ATTACHMENT I TO IPN-90-027

PROPOSED TECHNICAL SPECIFICATION CHANGES
REGARDING HIGH STEAM FLOW SAFETY
INJECTION (SI) TIME DELAY

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
DPR-64

Signals are also provided to actuate the SIS upon sensing the effects of a steam line break accident. Therefore, SIS actuation following a steam line break is designed to occur upon sensing high differential steam pressure between any two steam generators or upon sensing high steam line flow in coincidence with low reactor coolant average temperature or low steam line pressure. A time delay of no greater than six (6) seconds for high steam flow SIS actuation is included to compensate for instrument lag, thus avoiding spurious high steam flow SIS actuations.

The increase in the extraction of RCS heat following a steam line break results in reactor coolant temperature and pressure reduction. For this reason protection against a steam line break accident is also provided by low pressurizer pressure signals actuating safety injection.

Protection is also provided for a steam line break in the containment by actuation of SIS upon sensing high containment pressure.

SIS actuation injects highly borated fluid into the Reactor Coolant System in order to counter the reactivity insertion brought about by cooldown of the reactor coolant which occurs during a steam line break accident.

TABLE 3.5-1 (sheet 1 of 2)

ENGINEERED SAFETY FEATURES INITIATION INSTRUMENT SETTING LIMITS		
No. FUNCTIONAL UNIT	CHANNEL	SETTING LIMIT
1. High Containment Pressure (Hi Level)	Safety Injection	$\leq$3.5 psig
2. High Containment Pressure (Hi-Hi Level)	a. Containment Spray b. Steam Line Isolation	$\leq$23 psig
3. Pressurizer Low Pressure	Safety Injection	$\geq$1700 psig
4. High Differential Pressure Between Steam Lines	Safety Injection	$\leq$150 psi
5. High Steam Flow in 2/4 Steam Lines Coincident with Low T_{avg} of Low Steam Line Pressure	a. Safety Injection b. Steam Line Isolation	$\leq$ 6 sec time delay for SIS actuation $\leq$40% of full steam flow at zero load $\leq$40% of full steam flow at 20% load $\leq$110% of full steam flow at full load $\geq$ 540°F T_{avg} $\geq$ 600 psig steam line pressure
6. Steam Generator Water Level (low-low)	Auxiliary Feedwater	$\geq$ 5% of narrow range instrument span each steam generator
7.* a. 480v Bus Undervoltage Relay		$\geq$ 200v**
b. 480v Bus Degraded Voltage Relay (Non-SI)		$\geq$ 414v with a $\leq$45 sec time delay
c. 480v Bus Degraded Voltage Relay (Coincident SI)		$\geq$ 414v with a $\leq$10 sec time delay

TABLE 3.5-2 (sheet 2 of 2)

* To be effective after completion of all required modifications.

** The undervoltage protection devices used for diesel generator starting are induction type disc relays; therefore, the time to actual trip will decrease as a function of voltage decrease below the setpoint.

ATTACHMENT II TO IPN-90-027

SAFETY EVALUATION OF THE PROPOSED CHANGE

TO TECHNICAL SPECIFICATIONS

REGARDING HIGH STEAM FLOW SAFETY

INJECTION (SI) TIME DELAY

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SAFETY EVALUATION OF PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS

Section I - Description of Change

This application seeks to revise Section 3.5 (Table 3.5-1 and the Basis) of the Indian Point 3 (IP-3) Technical Specifications. The Technical Specifications are being revised to include up to a six (6) second time delay for safety injection (SI) actuation for the high steam flow signal. Operating experience has demonstrated that this circuit has caused inadvertent actuation of the engineering safeguards due to instrumentation lag in the steam flow and steam pressure signals. The introduction of a time delay will compensate for the instrumentation lag, thus avoiding spurious SI actuations.

Section II - Evaluation of Change

One of the circuits that initiates SI is high steam flow in coincidence with low T average or low steam pressure indicative of a steam break downstream of the main steam flow nozzles. The high steam flow setpoint is automatically adjusted in proportion to main turbine load. The first stage turbine pressure is used as a measure of load. The setpoint generated is compared to the actual delta P signal from the steam flow transmitters.

The circuitry is designed such that two out of four signals from the high steam flow coincidence logic is required before actuation of SI and steam line isolation. When the actual steam flow, as indicated by the delta P signal, reaches the programmed setpoint, a high steam flow SI signal is generated. Normally, this would not be a problem since it is interlocked with low steam pressure or low T average. However, anytime T average or low steam pressure are below their setpoints, or an instrument bus supplying power for the logic is de-energized, the two out of four logic is met and a SI signal will be initiated.

Plant trips have created momentary actuation of this high steam flow coincidence logic. When the turbine trips, the first stage turbine pressure decreases very rapidly. The high steam flow setpoint, therefore, decreases very rapidly. Due to inherent instrumentation lags, the actual steam flow signal (delta P) decreases at a slower rate. The setpoint can momentarily fall below the indicated delta P and a momentary high steam flow signal is generated. This high steam flow signal will clear when steam flow has decreased to below the setpoint. There have been instances when instrument bus failure has initiated a plant trip and, concurrently, resulted in this making up the permissive logic which along with the momentary high steam flow actuation initiates a SI signal. These SI's pose inadvertent challenges to the safety systems and also initiate isolation of the main steam system.

A time delay relay will be installed in this circuitry such that it will be energized upon completion of both the high steam line flow matrix and one (1) of the two (2) coincident matrices. In order to obtain SI and steam line isolation actuations signals in the event of an actual steam line break, the duration of the time delay chosen for the high steam flow coincidence logic must be short enough to still assure required actuation before losing the conditions which satisfy the coincidence logic.

Analysis has determined that the addition of up to a six (6) second delay will still assure actuation of SI and steam line isolation in the event of an actual steam line break.

In order to support the addition of a time delay on the high steam flow coincidence logic, Westinghouse performed an analysis of the steam line rupture events which rely on this safeguards actuation logic to mitigate the consequences of the event with the inclusion of the time delay. For IP-3 these steam line break events only include the large double-ended ruptures of a main steam line. For these ruptures two areas of concern were considered; core response due to the possible reactivity excursion resulting from the excessive cooldown of the reactor coolant system and containment integrity due to the mass and energy released through the break to the inside of the containment.

With regard to core response, the analysis was performed to determine:

a. The core heat flux and Reactor Coolant System (RCS) temperature and pressure resulting from the cooldown following the steam line break. These conditions are determined using the LOFTRAN code.

b. The thermal-hydraulic behavior of the core following a steam line break. A detailed thermal-hydraulic computer code, THINC is used to determine if Departure from Nucleate Boiling (DNB) occurs for the core conditions computed in item (a) above.

The results of the analysis show that with a time delay of up to six (6) seconds on the high steam flow coincident logic, the applicable acceptance criteria for the IP-3 steam line rupture events are still met. Specifically, for core response the DNB ratio (DNBR) evaluation, performed by Westinghouse using the W-3 DNBR correlation in the THINC computer code, showed that the minimum DNBR is greater than the applicable DNBR limit.

For containment integrity, the analysis was performed to determine:

a. The mass and energy released to containment through the steam line rupture. The mass and energy release rates are determined using the LOFTRAN code.

b. The containment pressure conditions inside containment resulting from these mass and energy release rates. These containment pressure conditions inside containment are determined using the COCO computer program.

The containment integrity analysis performed to support the SI time delay is consistent with the Authority's Ultimate Heat Sink (UHS) submittal of July 24, 1989. This submittal was approved by the NRC on May 7, 1990 with the issuance of Amendment No. 98 to the IP3 Operating License. The details of the analysis are described in WCAP-12269 Revision 1, "Containment Margin Improvement Analysis For Indian Point Unit 3", which was included as part of the July 24, 1989 submittal. The containment peak accident pressure resulting from a steam line break, assuming up to a six (6) second SI time delay on the high steam flow coincidence logic, is 42.42 psig. It should be noted that this is less than the containment design pressure of 47 psig.

The redundant time delay relays will be installed in the Engineered Safeguards System racks in the Control Room. They will be seismically mounted in the rear compartments of Racks G.4 and G.6. Each rack has been evaluated for the additional weight (2.57 lbs.) of the relays and it has been determined that it is negligible. Since these relays will be installed in the Control Room which has a mild environment, they do not need to be environmentally qualified. The electrical installation of the relays shall be such that the installation is equal to or better than the original installation and that channelization and separation of the Engineered Safeguards System is not degraded.

Section III - No Significant Hazards Evaluation

In accordance with the requirements of 10CFR50.92, the enclosed application is judged to involve no significant hazards based upon the following information:

(1) Does the proposed license amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response

The proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated. The probability of a steam line rupture event is unaffected by adding a six (6) second time delay relay to the high steam flow coincidence logic. The consequences of a steam line rupture event with the time delay have been analyzed. The analysis shows that with regard to core response the minimum DNBR is greater than the applicable DNBR limit. Also, the containment peak accident pressure resulting from the mass and energy releases as a result of a steam line rupture, assuming up to a six (6) second SI time delay is below the design containment pressure (42.42 psig vs 47 psig). Therefore, it can be concluded that there is not a significant increase in the probability or consequences of an accident previously evaluated.

(2) Does the proposed license amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response

The addition of redundant time delay relays to the high steam flow coincident logic does not create the possibility of a new or different kind of accident from any accident previously evaluated. The time delay relays, which will be seismically installed, are designed to withstand a single failure. The failure mode for the time delay relays is a short of the relay coil which results in blown fuses for the affected train of Engineered Safeguards (which is the typical consequence of a failed relay in the Engineered Safeguards System). This would prevent the affected train from initiating the Engineered Safeguards System. However, the redundant train would be available to initiate all required equipment to mitigate the steam line rupture event. Therefore, a new or different kind of accident is not created.

(3) Does the proposed amendment involve a significant reduction in a margin of safety?

The proposed amendment does not involve a significant reduction in a margin of safety. Adding up to a six (6) second time delay to the high steam flow coincident logic has been analyzed from both a core response and containment integrity perspective. The analysis shows that with regard to core response the minimum DNBR is greater than the applicable DNBR limit. Concerning containment integrity, the containment peak accident pressure resulting from a steam line rupture, assuming up to a six (6) second SI time delay is 42.42 psig, which is below the containment design pressure of 47 psig.

Based on the above, the Authority considers that adding a six (6) second time delay for SI actuation on the high steam flow coincident circuitry can be classified as not likely to involve significant hazards.

Section IV - Impact of Changes

These changes will not adversely impact the following:

1. ALARA Program
2. Security and Fire Protection Programs
3. Emergency Plan
4. FSAR or SER Conclusions
5. Overall Plant Operations and the Environment

Section V - Conclusion

The incorporation of these changes: a) will not increase the probability nor the consequences of an accident or malfunction of equipment important to safety as previously evaluated in the Safety Analysis Report; b) will not increase the possibility for an accident or malfunction of a different type than any evaluated previously in the Safety Analysis Report; c) will not reduce the margin of safety as defined in the bases for any Technical Specification; d) does not constitute an unreviewed safety question; and e) involves no significant hazards considerations as defined in 10CFR50.92.

Section VI - References

1. IP-3 FSAR
2. IP-3 SER
3. Westinghouse Report entitled: "Safety Analysis of the Hypothetical Steam Line Rupture Accident Inside Containment for Indian Point Unit 3 With An Additional Time Delay On The High Steam Flow Coincident Logic," January 1989, revised December 1989
4. Letter to the NRC from Mr. J. C. Brons, dated July 24, 1989 concerning the increase in the Ultimate Heat Sink temperature
5. Amendment No. 98 to the Indian Point 3 Operating License, dated May 7, 1990