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April 7, 1983

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Request for Additional Information
Equipment Qualification
LGS Docket Nos. 50-352/353

Reference: Letter A. Schwencer to E. G. Bauer, Jr. dated June 17, 1982

Dear Mr. Schwencer:

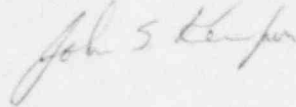
The reference letter stated that the Applicant would be required to revise Section 3.11 of the FSAR to include the environmental qualification of mechanical equipment in the harsh environment as well as electrical and mechanical equipment located in the mild environment so that the extent of compliance with GDC #4 can be evaluated.

The Applicant plans to revise Section 3.11 to reference a separate report containing the information required by the reference letter. An abstract of this report which describes our programs for environmental qualification of both safety-related electrical and mechanical equipment is enclosed for your information. This abstract was presented to your Equipment Qualification Branch at our 3/4/83 meeting. As discussed during that meeting, PECO plans an initial EQ report submittal in May 1983, followed by a

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supplemental submittal in October 1983. At that time, qualification is expected to be 85 to 90% complete. A summary of the electrical environmental portion of the meeting presentation text is also included.

Sincerely,



Enclosures

Copy to: Judge Lawrence Brenner
Judge Richard F. Cole
Judge Peter A. Morris
Troy B. Conner, Jr., Esq.
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Atomic Safety and Licensing Appeal Board
Atomic Safety and Licensing Board Panel
Docket and Service Section

ABSTRACT
ENVIRONMENTAL QUALIFICATION
FOR
SAFETY RELATED EQUIPMENT

LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

ABSTRACT - ENVIRONMENTAL QUALIFICATION REPORT

This description provides a summary of the information to be addressed and substantiated in the Environmental Qualification Report (EQR). The Environmental Qualification Report will identify and document the Philadelphia Electric Co. (PECo) program for the environmental qualification of safety-related equipment installed in the Limerick Generating Station.

1.0 Environmental Design Criteria for Mechanical and Electrical Equipment

All safety related equipment must be capable of performing its safety function and/or remaining in a safe mode under all conditions postulated to occur during its installed life. This requirement is embodied in General Design Criteria 1, 2, 4, and 23 of Appendix A to 10 CFR 50, in Criterion III and Criterion XI of Appendix B to 10 CFR 50, 10 CFR 50.55a(h), which incorporates by reference IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations," and in 10 CFR 50.49.

The NRC has issued definitive criteria in NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment", which contains the following criteria:

- a. Category I, for plants whose CP-SERS were issued after July 1, 1974, incorporates and supplements IEEE Standard 323-1974.
- b. Category II, for plants whose CP-SERS were issued before July 1, 1974, incorporates and supplements IEEE Standard 323-1971 unless the operating license applicant's record indicates that the IEEE Standard 323-1974 is to be used, in which case Category I criteria are applicable.

The Limerick CP-SER was issued in June, 1974, therefore, NUREG-0588 Category II criteria are applicable.

The NRC has not issued definitive criteria for environmental qualification of safety-related mechanical equipment. The Limerick Mechanical Equipment Qualification Program considers the guidance provided by the NRC for qualification of electrical equipment and applies the applicable methodologies to form the basis for mechanical equipment qualification.

In February 1980 and June 1982, the NRC requested that PECO perform a review of their environmental qualification program for safety-related equipment to identify the degree to which the program complied with the regulatory criteria. An environmental qualification report is being developed to provide detailed information on the Limerick EQ program. The following sections provide a summary of the information to be contained in the EQR including mechanical equipment and mild environment qualification.

2.0 Determination of Equipment to be Environmentally Qualified

The list of equipment that is included in the environmental qualification program was established by considering those systems which are required to mitigate the consequences of a LOCA or HELB. This list also includes components required for display information, and components that perform post-accident sampling and monitoring. This list specifically includes, the equipment required to achieve or support (1) emergency reactor shutdown, (2) containment isolation (3) reactor core cooling, (4) containment heat removal, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment.

Subsequent to identifying the equipment requiring qualification, equipment locations were identified using design drawings and are being verified by field inspection. Equipment locations are identified by architectural room numbers with defined boundaries.

3.0 Establishment of Environmental Service Conditions

Environmental conditions have been determined for normal, abnormal and accident conditions.

All areas inside containment and rooms containing high energy lines or post LOCA recirculatory fluid lines outside of containment are considered to be harsh environments.

3.1 Environmental Conditions During Normal Plant Operation Temperature and Humidity

Redundant Class 1E plant heating, ventilation and air conditioning (HVAC) systems were designed to maintain the temperature and humidity within the normal limits which will be shown in FSAR Section 3.11. FSAR Section 9.4 describes the HVAC system.

Radiation

The total integrated radiation doses (TID) for normal operation for 40 years of equipment life have been calculated assuming a 100% load factor and rated power. The doses are based on the design radiation source terms of the radiation sources within each plant area.

Aging

Aging effects on all equipment are considered in the qualification program to conform to the requirements of Section 4 of NUREG-0588. Components susceptible to aging effects will be identified and refurbishment and/or replacement will be incorporated into the Limerick Preventive Maintenance/Surveillance Program. Known susceptibility to aging degradation, results of inspections and manufacturers' recommendations will be factored into the Maintenance/Surveillance Program.

Non Seismic Plant Induced Vibration

Effects of known normal vibratory loads on equipment are considered in the EQ program when significant.

3.2 Accident Environmental Conditions

Operability Duration

Operability duration requirements have been determined based on the length of time the equipment must maintain its ability to perform its safety function.

Temperature and Pressure Condition Inside Containment

The primary containment time dependent pressure and temperature profiles calculated for the spectrum of postulated LOCA's and MSLB's have been calculated using NRC approved NRC methodology. Information on the generation of these profiles is contained in Section 6.2 of the Limerick FSAR.

Temperature and Pressure Conditions Outside Containment

Temperature and pressure conditions resulting from a HELB outside of containment have been determined using plant specific profiles. These profiles bound accident environments caused by other events. FSAR Sections 3.6, 3.11, 6.2, 9.4 describe the analyses used in generating these profiles.

Radiation

Post-LOCA radiation doses inside containment were calculated in accordance with NUREG-0737. The source terms are consistent with those specified in NUREG-0588 and NUREG-0737.

Seismic and Hydrodynamic

Dynamic qualification of equipment due to seismic and hydrodynamic loads from SRV and LOCA will be addressed in detail in FSAR Section 3.10 and DAR Section 7.1.7.

Submergence

The potential for submergence of equipment inside and outside containment is identified. Identified equipment is either qualified for submergence or analyzed to ensure both that it completes its function prior to submergence and that failure after submergence is acceptable. If these conditions can not be met the equipment will be relocated above flood level.

Chemical Effects

Limerick has the capability of demineralized water spray actuation to mitigate the effects of a LOCA. Although no credit for spray actuation has been taken in determining temperature/pressure conditions inside containment, equipment inside containment is being evaluated for the effects of spray.

Synergistic Effects

Synergistic effects, where known, are considered. Specifically, where a supplier has identified synergisms or where PECO is aware of synergistic effects for a particular component it has been addressed. Appropriate documentation is included in the qualification file.

Margin

Margins appropriate to account for unquantified uncertainties in the effects of production variations and/or inaccuracies in test instruments are included in the qualification program.

4.0 Qualification Testing and Analysis of Equipment

All qualification testing and analysis of safety-related electrical equipment is being completed according to the appropriate NUREG-0588 guidelines. Sequential testing and analysis or a combination thereof is being completed for all electrical equipment. Analyses, performed on a case by case basis, have been conducted using approved methodologies to provide adequate justification.

Essential organic materials will be evaluated with respect to normal and post accident environmental conditions for safety-related active mechanical equipment exposed to a harsh environment.

5.0 Methodology for Evaluating Environmental Qualification to Service Conditions

A comparison of environmental qualification to equipment service conditions will be completed for all equipment located in harsh environmental zones. The equipment will be evaluated for the 40-year normal environment and accident environments resulting from the spectrum of LOCA's and HELB's inside and outside containment. A point by point comparison will be made between service condition parameters and qualified levels.

In addition, reviews and analyses were completed to ensure that the equipment tested was either identical or similar to the installed plant equipment.

6.0 Corrective Action Plans

Corrective action plans are being developed for all equipment for which documentation does not substantiate complete qualification. Completion of the corrective action plans will result in achieving qualification under the prescribed criteria within two months of fuel load.

7.0 Justification for Interim Operation

Justification for interim operation will be provided for all equipment whose qualification cannot be demonstrated prior to licensing. Analyses will be performed to ensure that failure of the equipment will not impact the prescribed safety functions, affect in a detrimental way other safety equipment or functions, or mislead an operator into taking an action that could adversely alter the course of the accident.

8.0 Maintenance/Surveillance Program

A Maintenance/Surveillance Program will be developed to encompass vendor prescribed maintenance procedures and periodic inspections of equipment to ensure that degradation is not occurring sooner than predicted. The program will require replacement of subcomponents (e.g., seals, gaskets, etc.) at predetermined intervals to maintain the designated life. In addition, the program will encompass procedures to ensure that the environment is maintained relatively clean to avoid the possible adverse effects of dust.

9.0 Spare and Replacement Parts

Safety related equipment, spare and replacement parts are being ordered to meet or exceed the original specifications. For replacement parts being procured from the original specification and which are identical to the originally supplied equipment, a certificate of conformance is considered sufficient documentation to support qualification. However, if identical replacement parts are not available, environmental qualification for the new replacement parts will be demonstrated.

10.0 Mild Environment Qualification

Mild environment qualification is a quality assurance function and is addressed using 10 CFR 50 Appendix B and Regulatory Guide 1.33 criteria.

Summary of LGS
Environmental Qualification Program Presentation
to NRC on March 4, 1983

The construction permit safety evaluation report for Limerick was issued in June, 1974, therefore, Limerick is a NUREG 0588 Category II plant.

The scope of the review effort is safety-related electrical equipment located in a potentially harsh environment and required to mitigate the effects of a LOCA or HELB. In addition, PECO has committed to R.G. 1.97 revision 2, and therefore R.G. 1.97 Category I and II equipment are included.

The equipment has been organized into packages such that like types of equipment are included within a given package. The packages are also distinct with respect to procurement responsibility. There are 91 equipment packages with Bechtel procurement responsibility and 20 equipment packages with GE procurement responsibility.

The PECO Electrical Engineering Division Environmental Qualification Group (EQG) has complete responsibility for the qualification of electrical equipment for both the LGS and Peach Bottom APS plants. EQG's experience in equipment qualification began with the re-review effort required by Circular 78-08 and the 79-01 Bulletins. In addition, the EQG members are active participants in both AIF and EPRI qualification groups. The EQG has responsibility for overall technical direction and final review and acceptance of the total scope of Bechtel (91 packages) and GE (20 packages) procurement, and in addition has elected to perform the initial review of 15 GE packages without outside assistance. Bechtel has responsibility for the initial review of 91 packages. The term initial review should be clarified; this review has been ongoing for several years. It has consisted of reviewing the initial vendor documentation and upgrading the documentation as necessary. Equipment has been replaced in some cases. PECO has been closely involved with initial review efforts by Bechtel. GE has recently been authorized to perform the initial review of 5 equipment packages, and in addition, GE is performing a Limerick unique small break accident analysis.

In terms of environmental conditions, the primary containment temperature, pressure, and relative humidity are defined in FSAR figure 6.2-8. The environmental conditions for secondary containment have been defined based upon the architectural room boundaries for both LOCA and HELB accidents. The HVAC design for LGS is such that the HVAC system goes into a recirculation mode post-LOCA, and as a result, the maximum reactor enclosure temperature is limited to 120°F. The influence of HELB accidents is limited by steam flooding dampers which isolate the isolation valve compartments upon detection of the break.

Radiation values have been calculated based on NUREG 0588 and NUREG 0737 source terms, but the specific methodology used is the NUREG 0737 methodology. Based upon a similar plant design which has calculations for radiation doses using NUREG 0588 methodology, the LGS values have been determined to be conservative. Beta radiation will be evaluated for unshielded organics; cables are the specific component for which Beta radiation is being evaluated.

An evaluation of HELB flood effects on safety-related equipment is being performed as a separate program, however, the results will be factored into the equipment qualification program. Because LGS has the capability of containment spray, the review of equipment inside primary containment will include containment spray.

Dust is a maintenance function which will be addressed within operating procedures to assure that filters in the HVAC system are replaced periodically.

Margins will be included in the NUREG 0588 Category II reviews to assure that uncertainties associated with production variations and inaccuracies in test instrumentation are accounted for.

Aging will be addressed within the context of a maintenance input with a primary objective of determining a replacement interval for materials and components which require periodic replacement. Engineering judgment will be used in determining the replacement interval in consideration of the organic materials' activation energy, pre-aging data if the equipment was tested to the IEEE 323-1974 Standard, manufacturers recommendations, experience at Peach Bottom APS and LGS, and the surveillance program. Synergisms are being addressed for cable. In addition, a field walkdown is being performed to assure that the documentation being reviewed is applicable to the equipment actually located in the field.

Review documentation will be submitted to the NRC in the form of an equipment qualification report. The PECO terminology for the system component evaluation work sheets is EQRR, environmental qualification review record. An EQRR will be submitted for each equipment item identified within the scope as previously defined, i.e. safety-related electrical equipment located in a potentially harsh environment and required to mitigate the effects of a LOCA or HELB accident. Within the introductory section of the report, a statement of assurance will be provided that both non-safety-related equipment and safety-related equipment not required to mitigate the effects of a LOCA or HELB but located in a potentially harsh environment will not fail in a manner that will cause the malfunction of safety-related equipment which is needed to mitigate the accident or will not mislead the plant operator.

The format of the EQRR is similar to that which was used for Peach Bottom APS with the following exceptions:

1. A space has been provided at the bottom of the form to identify plans for resolution of deficiencies.
2. Spaces have been provided on the right side of the form to identify electrical interface methods, and maintenance references.
3. The computer program has been modified to accept two values for the Specification-Radiation input. For cables only, two values will be located in this field. The top value will be followed by a "G" for gamma dose and the bottom value will be followed by a "B" for beta dose. This will provide the reviewer with assurance that beta radiation has been adequately addressed for exposed organics.

In terms of status of the Bechtel procured equipment, the initial review has been completed on 55 of 91 packages. As previously expressed, initial review as used here really represents all the work required by Bechtel to submit a recommendation to PECO that the equipment documentation is acceptable to meet NUREG 0588 Category II requirements. The PECO EQG is presently reviewing the Bechtel work to independently determine its acceptability and finally to incorporate the information into the LGS Environmental Qualification Report. PECO will, in the near future, review the 20 packages for NSS supplied equipment in the same manner, however, a purchase order has only recently been given to GE to provide 5 audit packages and 15 design verification file packages. The audit packages will be similar to those provided to Mississippi Power and Light for their environmental qualification audit.

As reference dates, LGS Unit 1 is scheduled for fuel load in August, 1984 and is scheduled for commercial operation in April, 1985.

PECO is planning to submit an initial EQ report in May, 1983. This initial submittal will include an introductory section and a limited number of EQRR forms. The final EQ report is planned for submittal by October, 1983. At that time, 85% of the equipment will be qualified and installed. The EQRR forms will be submitted for electrical equipment only. With respect to the future review of LGS Unit 2, PECO will amend the Unit 1 report to cover only those equipment items which are different than the Unit 1 equipment. This ended the presentation by PECO.

The NRC cautioned that the field walkdowns should be conducted in such a manner to assure that electrical interface qualification is a point of emphasis. Also, 10CFR50.49 has expanded the scope of equipment to include non-safety-related equipment. If any non-safety equipment can cause safety-related equipment to malfunction, it must be qualified. In response to an NRC question, PECO replied that TMI equipment is included in the LGS qualification program. The NRC requested and PECO agreed to provide justification for interim operation of equipment not fully qualified by fuel load.

WJB:LCY
3/28/83