BEFORE THE UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the matter of)

POWER AUTHORITY OF THE STATE OF NEW YORK) Docket No. 50-286

Indian Point 3 Nuclear Power Plant)

APPLICATION FOR AMENDMENT TO
OPERATING LICENSE

Pursuant to Section 50.90 of the regulations of the Nuclear Regulatory Commission (NRC), the Power Authority of the State of New York, as holder of Facility Operating License No. DPR-64, hereby applies for an Amendment to the Technical Specifications contained in Appendix A of this license.

This application seeks to amend Sections 3.1.A, 3.3.A, 3.5, 4.1 and 6.9.2 of Appendix A to the Operating License. The proposed changes are being submitted in accordance with the request made in NRC letter dated September 7, 1982, and reflect certain revised operating requirements based on the reanalysis of the Low Temperature Overpressure Protection System.

The proposed changes to the Technical Specifications are presented in Attachment I to this application. The Safety Evaluation corresponding to this change is included in Attachment II.

POWER AUTHORITY OF THE STATE
OF NEW YORK

BY John C Brons
J. C. Brons
Senior Vice President
Nuclear Generation

STATE OF NEW YORK
COUNTY OF WESTCHESTER

Subscribed and sworn to before
me this 1st day of July , 1985

Doreen Pisco
Notary Public

DOREEN PISCO
Notary Public, State of New York
No. 4737373
Qualified in Westchester County
Term Expires March 30, 19 87

ATTACHMENT A

Supplemental Response to NRC's 9/7/82 Letter Regarding IP-3's LTOPS

Question 1a:

It is not apparent that your low temperature overpressure protection system (LTOPS) adequately protects the reactor vessel during some transient events. For example, the start of a reactor coolant pump (RCP) in a loop with a hot steam generator, when the Reactor Coolant System (RCS) is solid with non-flowing water, will cause the temperature and pressure of the RCS water to increase. Your system would automatically raise the PORV setpoint as a function of auctioneered cold or hot leg water temperature. However, the reactor vessel may not be uniformly heated in this transient. To protect the welds in the coldest portion of the belt line region of the vessel, the PORV setpoint should remain at that determined by the initial RCS temperature.

Response:

The Authority had indicated in Reference 1 that an analysis will be performed to confirm that the PORV setpoints are set such that the final RCS peak pressure, for a heat input pressure transient, will not exceed the Appendix G pressure limit that corresponds to the RCS temperature at the start of the transient. This analysis has been completed by the Authority in August, 1984, and the proposed Technical Specifications provided in Attachment 1 to this letter contain PORV setpoints which include consideration of the variation in fluid temperature associated with the start of one RCP with steam generators at an elevated temperature with respect to RCS. Additionally, the analysis was conservative in that no changes in the reactor vessel metal temperature was assumed.

The limiting condition analyzed for the heat input case is the start of one RCP with steam generators 100° F hotter than the RCS. This exceeds by 100% the existing 50° F temperature differential allowed by operating procedures. The increase in RCS temperature, for a 100° F differential between steam generators and RCS was calculated to be 50° F and therefore the proposed PORV setpoint curve includes a 50° F shift to the right of the Appendix - G curve, to ensure that the LTOPS protects the reactor vessel where metal temperature may lag RCS fluid temperature.

As described in Reference 1, the LTOPS is comprised of a three-channel system that utilizes cold leg RTD's input. The analysis has investigated the fluid temperature variation at the RTD's and the following characteristics were determined. At the start of the transient less than 1% of the hotter mixed RCS and RCS steam generator tubes volume travels across each of the idle loop cold legs to the location of the cold leg RTD's while the majority of the fluid travels down the lower downcomer. The resultant fluid temperature increase at the idle loop cold leg RTD's is calculated to be 5° F for a 100° F differential. As the transient continues there will be a period of increasing RCS temperature at the cold leg RTD's in the idle loops due to the energy removal from the active steam generator. After several minutes, the cold leg RTD's on the idle loops will see fluid temperatures that are either below or equal to average RCS fluid temperature, while the active loop cold leg RTD will see the average RCS fluid temperature. At the end of the transient, temperatures will be equalized throughout the RCS and the secondary side at a value 50° F above initial RCS fluid temperature. Consequently, a 50° F shift to the right in the PORVs opening setpoints does ensure that the RCS pressure is limited to a value appropriate for the vessel metal temperature since 50° F bounds the maximum expected temperature difference between fluid and metal temperatures.

Question 1b:

Another example is that if, during a cooldown, the cold leg temperature detector, which is downstream of the generator being used, is in a failed condition during a water mass input event (e.g., an inadvertent operation of a charging pump or a safety injection pump), your LTOPS may not protect the coldest portion of the vessel since the setpoint would not be based on the coldest fluid temperature.

Response:

The Authority had indicated in Reference 1 that, for a mass input case, it will confirm the capability of the OPS to protect the coldest portion of the vessel. Previously, the Authority had indicated that the OPS is a three-channel system and the loss of a single channel still allows the other two channels to sense the temperature change. This is true provided that the colder water is introduced into the cold legs in a symmetric fashion. Introduction of colder water asymmetrically could lead to failure of the OPS to sense the localized colder fluid. Such a case is presented by the mass input due to one charging pump with coincidental loss of letdown. However for this case the mass input to the RCS is small (less than 100 gpm) and even minimal mixing in the cold leg and upper downcomer regions will result in insignificant temperature variation in the vessel belt line region. Furthermore, vessel conduction would further reduce any resultant temperature reduction in the metal.

The larger mass input case due to an inadvertent start of a safety injection pump results in relatively small amounts (approximately 550 gpm or .5% RCS volume/minute) of colder water to the RCS and the previous considerations still apply. However, in this case the colder water is supplied in a symmetric fashion and mixing in the cold legs will result in the RTD's sensing the colder fluid and acting appropriately. It should be noted that for this case, the 50° F shift imposed provides additional assurance that the pressure limit is conservatively applied for the metal temperature.

Question 1c:

Please address these concerns by showing for all times when the RCS water temperature is changing, your LTOPS protects the coldest portion of the reactor vessel. Include in your analysis the effect of all significant response times of components and subsystems such as that for the PORV and its associated nitrogen system, the temperature detectors, the pressure detectors and the logic circuitry. Please explicitly list these response times along with a justifiable error band for each that can be continually maintained.

Response:

The analysis performed by the Authority included the response time for the PORV's to initiate opening and the time for the PORV's to traverse from the closed to full open position. The PORV is assumed to have a delay time of 0.3 seconds, and a total opening time of 3.0 seconds. The response time for the RTD's has no impact on OPS capability due to the inclusion of a fixed bias (50° F shift) to the fluid temperature used for calculating the pressure setpoint. The 0.3 second time accounts for the delay for transmitter (pressure) and bistable response time, and relay operation in the logic circuitry. As requested, the Authority has investigated the instrument error associated with the PORV opening logic circuitry and has determined that the overall pressure signal error is ± 18.4 psig and the overall temperature error is ± 7.1° F. These values were derived from the following associated instrument accuracies:

Resistance Temperature Detector:
± 2° F
Resistance to Current Converter:
(R/I) ± 1.0% or ± 6.0° F (over 600° F scale)
Current to Current Converter:
(I/I) ± 1.0% or ± 3.3° F (over 330° F scale)
Function Generator:
f(X) ± 0.50% or ± 7.5 psig (over 1500 psig scale)
Difference Bistable:
+0% / -1% or +0 psig / -15 psig (over 1500 psig scale)
Pressure Transmitter:
± 0.5% or ± 7.5 psig (over 1500 psig scale)

The total error was calculated by summing the squares of the devices comprising the loop and taking the square root, a method accepted as industry practice. The accuracy values were obtained from vendor literature provided with the equipment. Total response time was derived by summing the worst case instrument channel.

The Appendix G curves provided by Westinghouse in WCAP-9491, dated April, 1979, assume a 10° F temperature and a 30 psig pressure error value. These error values exceed the expected error from the OPS circuitry and the Authority to ensure conservatism has adopted these curves without adjustment for determining the PORV opening circuitry setpoint curve as found in Attachment I, the proposed Technical Specifications.

Question 2:

In regard to the most limiting single failure, please consider an event to be a loss of a D.C. bus which results in the isolation of the letdown flow path and the single failure to be that of the PORV which is powered by another D.C. bus.

Response:

The Authority had indicated in Reference 1 that it considers this event as very unlikely in that it involves the simultaneous failure of a specific bus and PORV at the time when OPS is required (only certain temperature range during heatup or cooldown). In addition, pressurizer level is monitored by the operator whenever charging pumps are operating. The analysis performed by the Authority had studied the above scenario despite its low probability. The single failure of one PORV has been included in the analyses performed for the OPS, thereby identifying the limiting transients, for the mass and heat input respectively, as the start of one SI pump and the start of one RCP with secondary-side at elevated temperature. The loss of a D.C. bus, that causes the loss of one PORV and letdown (powered from same bus), therefore initiating a pressure transient, concurrent with the loss of the second PORV, has been determined to require the presence of a pressurizer bubble regardless of the OPS operability status. The Authority's August, 1984, reanalysis of the OPS has determined that a maximum pressurizer level of 80% is necessary to allow for a 10-minute operator action to terminate the event.