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BECo. Ltr. #82-181

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

License No. DPR-35
Docket No. 50-293

Implementation Review of NUREG 0737 (Submittal V - Final)

Reference: (a) BECo Letter #82-145, A. V. Morisi to D. B. Vassallo, dated May 18, 1982

(b) NUREG-0737 - Clarification of TMI Action Plan Requirements

Dear Sir:

Completing our submittals as discussed in Reference a), the attached is the design description for NUREG-0737, Item II.E.4.2.

Containment Isolation Dependability

This item includes seven (7) individual positions and to date only Positions one (1) thru six (6) have been closed. Position seven (7) has been the subject of ongoing correspondence and no commitment to implement this position has been provided by BECo or requested by the NRC.

Regarding the first four positions, please note that Boston Edison Company (BECo) interprets the clarifications provided on Page II.E.4.2-2, Reference b) as not applicable for operating reactors. Operating reactors such as Pilgrim Nuclear Power Station (PNPS) have been provided with guidance via: NUREG-0578, regional meetings, and clarifications during 1979. BECo developed responses based on this guidance and has implemented plant modifications accordingly.

When NUREG-0737, Reference b), was issued in November, 1980 clarifications one (1) thru four (4) on Page II.E.4.2-2 included requirements to meet General Design Criteria 54, 55, 56 and 57, which had not been included in previous NRC guidance and expanded the applicability of Standard Review Plan 6.2.4. These items were considered closed out for operating reactors prior to issuance of NUREG-0737, therefore; clarifications one (1) thru four (4) are not considered applicable to PNPS.

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BECo's implementation of positions one (1) thru four (4) has been discussed with the staff on several occasions and was inspected by I&E during a site visit during the week of November 2, 1980, resulting in a procedural change.

We believe we meet the intent of NUREG 0737 on this item and request your concurrence based upon your review of the attached information.

Please do not hesitate to contact us concerning your review of this letter and attachments should you require further information or clarification.

Very truly yours,

awmorisi

ATTACHMENT

II.E.4.2 CONTAINMENT ISOLATION DEPENDABILITY

(NUREG POSITION NOS. 1 THROUGH 6)

A. INTRODUCTION

Before discussing the details of our conformance with this requirement it is appropriate to discuss the methodology we have used. The review was based on the closure of containment isolation valves in non-essential systems from signals considered indicative of LOCA conditions (i.e., low reactor water level and high drywell pressure). Signals which result only in isolation of an individual system are not considered in this review. Unless otherwise identified, only primary containment isolation is considered.

B. NUREG POSITIONS 1, 2, AND 3

Essential systems are defined to be "those systems that should be selectively isolated during containment isolations only after it is established that the use of these systems will not be needed for an accident or abnormal transient". The following systems are considered to be "essential":

a. RHR (except head spray and shutdown cooling)

b. Standby Liquid Control

c. RCIC

d. Core Spray (except test lines)

e. HPCI

f. RBCCW

g. Control Rod Drive Inlet and Outlet

h. Primary to Secondary Containment Vacuum Breakers

The bases for their selection as essential systems are given in the PNPS-1 FSAR, Section 1.5.2.6.2. It was not necessary to identify bases for each individual system, as the common bases given are sufficient to validate the selection of the above systems.

Non-essential systems are defined to be "those systems not needed for mitigation of an accident or abnormal transient and which should be immediately isolated during containment isolation." The following systems which penetrate the primary containment are considered to be "non-essential":

a. Main Steam

b. Feedwater

c. Reactor Water Sample

d. RHR Reactor Head Spray and Shutdown Cooling

e. Reactor Water Cleanup

f. Core Spray Test Line to Suppression Pool

g. Drywell Equipment Drain

h. Drywell Floor Drain

i. Traversing In-core Probe

j. Instrument Air

k. Service Air

l. Containment Atmosphere Control Systems [1]

Those nonessential systems considered to satisfy the requirements of Position (1) and (3) are as follows:

a. Drywell Equipment Drain Isolation Valves

b. Drywell Floor Drain Isolation Valves

c. Reactor Water Sample

d. RHR Reactor Head Spray and Shutdown Cooling

e. Core Spray Test Line to Suppression Pool

The design of the remaining nonessential systems meet the original plant design requirements for isolation but do not meet all of the NUREG-0737 guidelines. Specific exceptions are discussed below.

Main Steam Isolation Valves and Drain Valves

Eight air operated MSIV's, one automatic isolation valve inside and one automatic isolation valve outside containment, on each of the four main steam lines, and two motor operated drain valves are installed at PNPS. All ten valves automatically isolate on receipt of any of the following signals:

[1] This includes Emergency Vent and Purge and H_2/O_2 Monitoring. Its selection as a "non-essential system" in this review does not exclude its role as an Engineering Safeguard. CACS, and related subsystems, although not needed immediately following an accident (and therefore isolated) may be required for accident mitigation at a later time.

a. Reactor low low water level

b. Low steam pressure at turbine inlet with Mode Switch in "RUN"

c. Main Steam Line High Flow

d. Main Steam Line High Radiation

e. Reactor high water level with Mode Switch not in "RUN"

f. High temperature in steam line tunnel

Only "a" above is considered indicative of a LOCA. Diversity is not provided. This is the original GE design.

Addition of the "high drywell pressure" signal would preclude use of main condensers as an additional heat sink, if necessary.

The NRC, in a letter dated 12/18/79, requested the addition of a second (diverse) isolation signal, high drywell pressure. In response to this request, it was determined that closure of MSIV's or MSIV drains on high drywell pressure is not desirable (BECo letter 80-54, 4-4-80). Operability of the MSIV's allows the capability to dump as much reactor decay heat as possible to the condenser following a reactor trip on high drywell pressure. After post-LOCA water level recovery, it may be desirable to re-open MSIV's for this purpose. Lockout of the MSIV drains on a "high drywell pressure" signal could result in condensate accumulation between MSIV's which might prevent re-opening of MSIV's or damage steam lines.

Feedwater Isolation Valves

Two check valves are provided on each of the two feedwater lines (one inside and one outside containment).

No provision is made for automatic isolation on a containment isolation signal or for diversity of isolation signals.

Continued use of the feedwater system is desirable for as long as possible after a LOCA to provide a major source of makeup water.

Isolation of the feedwater system on a LOCA would preclude the use of a major source of makeup water to the reactor. Isolation will be achieved when required because, as feedwater flow is reduced after loss of RFP's, reactor pressure at some point will exceed feedwater pressure and shut the isolation check valves.

Reactor Water Cleanup Isolation Valves

Two motor operated valves are provided on the RWCU inlet. One motor operated valve and one check valve are provided on the RWCU outlet.

The check valve on the RWCU outlet line is part of the Feedwater System and located inside containment. The motor operated valves automatically isolate on receipt of any of the following signals:

a. Reactor low water level

b. RWCU high inlet flow

c. Non-regenerative heat exchanger high temperature at outlet

d. Standby liquid control system initiation

e. Cleanup area high temperature

Only "a" above is considered applicable to a LOCA. Diversity is not provided. This is the original GE design.

It is not desirable to isolate RWCU on high drywell pressure signal alone, per GE recommendation. It is desirable to maintain the RWCU system operational for cleansing vessel water during a situation where high drywell pressure exists without coincident low reactor water level. Such a scenario could exist on failure of drywell coolers.

Traversing In-Core Probe Isolation Valves

One ball valve and one explosive shear valve are provided on each of the four guide tubes, all outside containment. A single check valve is provided outside containment on the purge line to the indexing mechanisms.

Diverse isolation signals will automatically activate the withdrawal mechanism of a TIP sensed to be out of its stowed position. As the withdrawing TIP passes over a limit switch, the respective ball valve will isolate the line.

The ball valves are maintained normally shut. They open only on movement of the TIP across a limit switch. If open, they automatically shut (as described above) on a containment isolation signal. If they do not shut, the backup explosive shear valves can be actuated by keylock in the Control Room.

The check valve in the half inch purge line just outside primary containment will provide isolation if drywell pressure should exceed purge line pressure. No automatic isolation is provided on the purge line. This is the original GE design.

Instrument Air Isolation Valves

One check valve and one air operated valve are provided, both outside containment. The air operated valve is operated manually from the Control Room with no automatic signals or diversity. Only the check valve is seismic Class I.

This GE design, considered acceptable by the NRC in a letter dated 12/18/79, satisfies the original plant design requirements.

Instrument air is maintained at a pressure in excess of the maximum accident pressure expected in the drywell. Should instrument air be reduced to less than containment pressure, the 3" check valve in series with the remote manual air operated valve in the essential instrument air header will provide adequate isolation.

Service Air Isolation Valves

Two check valves are provided, both outside containment, on a capped line. A normally closed manual valve is also provided. No provision is made for automatic isolation on a containment isolation signal or for diversity of isolation signals. Only the inboard check valve is seismic Class I.

This spare line is capped within the drywell and not currently used during normal operation. The use of a cap, two check valves, and a normally shut manual valve is considered adequate.

Containment Atmosphere Control System Isolation Valves

All isolation valves in the original system, including H_2/O_2 monitoring, automatically isolate on diverse signals. The new Emergency Containment Vent and Purge Lines connect with the old CACS inboard of these isolation valves. [1] The sixteen normally shut valves, located outside containment, receive no automatic isolation but are controlled by keylock.

Automatic isolation of the normally keylocked (closed) emergency lines is undesirable as this portion of the system must be available after an accident.

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1 The new subsystem to the containment vent and purge system is described in our response to NUREG-0737 Item II.E.4.1 (BECo letter 82-159, 6-4-82)

C. NUREG POSITION 4

With the exception of the isolation valves listed below, the automatic isolation control systems of both primary and secondary containment are designed such that resetting the isolation signal(s) will not result in automatic re-opening of the containment isolation valves.

The H_2/O_2 Monitoring System isolation valves and the Secondary Containment HVAC isolation valves are controlled by maintained contact switches, which, if they are in the "OPEN" position, will cause the valves to open automatically once the isolation signals are reset. In order to prevent this, each control switch must be moved to the "CLOSE" position prior to resetting the isolation signals. The torus vacuum breakers will return to the "TEST" mode, if their switches were in that position originally, when the isolation signals are reset. In the test mode the vacuum breaker isolation valves are maintained open independent of torus to secondary differential pressure. To close the valves after a LOCA, the valve control switches must be moved to AUTO prior to logic reset.

The Standby Gas Treatment System isolation valves are normally closed. They open on receipt of the isolation signals. If the maintained contact switches which control these valves are left in the "CLOSE" position, these valves will close automatically when the isolation signal is reset. To prevent this, the control switches must be moved to "OPEN" prior to resetting the isolation signals.

Resetting the isolation signal for the systems discussed above requires actuation of two switches in order. The second of these two is a keylocked switch. A procedure is being developed which will require the operator to position individual isolation valves to their "safe" position prior to resetting the isolation signal.

The design described above has been accepted by the NRC as satisfying the intent of the requirements for reset of containment isolation (refer to NRC letter dated 12/13/79). A future modification to the H_2/O_2 System will add the required reset protection. BECo has committed to these modifications and provided justification for interim operation with the system as it exists in BECo letter 82-24 to D. G. Eisenhut dated 1/25/82.

With the exception of the valves listed above, re-opening of any containment isolation valve requires deliberate operator action and is only possible on a valve-by-valve basis.

All pertinent technical specifications requiring revision due to this position have been updated.

D. NUREG POSITION 5

All penetration isolation valves which must close on high drywell pressure receive the same isolation signal. The pressure setpoint for this signal is 2.2 psig. This is the minimum setpoint compatible with normal operating conditions.

The minimum high containment pressure setpoint was based on operational experience. The current trip setpoint is 2.2 psig. Operating experience has shown that the 0.7 psi differential between the maximum normal operational pressure (1.5 psig) and the trip setpoint (2.2 psig) is adequate to avoid spurious isolation due to instrument drift and error. The trip setpoint does not exceed 1.0 psi above the maximum normal operational pressure. Therefore, further justification is not required.

Technical Specifications were updated to show a High Drywell Pressure setpoint of ≤ 2.5 psig in Amendment #42.

E. NUREG POSITION 6

The containment purge valves meet the staff interim position of 10-23-79.

1. The 20" valves are normally closed, except for purge/vent operations. These valves are limited to being open less than 90 hours per year during normal operation. The 2" purge/vent valves are used to control primary containment pressure and oxygen concentration.

2. The 2" valves are also normally closed. They are opened for as short a time and the least number of times possible. The valves receive low reactor water level, high drywell pressure, and refueling floor high radiation isolation signals. Override provisions are provided for the valves via keylocked control swtiches located in the control room. In the override position, the valves would be prevented from re-opening or would reclose if open, should reactor water level drop to the safety injection level.

3. The 20" valves, when open, are at 45° of maximum opening. This shortens the time for closure. The valves normally close within 10 seconds. These valves receive the same isolation signals as the two inch valves discussed above. There is no isolation override capability for these valves.

4. The containment ventilation system isolation valves used for Post LOCA containment atmospheric control are one-inch valves with 1/4" ports. These valves perform no useful function during normal operation and are keylocked closed at all times except valve test and post LOCA. See response to item II.E.4.1 for details (BECo letter #82-159).