Generic Letter 82-33

BOSTON EDISON

Pilgrim Nuclear Power Station
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BECo 89-053
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U.S. Nuclear Regulatory Commission
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RESPONSE TO REQUEST FOR ADDITIONAL
INFORMATION, EMERGENCY RESPONSE CAPABILITY,
REGULATORY GUIDE 1.97, REVISION 3 (TAC 51119)

By letter dated January 24, 1989, the NRC requested additional information needed to complete its review of conformance to Regulatory Guide 1.97, Revision 3. The requested information is attached. We have not yet completed our evaluation of the post-accident environment for effluent radioactivity monitoring instrumentation and the status of standby power. Upon completion of our evaluation we will submit the requested documentation on the post-accident environment to confirm the basis for the qualification of this equipment. This confirmation will be submitted by December 1, 1989.

RG Bird
R. G. Bird

DMV/jcp/3046

Attachment: Additional Information on Accident Monitoring Instrumentation at the Pilgrim Nuclear Power Station

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Additional Information on Accident Monitoring Instrumentation at the Pilgrim Nuclear Power Station

1. Seismic Qualification

NRC Question:

Reference 3, Appendix A, raised some questions about the seismic qualifications of instrumentation for monitoring 22 variables. Reference 4 did not resolve these questions. Does the existing instrumentation meet the seismic criteria in effect at the time the plant was first licensed?

References:

3. NRC letter, J. A. Zwolinski to W. D. Harrington, Boston Edison Company, "Conformance to Regulatory Guide 1.97, Pilgrim Nuclear Power Station," December 12, 1985.

4. Boston Edison Company letter, J. H. Lydon to Document Control Desk, NRC, "Additional Information Concerning Regulatory Guide 1.97," February 10, 1987.

BECo Response:

We conducted a spot check of the purchasing requirements for 8 of the 9 variables containing Category 1 instrumentation. By selecting Category 1 items the spot check was biased toward instrumentation which had to meet seismic criteria when purchased. This check showed that the instrumentation for these variables was purchased in accordance with the applicable specifications. No further review is considered necessary based on the results of our spot check and the fact that a seismic qualification design specification requirement has been in place since initial construction.

The following seismic design criteria were applicable for the procurement and installation of existing instrumentation at the Pilgrim Nuclear Power Station (PNPS).

The original program for the seismic qualification of Class 1E instrumentation and associated equipment at PNPS used Bechtel Specification 6498-G5 (1968), "Design Criteria for Earthquake Conditions." This specification used frequency-dependent seismic accelerations for qualification by either test or analysis.

On June 1, 1972, PNPS was issued Operating License DPR-35. Subsequently, Bechtel Specification 6498-G5 (1968) was superseded in 1974 by Bechtel Specification 6498-G505 (1974), "Specifications for Seismic Qualification of Safety Essential Equipment and Equipment Supports for the Boston Edison Company Pilgrim Station No. 600 Unit No. 1." This specification adopted the methodologies outlined in IEEE 344-1971, "Seismic Qualification of Class 1 Electric Equipment for Nuclear Power Generating Stations."

In 1983, we updated Final Safety Analysis Report (FSAR) Section 12.2.5.4, Purchase of Safety-Related Equipment, to adopt the guidelines of IEEE 344-1975 for the seismic qualification of all new equipment at PNPS. IEEE 344-1975 promotes rigorous state-of-the-art quantitative techniques to seismically qualify equipment and to document the qualification. NRC Regulatory Guide 1.100, Revision 1, "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants," endorses the methodologies in IEEE 344-1975.

2. Neutron Flux Monitoring

NRC Question:

You are endorsing the BWR Owners Group's position on the use of Category 1 neutron flux monitoring instrumentation. Category 1 neutron flux monitoring systems are available. The NRC staff has not completed its review of the BWR Owners Group position on neutron flux monitoring. We request that a commitment to meet R. G. 1.97 be provided, if the staff does not approve the BWR Owners Group's position that Category 1 neutron flux monitoring is not needed.

BECo Response:

We continue to endorse the BWR Owners' Group's position that a fully qualified, Class 1E post-accident neutron monitoring system is not appropriate.

3. Environmental Qualification

NRC Question:

Documentation on the post-accident environment and the basis for the qualification of the equipment needs to be provided for the following locations and equipment: the effluent radioactivity monitor, drywell spray flow, reactor core isolation cooling system flow, low pressure coolant injection system flow, cooling water flow to engineered safety features system, status of standby power, and particulates and halogens instrumentation.

BECo Response:

a. Effluent Radioactivity

Regulatory Guide 1.97 describes the effluent radioactivity-noble gases variable as the monitoring of effluents from buildings or areas where primary containment penetrations and hatches are located. In particular, this includes effluents from the secondary containment and auxiliary buildings and the fuel handling building because they are in direct contact with primary containment.

At PNPS, the following instruments and their associated equipment are used for monitoring these effluents:

RE1001-608 Ion Chamber Detector - Main Stack
RE1001-609 Ion Chamber Detector - Reactor Building Vent
RE1001-610 Ion Chamber Detector - Turbine Building Roof Exhaust

We have not yet completed our evaluation of the post-accident environment for these instruments and their associated equipment. Upon completion of our evaluation, we will submit the requested documentation on the post-accident environment and the basis for the qualification of this equipment. This information will be submitted to the NRC by December 1, 1989.

b. Drywell/Torus Spray Flow

This Category 2 variable is excluded from environmental qualification requirements because backup monitoring is provided by the environmentally qualified, Category 1 variables, primary containment pressure and temperature.

Drywell/torus spray flow instrumentation is used to verify the containment spray subsystem is operating as designed to condense steam in the primary containment. The design objective of the containment spray subsystem is to lower primary containment pressure and temperature post-accident. Thus, the environmentally qualified instrumentation that monitors primary containment pressure and temperature provides backup monitoring for the drywell/torus spray flow instrumentation.

c. Reactor Core Isolation Cooling (RCIC) System Flow

This Category 2 variable is excluded from environmental qualification requirements because backup monitoring is provided by the environmentally qualified, Category 1 variable, reactor pressure vessel (RPV) water level.

RCIC system flow instrumentation is used to verify the RCIC system is operating as designed to provide makeup water to the RPV following reactor vessel isolation. The environmentally qualified instrumentation that monitors RPV water level provides alternative verification that the RCIC system is injecting water into the reactor vessel. Thus, the RPV water level instrumentation provides backup monitoring for the RCIC system flow instrumentation.

d. Low Pressure Coolant Injection (LPCI) System Flow

This Category 2 variable is excluded from environmental qualification requirements because backup monitoring is provided by the environmentally qualified, Category 1 variable, RPV water level.

LPCI system flow is used to verify the LPCI system is operating as designed to restore and maintain the coolant inventory in the RPV following a loss-of-coolant accident. The environmentally qualified instrumentation that monitors RPV water level provides alternative verification that the LPCI system is injecting water into the reactor vessel. Thus, the RPV water level instrumentation provides backup monitoring for the LPCI system flow instrumentation.

e. Cooling Water Flow to Engineered Safety Features System

This Category 2 variable is excluded from environmental qualification requirements because backup monitoring is provided by the environmentally qualified, Category 1 variables: primary containment pressure, RPV water level, and torus water temperature.

At PNPS, the reactor building closed cooling water (RBCCW) system provides post-accident cooling water to the core standby cooling system components and the residual heat removal (RHR) heat exchangers. The core standby cooling water components receiving RBCCW cooling post-accident include the components of the RHR, RCIC, core spray, and high pressure coolant injection (HPCI) systems. RBCCW cooling of the RHR heat exchangers post-accident results in cooling of the suppression pool.

RBCCW system flow indication is used to verify this post-accident cooling water is being provided as designed. However, the ultimate objective of supplying cooling water to the core standby cooling components and the RHR heat exchangers is to enable the engineered safety features to provide core cooling, restore reactor water level, reduce containment pressure, and provide suppression pool cooling. Thus, the environmentally qualified instrumentation that monitors primary containment pressure, RPV water level, and torus water temperature provide backup monitoring for the RBCCW system flow instrumentation.

f. Status of Standby Power

We have not yet completed our evaluation of the post-accident environment for Regulatory Guide 1.97 instrumentation associated with the status of standby power. Upon completion of our evaluation, we will submit the requested documentation on the post-accident environment and the basis for the qualification of this equipment. This information will be submitted to the NRC by December 1, 1989.

g. Particulates and Halogens Instrumentation

These variables are listed in Regulatory Guide 1.97, Revision 3, under Airborne Radioactive Materials Released From Plant and are categorized as Type E, Category 3 variables. As Category 3 variables, environmental qualification requirements are not applicable.

4. Drywell Atmosphere Temperature

NRC Question:

You have indicated that the drywell atmosphere temperature is a Type A variable. As a Type A variable it must meet all Category 1 criteria. Your submittals did not provide any information concerning separation and isolation of channels. Confirm the need for classifying the drywell atmosphere temperature as a Class A variable. If it is a Class A variable, provide information addressing separation and isolation of channels.

BECo Response:

Drywell atmosphere temperature has been classified as a Type A variable because the PNPS Emergency Operating Procedures (EOPs) depend on monitoring this variable. The control room operators are required to monitor the drywell atmosphere temperature. If the drywell atmosphere temperature exceeds 152°F, the procedure entry condition for EOP-03, Primary Containment Control, requires the control room operator to begin actions to recover from the adverse condition.

The design of the drywell atmosphere temperature indication used for Regulatory Guide 1.97 at PNPS provides for full separation and isolation of redundant channels. The redundant temperature elements (TE9019 and TE9044) and associated equipment are powered by redundant safeguards power supplies and are electrically independent. Physical separation is maintained by routing the cable through separated conduit and raceways.

5. Status of Standby Power

NRC Question:

Identify the standby power systems. Also, the instrumentation and the ranges of the instrumentation used to monitor the status of standby power systems.

BECo Response:

The standby power systems and other energy sources important to safety at PNPS include the 4160 V distribution system, the emergency diesel generators, the 125 VDC system, the 250 VDC system, and the instrument air system. The following instrumentation is used to monitor the status of these standby power systems.

Instrumentation	Range
4160 V Distribution System:	
Ammeters measuring current from startup auxiliary transformer to Buses A1 through A6	0-2,000 amps
Ammeters measuring current from unit auxiliary transformer to Buses A1 through A6	0-2,000 amps
Ammeters measuring current from shutdown transformer to Buses A5 through A6	0-1,000 amps
Voltmeters for Buses A1 through A6	0-6,000 volts
Emergency Diesel Generators:	
Diesel Generator 1,	
Voltmeter	0-6,000 volts
Ammeter	0-600 amps
Diesel Generator 2,	
Voltmeter	0-6,000 volts
Ammeter	0-600 amps
125 VDC System:	
Battery chargers A & B and backup battery charger	
Voltmeters (charger output)	0-150 VDC
Ammeters (charger output)	0-250 amps
Batteries A & B	
Voltmeters (voltage on battery)	0-150 VDC
Ammeters (current into or out of battery)	-150 to 0, 0 to 500 amps

Instrumentation	Range
250 VDC System:	
Normal & backup battery charger	
Voltmeters (charger output)	0-300 VDC
Ammeters (charger output)	0-250 amps
Battery	
Voltmeter (voltage on battery)	0-300 VDC
Ammeter (current into or out of battery)	-50 to 0, 0 to 500 amps
Instrument Air System:	
Instrument air supply header pressure	0-135 psig

6. Particulates and Halogens

NRC Question:

Identify the ranges of the portable particulates and halogens monitoring equipment.

BECo Response:

In an accident condition, the identified release points at PNPS for particulates and halogens are the main stack, the reactor building vent, and the turbine building. Releases from the main stack and reactor building vent are sampled through the use of a particulate filter and a charcoal-based iodine collection chamber, installed ahead of the routine effluent monitoring sample lines. For turbine building releases under accident conditions, particulates and halogens are sampled through the use of a portable air sample pump and filter.

Station Procedures 5.7.3.3, 5.7.3.4, and 5.7.3.5 specify how samples of effluent particulates and halogens will be collected and analyzed under accident conditions from the main stack, reactor building vent, and turbine building, respectively. When the sample dose rate is $\leq$ 25 mR/hr, the sample is measured in the onsite radiochemistry lab using a multi-channel analyzer. When the sample dose rate is > 25 mR/hr but $\leq$ 550 mR/hr, the sample may be measured using the multi-channel analyzer if it is first cut down to a section that has a dose rate $\leq$ 25 mR/hr. When the sample dose rate is > 550 mR/hr, the sample cannot be analyzed until it has decayed sufficiently.

In addition to the above, these station procedures require the use of nomograms to estimate sample activity from the sample dose rate. When the sample dose rate falls in the range 10^{-2} mR/hr to 10^{4} R/hr, the nomograms are capable of estimating Iodine-131 inventory on the sample in the range 10^{-1} μCi to 10^{6} mCi. High range radiation survey instruments (Teletector or equivalent) are available to measure sample dose rates up to 10^{3} R/hr. The radiation dose received by plant personnel in the collection, handling, transporting, and analyzing of effluent samples will not exceed the exposure limits of General Design Criterion 19.