation. Past experience with partially drained RHR system operation has demonstrated that no operating difficulties should be experienced with the RHR system if reactor vessel level is maintained greater than or equal to -72 inches. (The reactor vessel flange is the reference point for this measurement.) GP-008 includes this requirement by specifying -72 inches as the minimum level for RHR pump operation. Since the RHR system must be operable whenever fuel is in the reactor vessel, this results in an indirect requirement of -72 inches as the minimum level when fuel is in the reactor vessel.

AOP-20 describes the actions to be taken upon loss of residual heat removal. In the event inventory is being lost due to leakage, immediate action is taken to identify and isolate the source of leakage. If the source of leakage is a piping break in the RHR system, the affected RHR loop(s) is isolated and the affected RHR pump is turned off. If heat removal is lost due to a valve malfunction, immediate action is taken to restore flow.

If the RHR system is inoperable, AOP-20 requires that containment integrity be established prior to exceeding 200°F RCS temperature. All available containment Cooling Fans and Control Rod Drive Mechanism Cooling Fans are started to aid in containment cooling.

Under drained-down conditions, the following additional actions are taken upon loss of RHR:

a) A path for makeup water is placed in service via the charging or SI system.

b) If a normal makeup path cannot be established, a primary water hose is routed to any opening created by the maintenance activity.

c) The RCS is sampled for boron concentration at least once per shift.

Procedure AOP-20 stresses the importance of supplying makeup to the RCS to maintain the core covered. No requirements are placed upon establishing RCS integrity in this situation. Such a requirement would be undesirable if makeup is being provided via the opening created by the required maintenance (Action b above).

While in a drained-down condition, the following restrictions generally apply:

a) Evolutions which affect the RCS boundary, cooling capability, or makeup supply are carefully evaluated on a case-by-case basis to prevent the occurrence of any conditions which would substantially degrade NSSS operation. (The evaluation methodology was described previously in response to Question 1 above.)

b) In order to remove any component from service which is directly related to decay heat removal capability (RHR, CCW, or SW), an Operations Work Procedure (OWP) must be used. These procedures provide strict guidelines for alignment, testing, and realignment of any component which is removed from service for any reason. Each component in the above-listed systems will have its own individual OWP approved prior to removing it from service. This ensures strict control over any evolutions which disable any component in a system which directly affects the core cooling.

c) An operator is stationed in containment with access to communications when a drain-down evolution is performed. This operator frequently monitors standpipe level. RCS level is also monitored in the Control Room by means of a level transmitter (LT-403) connected to "B" Reactor Coolant Loop. These readings are compared to each other once per shift. RCS level as read from LT-403 is also logged once per hour.

d) During the drain-down evolution, the standpipe must be connected to "B" Loop. This provides redundancy in level indication since the level transmitter (LT-403) is placed in service when the connection to "B" standpipe is placed in service. This redundancy does not exist when the standpipe is connected to "A" or "C" loop. Once the drain-down evolution is complete, the standpipe may be connected to "A" or "C" loop if required by the maintenance activity. LT-403 cannot be moved.

While the RCS is drained, an increase in RCS pressure may result in a nonconservative indication of vessel level. This is prevented by maintaining the RCS vented to the containment atmosphere via the Pressurizer Safety Valve Loop Seal Drains and the Head Vent System.

Should RHR be lost, there would still be a capability to monitor RCS temperature through use of the bottom-mounted core exit thermocouples. These thermocouples (47) are mounted on the incore nuclear instrument guide thimbles and continuously provide indication unless the thimbles must be retracted for fuel movement (which is only done with the cavity flooded). The thimbles are retracted just prior to cavity flood.

In general, the tygon tube is an accurate means of determining vessel level. The tygon tube is permanently mounted in position and is anchored in place. The markings for determining vessel level are attached behind the standpipe and are not physically attached to the tube, therefore vertical motion of the standpipe will not affect its accuracy.

While draining the Reactor Coolant System, standpipe level will be slightly nonconservative, due to the lag time caused by the piping configuration resulting in the standpipe "seeing" a slightly higher level than actual. This effect will be more pronounced at higher drain rates, but will not be significant until level drops near the minimum level of -72" below the vessel flange. At this point, a disparity between actual and indicated level may result in loss of RHR pumps due to air ingestion. This possibility is eliminated by the practice of reducing the drain rate as RCS level decreases.

NRC Question 6

Provide a brief description of training provided to operators and other affected personnel that is specific to the issue of operation while the RCS is partially filled. We are particularly interested in such areas as maintenance personnel training regarding avoidance of perturbing the NSSS and response to loss of decay heat removal while the RCS is partially filled.

HBR2 Response

The occurrence of loss of residual heat removal capability is covered in various portions of the Operator Training Programs. The following provides where this is covered and in what depth:

A. Auxiliary Operator Training

   1. Basic Systems Lesson Plan BS/RHR-LP-1 describes the method used to monitor reactor vessel level while draining the RCS and notes when cavitation of the RHR pumps may be expected to occur. It also contains related published industry events describing loss of RHR.

   2. The Auxiliary/Radwaste Operator Continuing Training Program 87-1 contains related published industry events discussing loss of RHR.

B. Reactor Operator Training

   1. Modifications Lesson Plan 8 (MODS-LP-8), Revision 0, specifically addresses loss of decay heat removal due to loss of fluid levels in the Reactor Coolant System. Vortexing and air entrainment are discussed. Industry events pertaining to this occurrence are discussed.

   2. Residual Heat Removal Lesson Plan 2 (RHR-LP-2), Revision 4, states the minimum level in RCS for RHR pump operation and references SER-79-84 for examples of loss of RHR cooling.

   3. Reactor operator qualification cards require the candidate to discuss General Procedure 008, "Draining the RCS", and Abnormal Operating Procedure 020, "Loss of Residual Heat Removal".

      a) GP-008 contains a note cautioning against drain down that could cause vortexing and air entrainment.

      b) AOP-20 addresses loss of RHR cooling and includes actions to be taken if a complete loss of decay heat removal occurs. Also included are actions ensuring a makeup source of water is made available.

C. Senior Reactor Operator Training

   Incorporates the qualification cards requiring the same procedures to be discussed, as in B.3 above, for reactor operators.

D. Licensed Operator Retraining

During 1987 Week 2 classroom retraining, industry events caused by loss of decay heat removal capability were presented.

E. Maintenance Training

Training provided for maintenance personnel has not been specific to the issue of operation while the RCS is partially filled.

Conduct of Operations, which is covered in the POM and Basic Systems course, is related to this issue in that personnel are instructed that valves and electrical breakers are operated only by Operations personnel with concurrence of the Shift Foreman.

Additionally, maintenance procedures and surveillance tests (OST and EST) have precautions and/or prerequisites that reduce the probability of perturbing other equipment/components while performing work or tests.

NRC Question 7

Provide identification of additional resources provided to the operators while the RCS is partially filled, such as assignment of additional personnel with specialized knowledge involving the phenomena and instrumentation.

HBR2 Response

Additional personnel are assigned during the drain-down evolution in containment to monitor standpipe level.

NRC Question 8

Provide a comparison of the requirements implemented while the RCS is partially filled and requirements used in other Mode 5 operations. Some requirements and procedures followed while the RCS is partially filled may not appear in the other modes. An example of such differences is operation with a reduced RHR flow rate to minimize the likelihood of vortexing and air ingestion.

HBR2 Response

Except for the -72 inch minimum reactor vessel level requirement, no special requirements are imposed during partially drained evolutions other than those which would be in effect during any cold shutdown condition with fuel in the reactor vessel with no fuel handling evolutions in progress. AOP-20 "Loss of Shutdown Cooling", provides guidance to the operators for core cooling problems when the RCS is less than 350°F up to the refueling condition (including the partially drained condition).

NRC Question 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.

HBR2 Response

Proposed Changes

Training which emphasizes not perturbing the NSSS while the RCS is partially filled will be conducted for mechanics, electricians, and I&C technicians. This training will be completed prior to next refueling.

The following improvements in the procedures and administrative controls for cold shutdown operations are being considered by Operations.

a) Improve the administrative controls used in cold shutdown to ensure one flow path for boric acid injection is available when fuel is in the reactor vessel.

b) Revise GP-008 to directly state that -72 inches is the minimum level with fuel in the reactor vessel.

c) Revise GP-008 to clearly require an operator be stationed in the containment to monitor the standpipe level during the draining evolution, to clearly require the calibration of LT-403 prior to use, require and document the comparison of LT-403 indication to the standpipe indication, to clearly require the drain-down evolution to be performed with the standpipe aligned to "B" RCS Loop, and to clearly require the drain-down evolution be stopped if abnormalities are observed in reactor vessel level indication.

d) Revise GP-008 to require RCS temperature ≤ 140°F as a prerequisite.

e) Revise GP-008 to require reducing the drain rate as reactor vessel level approaches -72 inches.

f) Review AOP-20 for enhancements such as additional options for establishing makeup and ensuring the makeup water reaches the core.

As a result of the consideration in Item 5, HBR2 is conducting a study to model the RCS under a loss of RHR condition in order to determine the time available for operator actions prior to core uncovery. This model is being generated as an engineering task to create an analytical basis for reduced level situations. The computer simulation "ORIGEN II" tied with heat transfer calculations will predict the time to boiling and the time to core uncovery/damage.