ATTACHMENT A

Proposed Technical Specification Change

Proposed Change:

Reference is made to Pilgrim Nuclear Power Station, Technical Specifications, Appendix A, Tables 4.1.1, 4.1.2, 3.2.C, and associated Notes and Bases.

The following changes are requested to be made:

1) Table 4.1.1

change: "High Water Level Scram Discharge Tank"

to: "High Water Level Scram Discharge Tanks"

change: Group "A" on that same line

to: Group "D"

2) Notes for Table 4.1.1

change Note 2 from: "A description of the three groups ... of this Specification"

to: "A description of the four groups ... of this Specification"

3) Table 4.1.2

change: "High Water Level in Scram Discharge Tank"

to: "High Water Level in Scram Discharge Tanks"

change: Group "A" on that same line

to: Group "D"

change: Note (6) reference in both columns

to: Note (7)

4) Notes for Table 4.1.2

change Note 1 from: "A description of three groups ... of this Specification"

to: "A description of four groups ... of this Specification"

delete from Note 6 the word "the" between "during" and "refueling outages".

add the following note:

"7. Calibration of these devices will be performed during refueling outages."

5) Bases: Pages 34, 35, 36, 37 and 38

Replace existing pages with marked up pages provided.

6) Table 3.2.C

change: "1.(9)"

to: "1 (per tank) (9)"

Reason for Change:

Per NRC Confirmatory Order dated June 24, 1983, Boston Edison Company has permanently modified the Scram Discharge Volume (SDV) system to the criteria endorsed by the BWR Owners' Subgroup and endorsed by the NRC Generic Safety Evaluation Report on the BWR Scram Discharge System dated December 1, 1980.

The SDV modifications include two (2) new scram discharge instrument volumes with redundant and diverse instrumentation and replacement of the 2 inch diameter SDV header drain lines with 6 inch diameter drain lines to improve hydraulic coupling. The original scram discharge instrument volume tank and associated instruments have been removed from service.

The SDV modification retains the two existing Control Rod Drive (CRD) Scram Discharge Headers. However, with the SDV modification, each header will drain to a separate Scram Discharge Instrument Volume (SDIV) (SDIV - East or SDIV - West). Each header has been provided with two redundant vent valves, and each instrument volume has two redundant drain valves.

Each SDIV has two level transmitters which provide continuous monitoring of level in the instrument volume over a range of approximately four (4) gallons to forty-five (45) gallons. The level transmitters and associated bistable devices provide signals for reactor scram on high water in the SDIVs at approximately thirty-nine (39) gallons and for the "not-drained" alarms, at approximately four and one half (4.5) gallons. In addition each SDIV is provided with three resistance temperature device (RTD), heat actuated, level sensors.

One RTD in each tank provides a signal to the reactor manual control system for control rod withdrawal block if water level in the SDIV should reach approximately 18 gallons. The two upper RTDs in each SDIV provide reactor scram signals on high water level ($\approx$39 gallons) in addition to the two level transmitters.

Background

On July 7, 1980 the NRC forwarded model Tech. Specs. for SDV from which BECo proposed limiting conditions of operation and surveillance revisions to the PNPS Tech. Specs. These were approved by your office and issued as Tech. Spec. Amendment #65 dated November 10, 1982. On June 24, 1983, a Confirmatory Order was issued to BECo, confirming our proposed schedule and design modifications to the SDV system. Accompanying the confirmatory order was a set of model Tech. Specs. which we reviewed and found to be consistent with the previously issued Amendment 65 Technical Specification. The changes being proposed at this time are administrative in nature, in that part of the modification to the SDIVs consists of replacing the level switches with a new group of analog transmitter trip devices. This in turn necessitates a nomenclature change in the Technical Specification Tables. No other changes are considered necessary, as the other part of the modification ie.. providing diverse and redundant instrumentation and installing dual SDIVs, do not involve LCO, surveillance, or instrumentation setpoint changes. The incorporation of the new group of trip devices as well as an update to the bases that describe them, constitutes the entire T.S. change proposal.

Safety Considerations:

This change does not present an unreviewed safety question as defined in 10 CFR 50.59. It has been reviewed and approved by the Operations Review Committee and reviewed by the Nuclear Safety Review and Audit Committee.

Significant Hazards Considerations:

It has been determined that this amendment request involves no significant hazards consideration. Under the NRC's regulations in 10 CFR 50.92, this means that operation of the Pilgrim Nuclear Power Station in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

The NRC has provided guidance concerning the application of standards for determining whether license amendments involve significant hazards considerations by providing certain examples (48 FR 14870). One example of an amendment that is considered not likely to involve a significant hazards consideration is:

> "(ii) A change that constitutes an additional limitation, restriction, or control not presently included in the Technical Specifications: for example, a more stringent surveillance requirement."

The present Technical Specifications were written to apply to a single SDIV and its associated instrumentation.

With the addition of a second SDIV, the existing limitations and testing frequencies will now apply to the dual SDIV system which could be considered to be a doubling of surveillance testing. Therefore, this change constitutes "a more stringent surveillance requirement" and example (ii) would apply.

Schedule of Change:

This change, based upon NRC approval, will become effective when operation with the SDIV system is required.

Attachment B

Proposed Technical Specification Change

List of pages affected by this change:

Pages 30, 31, 32, 33, 34, 35,
36, 37, 38, 39,and 54.

TABLE 4.1.1
REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION FUNCTIONAL TESTS
MINIMUM FUNCTIONAL TEST FREQUENCIES FOR SAFETY INSTR. AND CONTROL CIRCUITS

	Group (2)	Functional Test	Minimum Frequency (3)
Mode Switch in Shutdown	A	Place Mode Switch in Shutdown	Each Refueling Outage
Manual Scram	A	Trip Channel and Alarm	Every 3 Months
RPS Channel Test Switch (5)	A	Trip Channel and Alarm	Each Refueling Outage
IRM			
High Flux	C	Trip Channel and Alarm (4)	Once Per Week During Refueling and Before Each Startup
Inoperative	C	Trip Channel and Alarm	Once Per Week During Refueling and Before Each Startup
APRM			
High Flux	B	Trip Output Relays (4)	Once/Week (7)
Inoperative	B	Trip Output Relays (4)	Once/Week
Downscale	B	Trip Output Relays (4)	Once/Week
Flow Biase	B	Calibrate Flow Bias Signal	Once/Month (1)
High Flux (15%)	B	Trip Output Relays (4)	Once Per Week During Refueling and Before Each Startup
High Reactor Pressure	A	Trip Channel and Alarm	(1)
High Drywell Pressure	A	Trip Channel and Alarm	(1)
Reactor Low Water Level (6)	A	Trip Channel and Alarm	(1)
High Water Level in Scram Discharge Tank	D	Trip Channel and Alarm	Every 3 Months
Turbine Condenser Low Vacuum	A	Trip Channel and Alarm	(1)
Main Steam Line High Radiation	B	Trip Channel and Alarm (4)	Once/Week
Main Steam Line Isolation Valve Closure	A	Trip Channel and Alarm	(1)
Turbine Control Valve Fast Closure	A	Trip Channel and Alarm	(1)
Turbine First Stage Pressure Permissive	A	Trip Channel and Alarm	Every 3 Months
Turbine Stop Valve Closure	A	Trip Channel and Alarm	(1)
Reactor Pressure Permissive	A	Trip Channel and Alarm	Every 3 Months

NOTES FOR TABLE 4.1.1

1. Initially, once per month until exposure (M as defined on Figure 4.1.1) is 2.0×10^5; thereafter, according to Figure 4.1.1 with an interval not less than one month nor more than three months. The compilation of instrument failure rate data may include data obtained from other boiling water reactors for which the same design instrument operates in an environment similar to that of PNPS.

2. A description of the four groups is included in the Bases of this Specification.

3. Functional tests are not required when the systems are not required to be operable or are tripped.

   If tests are missed, they shall be performed prior to returning the systems to an operable status.

4. This instrumentation is exempted from the instrument channel test definition. This instrument channel functional test will consist of injecting a simulated electrical signal into the measurement channels.

5. Test RPS channel after maintenance.

6. The water level in the reactor vessel will be perturbed and the corresponding level indicator changes will be monitored. This perturbation test will be performed every month after completion of the monthly functional test program.

7. This APRM testing will be performed once per week when in the run mode. If the reactor is out of the run mode for more than one week, the testing will be performed as soon as practicable after returning to the run mode.

TABLE 4.1.2
REACTOR PROTECTION SYSTEM (SCRAM INSTRUMENT CALIBRATION
MINIMUM CALIBRATION FREQUENCIES FOR REACTOR PROTECTION INSTRUMENT CHANNELS

Instrument Channel	Group (1)	Calibration Test (5)	Minimum Frequency (2)
IRM High Flux	C	Comparison to APRM on Controlled Shutdowns	Note (4)
APRM High Flux			
Output Signal	B	Heat Balance	Once every 3 Days
Flow Bias Signal	B	Internal Power and Flow Test	Each Refueling Outage
LPRM Signal	B	TIP System Traverse	Every 1000 Effective Full Power Hours
High Reactor Pressure	A	Standard Pressure Source	Every 3 Months
High Drywell Pressure	A	Standard Pressure Source	Every 3 Months
Reactor Low Water Level	A	Pressure Standard	Every 3 Months
High Water Level in Scram Discharge Tank	D	Note (7)	Note (7)
Turbine Condenser Low Vacuum	A	Standard Vacuum Source	Every 3 Months
Main Steam Line Isolation Valve Closure	A	Note (6)	Note (6)
Main Steam Line High Radiation	B	Standard Current Source (3)	Every 3 Months
Turbine First Stage Pressure Permissive	A	Standard Pressure Source	Every 6 Months
Turbine Control Valve Fast Closure	A	Standard Pressure Source	Every 3 Months
Turbine Stop Valve Closure	A	Note (6)	Note (6)
Reactor Pressure Permissive	A	Standard Pressure Source	Every 6 Months

NOTES FOR TABLE 4.1.2

1. A description of four groups is included in the bases of this Specification.

2. Calibration tests are not required when the systems are not required to be operable or are tripped.

3. The current source provides an instrument channel alignment. Calibration using a radiation source shall be made each refueling outage.

4. Maximum frequency required is once per week.

5. Response time is not a part of the routine instrument channel test, but will be checked once per operating cycle.

6. Physical inspection and actuation of these position switches will be performed during the refueling outages.

7. Calibration of these devices will be performed during refueling outages.

BASES:

3.1 The reactor protection system automatically initiates a reactor scram to:

1. Preserve the integrity of the fuel cladding.

2. Preserve the integrity of the reactor coolant system.

3. Minimize the energy which must be absorbed following a loss of coolant accident and prevents criticality.

This specification provides the limiting conditions for operation necessary to preserve the ability of the system to tolerate single failures and still perform its intended function even during periods when instrument channels may be out of service because of maintenance. When necessary, one channel may be made inoperable for brief intervals to conduct required functional tests and calibrations.

The reactor protection system is of the dual channel type. Ref. Section 7.2 FSAR. The system is made up of two independent trip systems, each having two subchannels of tripping devices. Each subchannel has an input from at least one instrument channel which monitors a critical parameter.

The outputs of the subchannels are combined in a 1 out of 2 logic; i.e., an input signal on either one or both of the subchannels will cause a trip system trip. The outputs of the trip systems are arranged so that a trip on both systems is required

BASES:

4.1 A. The minimum functional testing frequency used in this specification is based on a reliability analysis using the concepts developed in reference (6). This concept was specifically adapted to the one out of two taken twice logic of the reactor protection system. The analysis shows that the sensors are primarily responsible for the reliability of the reactor protection system. This analysis makes use of "unsafe failure" rate experience at conventional and nuclear power plants in a reliability model for the system. An "unsafe failure" is defined as one which negates channel operability and which, due to its nature, is revealed only when the channel is functionally tested or attempts to respond to a real signal. Failures such as blown fuses, ruptured bourdon tubes, faulted amplifiers, faulted cables, etc. which result in "upscale" or "downscale" readings on the reactor instrumentation are "safe" and will be easily recognized by the operators during operation because they are revealed by an alarm or a scram.

The channels listed in Tables 4.1.1 and 4.1.2 are divided into four groups for functional testing. These are:

A. On-Off sensors that provide a scram trip function.

B. Analog devices coupled with bi-stable trips that provide a scram function.

to provide a reactor scram. This system meets the intent of EEI - 279 for Nuclear Power Plant Protection Systems. The system has a reliability greater than that of a 2 out of 3 system and somewhat less than that of a 1 of 2 system.

With the exception of the Average Power Range Monitor (APRM) channels, the Intermediate Range Monitor (IRM) channels of the Main Steam Isolation Valve closure and the Turbine Stop Valve closure, each subchannel has one instrument channel. When the minimum condition for operation on the number of operable instrument channels per untripped protection trip system is met or it if cannot be met and the effected protection trip system is placed in a tripped condition, the effectiveness of the protection system is preserved; i.e., the system can tolerate a single failure and still perform its intended function of scramming the reactor. Three APRM instrument channels are provided for each protection trip system.

APRM's #1 and #3 operate contacts in one subchannel and APRM's #2 and #3 operate contacts in the other subchannel. APRM's #4, #5, and #6 are arranged similarly in the other protection trip system. Each protection trip system has one more APRM than is necessary to meet the minimum number required per channel. This allows the bypassing of one APRM per protection trip system for maintenance, testing or calibration. Additional IRM channels have also

C. Devices which only serve a useful function during some restricted mode of operation, such as startup or shutdown, or for which the only practical test is one that can be performed at shutdown.

D. Diverse Analog Transmitter/ trip unit devices that provide alarms, trips or scram functions.

The sensors that make up group (A) are specifically selected from among the whole family of industrial on-off sensors that have earned an excellent reputation for reliable operation. During design, a goal of 0.99999 probability of success (at the 50% confidence level) was adopted to assure that a balanced and adequate design is achieved. The probability of success is primarily a function of the sensor failure rate and the test interval. A three-month test interval was planned for group (A) sensors. This is in keeping with good operating practices, and satisfies the design goal for the logic configuration utilized in the Reactor Protection System.

To satisfy the long-term objective of maintaining an adequate level of safety throughout the plant lifetime, a minimum goal of 0.9999 at the 95% confidence level is proposed. With the (1 out of 2) X (2) logic, this requires that each sensor have an availability of 0.993 at the 95% confidence level. This level of availability may be maintained by adjusting the test interval as a function of the observed failure history (6).

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(6) Reliability of Engineered Safety Features as a Function of Testing Frequency, I.M. Jacobs "Nuclear Safety," Vol. 9, No. 4, July-Aug. 1968, pp. 310-312

been provided to allow for bypassing of one such channel. The bases for the scram setting for the IRM, APRM, high reactor pressure, reactor low water level, MSIV, closure, generator load rejection, turbine stop valve closure and loss of condenser vacuum are discussed in Specification 2.1 and 2.2

Instrumentation (pressure switches) for the drywell are provided to detect a loss of coolant accident and initiate the core standby cooling equipment. A high drywell pressure scram is provided at the same setting as the core cooling systems (CSCS) initiation to minimize the energy which must be accomodated during a loss of coolant accident and to prevent return to criticality. This instrumentation is a backup to the reactor vessel water level instrumentation.

High radiation levels in the main steam line tunnel above that due to the normal nitrogen and oxygen radioactivity is an indication of leaking fuel. A scram is initiated whenever such radiation level exceeds seven times normal background. The purpose of this scram is to reduce the source of such radiation to extent necessary to prevent excessive turbine contamination. Discharge of excessive amounts of radioactivity to the site environs is prevented by the air ejector off-gas monitors which cause an isolation of the main condenser off-gas line.

A reactor mode switch is provided which actuates or bypasses the various scram functions appropriate to the particular plant operating status. Ref. Section 7.2.3.7 FSAR.

To facilitate the implementation of this technique, Figure 4.1.1 is provided to indicate an appropriate trend in test interval. The procedure is as follows:

1. Like sensors are pooled into one group for the purpose of data acquisition.
2. The factor M is the exposure hours and is equal to the number of sensors in a group, n, times the clapsed time T (M = nT).
3. The accumulated number of unsafe failutes is plotted as an ordinate against M as an asscissa on Figure 4.1.1.
4. After a trend is established, the appropriate monthly test interval to satisfy the goal will be the test interval to the left of the plotted points.
5. A test interval of one month will be used initially until a trend is established.

Group (B) devices utilize an analog sensor followed by an amplifier and a bi-stable trip circuit. The sensor and amplifier are active components and a failure is almost always accompanied by an alarm and an indication of the the source of trouble. In the event of failure, repair or substitution can start immediately. An "as-is" failure is one that "sticks" mid-scale and is not capable of going either up or down in response to an out-of-limits input. This type of failure for analog devices is a rare occurrence and is detectable by an operator who observes that one signal does not track the other three. For purpose of analysis, The IRM system and APRm (15%) scram provide protection atainst excessive power levels and short reactor periods in the startup and intermediate power ranges.

The control rod drive scram system is designed so that all of the water which is discharged from the reactor by a scram can be accomodated in the discharge piping.

The two scram discharge volumes accommodate in excess of 39 gallons of water each and are at the low points of the scram discharge piping. No credit was taken for these volumes in the design of the discharge piping as concerns the amount of water which must be accommodated during a scram.

During normal operation the scram discharge volume system is empty; however, should it fill with water, the water discharged to the piping could not be accommodated which would result in slow scram times or partial control rod insertion. To preclude this occurrence, redundant and diverse level detection devices in the scram discharge instrument volumes have been provided which will alarm when water level reaches 4.5 gallons, initiate a control rod block at 18 gallons, and scram the reactor when the water level reaches 39 gallons. As indicated above, there is sufficient volume in the piping to accommodate the scram without impairment of the scram times or amount of insertion of the control rods. This function shuts the reactor down while sufficient volume remains to accommodate the discharged water and precludes the situation in which a scram would be requested but not be able

it is assumed that this rare failure will be detected within two hours.

The bi-stable trip circuit which is a part of the Group (B) devices can sustain unsafe failures which are revealed only on test. A study was conducted of the instrumentation channels included in the Group (B) devices to calculate their "unsafe" failure rates. The analog devices (sensors and amplifiers) are predicted to have an unsafe failure rate of less than $20 \text{ X } 10^{-6}$ failure/hour. The bi-stable trip circuits are predicted to have an unsafe failure rate of less than $2 \text{ X } 10^{-6}$ failures/hour. Considering the two hour monitoring interval for the analog devices as assumed above, and a weekly test interval for the bi-stable trip circuits, the design reliability goal of 0.99999 is attained with ample margin.

The bi-stable devices are monitored during plant operation to record their failure history and establish a test interval using the curve of Figure 4.1.1. There are numerous identical bi-stable devices used throughout the plant's instrumentation system. Therefore, significant data on the failure rates for the bi-stable devices should be accumulated rapidly.

The frequency of calibration of the APRM Flow Biasing Network has been established as each to perform its function adequately.

A source range monitor (SRM) sytem is also provided to supply additional neutron level information during start-up but has no scram functions. Ref. Section 7.5.4 FSAR. The APRM's cover the "Refuel" and "Startup/Hot Standby" modes. THus, the IRM and APRM 15% scram are required in the "Refuel" and "Startup/Hot Standby" modes. In the power range the APRM system provides the required protection. Ref. Section 7.5.7 FSAR. Thus, the IRM system is not required in the "Run" mode.

The high pressure high drywell pressure, reactor low water level and scram discharge volume high level scrams are required for Startup/Hot Standby and Run modes of plant operation. They are, therefore, required to be operational for these modes of reactor operation.

The requirements to have the scram functions as indicated in Table 3.1.1 operable in the Refuel mode is to assure that shifting to the Refuel mode during reactor power operation does not diminish the need for the reactor protection system.

The turbine condenser low vacuum scram is only required during power operation and must be bypassed to start up the unit. Below 305 psig turbine first stage pressure (45% of rated), the scram

refueling outage. The flow biasing network is functionally tested at least once per month and, in addition, cross calibration checks of the flow input to the flow biasing network can be made during the functional test by direct meter reading. There are several instruments which must be calibrated and it will take several days to perform the calibration of the entire network. While the calibration is being performed, a zero flow signal will be sent to half of the APRM's resulting in a half scram and rod block condition. Thus, if the calibration were performed during operation, flux shaping would not be possible. Based on experience of other generating stations, drift of instruments, such as those in the Flow Biasing Network, is not significant and therefore, to avoid spurious scrams, a calibration frequency of each refueling outage is established.

Group (C) devices are active only during a given portion of the operational cycle. For example, the IRM is active during startup and inactive during full-power operation. Thus, the only test that is meaningful is the one performed just prior to shut-down or startup; i.e., the tests that are performed just prior to use of the instrument.

Group (D) devices, while similar in description to those in Group (B), are different in use because they (the analog transmitter/trip unit devices) provide alarms, trips or scram functions. An availability analysis is detailed in NEDO-21617 (4/77).

Surveillance frequencies for the SDV system instrumentation is detailed in Amendment Number 65. NRC concurrence with this surveillance pro-

3.1 BASES (Cont'd)

signal due to turbine stop valve closure is bypassed because flux and pressure scram are adequate to protect the reactor.

The requirement that the IRM's be inserted in the core when the APRM's read 2.5 indicated on the scale assures that there is proper overlap in the neutron monitoring systems and thus that adequate coverage is provided for all ranges of reactor operation.

The provision of an APRM scram at 15% design power in the "Refuel" and "Start-up/Hot Standby" modes and the backup IRM scram at 120/125 of full scal assures that there is proper overlap in the neutron monitoring systems, and, thus, that adequate coverage is provided for all ranges of reactor operation.

4.1 BASES (Cont'd)

gram is contained in the Safety Evaluation Report and its associated Technical Evaluation Report (TER-C-5506-66) dated 11/10/82.

Calibration frequency of the instrument channel is divided into two groups. These are as follows:

1. Passive type indicating devices that can be compared with like units on a continuous basis.
2. Vacuum tube or semiconductor devices and detectors that drift or lose sensitivity.

Experience with passive type instruments in generating stations and substations indicates that specified calibrations are adequate. For those devices which employ amplifiers, etc., drift specifications call for drift to be less than .04% month; i.e., in the period of a month a drift of 4% would occur and thus providing for adequate margin. For the APRM system drift of electronic apparatus is not the only consideration in determining a calibration frequency. Change in power distribution and loss of chamber sensitivity dictate a calibration every seven days. Calibration on this frequency assures plant operation at or below thermal limits.

A comparison of Tables 4.1.1 and 4.1.2 indicates that two instrument channels have not been included in the latter Table. These are: mode switch in shutdown and manual scram. All of the devices or sensors associated with these scram functions are simple on-off switches and, hence, calibration during operation is not applicable, i.e., the switch is either on or off.

PNPS
TABLE 3.2.C
INSTRUMENTATION THAT INITIATES ROD BLOCKS

Minimum # of Operable Instrument Channels Per Trip Systems (1)	Instrument	Trip Level Setting
2	APRM Upscale (Flow Biased)	$(0.58\ W + 50\%)\left[\frac{FRP}{MFLPD}\right]$ (2)
2	APRM Downscale	2.5 indicated on scale
1 (7)	Rod Block Monitor (Flow Biased)	$(0.65\ W + 42\%)\left[\frac{FRP}{MFLPD}\right]$ (2)
1 (7)	Rod Block Monitor Downscale	5/125 of full scale
3	IRM Downscale (3)	5/125 of full scale
3	IRM Detector not in Startup Position	(8)
3	IRM Upscale	≤ 108/125 of full scale
2 (5)	SRM Detector not in Startup Position	(4)
2 (5) (6)	SRM Upscale	$\leq 10^5$ counts/sec.
1 (per tank) (9)	Scram Discharge Volume Water Level-High	≤ 18 gallons