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New York Power Authority

John C. Brons
Executive Vice President
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February 7, 1989
IPN-89-008

U.S. Nuclear Regulatory Commission
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Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
Implementation of Programmed Enhancements Recommended by Generic Letter No. 88-17, "Loss of Decay Heat Removal."

Reference: 1. Letter IPN-88-001 from Mr. J.C. Brons to NRC, "Implementation of Expeditious Actions Recommended by Generic Letter 88-17, 'Loss of Residual Heat Removal'," dated January 3, 1988.

Dear Sir:

This letter provides the Authority's response to the programmed enhancements recommended in the subject generic letter (GL 88-17). As stated in Reference (1) the Authority does not anticipate operation at mid-loop with irradiated fuel in the vessel during the Cycle 6/7 refueling outage at Indian Point 3 (IP-3) which is scheduled to commence February 4, 1989. A full core discharge is planned to facilitate the replacement of all four steam generators, thus precluding application of GL 88-17 to reduced inventory conditions during this outage.

The programmed enhancements attached to this letter which involve analyses of plant configuration at reduced inventory, equipment design review and update of administrative controls/procedures affecting mid-loop operation will be completed prior to the start of the second refueling outage following issuance of GL 88-17. This outage will be the Cycle 7/8 refueling outage anticipated in late 1990. Those programmed enhancements requiring hardware changes or significant plant testing will be implemented prior to start-up following the Cycle 7/8 refueling outage.

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Should you or your staff have any further questions regarding this letter, please contact Mr. P. Kokolakis of my staff.

Very truly yours,

John C. Brons
Executive Vice
President
Nuclear Generation

STATE OF NEW YORK
COUNTY OF WESTCHESTER

Subscribed and sworn to before me this
7 th day of February, 1989.

Mina Holden
Notary Public

MINA HOLDEN
NOTARY PUBLIC, State of New York
Westchester County
No. 4829150
My Commission Expires Aug. 31, 1989

Attachment
cc: U.S. Nuclear Regulatory Commission
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RESPONSE TO GENERIC LETTER NO. 88-17
RECOMMENDED PROGRAMMED ENHANCEMENTS

(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,

(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.),

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

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

RESPONSE:

Hardware changes in the plant or the control room involving instrumentation will be implemented prior to start up following the second refueling outage from the date of GL 88-17. Analysis and associated procedure changes will be completed prior to the start of the second refueling outage. Long term enhancements will include:

(a) The existing reference water column for RCS level discussed in Reference (1) will be upgraded to replace instrument supply and vent lines with stainless steel tubing with attention towards avoiding air entrapment or creating loop seals which could result in false readings. The water column itself will consist of either permanently installed tygon tubing or a hard pipe sightglass arrangement, with provisions for continuous communication of level to the control room. Analyses, calculations or tests will be used to:

- determine response of level indication to changes in reactor vessel or containment pressure,
- derive level error between the reference level column and the hot leg level at the RHR suction pipe juncture for various RHR system flow rates,
- establish a curve for the operator showing the minimum required level to avoid suction vortexing for the range of RHR flows required for shutdown decay heat removal,
- describe transient effects on level indication of starting the alternate RHR pump and securing the running pump.

The Authority is currently investigating the feasibility using an ultrasonic level indicating system as the second independent indication of RCS level. Appropriate alarm functions for level indication will be considered as part of this review.

(b) As described in Reference (1) two independently powered core exit thermocouples (CETs) are digitally trended by plant computer in the control room during reduced inventory operation. Although the control room computer will alarm on high CET temperature, this function is not necessary since RHR heat exchanger outlet temperature is maintained in a specified range to adequately control shutdown decay heat loads. Loss of RHR flow is sufficient to alert the operator to closely monitor CET temperature to avoid exceeding operating limits for the cold shutdown condition. The plant is normally not drained with the RV head off, so mid-loop operation with the head off and the inability to provide core-exit temperature indication should not be of concern.

(c) RHR pump motor current indication is being evaluated for a backup to RHR heat exchanger flow for another means of monitoring RHR system performance in the control room. RHR pumps have an associated trip alarm in the control room which is sufficient to alert the operator to a loss of decay heat removal flow.

(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 support systems under conditions for which cooling would normally be provided by the DHR systems.

(b) procedures that cover emergency, abnormal, off-normal, or the 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.

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

RESPONSE:

Procedures were implemented prior to receipt of GL 88-17 which addressed its concerns to the extent the Authority determined practical and necessary to ensure the continued safe operation of the plant in the cold shutdown condition.

Further analysis of mid-loop concerns to be conducted under items (1), (3) and (4), will form the basis for updating those normal and off-normal procedures associated with mid-loop operation. This update will be completed prior to the start of the second refueling outage and will include items such as:

- minimum RCS level and RHR flow to avoid pump cavitation at mid-loop conditions,
- time limitations for restoring RHR or initiating alternate core cooling to prevent exceeding cold shutdown operating limits in the event the running RHR pump trips,

- makeup rate requirements to prevent boiling in the core for the potential case of a sustained loss of RHR,
- avoiding plant configurations that have not been analyzed or that could result in potential core uncovery if RHR is lost.

Westinghouse procedural guidelines for reactor vessel draindown and loss of RHR are expected in the near future. A review of these guidelines against IP-3 procedures for additional consideration of mid-loop contingencies will be performed prior to start of the second refueling outage.

(3) Equipment

RECOMMENDATION:

(a) Assure that adequate, operable, and /or available equipment of high reliability[1] is provided for cooling the RCS and for avoiding a loss of RCS cooling.

(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.

(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.

RESPONSE:

(a) The continued high reliability of the RHR system (the primary means of cooling the core while shutdown) and provisions for avoiding its loss will be further evaluated during:

- Upgrade and addition of instrumentation described in (1) above,
- Enhancement of procedures already in place which govern reduced inventory operation based on analysis or tests performed in (1) and (2) above which establish minimum requirements for instrumentation, cooling, RCS level and equipment availability,
- Consideration of additional controls to prevent loss of power supplies to required instruments and equipment for cooling the RCS in mid-loop.

(b) Detailed guidance will be provided to the operators to ensure adequate core cooling is maintained in the event of a sustained loss of RHR at mid-loop. This will include such items as:

- time available to restore RHR or initiate alternate cooling prior to exceeding the cold shutdown limit of 200°F,

1 Reliable equipment is equipment that can be reasonably expected to perform the intended function.

- minimum makeup flow to prevent CET temperature from exceeding 200°F and preventing the onset of boiling in the core,
- makeup path requirements to ensure adequate core cooling for various plant configurations,
- adequate venting of the RV upper plenum for special circumstances involving cold leg openings or installation of all hot leg nozzle dams, to preclude the potential for rapid core uncovery in the unlikely event the onset of boiling cannot be prevented.

(c) Additional administrative controls will be added as necessary to ensure that adequate RWST inventory and makeup capability (i.e. two paths) are available to meet the requirements of (b) above.

(d) Any communications equipment necessary for the operators to execute (a) above will be made available.

(4) Analyses

RECOMMENDATION:

Conduct analyses 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.

RESPONSE:

A plant specific model of the mid-loop condition will be developed using end-of-cycle (EOC) decay heat loads to establish the alternate cooling requirements for prevention of boiling in the core in the event of a sustained loss of RHR. Satisfactory demonstration that the onset of boiling in the core can be prevented or sufficiently minimized, in conjunction with appropriate administrative controls, will preclude the need for containment closure requirements.

Analyses, calculations or plant specific tests conducted to satisfy recommendations (1) and (3) above will provide the analytical basis for the procedural bounding of instrument and equipment behavior during mid-loop operations.

(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.

RESPONSE:

Following completion of all administrative changes and hardware modifications that may result from analyses conducted in response to GL 88-17, a review of IP-3 TSs will be conducted to identify any TSs which could inhibit the effectiveness of such changes or modifications made. Although no impact by

existing TSs on safety benefits gained is anticipated, proposed changes to the IP-3 TSs which may become necessary, will be made following closure of all actions or open items resulting from the subject letter.

(6) RCS Perturbations

RECOMMENDATIONS:

Item (5) of the expeditious actions [portion of GL 88-17] should be reexamined and operations refined as necessary to reasonably minimize the likelihood of loss of DHR.

RESPONSE:

Precautions to avoid operations which could perturb the RCS while drained to mid-loop currently exist in procedures governing reduced inventory operation. However, Westinghouse studies conducted to date have identified certain mid-loop configurations with cold leg openings as having the largest potential impact on plant safety should a loss of RHR occur. Therefore, a review of maintenance and testing requiring reduced inventory will be conducted to identify those activities which will result in cold leg openings. Prior to the start of the second refueling outage following GL 88-17, special precautions regarding maintenance activities involving cold leg openings will be added to procedures controlling mid-loop operation to include:

- reasonable attempt to schedule such activities towards the end of a refueling outage when decay heat loads are low,
- consideration for reviewing maintenance in progress or scheduled testing which could perturb RCS level or affect RCS inventory prior to opening a cold leg,
- consideration of requiring containment closure, establishing an upper plenum vent path and increasing monitoring requirements if the scheduling of a maintenance item involving a cold leg opening at mid-loop cannot be avoided at the beginning of an outage when decay heat loads are relatively high.