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SUBJECT: Responds to Generic Ltr 88-17, "Loss of DHR."

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February 1, 1989

U.S. Nuclear Regulatory Commission
Document Control Desk
Attn: Mr. Carl Stahle
PWR Project Directorate No. 1
Washington, D.C. 20555

Subject: Loss of Decay Heat Removal (Generic Letter 88-17)
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Reference: (a) Letter from R.C. Mecredy (RG&E) to Carl Stahle (NRC), Loss of Decay Heat Removal (Generic Letter 88-17), dated January 4, 1989

Dear Mr. Stahle:

Generic Letter 88-17 required a description of actions taken to implement each of eight recommended Expeditious Actions and a description of enhancements, specific plans and a schedule for implementation of each of six Programmed Enhancements identified in the Generic Letter. Reference (a) provided our plans regarding the Expeditious Actions. The Expeditious Actions will be implemented prior to entering the reduced inventory condition for the 1989 spring refueling outage.

Attachments 1-6 provide our specific plans for implementation of the six Programmed Enhancement recommendations. The implementation schedule for hardware modifications will be the end of our spring 1990 refueling outage. Enhancements that do not depend on hardware changes will be implemented by May 1990, which is 18 months after receipt of Generic Letter 88-17.

The Programmed Enhancements cover the topics of instrumentation, procedures, equipment, analyses, technical specifications, and RCS perturbations. Due to some overlap with the Expeditious Action recommendations, actions to implement some of the Programmed Enhancements have been described in Reference (a). Accordingly, we have reiterated these in this response.

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We are developing plans to implement several instrumentation enhancements, which will augment or replace some of the added instrumentation planned for implementation under the Expeditious Actions. The Programmed Enhancements will be designed to aid operators in trending those parameters important to maintaining RHR operation and to detect abnormalities prior to a condition which could lead to a loss of RHR cooling.

We are developing plant-specific analyses, in addition to the analyses applicable to R.E. Ginna in WCAP-11916, in order to help provide an understanding of NSSS behavior under all anticipated plant configurations while in the reduced inventory condition. The plant-specific analyses can also serve as a basis for making procedural or hardware modifications at a later time that may alter those which are currently being planned and described herein. A planned action that could be affected by analyses is containment closure. Analyses are being developed to provide an understanding of NSSS behavior and the time to core uncovery relative to time after shutdown, decay heat rate, initial water temperature, and plant configurations. Furthermore, a risk evaluation for implementation of a spectrum of containment closure configurations versus availability of specific plant modifications is being considered.

Flexibility of planned actions has been permitted by Generic Letter 88-17 with implementation of Programmed Enhancements and analyses, which may be used to lessen the prescribed Expeditious Action recommendations, supported by appropriate licensee evaluations.

It is understood that the objective of Generic Letter 88-17 is to provide additional assurance of RHR cooling and containment closure while in the reduced inventory condition during the period immediately and shortly following reactor shutdown when decay heat rate is high enough to cause core uncovery. It has been recognized that the Expeditious Actions and Programmed Enhancements are not regarded as necessary to provide an adequate level of safety, but rather a means of improvement to the existing (adequate) level of safety. Thus, changes to commitments made on Expeditious Actions and Programmed Enhancements can be made by RG&E, provided appropriate internal reviews are conducted and documented. Procedural and hardware modifications may be implemented without prior NRC approval where the criteria of 10 CFR 50.59 are met.

Very truly yours,

Robert C Mecredy

Robert C. Mecredy
General Manager
Nuclear Production

GAH\019
Attachments

xc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Ginna Senior Resident Inspector

PROGRAMMED ENHANCEMENT 1
Instrumentation

RECOMMENDATION

Provide reliable indication of parameters that describe the state of the RCS and the performance of systems normally used to cool the RCS for both normal and accident conditions. At a minimum, provide the following in the CR:

a) two independent RCS level indications.

IMPLEMENTATION

Existing level instrumentation as well as our plans to install additional level indication are described in Attachment 4 of our response to Generic Letter 88-17 (Expeditious Action 4). The existing level instrumentation consists of a permanently-mounted dp cell (PT-432A) located on the "B" loop of the RCS hot leg. Readout of the transmitter is local as well as on the front of the main control board. The indicator has a range of 0 to 100 inches, where 0 corresponds to a level 4 inches above the bottom of the hot leg, and 100 inches is approximately 16 inches above the reactor vessel flange. During the reduced inventory condition, the Control Room indicator will be monitored and manually logged at 15 minute intervals.

As described in our response to Expeditious Action 4, a second reliable level indicator is planned for installation during the 1990 refueling outage. The new transmitter is planned to be installed in the "A" loop of the RCS hot leg. Readout will be in the Control Room. The RHR suction line tie-in is located in this section of piping, oriented vertically at the bottom of the hot leg. This additional level indicator will provide a second reliable instrument available in the Control Room, providing independence of power supply and connection to the RCS.

In order to account for differences which may exist between these level transmitters, we will utilize the Westinghouse guidance documented in ESBU/WOG-88-173, dated October 14, 1988. The guidance provided a method of calculating level differences considering the effects of open channel flow, reactor vessel density/temperature difference, reactor vessel pressure drop, velocity head, acceleration at beginning of active cold leg, deceleration of active hot leg, and momentum effects. This calculated difference can be used for guidance and training for Operations personnel, recognizing that the calculation method is analytical and involves a degree of uncertainty. However, this information helps to increase the awareness and overall understanding of level indication.

We are planning installation of a temporary transmitter and indicator attached to the "A" loop prior to entering the reduced inventory condition in the 1989 spring refueling outage. This instrument will also be monitored and manually logged at 15 minute intervals. In addition, level indications will be recorded twice per shift on the temporary indicator, on the existing (PT-432A) indicator, and on the existing plastic tube for trending potential level differences with RHR flowrate. This information will be reviewed against the calculated difference and factored into our overall training of the level parameter prior to the spring 1990 refueling outage.

An enhancement to the existing level instrumentation is being planned during the 1990 outage to relocate the reference leg to the pressurizer (which will be vented) in order to eliminate a loop level error that may result from a difference between the RCS pressure and the containment atmosphere.

An enhancement is also being planned to replace the level transmitter for the existing (PT-432A) system with a slightly more accurate one, improving the overall system uncertainty. An uncertainty analysis will also be performed on the new Loop "A" indicator installation.

b) at least two independent temperature measurements representative of the core exit whenever the RV head is located on top of the RV (we suggest that temperature indications be provided at all times).

<u>IMPLEMENTATION</u>

Implementation of this programmed enhancement has been described under our response to Expeditious Action 3 of Generic Letter 88-17. Temperature of the RCS is provided from TT-630 when the RHR system is in operation. This temperature is measured at the discharge of the RHR pumps upstream of the RHR heat exchangers. The indicator is located in the Control Room in the form of a recorder with a range from 100°F-400°F.

Beginning with our spring 1988 refueling outage, we have implemented the policy whereby two core exit thermocouples remain connected during reduced inventory operations. The thermocouples left connected will be powered from separate trains. The thermocouples can be read on a digital display in the Control Room and have a range of 0-2300°F. The temperature indications which are provided as inputs to the Plant Process Computer System (PPCS) would be automatically monitored and alarmed. The temperatures will be manually logged once per hour when the PPCS is operating; otherwise, they will be logged at 15 minute intervals.

c) the capability of continuously monitoring DHR system performance whenever a DHR system is being used for cooling the RCS.

IMPLEMENTATION

While operating in the reduced inventory condition, the RHR system is monitored in the Control Room utilizing RHR system flow (FT-626), system pressure (PT-420 and PT-420A), system temperature (TT-630), loop level (PT-432A), and two core exit thermocouples.

Summary of Present RHR System Indications

- **FT-626 - RHR System Flow**

  Located in the common RHR discharge line downstream of the RHR heat exchangers. Readout on the main control board on a recorder and an indicator. Range 0-4000 gpm. A low flow alarm in the Control Room is also set at 400 gpm when operating in reduced inventory condition.

- **PT-420 - RHR System Pressure (also defines RCS pressure)**

  Located in the inlet line to the RHR system from Loop "A" hot leg. Readout on the main control board on an indicator with range 0-750 psig. Readout also provided on a recorder and MCB indicator with range 0-3000 psig.

- **PT-420A - RHR System Pressure (also defines RCS pressure)**

  Connected to RCS pressurizer. Readout on main control board on a recorder and MCB indicator. Range 0-3000 psig.

- **TT-630 - RHR System Temperature**

  Located in discharge line of the "A" RHR pump upstream of the heat exchanger. The "B" RHR loop temperature is also read on this transmitter via cross-tie. Readout on main control board on a recorder. Range 100-400°F.

- **Core Exit Thermocouples - Core Exit Temperature**

  Located in reactor vessel with sheaths routed through the reactor head instrument port. Readout in main Control Room on a digital indicator. Range 0-2300°F. Our Expeditious Actions include providing these inputs to the PPCS for automatic monitoring and alarming.

♦ PT-432A - Loop Level

Located on Loop "B" hot leg. Readout available locally and on main control board on an indicator. Range from 0 to 100 inches. A second permanently-mounted dp cell to be located on Loop "A" hot leg is being planned for the 1990 refueling outage. A temporary level instrument will be installed on Loop "A" hot leg prior to entering the reduced inventory condition for the spring 1989 refueling outage.

In order to enhance the monitoring of the state of the RHR and RCS during reduced inventory conditions, several plant modifications are being developed for implementation during the 1990 refueling outage. Three enhancements are being developed: 1) RHR pump suction pressure monitoring, 2) RHR motor current monitoring, and 3) RHR NPSH monitoring.

Utility groups and Westinghouse Corporation have reported that the first early warnings of RHR pump vortexing can be sensed by fluctuations in suction pressure and motor current. Suction pressure transmitters to be installed in the "A" and "B" trains will provide a signal to the Control Room for monitoring and trending RHR pump suction pressure. Motor current will be made available from tie-ins to the independent safety Buses 14 and 16, which provide 480V AC power to the RHR pump motors. NPSH monitoring of the RHR pumps will be accomplished by utilizing the parameters of pump flow, fluid temperature and suction pressure. A processor will compare NPSH required with NPSH available. Appropriate alarms can then be set based upon margin on NPSH required. Indications for these parameters are being planned for installation during the 1990 refueling outage.

Planning is commencing for providing the signals for suction pressure, RHR motor current and NPSH to the Plant Process Computer System (PPCS) for trending in the Control Room. Alarms will be chosen appropriately. This will be described further in d) below. The PPCS equipment can greatly enhance the operators' ability to trend the RHR system. The PPCS is continually monitored in the Control Room. The RHR parameters mentioned above can be input to the PPCS and set up in a single control group (up to 6 parameters can be displayed on one screen) whereby all or selected parameters can be trended over predetermined sampling increments. Graphical representation of selected key parameters can also be arranged to enable fluctuations of the values from steady state to be observed. In this manner, a fluctuation in suction pressure, for example, of 5% or 10% from its steady state value could be observed and alarmed. The PPCS can be programmed to sample the individual parameters at predetermined intervals, for example, once per second. Trending of the values could be output in tabular form for all the parameters if desired and up to three on a single screen in graphical form. Utilizing the PPCS in this way provides the operators with a powerful trending tool because of its flexibility to observe the selected parameters.

Should the PPCS be inoperable, our Expeditious Actions have described the available instrumentation and monitoring. In this case, two core exit temperature indications, available in the Control Room, would be monitored and logged at 15 minute intervals. Two independent loop level indications would be available in the Control Room and be logged at 15 minute intervals.

d) visible and audible indications of abnormal conditions in temperature, level and DHR system performance.

Visible indications of temperature, level and RHR system performance are described in a), b) and c) above. A low flow alarm on the main control board is presently available and is set at 400 gpm from the flow transmitter FT-626 prior to entering the reduced inventory condition. As part of Expeditious Action 3, we are planning to utilize the input from the two core exit thermocouples to the PPCS to establish an alarming function.

In addition, it is our intent to provide the signals not already input to the PPCS to the computer during the 1990 refueling outage. These parameters would comprise what is called a control group of RHR parameters.

Qty	Instrument	Parameter	Instrumentation Status	Present PPCS Status
(1)	FT-626	RHR system flow	existing	Yes
(1)	PT-420	RCS pressure	existing	Yes
(1)	TT-630	RHR system temperature	existing	Yes
(2)		Core exit thermocouple temperature	existing	Yes
(2)	PT-432A + one	RCS loop level	one existing one planned	No No
(2)		RHR pump "A" and "B" suction pressure	two planned	No
(2)		RHR "A" and "B" motor current	two planned	No
(2)		RHR pump "A" and "B" discharge flow	two planned	No
(2)		RHR pump "A" and "B" NPSH monitoring	two planned	No

It is our belief that providing the capability to trend and monitor these parameters on the PPCS would provide the operators with the necessary information to quantify the state of the RHR system during reduced inventory. If desired, the PPCS programming can be set up to alarm based upon a variation from a running average. This can be valuable in determining variations from steady state conditions and be more useful than a single alarm setpoint. Available space is at a premium on the main control board.

Utilizing the PPCS would enable monitoring and trending to be performed at a single station within the Control Room. The flexibility of trending other existing inputs at a future time, if desireable, also exists and these parameters can be added to the RHR control group with a programming change without difficulty.

Suction pressure and motor current indications are presently not available, therefore, it is not known at this time what degree of fluctuation in the readings can be normally expected to exist for the conditions where adequate loop level and pump flow prevent risk of pump loss due to vortexing. As experience is gained through the use of the proposed new instrumentation, appropriate alarm setpoints can be established. It is anticipated that the degree of fluctuations may be different depending on available loop level, for instance. Therefore, the flexibility inherent in the PPCS to adjust the degree of fluctuation from a running average based on plant condition could be a valuable aid for the operators.

PROGRAMMED ENHANCEMENT 2
Procedures

RECOMMENDATION

Develop and implement procedures that cover reduced inventory operation and that provide an adequate basis for entry into a reduced inventory condition. These include:

a) procedures that cover normal operation of the NSSS, the containment, and supporting systems under conditions for which cooling would normally be provided by DHR systems.

IMPLEMENTATION

Procedure O-2.3.1, Draining the Reactor Coolant System, is the primary operating procedure which controls operations while in reduced inventory. Based upon our planned Expeditious Actions described in reference (a), a number of changes to this procedure are being made and will be implemented as required prior to the spring 1989 refueling outage. A new procedure O-2.3.1A, Status of Containment Closure During Reduced Inventory, is being prepared to provide the provisions for each penetration as a prerequisite to ensure containment closure, including personnel and equipment hatches. The procedural guidance will enable compliance with the 2-hour closure requirement. Procedure O-2.3.1 will be revised to include the prerequisites prior to entering the reduced inventory condition. The requirement to establish the necessary equipment and flow paths needed to raise loop level to enable restart of an RHR pump and provide alternate means of inventory addition to prevent core uncovery until such time as RHR cooling can be reinitiated, will be placed in this procedure. The limiting requirements on temperature of the coolant (140°F maximum) and time after shutdown (48 hours), which were the guidelines utilized in the analysis (Westinghouse WCAP-11916), are also prerequisites. However, these are the limiting conditions. During planned outages, the typical time after shutdown would be on the order of 100 hours and coolant temperature at about 100°F.

Once the entry conditions have been satisfied, draindown of the RCS can commence. A number of changes to Procedure O-2.3.1 required to satisfy the Expeditious Actions include:

1) Establishing a large hot side vent path during the draindown procedure. This will be provided from the pressurizer manway as supported by a plant-specific analysis.

2) Itemizing the available level indications to operators, those that are required to be logged and notations concerning level differences which may exist based on analysis. Loop level will be logged by operators at 15 minute intervals. Trending will also be performed utilizing the level indicators which will exist for the upcoming outage as well as future outages.

3) Existing O-2.3.1 requires throttling of the RHR flowrate as loop level decreases. As level is reduced, the flow is throttled to about 800 gpm. If level is brought down to loop centerline (or 4" below centerline for RTD maintenance), the flow is further throttled down to about 500 gpm. These flowrates have been demonstrated to prevent the onset of vortexing and are well within the analytical setpoints determined in WCAP-11916 for the R.E. Ginna piping configuration.

Procedure O-2.3.1 describes two methods for draindown of the RCS. If the reactor coolant is to be purified, the refueling water purification pump is utilized and the water is pumped to the CVCS holdup tank. If purification is not deemed necessary, one of the reactor coolant drain tank pumps is utilized. The volume of water drained from the RCS to the holdup tank is calculated as a method to ensure that the required volume is removed from the RCS prior to preparation for steam generator manway removal.

Procedures and practices have been developed to vent the RCS through the reactor vessel conoseals. This procedure has been demonstrated successfully by past practice to reduce the possibility of perturbations during the draindown process and aid in stabilizing the available level indications. Additionally, both trains of the RHR system will be available while in the reduced inventory condition; one of the two is required to be operating.

Procedure O-2.3.1 directs operators to AP-RHR.2 if RHR becomes inoperable. This guidance has been revised to address the information and concerns noted in Generic Letter 88-17, Expeditious Actions, and other supporting documents. Abnormal and Emergency Procedures are discussed in more detail in part b) below.

The entry conditions established in O-2.3.1 and revisions made or in process to implement the Expeditious Actions under Generic Letter 88-17 provide the basis for entry in the reduced inventory condition. The requirements of instrumentation available, monitoring, status of containment closure, and available equipment, flow paths and procedures establish the basis for operating in this mode.

b) procedures that cover emergency, abnormal, off-normal, or equivalent operation of the NSSS, the containment, and supporting systems if an off-normal condition occurs while operating under conditions for which cooling would normally be provided by DHR systems.

IMPLEMENTATION

Abnormal Procedure AP-RHR.2, Loss of RHR at Low Loop Levels, has been written to specifically cover operator actions while in the reduced inventory condition. Another Abnormal Procedure, AP-RHR.1, provides actions when not in the reduced inventory condition.

AP-RHR.2 is entered upon receipt of the RHR low flow alarm A-20 set at 400 gpm, an unexpected increase in RCS temperature, erratic or no flow on RHR system flow indicator FT-626, or receipt of safeguard breaker trip alarm J-9.

Procedural actions require determination of the cause and corrective action to be taken prior to starting the second RHR pump. The first concern is to protect the RHR pumps should vortexing occur. Several new planned Programmed Enhancements will aid the operators in establishing guidelines for anticipating the onset of vortexing or abnormal pump operation. These instrumentation enhancements and guidance to operators will be factored into the operating procedure after implementation of these enhancements. Second, operators ensure adequate RCS inventory is available before restart of an RHR pump. This is to prevent further vortexing and risk of pump damage. Notes will be appropriately placed in the procedure so that operators are aware that level indicators may vary at locations around the RCS loops due to dynamic effects. Results of the analytical calculation method as well as our plant-specific level trending will provide guidance. Refilling the RCS is initiated as an immediate action utilizing the RWST gravity feed method. This method of inventory addition has been demonstrated by analysis to deliver a large quantity of water to refill the RCS loops and restart an RHR pump.

Two additional available sources of RCS inventory addition will be provided, each capable of ensuring that core uncovery will not occur. If air has been entrained in the RHR system, actions to vent the RHRS are taken. Operating Procedure O-2.3.1 requires the stationing of an individual in containment while operating with a loop level below the top of the hot leg (25 inches) to ensure prompt performance of this function. The vent location is specified. This individual is equipped with a portable radio or equivalent means for direct communication with the Control Room. Actions are continued to ensure conditions are met to restart an RHR pump to regain this primary source of decay heat removal. AP-RHR.2 will also direct activities in parallel with the above to establish a closed containment and evacuate unnecessary personnel from containment.

In the event that the initial response to regain adequate RCS level and RHR pump flow is not obtained, the procedure will direct operators to initiate secondary methods of inventory addition and decay heat removal. Charging to an intact RCS cold leg and high head safety injection to the RCS hot leg have been provided for this purpose in accordance with the basis established in WCAP-11916. In addition, an emergency procedure to operate the reactor coolant drain tank pumps, ER-RHR.1, can be initiated to provide a supplemental means of decay heat removal prior to regaining operation of the RHRS. While not equivalent as a backup for the RHR pumps, they can serve to reduce the heatup rate of the RCS and prolong the time to reach a boiling condition while the RHRS remains inoperable.

The Westinghouse Owners Group is developing recommendations and a program to standardize the emergency procedures and response to abnormal conditions while in reduced inventory. RG&E will participate in this development as a member of the WOG. We will attempt to incorporate the recommendations made by the Owners Group as they are applicable to R.E. Ginna Station, including the entry conditions for the symptoms listed in the discussion section of this item in Generic Letter 88-17.

c) administrative controls that support and supplement the procedures in items a), b), and all other actions identified in this communication, as appropriate.

IMPLEMENTATION

The administrative controls implemented as a result of Generic Letter 88-17 have, for the most part, been described in our response to the Expeditious Actions. Among them, controls exist which deal with the following key areas:

1. Prohibiting adverse configurations 4 and 5 as described in WCAP-11916 (cold side openings with RCS unvented).

2. Stationing an individual inside containment when water level is below the top of the hot leg for the purpose of venting the RHRS.

3. Utilizing a volumetric measurement of RCS inventory during the draindown to ensure that the appropriate volume of water has been drained prior to steam generator manway removal.

4. Reviewing status and changes to equipment line-ups during each of two daily planning meetings.

5. Reviewing activities related to RCS draindown with supervisors and foremen.

6. Minimizing the time while operating at reduced inventory. Other than required activities that must be performed at low loop levels, reasonable efforts will be made to delay activities until loop level is raised above reduced inventory.

7. Performance of activities which have the potential to perturb the RCS will require shift supervisor signoff prior to initiating the activity.

PROGRAMMED ENHANCEMENT 3
Equipment

RECOMMENDATION

a) Assure that adequate operating, operable and/or available equipment of high reliability is provided for cooling the RCS and for avoiding a loss of RCS cooling.

IMPLEMENTATION

The RHR system design and performance evaluation is discussed in Section 5.4.5 of the UFSAR. Support equipment for the RHR system such as the component cooling system, service water system and electrical power systems are reliable and provide sufficient redundancy to support operability of the RHRS. Prior to entering the reduced inventory condition, the plant is cooled down using both RHR pumps and heat exchangers. As the plant continues to be cooled down, one RHR pump provides adequate flow. Component cooling pumps and heat exchangers and service water pumps are either operable or operating based on load demands. Electrical 480V power is supplied from the preferred off-site source with automatic loading of the emergency diesel generators in the event of off-site power loss. One emergency diesel generator is adequate to supply all equipment required during the reduced inventory condition.

All alarms normally available to operators during power operation are available during nonpower operation from the component cooling and service water systems. Among the component cooling system alarms are the following:

1. RHR pump CCW flow to the pump seals, low flow (15 gpm)

2. Component cooling heat exchanger outlet high temperature (121°F)

3. Component cooling pump discharge low pressure (20 psig less than normal)

4. Component cooling pump inlet header high temperature (150°F)

5. Component cooling loop low flow (1800 gpm)

6. Component cooling service water low flow (1000 gpm).

Maintenance activities on the redundant set of RHRS supporting equipment which could perturb the RCS will be administratively controlled and require shift supervisor signoff. In general, planned activities on these systems are avoided during cooldown or reduced inventory conditions. Both trains of the RHR system are required to be operable. Our definition of operability includes supporting equipment.

b) Maintain sufficient existing equipment in an operable or available status so as to mitigate loss of DHR or loss of RCS inventory should they occur. This should include at least one high pressure injection pump and one other system. The water addition rate capable of being provided by each equipment item should be at least sufficient to keep the core covered.

IMPLEMENTATION

Our proposed actions in response to this item were fully covered in our response to Expeditious Action 6 of Generic Letter 88-17. We will implement these actions prior to the spring 1989 refueling outage. We have required three methods and appropriate flowpaths available during the reduced inventory operation and as a prerequisite prior to entry. These methods are:

1) RWST gravity feed through MOV-856 to the RCS Loop "A" hot leg

2) Charging pump flow from the RWST to an intact RCS cold leg

3) High pressure safety injection pump flow from the RWST to the RCS hot leg.

These methods have been specifically analyzed in WCAP-11916 for the 2-loop plant for 5 configurations into which the plant could be placed. We are establishing controls to prohibit Configuration 4 and 5 (cold side opening with RCS not vented). It should be noted that the need for high pressure safety injection was specifically analyzed for Configuration 5 which will be prohibited. The methods we will make available will allow adequate operator time for action and provide sufficient inventory to raise the loop level to reinitiate RHR and prevent core uncovery.

c) Provide adequate equipment for personnel communications that involve activities related to the RCS or systems necessary to maintain the RCS in a stable and controlled condition.

IMPLEMENTATION

A broad range of communications equipment is available at R.E. Ginna Station. These systems are described in Section 9.5.2 of the UFSAR. Three systems are located within the plant: a combination paging and party system, sound powered phone system, and radio paging system. Auxiliary operators routinely utilize portable radio sets to communicate with the Control Room. A repeater located in the yard area provides greater flexibility with radio communications. Except for the trending of loop level indications to aid in determining level differences between the two level transmitters and the plastic tube inside containment, monitoring of level and temperature will occur from the Control Room. Adequate communications systems exist to enable direct and rapid contact between personnel in the plant and the Control Room.

PROGRAMMED ENHANCEMENT 4
Analyses

RECOMMENDATION

Conduct analysis to supplement existing information and develop a basis for procedures, instrumentation installation and response, and equipment/NSSS interactions and response. The analyses should encompass thermodynamic and physical (configuration) states to which the hardware can be subjected and should provide sufficient depth that the basis is developed. Emphasis should be placed upon obtaining a complete understanding of NSSS behavior under nonpower operation.

IMPLEMENTATION

Under a program funded by the Westinghouse Owners Group, Westinghouse developed WCAP-11916, Loss of RHRS Cooling While the RCS is Partially Filled, dated July 1988. This document provides an analytical basis for the procedures, required instrumentation, operator response and system interactions. The analysis provides a clear understanding of how the NSSS will behave under various nonpower configurations.

A fluid system evaluation was performed, to provide analytical information concerning the phenomena of air ingestion into the RHRS during reduced inventory operations. In addition, thermal-hydraulic computer analyses were performed to predict reactor coolant system behavior following the loss of RHRS cooling during reduced inventory operations.

Scale model testing was performed to obtain data relative to air ingestion and vortex formation at the RHRS inlet nozzle. These data were used along with plant operational data, to develop correlations for RCS level and RHR flowrate which will avoid air binding of the RHRS.

Thermal-hydraulic computer analyses were performed to predict the time to boiling, the RCS pressurization rate, the time to core uncovery and different recovery actions following the loss of RHRS cooling during reduced inventory operations. Various RCS configurations and conditions were modelled to cover the range expected for various maintenance and surveillance activities.

These analyses include RCS intact with and without water in a steam generator at 20, 48, and 120 hours after shutdown with an initial temperature of 140°F. Large vent analyses were performed to determine the time to core uncovery for situations in which a loss of RHR cooling occurs and a large vent path above the core, such as hot side S/G or pressurizer manway, is assumed open. Nozzle dam analyses were performed with both hot leg dams installed and a cold side manway removed, both hot leg dams installed with a large check valve opening for repair, and a hot leg dam in place

with the cold side manway removed on the same steam generator. Vapor venting analyses were performed with 3/4" vents from the reactor vessel head and pressurizer and with 2 pressurizer PORVs vented to containment. Liquid vent analysis was performed for cold leg openings for a 6" and 12" check valve opening as well as a 19" steam generator manway opening, all cases without nozzle dams installed. Analysis was also performed for the case of steam generator condensation if one steam generator were filled to the narrow range.

The recovery analyses performed in the WCAP for the 2-loop model were as follows:

1) 2-loop, 48 hour decay heat, both steam generators empty, and the RCS intact. The recovery action is to initiate gravity feed from the RWST after 15 minutes.

2) 2-loop plant, 48 hours after shutdown, one steam generator empty, one full and the RCS intact. The recovery action is to initiate gravity feed from the RWST after 30 minutes.

3) 2-loop plant, 48 hours after shutdown, all steam generators are empty, and a 12" valve opening exists in the cold side. No nozzle dams are in place. The recovery action is to initiate 55 gpm makeup (charging) to the intact cold leg after 30 minutes.

4) 2-loop plant, 48 hours after shutdown, all steam generators are empty, and a 12" valve opening exists in the cold side. The hot leg nozzle dams are installed. The modelled recovery action is to initiate 55 gpm makeup (charging) to the hot leg just after the core boils. **<u>IT SHOULD BE NOTED THIS ACTION WOULD NOT HAVE PREVENTED CORE DAMAGE.</u>**

5) 2-loop plant, 48 hours after shutdown, all steam generators are empty, the cold side manway is open and both hot leg nozzle dams are in place. The recovery action is to initiate 360 gpm high head safety injection (SI) flow to the cold legs just after the core boils. **<u>ONCE AGAIN, THIS ACTION WOULD NOT HAVE PREVENTED CORE DAMAGE FOR THIS CONFIGURATION.</u>**

6) 2-loop plant, 48 hours after shutdown, all steam generators are empty, the cold side manway is open and both hot leg nozzle dams are in place. This time the recovery action is to initiate 360 gpm SI flow to the <u>HOT LEG</u> just after the core boils. For this recovery action, core damage is averted.

7) 2-loop plant, 48 hours after shutdown, all steam generators are empty, a 12" valve opening in the cold side exists and both hot leg nozzle dams are in place. The recovery action is to initiate 360 gpm SI flow to the hot legs just after the core boils. For the recovery action, core damage is averted.

8) 2-loop plant, 48 hours after shutdown, all steam generators are empty. The recovery action is to begin refilling one steam generator at 15 minutes and initiate gravity feed after 30 minutes. This recovery action was not successful in retarding the RCS pressurization rate enough to cause the RCS pressure to remain below the 40 psia gravity feed limit. If the steam generator were filled earlier or decay heat were reduced (longer time after shutdown), this method may allow the gravity feed method to be effective. Regardless of the effectiveness of gravity feed for this case, the steam generator will provide a beneficial heat sink until RCS inventory and RHR cooling can be restored by other means.

RG&E will initiate procedural controls to prohibit two adverse configurations identified in WCAP-11916. These configurations could occur if a large cold side opening were to exist and a large vent path was not provided where 1) both nozzle dams were installed and 2) nozzle dams were not yet installed. The operating procedures will require a large vent path sufficient to prevent pressurization and subsequent loss of inventory which could subsequently lead to core uncovery if unmitigated. Because of this vent path, justification exists to establish containment closure within the 2 hour limit in lieu of 30 minutes. It is noted that the need for high head safety injection to the hot legs would not be necessary, because of the large vent path to prevent RCS pressurization. Nevertheless, we are implementing this method as a defense in depth contingency.

The WCAP-11916 analysis provided information regarding gravity feed as a means to raise fluid level in order to restart an RHR pump. The analysis was performed assuming gravity feed flow through the charging system into the RCS. Because our Abnormal Procedures utilize a different flow path, a plant-specific analysis has been performed to determine the resulting flowrate and expected water level increase. Our plant-specific analysis confirmed that a much larger volume of water would be available for delivery, assuming the initial conditions identical to those used in WCAP-11916.

The capability exists to increase water level well above the top of the hot legs within the timeframe allotted. The plant-specific analysis assumed (identical to WCAP-11916) that RCS pressure was 30 psia at the time gravity feed was initiated, i.e., at 16 minutes after loss of RHR. As RCS pressure continued to rise, it would eventually overcome the capability of the RWST head of water. This pressure rise creates the time limitation on the gravity feed method. This plant-specific analysis has been performed to compare volume of inventory addition capability. It is noted that in providing a large hot side vent in accordance with our plans, RCS pressurization will not occur, and thus the gravity feed method would be effective as long as the vent path exists.

Our review of WCAP-11916 indicated that additional plant-specific configurations would augment the existing cases. Therefore, several analyses are being conducted. Results of these analyses are planned to be completed prior to our entry into the reduced inventory condition for the 1989 refueling outage. These include:

1. Determine the plant-specific curve for time to reach saturation as a function of time after shutdown. The results of this analysis are expected to be similar to Figure 3.3.6-4 of WCAP-11916 except plant-specific 14 x 14 OFA fuel will be utilized in lieu of standard fuel. RCS initial temperature will be analyzed from 100°-140°F.

2. Calculate the boil-off rate following loss of RHR for the above. These results can be used to determine required makeup flow to prevent core uncovery.

3. Calculate the RCS vent size required to preclude pressurization following loss of RHR with nozzle dams installed and as a function of time after shutdown. This analysis will be used to justify the use of the pressurizer manway vent path.

4. Calculate the time to core uncovery as a function of time after shutdown assuming the pressurizer manway opening for 3 nozzle dam cases:

   a) All nozzle dams installed
   b) No nozzle dams installed (i.e., large vent case)
   c) Cold leg nozzle dams installed, hot side nozzle dams not installed

The results of this analysis will provide the evaluations for expected NSSS behavior for all phases in the nozzle dam installation/removal process. It will also provide the basis for extending containment closure time limitations during entry into reduced inventory at the end of the outage when decay heat is lowest.

The results of these new analyses will be provided to the Training Department and the essential elements developed into the training program to be received by licensed operators prior to the 1990 refueling outage and subsequently. Confirmation that the pressurizer manway opening is of sufficient size will be provided to the Operations staff prior to the 1989 refueling outage, since our initial planning has accounted for this vent path.

PROGRAMMED ENHANCEMENT 5
Technical Specifications

RECOMMENDATION

Technical Specifications (TSs) that restrict or limit the safety benefit of the actions identified in this letter should be identified and appropriate changes should be submitted.

IMPLEMENTATION

Generic Letter 88-17 identified two conditions which exist in some TSs which could limit the benefit of the recommendations made in Generic Letter 88-17. These are minimum RHR system flowrate and auto-closure interlock on high RCS pressure. Neither of these TSs are applicable to R.E. Ginna.

Operating Procedures O-2.3.1 and O-2.3.1A will specify the equipment to be available to mitigate the consequences of loss of RHR. Requirements will also be generated to close containment within the specified time. Abnormal Procedure AP-RHR.2 will be revised to provide operators with guidance on the preferred and backup methods of inventory addition and regaining of RHRS cooling. The Operating Procedures also specify RHR pump flowrate to prevent the onset of vortexing based upon loop level. The basis for these values is established analytically in WCAP-11916 and by experience during past operation at these conditions. These procedural actions provide an alternative method to TSs which will achieve the same purpose.

PROGRAMMED ENHANCEMENT 6
RCS Perturbations

RECOMMENDATION

Item 2.5 of the Expeditious Actions should be re-examined and operations refined as necessary to reasonably minimize the likelihood of loss of DHR.

IMPLEMENTATION

Refinements have been implemented on an ongoing basis to enhance the safe operation of the plant during reduced inventory. Past enhancements included RHR flow versus level guidance, installation of a permanently-mounted level instrument (PT-432A) in addition to the plastic level tube, maintaining a log for loop level comparison, stationing an individual in containment to vent the RHR system, and implementing an Abnormal Procedure specifically for low loop levels.

The practice of venting the RCS through conoseals in the reactor head during the draindown process and volumetric measurement of water drained from the RCS have been significant in minimizing perturbations that could occur during this process.

The success of the conoseal venting method has resulted in a stabilized draindown of the steam generator tubes and is judged equivalent to alternate methods such as nitrogen injection to steam generator connections, a method performed with success at some plants. The volumetric measurement of the RCS drained to the CVCS holdup tank has also provided assurance that the desired volume of water has been removed from the steam generators and RCS loops, such that the required maintenance activity of manway removal and nozzle dam installation can safely commence.

Other actions addressing the perturbation concern were described in our Expeditious Action response. A review is being conducted to determine which Maintenance Procedures have the potential to create a perturbation to the RCS or RHRS. The procedures which are identified will be modified to include the reduced inventory concern and will require shift supervisor signoff prior to conduct of the procedure. Awareness of supervisors, foremen and other personnel will be increased through strong emphasis during the conduct of the daily planning meetings and plant communication systems. We are directing efforts to impress upon the Maintenance, I&C and Operations personnel the concern of perturbations while in this nonpower condition.

Based upon the operability requirement for the RHRS and our definition regarding supporting equipment, maintenance and testing activities on such systems as component cooling, service water and A-C electrical power systems are evaluated and approved on a case-by-case basis. Our review of the Maintenance Procedures is intended to determine when restrictions are appropriate and shift supervisor cognizance is especially important.

The instrumentation Programmed Enhancement (Attachment 1) will provide operators with a greater flexibility in identifying perturbations if they exist and the ability to trend process parameters during maintenance activities on as frequent a basis as deemed necessary.

The R.E. Ginna Station Outage Planning Group, managed by the Director of Outage Planning, has overall responsibility for the planning and scheduling of outage-related work. This group works closely with the Operations Department and Shift Supervisors to control activities to ensure that appropriate communications and controls are established to minimize the potential for perturbations. Personnel within these groups who control and approve activities while in the reduced inventory condition have many years of experience with operation in this condition and are cognizant of the concerns while in low loop levels.

Following the 1989 refueling outage, a review and critique of the Expeditious Actions included as part of our response and use of new instrumentation and monitoring implemented for the 1989 outage will be conducted jointly among the Outage Planning and Operations Department representatives.