POWER AUTHORITY OF THE STATE OF NEW YORK

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February 11, 1982
IPN-82-18

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing

Subject: Indian Point 3 Nuclear Power Plant
Docket NO. 50-286
Purging and Venting of Containment

Dear Sir:

By letter dated July 1, 1981, you requested information concerning the purging and venting of the Indian Point 3 Nuclear Power Plant containment. Attachment A to this letter addresses the requests for information contained in Enclosure 3 to your July 1, 1981 letter.

Attachment B to this letter provides the Authority's position on Conclusions 2 and 4 of Enclosure 4 to your July 1, 1981 letter. Attachment C to this letter provides the Authority's position on the sample Technical Specifications contained in Enclosure 5 to your July 1, 1981 letter and the sample Technical Specifications transmitted to the Authority by your letter dated November 24, 1981. Therefore, Attachment C to this letter, also responds to your November 24, 1981 letter.

Should you or your staff have any questions please contact Mr. J. Lamberski of my staff.

Very truly yours,

for J. P. Bayne
Senior Vice President
Nuclear Generation

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cc: attached

cc: Mr. W. H. Baunack, Acting Chief, Indian Point
U. S. Nuclear Regulatory Commission
P. O. Box 38
Buchanan, New York 10511

Mr. T. J. Kenny, Resident Inspector
Indian Point Unit 3
U. S. Nuclear Regulatory Commission
Buchanan, New York 10511

ATTACHMENT A

Purging and Venting of Containment-
Response to Enclosure 3
of July 1, 1981 NRC letter

POWER AUTHORITY OF THE STATE OF NEW YORK
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
FEBRUARY 11, 1982

REQUEST I.1

Submit a detailed analysis which justifies the estimated annual usage of the purge system and associated equipment.

RESPONSE I.1

The purge system is presently maintained isolated whenever the plant is above the cold shutdown condition. The analysis requested in Item I.1 is currently being performed. It is anticipated that this analysis, along with the other analyses requested in Items I.3 and I.4, will be provided to the NRC by July 6, 1982. The Authority does not plan to operate with the purge valves open when the plant is above cold shutdown prior to the NRC's review of this analysis.

REQUEST I.2

As a result of our study of valve leakage due to seal deterioration, leakage integrity tests of the isolation valves in the containment purge line are required to be conducted periodically. Propose a Technical Specification for testing the isolation valves in accordance with guidance provided in Enclosure 1.

RESPONSE I.2

The purge valves are maintained in the closed position when the plant is above the cold shutdown condition. In addition, the Authority is constructing an enclosure around these valves to protect them from severe environmental conditions.

Seat leakage tests are performed as required by Appendix J to 10CFR50 at refueling shutdowns but in no case at intervals greater than two years. Valve stroke tests are performed at refueling shutdowns per 10CFR50.55a(g).

The Weld Channel and Penetration Pressurization System (WCPPS) maintains the space between the purge valves pressurized and therefore serves as a continous on-line monitoring system detecting isolation valve leakage. The existing Technical Specifications require the WCPPS to be operable when the plant is above cold shutdown and specify the allowable leakage. Therefore the existing Technical Specifications are more stringent than the proposed NRC Technical Specification and additional Technical Specifications are not required.

REQUEST I.3

Your response to item 1f of CSB 6-4 is not adequate. Specify the amount of containment atmosphere that would be released through the purge isolation valve during the time required for them to close following a LOCA. Include instrumentation delays (from inception of LOCA) and actual valve closure time.

RESPONSE I.3

The purge system is presently maintained isolated whenever the plant is above the cold shutdown condition. The analysis requested in Item I.3 is currently being performed. It is anticipated that this analysis, along with the other analyses requested in Items I.1 and I.4 will be provided to the NRC by July 6, 1982. The Authority does not plan to operate with the purge valves open when the plant is above cold shutdown prior to the NRC's review of this analysis.

REQUEST I.4

Your "preliminary hand calculation" of the ECCS Evaluation Model (submitted June 14, 1979) is not adequate. Provide an analysis of the reduction in the containment pressure resulting from the partial loss of containment atmosphere following a LOCA and discuss the effect on ECCS performance. If the purge and pressure relief systems are to be used simultaneously, include such practice in the analysis.

RESPONSE I.4

The purge system is presently maintained isolated whenever the plant is above the cold shutdown condition. The analysis requested in Item I.4 is currently being performed. It is anticipated that this analysis, along with the other analyses requested in Items I.1 and I.3, will be provided to the NRC by July 6, 1982. The Authority does not plan to operate with the purge valves open when the plant is above cold shutdown prior to the NRC's review of this analysis.

REQUEST: I.5(a)

Submit an evaluation of the provisions (i.e., debris screen) made to insure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam following a LOCA.

RESPONSE: I.5(a)

1. Containment Purge Supply

Inspection of the containment purge supply duct has revealed that no equipment or component along the path of the duct can be expected to become a missile-like object which, under the action of a LOCA-generated disturbance inside the containment, could prevent closure of the purge supply isolation valves.

The containment purge supply duct discharges air into the containment through five (5) outlets distributed along the inside periphery of the containment wall. The purge duct is at elevation 88' '0." The discharge outlets are at approximately elevation 87'-0" and direct the air flow toward the intake of the fan cooler filter units located below.

Three of the five outlets are located above the Fan Cooler Filter units. The Fan Cooler Filter units are part of the Containment Air Recirculation Cooling and Filtration System, and are classified as Safety Class equipment.

Each Fan Cooler Filter unit is contained in a rectangular, box-shaped steel enclosure with no protruding appendages. The top of this box enclosure is located approximately 10 feet below the outlets. There is no component or accessory identified which could become detached and be projected toward an overhead outlet. Nevertheless, such a postulated object would then have to pierce either the outlet or the wall of the duct and travel in a curved trajectory at least 26 ft. (outlet closest to the isolation valve) along the duct before reaching the containment penetration isolation butterfly valves.

RESPONSE: I.5(a) (continued)

The fourth outlet is located approximately 15 feet above the Incore Drive units. These are non-safety equipment, enclosed in box-shaped steel containers with no components or protrusion which could result in missilelike flying objects.

The fifth outlet is located at the end of the purge duct and has no equipment within its vicinity.

2. Containment Purge Exhaust

Inspection of the containment purge exhaust duct has revealed that no equipment or component along the path of the duct can be expected to become a missile-like object which under the action of a LOCA-generated disturbance inside the containment, could prevent closure of the purge exhaust isolation valves.

The purge exhaust is a 36 inch diameter penetration through the containment wall at elevation 88'-00", and extends approximately 3¼ feet, straight inside the containment.

This 36 inch duct opening is confined with a protective screen (½"mesh). The extension of the duct inside containment, the protective screen and the elevation of the duct preclude the entrance of potential debris that could become entrained in the escaping air and steam following a LOCA.

REQUEST I.5(b)

Submit an analysis which demonstrates the acceptability of the provisions made to protect structures and safety related equipment; e.g., fans, filters, and duct work, located beyond the purge system isolation valves against loss of function from the environment created by the escaping air and steam.

RESPONSE I.5(b)

The attached preliminary report provides an evaluation of the containment building purge supply and exhaust, and pressure relief ducts structural integrity following LOCA. Additional analyses, as indicated in the attached preliminary report, are necessary to complete this response. It is anticipated that the final report including the aforementioned additional analyses will be provided to the NRC by July 6, 1982.

Preliminary Report On

EVALUATION OF CONTAINMENT

BUIDLING PURGE SUPPLY AND EXHAUST

AND PRESSURE RELIEF DUCTS

STRUCTURAL INTEGRITY FOLLOWING A LOCA

Introduction

The purpose of this report is to demonstrate the adequacy of the Containment Building (C.B.) Purge and Pressure Relief Ducts during a post LOCA condition.

The 36 inch diameter C.B. exhaust, the 10 inch diameter C.B. Pressure Relief and the 36 inch C.B. Purge air supply ducts and supports were analyzed for structural integrity considering the following LOCA transient scenario: All duct system isolation valves are open and a Loss of Coolant Accident occurs. The containment pressure increases to 3.5 psi in 1 second and the containment pressure sensors initiate a signal to isolate. The isolation signal delay time is 1.4 seconds. The duct system isolation valves begin closing at 2.4 seconds into the transient and reach full closed at 4.4 seconds.

Discussion

The systems were analyzed from the containment penetration to the inlet to the HEPA/HECA filter boxes for the C.B. Purge Exhaust and the C.B. Pressure Relief and from the containment building discharge header to the fan inlet damper for the C.B. Purge supply.

A pressure and temperature transient analysis following the LOCA was performed and the forces generated during this transient were calculated.

These forces were then combined with the seismic (O.B.E.) dead weight and thermal forces to generate the loads along the ducts and related supporting structures.

The duct panels, duct supports and structural grid holding the duct supports were analyzed using the loads that were generated.

The following input data and assumptions were used in these analyses:

- A containment volume of 2.61×10^6 Ft^3 is used for the calculation of the noncondensible gas inside the containment.

- The containment pressure and temperature transient response curves following a LOCA are taken from PASNY Indian Point 3 FSAR Section 14.3 and Appendix 6-D respectively.

- The fans in the containment purge and pressure relief duct systems are not operating. The effect of fans operating is considered insignificant.

- The purge air supply duct, the 12' X 11' louvers located at the end of the system is assumed to be closed for conservatism. However, there is a 1' X 1' leaking area to allow air flow to the atmosphere.
- The pressure drop for the Roughing and HEPA Filters are 1.4" H_2O at the design flow rate. The pressure drop for the HECA Filters are 3.5" H_2O at the design flow rate. The effective area for the roughing and HEPA Filters is 91% of the total area, and for the HECA Filters, it is 75%.

- The 36" purge supply and exhaust valves are at the 60° open position and the 10" pressure relief valves are at the 40° open position before the onset of a LOCA.

- The HEPA and HECA filters allow the high mass flow rate to pass through the filter elements with these elements remaining intact, therefore the filter resistance is a function of the velocity.

- No back flow from the C.B. Purge Exhaust to the P.A.B. via the Plenum chamber was considered. This represents the highest pressure in the Plenum chamber.

Results

The analyses discussed on page 3 indicated that additional analyses are necessary to complete the evaluation of the containment building purge supply and exhaust, and pressure relief ducts structural integrity following a LOCA.

The HEPA/HECA filter manufacturer will review the flow values through the C.B. Purge exhaust and C.B. Pressure Relief units to confirm the structural integrity of the units and that the individual elements remain intact.

The Fan House Plenum was not analyzed for internal pressure effects in that the Plenum is designed for 10" WG differential (.36 psi) and the peak pressure downstream of the HECA filters is 15.1 psia or approximately .4 psi. However, the section of Plenum upstream of the HEPA filters is exposed to approximately 2 psi. Additional analysis coordinated with the load transferred from the HEPA/HECA filters elements will be performed.

REQUEST II.1

Submit a detailed analysis which justifies the estimated annual usage of the pressure relief system and associated equipment.

RESPONSE II.1

The Containment Pressure Relief System and associated equipment is used to reduce the normal (non-accident) pressure buildup in the Containment Building, during power operation, as a result of Weld Channel and Containment Penetration Pressurization System leakage, minor leakage in the instrument air system, temperature changes, steam leaks, minor leakage in the nitrogen supply system, etc. If this normal pressure buildup is not relieved through the Containment Pressure Relief System, the plant would eventually trip, with the actuation of the Safety Injection System, due to containment high pressure.

This pressure relieving process normally commences at a Containment Pressure average reading of one (1) psig and continues until an average reading of zero (0) psig is achieved at which time the Containment Pressure Relief Valves are closed and the sections of ducts between the valves are automatically supplied air from the Weld Channel and Containment Pressurization System. The average mass of containment air that is released during the pressure relieving process is 28.8 lbs. This mass of containment air has been determined to be required to be relieved on an average of five (5) percent of the time that the reactor is above cold shutdown. This is based on previous experience with pressure relieving during 1981.

REQUEST II.2

Your response to Item 1f of CSB 6-4 is not adequate. Specify the amount of containment atmosphere that would be released through the pressure relief valves during the time required for them to close following a LOCA. Include instrumentation delays (from inception of LOCA) and actual closure time.

RESPONSE: II.2

The following discussion provides the information requested in II.2.

Branch Technical Position CSB6-4 states that the evaluation of a containment pressure relief system design should include "an analysis of the reduction in containment pressure resulting from the partial loss of containment atmosphere during the accident for ECCS backpressure determination." An analysis has been performed for Indian Point Unit 3 based on the limiting FAC analysis case (DECLG break, $C_D = 0.4$) which was obtained using the 1981 Westinghouse Evaluation Model.

Valves in the containment pressure relief system will close shortly after the beginning of a postulated LOCA transient based on the response to the containment isolation signal. The containment pressure relief system at Indian Point Unit 3 consists of a single 10-inch pressure relief line. The actuation circuitry and components for these valves have been evaluated and the following total time for operation (i.e., closure) of these valve for a LOCA has been determined:

TIME INCREMENT	TIME (Seconds)
Time to SI Signal	1.06
Time to CI Signal	0.32
Individual Valve Circuitry	0.04
Solenoid De-Energization	0.05
Actual Valve Closure	2.00
Total Time:	3.47

This line is conservatively represented in the analysis by the following model:

1. The frictional resistance associated with duct entrance and exit bases, filters, duct work bends and skin friction has not been considered.
2. Fan coastdown effects are ignored.
3. Steady-state flow is immediately established through the purge system ducts at the inception of the LOCA.
4. A 3.5 second valve closure time is considered. No credit is taken for the reduction in flow area with time as the valve moves toward the fully closed position.

A mixture of steam and air will pass through the containment pressure relief lines during the time that the isolation valves are assumed to remain open. The effects of varying the exhaust gas composition have been investigated by considering two extreme cases, air flow exclusively and steam flow exclusively. For the purposes of this analysis it was conservatively assumed that critical flow will be established through the pressure relief lines at the inception of the LOCA and will be maintained until valve closure time. The total mass released during the time in which the valves are assumed to be open is calculated as 247.5 lbs of air or 178.5 lbs of steam.

The reduction in containment pressure from the calculated mass loss is less than 0.1 psi in the case of either air flow or steam flow. A containment pressure reduction of this magnitude on the calculated peak clad temperature (PCT) is expected to be minor (less than 1.0 degrees F).

If consideration of the effects of containment pressure relief on LOCA is applied to the 12% tube plugging case (FQ = 2.04), no additional reduction in peaking is necessary.

REQUEST: II.3(a)

(a) Submit an evaluation of the provisions (i.e., a debris screen) made to insure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam following a LOCA.

RESPONSE: II.3(a)

The containment pressure relief penetration has been found to be in no danger of being affected by LOCA-generated missile disturbance. The pressure relief line is a 10 inch penetration which extends approximately 2 feet into the containment at elevation 56'-0". The opening is covered with a ½ inch mesh screen.

Since there is no equipment within at least a 15-foot conical revolution line in front of this 10 inch penetration, no potential entrained debris can be identified which would penetrate the screen and prevent closure of the containment pressure relief isolation valve inside containment as well as the two valves outside containment.

REQUEST II.3(b)

Submit an analysis which demonstrates the acceptability of the provisions made to protect structures and safety related equipment; e.g., fans, filters, and duct work, located beyond the pressure relief system isolation valves against loss of function from the environment created by the escaping air and steam.

RESPONSE II.3(b)

A preliminary report which provides an evaluation of the containment purge supply and exhaust, and pressure relief ducts structural integrity following a LOCA is contained in the response to Item I.5(b).

REQUEST II.4

Propose a Technical Specification for testing the isolation valves in accordance with the following frequency:

> "The leakage integrity tests of isolation valves in the containment pressure relief line shall be conducted at least once every three months."

RESPONSE II.4

Indian Point 3 has three pressure relief valves in series, two located in the Primary Auxiliary Building and the other inside containment. These valves are normally not subject to severe environmental conditions.

Seat leakage tests are performed as required by Appendix J to 10CFR50 at refueling shutdowns but in no case at intervals greater than two years. Valves stroke tests are performed at refueling shutdowns per 10CFR50.55(g).

The two intra-valve spaces, formed between the three valves, are pressurized with air by the Weld Channel and Penetration Pressurization System (WCPPS) when the valves are closed. The WCPPS therefore serves as a continuous on-line monitoring system to detect leakage of the two outer valves. The existing Technical Specifications require the WCPPS to be operable when the plant is above cold shutdown and specify the allowable leakage. Therefore the existing Technical Specifications are more stringent than the proposed NRC Technical Specification and additional Technical Specifications are not required.

ATTACHMENT B

Purging and Venting of Containment-
Response to Enclosure 4
of July 1, 1981 NRC letter

POWER AUTHORITY OF THE STATE OF NEW YORK
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
FEBRUARY 11, 1982

Response to Enclosure 4 of 7/1/81 NRC Letter

Safety Evaluation Report
Indian Point - Unit 3
Override of Containment Purge Isolation and other
Engineered Safety Features Actuation Signals

Conclusion #2:

The present design does not comply with criterion #5. When the revised Regulation Guide 1.141 is approved (scheduled for June 1981), the licensee must upgrade the radiation monitoring instrumentation to safety-grade quality.

Note:

Criterion No. 5--The instrumentation and control system provided to initiate the ESF should be designed and qualified as safety-grade equipment.

Response:

The Authority to date has not received the revised Regulatory Guide 1.141. Upon receipt of this Regulatory Guide, the Authority will review the applicability of it to Indian Point 3 Nuclear Power Plant and take the appropriate action. This scheduling of the action to be taken will be dependent on plant status and on order lead time for any new equipment or components which may be needed to modify the system.

signal devices will be consistent with the established type of indication for this type of status.

In addition to the above, this location was selected in lieu of the Supervisory Annunciator System because of the following:

1. The Supervisory Annunciator System would activate upon the resetting of each of the systems listed above. An alarm and a flashing light behind that indication would actuate. Upon acknowledgement of this alarm by the operator the flashing light would convert to a constant on light until the actuation signal was cleared. It is during the time that the light is constantly on that the status provided by this system could be possibly masked by all of the other indicators that would be in the same phase of operation as opposed to a visual signal device that is located in a close proximity of the reset (override) pushbutton.
2. The number of positions required in the Supervisory Annunciator System to provide this indication is three (3). While three (3) positions are presently available for use, the physical location of these spare positions are not consistent with the panel locations of the controls for these sytems.
3. The spare positions in the Supervisory Annunciator System are being rapidly used for status indication for modification

to the facility as a result of TMI modifications and other related concerns.

The design of the protection systems for initiation and control of the operation of the Engineered Safety Feature Systems has already been evaluated against the Commission's General Design Criteria as published July 1971 and the Institute of Electrical and Electronics Engineers Standard, IEEE 279, "Criteria for Nuclear Power Plant Protection Systems," dated August 1968. The results of this evaluation concluded that the initiation and control of the Engineered Safety Feature Systems conforms to the requirements stated above and is acceptable.

This position is consistent with the definition of an annunciator contained in IEEE Standard Dictionary of Electrical and Electronic Terms, Second Edition, which states: "a visual signal device consisting of a number of pilot lights or drops, each one indicating the condition that exists or has existed in an associated circuit, and being labelled accordingly."

It was determined based on the above reasons that the installation of the proposed indication devices meet the criterion as stated.

ATTACHMENT C

Purging and Venting of Containment-
Response to Enclosure 5
of July 1, 1981 NRC letter and
Enclosure 2 of November 24, 1981
NRC letter.

POWER AUTHORITY OF THE STATE OF NEW YORK
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
FEBRUARY 11, 1982

Response to Enclosure 5 of 7/1/81 NRC letter and Enclosure 2 of 11/24/81 NRC letter

The Commission's July 1, 1981 and November 24, 1981 letters requested that the Authority consider sample Technical Specifications 3/4.6.1.7 and 3/4.6.3.

Whenever the reactor is above the cold shutdown condition, the Indian Point 3 containment purge valves are administratively maintained closed. The purge valves have position indication in the control room and this position is logged every shift whenever the reactor is above the cold shutdown condition. The pressure relief valves are maintained closed during normal operation except to relieve containment pressure buildup due to inleakage from containment systems. Pressure relief is necessary to preclude inadvertant safety injection actuation. When opened, the valve angle is limited to 40 degrees by mechanical stops to ensure the ability of the valve to close against design basis accident pressure. The pressure relief valves also have position indication in the control room and their position is also logged every shift when the reactor is above the cold shutdown condition. Existing IP-3 Technical Specification section 3.6.A contains the actions to be taken when these valves are not operable. Based on the above, the Authority believes that adequate means exist to ensure containment integrity.

Finally, sample Technical Specification 3/4.6.3 for containment isolation valves was transmitted to the Authority by the Commission's July 1, 1981 letter. In that letter, the Commission stated that this specification is not completely finalized. In order to avoid any unnecessary duplication of effort regarding proposed Technical Specifications for containment isolation valves, the Authority wishes to delay consideration of these specifications until such time that they become finalized.