UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

IN THE MATTER OF)
)
PHILADELPHIA ELECTRIC COMPANY) DOCKET NOS. 50-352
) 50-353
(LIMERICK GENERATING STATION,)
)
UNITS 1 AND 2))

TESTIMONY OF W. J. BOYER, D. J. THOMPSON, D. A. KLINE, L. STANLEY, E. F. SPROAT, W. W. BOWERS, T. E. SHANNON AND J. DOERING, Relating to Contention I-42, Environmental Qualification of Electric Equipment.

INTRODUCTION AND SUMMARY

W. J. Boyer

1. Contention I-42 asserts that the scope of equipment which is required to be environmentally qualified for Limerick Generating Station has been expanded by reason of the adoption of 10 CFR 50.49 by the Nuclear Regulatory Commission. The equipment required to be qualified by 10 CFR 50.49 consists of three subsets of electrical equipment important to safety which is located in a harsh environment. These subsets are defined in section (b) of 10 CFR 50.49. The new classes of equipment to be environmentally qualified which the intervenor asserts have not been previously taken into account, consist of the subsets of equipment as defined in subsections (b)(2) and (b)(3) of 10 CFR 50.49.

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2. This testimony demonstrates that Limerick meets the requirements of 10 CFR 50.49. The scope of equipment that needed to be considered for qualification was unchanged by the rule. Initially, subsection (b)(3) had already been anticipated because the commitment of Philadelphia Electric Company (PECO) regarding Regulatory Guide 1.97, Rev. 2, referenced in

subsection (b)(3), preceded the promulgation of 10 CFR 50.49, and this Regulatory Guide itself identifies qualification requirements for the equipment within its scope.

3. With respect to the potential subset of equipment defined in subsection (b)(2) of 10 CFR 50.49, the testimony shows that Philadelphia Electric Company had already employed a conservative safety classification practice. It has also performed various studies, the results of which have also been taken into account using the same conservative safety classification practice. The testimony shows that there is no electrical equipment which requires qualification in subsection (b)(2) as a result of this classification practice. In addition, PECO will show that an

W. J. Boyer independent equipment safety classification was performed within its environmental qualification program which verified that there is no equipment for Limerick falling within 10 CFR 50.49 subsection (b)(2) which requires qualification. Although this independent review, referred to as the Component Classification Program, was completed prior to issuance of 10 CFR 50.49, an analysis of 10 CFR 50.49 and the Proposed Revision 1 to Regulatory Guide 1.89 against the Component Classification Program has been performed and the testimony shows that the Component Classification Program used a pre-defined set of Program Rules which classified equipment in a manner that would have detected any equipment within the subset of equipment defined by subsection (b)(2) of 10 CFR 50.49.

4. Second, Contention I-42 asserts that the plant operator could be misled by the failure of equipment which has not been qualified, but which is within the subsets of equipment defined by subsections (b)(2) and (b)(3) of 10 CFR 50.49. Since the testimony shows that there is no equipment in subset (b)(2), this issue is without merit. With respect to the equipment defined in subset (b)(3), PECO has been aware of qualification requirements for this equipment, as noted previously, by reason of its existing commitments regarding Regulatory Guide 1.97, Rev. 2. The testimony shows that plant operators will be directed by written procedures to rely on the Regulatory Guide 1.97 equipment for information if the plant equipment is subjected to harsh environment conditions, and thus will not be misled by unqualified equipment.

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5. Also, Contention I-42 states that the EQ Report is inadequate because in those cases where the equipment's qualified life does not equal the 40 year plant life, no action is identified to correct the deficiency. In addition, the contention asserts that some safety-related equipment such as the Standby Liquid Control System squib valves and the related Keylock switch in the control room are excluded from the Environmental Qualification Program.

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6. PECO's testimony shows that a qualified life of less than 40 years is not a qualification deficiency. If the qualified life of an item of equipment is less than 40 years, the Limerick plant maintenance staff is scheduling the item for replacement prior to its end of qualified life. The testimony also shows that the squib valves have been added to the EQR Appendix B, List of Equipment Important to Safety and the Keylock switch is not within the scope of 10 CFR 50.49.

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10 CFR 50.49 EQUIPMENT SCOPE

7. PECO has reviewed the Limerick Environmental Qualification Program against 10 CFR 50.49 entitled "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants". Based on this review, it has concluded that Limerick complies with 10 CFR 50.49. The equipment included in the Limerick Environmental Qualification Program has been compared to the scope of electrical equipment that is required to be qualified by 10 CFR 50.49 and it has been determined that all equipment defined by section (b) of the rule is included. All Limerick equipment within the scope of 10 CFR 50.49 will be qualified by the fuel load date.

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SUBSECTION (b)(1)

8. The equipment defined by subsection (b)(1) of The Rule, safety-related electric equipment, has been traditionally recognized as requiring environmental qualification. This requirement was originally embodied in General Design Criteria 1, 2, 4 and 23 of Appendix A to 10 CFR 50; Criterion III and Criterion XI of Appendix B to 10 CFR 50; 10 CFR 50.55a(h), which incorporates by reference IEEE 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations." These criteria have been referenced in the FSAR since it was originally submitted in March, 1981.

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T. E. Shannon

9. The Limerick Project Q-list was established in accordance with the requirements of Appendix B to 10 CFR 50 as the controlling document identifying the safety-related structures, systems, and components required to assure the:

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T. E. Shannon

1) Integrity of the reactor coolant pressure boundary.

2) Capability to achieve and maintain a safe shutdown.

3) Capability to prevent or mitigate the consequences of an accident which could result in potential off site exposures comparable to the guidelines of 10 CFR Part 100.

10. All structures, systems, and components are evaluated by Bechtel Power Corporation, as the architect-engineer for PECO, and by Limerick Project engineers to determine those which are required to achieve the above safety functions, using the General Design Criteria listed in 10 CFR Part 50, Appendix A. Information from other BWR plants is also used in these evaluations, since many of the Limerick structures, systems, and components are identical or similar to the ones used in those plants. The Q-List is updated as required to reflect design changes. Revisions of the Q-List undergo a thorough review by Bechtel Power Corporation and PECO to ensure that structures, systems, and components have been correctly classified.

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SUBSECTION (b)(3)

11. Section (b)(3) of the rule defines certain post-accident monitoring equipment which is further defined by Regulatory Guide 1.97, Rev. 2, published December, 1980, as referenced by the footnote to this section of the new Rule. Philadelphia Electric Company committed itself to meeting this Regulatory Guide, as described in FSAR Section 7.5.2.5.1.1.2 in March, 1981. Regulatory Guide 1.97, itself, identifies environmental qualification requirements for Category 1 and 2 equipment. This regulatory guide defines three categories of design and qualification criteria. Category 1 criteria are similar to the

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criteria applicable to safety systems. This includes environmental qualification in accordance with Regulatory Guide 1.89 and the methodology described in NUREG-0588. Category 2 criteria include selected criteria normally associated with safety systems, but the same environmental qualification requirements as

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Category 1. Category 3 criteria specify a high quality commercial-grade installation. No environmental qualification requirements are applicable to Category 3. The Post Accident Sampling System which is specifically identified in the contention is an example of a system to which Regulatory guide 1.97 Category 3 requirements apply, and as Category 3, no environmental qualification is required. PECO is committed to installing and qualifying all necessary post-accident monitoring equipment, prior to fuel load (FSAR Section 7.5.2.5.1.1.2 and Table 7.5-5). The Regulatory Guide 1.97 Category 1 and 2 equipment is identified by a note O in the Environmental Qualification Report, Appendix B as revised by transmittal from J. S. Kemper to A. Schwencer, 2/16/84 hereafter referred to as the Revised Appendix B.

12. Thus, the requirements for environmental qualification of equipment within the scope of 10 CFR 50.49 subsections (b)(1) and (b)(3) existed prior to the date on which 10 CFR 50.49 was

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promulgated. Based on the references cited above, PECO has been aware of and has committed itself to environmentally qualify the equipment within the scope of 10 CFR 50.49 subsections (b)(1) and (b)(3).

SUBSECTION (b)(2)

Q-List

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13. With respect to the potential subset of equipment described in 10 CFR 50.49, subsection (b)(2), Limerick's manner of conformance with various regulatory requirements and guidelines has resulted in system designs that have resulted in no equipment within its scope requiring qualification. This conclusion results directly from the development and use of the Limerick Project Q-list. The interfaces between safety-related electrical components are evaluated as part of the plant design process. Whenever cases are identified in which failure of non safety-related components could prevent attainment of the safety function objectives, they are eliminated by implementing design modifications or by adding them to the Project Q-List and qualifying them as necessary.

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14. The Electrical Equipment Separation Program is an example of such an interface evaluation. Regulatory Guide 1.75 Guidelines were used in this program as discussed in FSAR Section 8.1.6.1.14. A brief summary of the program follows. Electrical equipment and wiring for the engineered safeguard and reactor protection systems are segregated into separate channels and divisions so that no single credible event is capable of disabling sufficient equipment to prevent attainment of the safety function objectives. Separation requirements apply to control and instrument power and motive power for all systems involved. The separation of circuits and equipment is achieved by separate safety class structures, distance, barriers, isolation devices, or

combinations thereof. For cases in which non safety-related circuits share power supplies, enclosures, or raceways with safety related circuits, they are reviewed to ensure that they are separated by acceptable isolation devices, barriers, or distance.

15. Methods for assuring proper interface between safety-related power sources and non safety-related connected circuits and loads are listed below:

    1) Isolation devices included on the Q-List which are automatically initiated by a LOCA signal are provided at the power source.

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    2) The Q-List is revised to include non safety-related components such as pump motors and associated circuitry, even though the pump motor does not perform a safety function.

Either of the above actions ensures that a failure of the non safety-related component will not prevent a safety-related component from performing its safety function. In either case, a Q-Listed component exists as a result of the selected choice for assuring proper electrical interfaces.

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16. All electrical equipment on the Q-List is reviewed to determine its environmental qualification requirements. If the electrical equipment is determined to be located in a harsh environment, the appropriate environmental qualification parameters for the component are identified.

COMPONENT CLASSIFICATION PROGRAM

17. In addition to the design process described above, an independent verification of that equipment required to be qualified was performed under contract. This verification program is referenced in the Environmental Qualification Report (10/83) as the Component Classification Program (CCP).

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18. This program was initiated in February, 1982, when PECO determined that all LGS systems and components should be independently reviewed to determine their safety ranking in support of the LGS Equipment Qualification Program. The purpose of initiating this program was to assure the identification (in the Limerick Environmental Qualification Program) of all electrical equipment required to perform a safety function. In order to accomplish this task, PECO requested Quadrex Corporation to perform this review and analysis utilizing an established program designated Q*5.

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19. Documented Limerick Generating Station Q*5 Component Classification Program Rules were prepared, controlled, and used for this work in conformance with the Quadrex Quality Assurance Program. The Limerick Component Classification Rules were adapted from previous classification experience gained with both BWR and PWR plants. Reference documents used to develop these classification rules were as follows:

L. Stanley

Limerick Station Final Safety Analysis Report

NUREG-0737, Clarification of TMI Action Plan Requirements

10 CFR 50.2(v), Code of Federal Regulations

USNRC Regulatory Guide 1.26, Quality Group Classifications Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants, 2/76

USNRC Regulatory Guide 1.29, Seismic Design Classification, 9/78

USNRC Regulatory Guide 1.97, Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident, 12/80

USNRC Proposed Regulatory Guide 1.XYZ, Nuclear Power Plant Structures, Systems, Components, and Activities Subject to a Quality Assurance Program, 3/76, unissued

L. Stanley ANSI/ANS 52.1-1978, Nuclear Safety Criteria for Design of Stationary BWRs

ANSI/ANS 56.2-1976, Containment Isolation Provisions for Fluid Systems (ANS N271)

ANSI/ANS 4.5-1980, Accident Monitoring Functions in LWR's

ANS N212, Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants, draft 4, 5/74

ANSI/IEEE Std. 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations

20. The Q*5 CCP was initiated by defining five tasks:

TASK 1 - Program Initiation and Information Acquisition

D. J. Thompson TASK 2 - Identification of Systems Required for Safety

L. Stanley TASK 3 - Analysis of Component Functions/Component Coding

W. J. Boyer TASK 4 - Review, Processing, and Approval

TASK 5 - Report Submittals

PROGRAM RULES

21. Within TASK 1, the scope of work and program rules were defined.

D. J. Thompson The work scope was to review LGS systems and their components and

L. Stanley to assign a five-character code to each component classifying it

W. J. Boyer in accordance with its relative safety ranking.

22. The standard Q*5 Program Rules were modified in accordance with the PECO specification for this work. With respect to environmental qualification of electrical equipment, these modifications included:

1. Identifying the specific safety function for the equipment in response to a high energy line break (HELB) or loss of coolant accident (LOCA).

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2. Identifying the safety function objectives for which the equipment is to be relied upon. (The safety function objectives are identified in IE Bulletin 79-01B).

3. Identifying the equipment location by general plant area.

4. Identifying the duration that the equipment is required to perform its safety function objective in response to a HELB or LOCA.

5. Identifying the electrical state of the equipment in performing its safety function, i.e., energized, de-energized or alternately energized and de-energized.

23. In performing the Component Classification Program, the following primary source documents were used:

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a. LGS FSAR
b. Piping and Instrument Diagrams
c. Electrical Schematic Drawings
d. System Description and Operating Instruction Manuals
e. Quality Assurance Diagrams

SCOPE OF REVIEW

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24. Task 2, the identification of systems to be reviewed, was initiated by Quadrex and then reviewed by PECO.

Under this task, Quadrex prepared a matrix of required systems versus events as defined in Chapter 15 of the FSAR. In addition
L. Stanley — to the systems determined in this manner, Quadrex proposed
D. J. Thompson — additional systems for review. The systems listed in Table 1
W. J. Boyer — (attached) were reviewed for inclusion in the Component Classification Program by PECO.

25. The bases for excluding the emergency lighting, the in-plant communications systems, the plant process computer system, and the computer software, which are specific examples raised in the contention, are discussed below:

The emergency lighting system was not included in the Component Classification Program because it is not safety-related as defined by 10 CFR 50.49, it is not relied upon to provide lighting during a design basis accident in areas which could produce a harsh
E. F. Sproat — environment, and its failure cannot prevent achievement of the
W. J. Boyer — safety function objectives defined in subparagraphs (i) through (iii) of 10 CFR 50.49 paragraph (1). All operator actions that would be required take place in the control room following design basis accidents that could produce a harsh environment. Emergency lighting in other areas of the plant is not required during or following such accidents. The control room emergency lighting is powered from Class 1E sources and is located in a mild environment. Environmentally caused failures of Emergency Lighting System equipment will not cause failure of the Class 1E power system and thereby prevent achievement of the safety function objectives defined in subparagraphs (i) through (iii) of

10 CFR 50.49 paragraph (1) because the lighting system is

E. F. Sproat electrically isolated from the power system in accordance with the

W. J. Boyer requirements of Regulatory Guide 1.75. In addition, portable lighting will be available as required.

26. The in-plant communications systems were not included in the Component Classification Program because they are not safety-related as defined by 10 CFR 50.49; they are not relied upon to provide communications during a design basis accident that could produce a harsh environment; and their failure could not prevent achievement of the safety function objectives defined in subparagraphs (i) through (iii) of 10 CFR 50.49 paragraph (1). All operator actions that would be required following design basis accidents that could produce a harsh environment take place

E. F. Sproat in the control room. Communications via the in-plant

W. J. Boyer communications systems to plant areas which could experience a harsh environment are not required during or following these accidents. The in-plant communications systems are powered by Class 1E sources. Environmentally caused failures of the in-plant communications systems will not cause failure of the Class 1E power system and thereby prevent achieving the safety function objectives defined in subparagraphs (i) through (iii) of 10 CFR 50.49 paragraph (1) because the in-plant communications systems are electrically isolated from the power system in accordance with the requirements of Regulatory Guide 1.75. In addition, portable communications equipment will be available as required.

27. The plant process computer system and the computer software were not reviewed because the computer is not safety-related as defined by 10 CFR 50.49, it is not relied upon to provide information during a design basis accident that could produce a harsh environment and its failure could not prevent achievement of safety function objectives defined in subparagraphs (i) through (iii) of 10 CFR 50.49 paragraph (1). The computer software has not been reviewed because it is outside the scope of 10 CFR 50.49. Computer software is defined in ANSI/IEEE-ANS-7-4.3.2-1982 as Computer Programs and Data. Those terms are respectively defined as follows:

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> Computer Program - A schedule or plan that specifies actions that may or may not be taken, expressed in a form suitable for execution by a programmable digital computer.
>
> Data - A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by a programmable digital computer.

Information via the plant process computer system from plant areas that could experience a harsh environment is not required during or following these accidents. The plant process computer system interfaces with other systems that are safety-related as defined by 10 CFR 50.49. These electrical interfaces are designed in compliance with Regulatory Guide 1.75.

28. The feedwater control, which is listed in Table 1, (attached) was included in the Component Classification Program; however, the

review shows that it contains no equipment having a safety
W. J. Boyer — function as defined by 10 CFR 50.49. This was determined by
D. J. Thompson — reviewing each component code and verifying that none have 2E, 3E
L. Stanley — or 4F codes.

ANALYSIS AND CODING

29. Task 3, the Analysis of Component Functions/Component Coding, was accomplished on a plant system basis. The primary source documents discussed above were used to describe the particular plant system. The safety functions required of the particular
L. Stanley — plant system were identified from the Final Safety Analysis Report
D. J. Thompson — and System Descriptions. This information was correlated with results obtained for previously completed BWR plant Q*5 programs. The objective of this task was to assure complete understanding and familiarity with the plant system to be analyzed prior to starting the component classification coding.

30. In this task, components were identified and classified by their safety functions. The classification of electric interconnecting cabling and electrical interface devices can be determined from
L. Stanley — the classification of functionally related components. The types
D. J. Thompson — of components relevant to environmental qualification of electrical equipment which are included in the Limerick Component Classification Program are provided by the following table:

Electric motors
Electric valve operators
Electric valve position limit switches
Power supplies
Electric power switchgear
Motor control centers
Circuit Breakers
Fuses
Relays

Transmitters
Instrument sensors
Instrument loop power supplies
Instrument loop signal processing modules
Display indicators and recorders
Control switches

31. After listing the appropriate Limerick source drawings as references, the process of performing the Component Classification Program Q*5 coding analysis for each component began by identifying its safety functions. For each component, the coding of each identified function was completed using the approved component classification rules. Other components with a functional relationship to the particular component being analyzed were also identified on the coding form along with its classification results. An internal consistency check was provided by comparing the final coding of a particular component with the final coding of its functionally related components. Typical functional relationships used in the program were:

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(1) a valve motor operator would be functionally related to its valve, automatic controls, or manual switch;

(2) an initiation circuit relay would be functionally related to its redundant counterpart relay in another separation division, or with its actuated pump starter or valve operator; and

(3) an auxiliary supporting component, such as a power supply, would be functionally related with one or more essential loads driven by the power supply.

32. The internal consistency check assured that each component was evaluated in the context of its functional relationship to other components. It also provided a means of interrelating each component to others within a particular system. Furthermore, at each system boundary with other plant systems, this comparison assured that

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the overall system was evaluated relative to these external interfaces. Finally, the highest overall coding for the particular component was determined for each of the Q*5 character positions. This process was used for each component determined to have a safety function; those components determined not to have a safety function were tabulated on a database coding form.

REVIEW/APPROVAL AND SUBMITTAL

33. Task 4, Review, Processing and Approval, and Task 5, Report Submittals, included two additional levels of review and approval involving different individuals. After the second level review was completed, the information provided on the Q*5 coding forms

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was transferred to master forms so that the third level review could address both the accuracy of the classification coding and the overall content and quality of the completed analysis coding forms included in the system report which was reviewed and approved by PECO.

DESCRIPTION OF CODES

34. The first two characters are relevant as the component codes

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relate to environmental qualification of electrical equipment.

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The 2E, 3E, 4F and NN codes are defined in the Component Classification Program Rules. In brief summary they are:

Position 1 - ANSI Safety Class

Code 2 - Safety systems; such as Reactor Protection, Containment Isolation, and Emergency Core Cooling Systems.

Code 3 - Auxiliary systems; such as those which provide lubricant cooling or energy supply to support safety systems.

Code 4 - Important to Safety; such as certain portions of Regulatory Guide 1.97 and non-safety-related components whose failure could degrade safety system performance.

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Code N - Non-nuclear safety; such as non-safety-related components whose failure could not degrade safety system performance.

Position 2 - NRC Quality Group

Code E - Class 1E as defined in IEEE-308.

Code F - Important to Safety and corresponds directly with Position 1-Code 4.

Code N - Not recognized by an NRC quality group, not considered important to safety, not included in Class 1E and corresponds directly with Position 1-Code N.

EXAMPLE OF CODES

35. In order to better describe how this process occurred, representative examples of the Q*5 Component Classification Program follow. The examples pertain to equipment that includes codes 2E, 3E, and 4F. The particular equipment included in the

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example is the control circuit for an RHR injection valve and a limited number of functionally related components. The RHR system is on The List of Systems Important to Safety, which is Appendix A of the Environmental Qualification Report. As defined in the Function versus Event Matrix, the RHR system has the following safety functions:

a. FSAR 15.1.2; Feedwater Controller Failure - Maximum Demand
b. FSAR 15.2.2; Generator Load Rejection
c. FSAR 15.2.3; Turbine Trip
d. FSAR 15.2.7; Loss of Feedwater Control
e. FSAR 15.2.9; Failure of RHR Shutdown Cooling
f. FSAR 15.3.1; Recirculation Pump Trip
g. FSAR 15.3.2; Recirculation Flow Controller Failure - Decreasing Flow
h. FSAR 15.6.4; Steam System Piping Break - Inside Primary Containment
i. FSAR 15.6.5; Loss-Of-Coolant-Accidents - Inside Primary Containment
j. FSAR 15.6.6; Feedwater Line Break - Outside Primary Containment

36. For this example the following components were identified on P&ID M-51 and on the electrical schematic for the RHR System:

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D. J. Thompson

NPRD	PLANT ID	DESCRIPTION	LOCATION	FIRST TWO CHARACTERS OF CCP CODE
CKTBRK	HS-51-117A-1	HAND SWITCH	CONT. STR	2E
VALVEX	HV-51-1F017A	MOTOR OP GATE VALVE	SEC. CONT.	1A
VALVOP	HV-51-1F017A	MOTOR OPERATOR	SEC. CONT.	2E
INSTRU	PDISL-51-1N658A	PRESS DIFF IND SW	SEC. CONT.	2E
INSTRU	PDT-51-1N058A	PRESS DIFF TRANS	SEC. CONT.	2E
CKTBRK	51-AFU1AB21305	FUSE	SEC. CONT.	3E
CKTBRK	51-AFU1BB21405	FUSE	SEC. CONT.	3E
CKTBRK	51-AFU1CB22309	FUSE	SEC. CONT.	3E
CKTBRK	51-AFU1DB22409	FUSE	SEC. CONT.	3E

NPRD	PLANT ID	DESCRIPTION	LOCATION	FIRST TWO CHARACTERS OF CCP CODE
INSTRU	51-ALS-HV1F017A	LIMIT SWITCH	SEC. CONT.	2E
TRANSF	51-AT1AB21305	TRANSFORMER	SEC. CONT.	3E
TRANSF	51-AT1BB21405	TRANSFORMER	SEC. CONT.	3E
TRANSF	51-AT1CB22309	TRANSFORMER	SEC. CONT.	3E
TRANSF	51-AT1DB22409	TRANSFORMER	SEC. CONT.	3E
RELAYX	51-A421AB21305	RELAY	SEC. CONT.	2E
RELAYX	51-A421BB21405	RELAY	SEC. CONT.	2E
RELAYX	51-A421GB22309	RELAY	SEC. CONT.	2E
RELAYX	51-A421DB22409	RELAY	SEC. CONT.	2E
RELAYX	51-A491AB21305	THERMAL OVERLOAD RELAY	SEC. CONT.	3E
RELAYX	51-A491BB21405	THERMAL OVERLOAD RELAY	SEC. CONT.	3E
RELAYX	51-A491CB22309	THERMAL OVERLOAD RELAY	SEC. CONT.	3E
RELAYX	51-A491DB22409	THERMAL OVERLOAD RELAY	SEC. CONT.	3E
RELAYX	51-1K14A	RELAY	CONT. STR	2E
RELAYX	51-1K26A	RELAY	CONT. STR	2E
RELAYX	51-1K27A	RELAY	CONT. STR	2E
RELAYX	51-1K31A	RELAY	CONT. STR	2E
RELAYX	51-1K38A	RELAY	CONT. STR	2E
RELAYX	51-1K4A	RELAY	CONT. STR	2E

Where:

NPRD = Nuclear Plant Reliability Data System Component Code

Plant ID = Component Unique Identifier

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Description = Component Description

D. J. Thympson

Location = CONT. STR is control structure

SEC. CONT. is secondary containment

CCP CODE = Final CCP Code

A component coding form was prepared for each of these components. The component coding forms document the bases for the individual and overall component codes. Each component function is individually coded and the individual codes are combined into a single overall code according to hierarchy. The component's function is defined in three ways. The specified function associated with a LOCA or HELB; a brief description associated with each code in the case of multiple functions, including

reference to the applicable Component Classification Program rule; and a statement clarifying the overall function. With respect to the first two code positions, the code associated with the most important function is assigned as the final code.

EQUIPMENT LIST

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W. J. Boyer

37. Some components on the above list are not included in Appendix B of the Environmental Qualification Report as amended by letter from J. S. Kemper to A. Schwencer, dated 2/16/84, for any of several reasons. First, the components which have the location listed as "CONT. STR" are located in either the Control Room or the Auxiliary Equipment Room. Both rooms are maintained by safety-related HVAC systems and are not subject to harsh environments; therefore, these components are outside the scope of 10 CFR 50.49. This is also the case for the Standby Liquid Control System keylock switch, which is specifically identified in the contention. Appendix B does not list mild environment equipment. Second, HV-51-1F017A is listed twice because Quadrex coded both the valve and the valve operator. With respect to electrical equipment environmental qualification, the operator or the component with the NPRD code of VALVOP is relevant; because it is the electrical portion. Third, the fuses, transformers, relays, and thermal overloads are all internal components located within a motor control center (MCC) and are qualified as a part of the MCC. Therefore, they do not show on the Appendix B list as individual components; the MCC is listed instead.

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38. After culling the equipment located in a mild environment and internal components of equipment, the valve operator and the differential pressure transmitter remain as the third and fifth items on the list. Both are coded 2E, which means that they are part of a safety system and are IEEE Class 1E.

L. Stanley / D. J. Thompson

39. The component coding for FI1R602A (which is not on the preceding list) illustrates a component in the category of 10 CFR 50.49(b)(3). In this instance, the flow indicator provides the flow indication required by Regulatory Guide 1.97. Its 4F code indicates that it is an important-to-safety component and is subject to Class 1E requirements. This component has a range of environmental qualification requirements, since it is used for safe shutdown, emergency core cooling, containment integrity, and for monitoring of RHR service water system operation.

<u>Q-LIST COMPARISON</u>

L. Stanley / D. J. Thompson / T. E. Shannon

40. In addition to the five tasks previously described, a comparison of the results of the Quadrex Component Classification Program codes against the Bechtel Quality Assurance Drawings (QAD's) was performed. The QAD's are a reproduction of the P&ID's with the Q-listed components highlighted. The purpose of this review was to indicate the differences between the Limerick "Q-List" and the Component Classification Codes. The results show that of the approximately 30,000 components coded, there were 16 electrical equipment classification differences such that the equipment was not classified as safety-related by the Bechtel QAD but should be considered in the Limerick Environmental Qualification Program.

Of these, 9 of the 16 are located in a mild environment, and upon review, 4 of the 16 are to be reclassified as not requiring environmental qualification. Three of the 16 are retained on the Appendix B list and are included in the Limerick Qualification Program. The decision to reclassify 4 of the 16 is a result of a re-review by PECO's engineering staff.

D. J. Thompson
W. J. Boyer

41. To prepare the Environmental Qualification Report Appendix B list, several changes were made to the computer tape supplied by Quadrex. The plant ID number was reformatted for consistency with the Bechtel format and the system name was added. A computer sorting program was developed to list all components that are located in a harsh environment and that have a 2E, 3E or 4F Component Classification Program code. The list submitted as Appendix B of the Environmental Qualification Report (10/83) is based on this sort.

<u>CCP RULES COMPARISON TO 10 CFR 50.49</u>

L. Stanley
D. J. Thompson
W. J. Boyer

42. A comparison of the Component Classification Program rules against 10 CFR 50.49 was performed and it has been determined that the classification rules fully comply with the requirements of 10 CFR 50.49, even though they were prepared and implemented prior to the publication of the new rule. The conclusion that the Component Classification Program rules fully comply with the requirements of 10 CFR 50.49 is also based on a comparison of the Q*5 Program rules against NRC guidance provided by draft Regulatory Guide 1.89, Rev. 1. A comparison of the component classification aspects of 10 CFR 50.49 with respect to the Limerick

Station Component Classification Program codes, which were previously described, is provided in the following table:

10 CFR 50.49 REQUIREMENTS	CORRESPONDING FIRST TWO CHARACTERS OF CCP Code
(b)(1) Safety-related electric equipment.	2E, 3E
(b)(2) Non-safety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by safety-related equipment.	4F
(b)(3) Certain post-accident monitoring equipment	4F
(d) The applicant or licensee shall prepare a list of electric equipment important to safety covered by this section.	2E, 3E, and 4F component list

CCP RULES COMPARISON TO R.G. 1.89

43\. Each of the typical equipment or systems important to safety listed in Appendix A of draft Regulatory Guide 1.89, Rev. 1, with the exception of the Auxiliary Feedwater System (PWR), has been included in the Limerick Q*5 Component Classification Program. In the Proposed Revision 1 to Regulatory Guide 1.89. Appendix B examples, components used for high water level termination of HPCI, and components used for protection of equipment such as pumps, isolation valve operators, the reactor manual control system and its rod block interlocks, the feedwater control system, and the turbine pressure regulator system, have also been included in the Limerick Q*5 program. The only system listed in the Appendix B examples relevant to Limerick, but excluded from the program was the turbine generator control system. Its exclusion from the turbine generator control system is based on the design

L. Stanley
W. J. Boyer
E. F. Sproat

of the BWR plant in that the reactor system is isolated and is also protected by automatic operation of safety-related equipment and instrumentation, such as the main steam line isolation valve closure on low pressure and the reactor protection system trip signals from turbine control valve fast closure and turbine stop valve closure.

EQUIPMENT FAILURES MISLEADING OPERATORS

44. Based on the preceding testimony, Limerick has no equipment within the scope of 10 CFR 50.49 subsection (b)(2). Therefore the plant operators cannot be misled by the failure of non existent equipment. The potential that Limerick operators could be misled

W. J. Boyer by the failure of equipment that has not been environmentally

W. W. Bowers qualified has been eliminated based on the fact that plant operators will rely on the Regulatory Guide 1.97, Rev. 2, equipment when harsh environmental conditions exist. As previously discussed, PECO committed to meet Regulatory Guide 1.97, Rev. 2, and to environmentally qualify the equipment within its scope, as described in FSAR Section 7.5.2.5.1.1.2, in March, 1981.

TRIP PROCEDURES

45. The Limerick Transient Response Implementation Plan ("TRIP") Procedures assure that plant operators will rely on Regulatory

J. Doering Guide 1.97, Rev. 2, equipment when harsh environment conditions exist in the plant. These plant specific procedures provide direction to control room personnel during design basis and degraded accident scenarios.

46. These procedures are PECO's implementation of the Boiling Water Reactor Owners' Group Emergency Procedures Committee Emergency Procedure Guidelines (EPG). These guidelines have been reviewed by the NRC and an SER was issued to the Boiling Water Reactor Owners Group by letter from D. G. Eisenhut to T. Dente, dated 2/4/83 conveying its approval and direction that the guidelines should be implemented. They are a departure from previous industry practice of writing event oriented procedures in which an event had to be identified prior to selecting and executing the correct procedure. TRIP procedures are entered on symptoms and

J. Doering

treat symptoms. Specific plant parameters are continuously monitored and controlled to bring them to a safe or acceptable condition in order to permit the operator to proceed to a normal shutdown condition.

47. The procedures are organized in such a manner as to control those plant parameters which are important to protecting the plant safety barriers against the release of radioactive material to the environment. In particular, these are the key reactor parameters

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of power, level and pressure, and the key containment parameters of temperature, pressure and level. Another feature of the procedures is that they do not confine the operator to the use of equipment designed exclusively for accident mitigation, although this type of equipment is generally given a higher priority. Other plant equipment is suggested for use in the procedures as well in order to provide greater depth of protection or more suitable response to certain plant conditions. To ensure

that the operator is not required to identify the event causing a particular transient, the procedures are relied upon only on the discovery of certain physical conditions or symptoms commonly referred to as entry conditions. In the case of the reactor control guideline, these symptoms are reactor level, reactor power, indication of high drywell pressure and isolation of the reactor steam lines. In the case of the containment control guidelines, the same parameters which are being controlled are used as symptoms. They are containment temperature, pressure and level.

48. Whenever a symptom develops, the operator immediately enters the applicable procedure and takes the corrective action directed by the procedure. He will continue to follow the direction of the procedure until exit conditions for the procedure are satisfied. If the particular transient continues to degrade, the operator enters contingency procedures which handle the more degraded conditions until such time as he can return to the main procedures.

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OPERATOR RESPONSE TO HARSH ENVIRONMENT

49. Most of the equipment used in executing the reactor and containment procedures is environmentally qualified equipment designed to operate in an adverse environment. However, it is possible that some instrumentation which is not environmentally qualified could be used to measure parameters important to the successful execution of the procedure. Therefore, it is important that the operator be able to recognize the existence of severe

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environmental conditions in areas of the plant in which such conditions are likely to exist. An extensive network for monitoring severe environmental conditions in the reactor building exists in the form of the nuclear steam supply shutoff system temperature instrumentation. If any of the four control room annunciators labeled "Steam Leak Detection" alarm, the operator has positive indication of the development of an adverse environmental condition in all rooms containing high energy or medium energy lines, with the exception of the area within the drywell. In this case, the drywell pressure is used as the prime indicator for determining of adverse environmental conditions. Although conservative because there may be other reasons that high drywell pressure has developed, this parameter provides positive indication of the possibility that steam from the primary system has been introduced into the drywell atmosphere. These indications of potential adverse environmental conditions within the reactor building and primary containment provide the bases for special instructions within the plant transient response implementation plan procedures cautioning the operator to use specific instrumentation

J. Doering
W. W. Bowers

50. A review of the listing of Regulatory Guide 1.97 instrumentation shows that all the entry conditions into the TRIP procedures are monitored by environmentally qualified instrumentation. Once in the TRIP procedures, the operator is directed down several different action paths. At the beginning of each of these paths, if there is a possibility that the operator might use other than

qualified instrumentation in execution of the procedure, he is conditionally instructed that if an environmental problem exists, as indicated by the previously mentioned parameters, he is to use specific instrumentation for carrying out the instructions. The impact on execution of the TRIP procedures is minimal since the qualified instrumentation that must be used is either the instrumentation which the operator would normally choose to use under those conditions or the only qualified instrumentation available to monitor the parameter. The specific format is to introduce in the first instruction or prior to the first instruction in the procedure a note directing the operator's attention to the environmental indicators and spelling out the conditional instrument use. In addition, in accordance with the requirements of Regulatory Guide 1.97, the applicable instrumentation will be highlighted by special markings on the control panel to aid in its identification and assure that only such instruments will be used under the circumstance of adverse environmental conditions.

EXAMPLE OF OPERATOR RESPONSE

51. A discussion on the use of TRIP procedures in response to the design basis loss of coolant accident is provided by way of example. The instrumentation which would be used in carrying out

J. Doering the plant TRIP procedure was identified along with a conservative estimate of the time during which this instrumentation would be required. The parameters of interest are:

1. reactor power
2. reactor level
3. reactor pressure

4. safety relief valve position
5. suppression pool temperature
6. suppression pool level
7. drywell pressure
8. drywell temperature
9. suppression pool pressure
10. reactor water level reference leg temperature

52. The operator is specifically instructed in the plant TRIP procedures to utilize only certain indications in the event of an indication of adverse environmental conditions. Specifically, the following notes are part of this procedure:

1. In the power section of the reactor control procedure, the operator is cautioned to use the APRM downscale indication to verify plant shutdown within approximately 20 minutes following the initiation of a loss of cooling accident. (This is acceptable since during the loss of cooling accident a plant shutdown is expected and the operator exits the power section of the procedure immediately after verifying that power has decreased to the APRM downscale level.)

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2. In the level section of the reactor control procedure, the operator is cautioned to use only the Post Accident Monitor or Fuel Zone level indications if he has observed a steam leak detection alarm. (This ensures that if adverse environmental conditions develop in the reactor building that could affect other instrumentation, the operator will use qualified level instrumentation.)

3. Similar to level, the pressure section of the reactor control procedure instructs the operator to use only the post accident monitor for monitoring reactor pressure if he has observed any of the 4 "Steam Leak Detection" alarms. (Again, this ensures that under conditions of potential adverse environmental conditions existing in the reactor building, only qualified reactor pressure instrumentation will be used.)

4. Similar precautions have been taken in the containment control procedure. For suppression pool temperature, a note instructs the operator to utilize only the SPOTMOS system for suppression pool temperature indication. (Since this Class 1E qualified system is the only suitable instrumentation for measuring suppression pool temperature existing in the plant, it is reasonable to restrict the operator in all cases to the use of this indication.)

5. The suppression pool level section of this procedure needs no special treatment to assure the use of qualified instrumentation since only qualified instrumentation is used to measure suppression pool level.

6. All instrumentation used to monitor drywell pressure is qualified, therefore no special action must be taken in this section of the procedure.

7. Drywell temperature indication contains specific cautions regarding the environmental condition of the drywell. The temperature instructions contain a note which instructs the operator that if the drywell pressure exceeds 2 lb./sq. in., he should use only temperature recorder TR-57-122 to read drywell temperature. The 2 psig value was chosen to indicate, via pressure, that a significant environmental impacting event was in progress. (The temperature instrumentation chosen provides qualified indication of the drywell temperature throughout a severe loss of cooling accident.)

53. The above description indicates how the plant transient response procedures cope with the potential adverse environmental impact on certain parametric indications. The operators, who have been trained via the training simulator in the use of these procedures,

J. Doering will have this cautionary information to ensure that upon entry into the procedures, only environmentally qualified instrumentation will be used when it is necessary or when there is doubt as to the validity of other indications.

MAINTENANCE REQUIREMENTS

54. The environmental qualification of instrumentation and other electrical equipment is contingent upon replacing equipment at the

W. J. Boyer end of its designated life and upon performing required maintenance during its designated life. As part of the environmental qualification documentation review process, maintenance

requirements which are related to the environmental qualification of electrical equipment are documented on the individual equipment EQRR forms. The maintenance requirements are identified by reference to the applicable sections of the test reports or other documentation. This information is provided on the equipment EQRR forms at the identified location A on the Attachment 2, EQRR form. An integral part of the information identifying maintenance requirements on the forms is the aging information; the designated life is provided at the identified location B on Attachment 2.

55. The designated life and maintenance requirements on the EQRR forms are related in the following manner. The designated life is the period of normal plant operation during which the equipment is expected to operate satisfactorily and still perform its safety function in response to a design basis LOCA or HELB. The designated life is supported by test data and operating experience and is based on the Arrhenius theory of material degradation due to thermal aging.

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56. Within the designated life, maintenance requirements as identified on the EQRR forms must be fulfilled to sustain the equipment in its qualified condition. At the end of the designated life, the equipment must be replaced unless additional testing or analyses have been performed to extend the designated life. Many electrical equipment items have been qualified without necessity to perform periodic maintenance as a prerequisite for sustaining the equipment's qualification. For example, cable and cable splice insulation are passive electrical components with a designated

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life of 40 years and do not require maintenance to sustain their qualification. Other equipment items require periodic maintenance to sustain their designated life.

57. The Limerick Plant Staff Maintenance Group reviews each Environmental Qualification Review Record (EQRR) to determine which EQRR's contain required replacement intervals for the equipment because the designated life is less than 40 years or contain maintenance activities which are necessary to maintain the qualification of the equipment during the designated life. If the EQRR indicates that the designated life is greater than 40 years and that no maintenance is required to maintain the environmental qualification, no further review of the EQRR is made. However, periodic maintenance requirements may still be applied to the item based upon other considerations. When maintenance activities are required to sustain environmental qualification, the documents listed in the Maintenance Requirements section of the EQRR, are reviewed and the required activity, including frequency of performance, is listed on the Maintenance Group Form. This form also lists the equipment to which these activities apply.

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58. When the EQRR indicates that equipment has a designated life which is less than 40 years, the plant identification number of the component which must be replaced and its replacement schedule are entered on the Maintenance Group Form mentioned previously. After reviewing the EQRR's and establishing the required maintenance or equipment replacement activities, a list of procedures necessary to implement the activities is established.

W. J. Boyer

EXAMPLES OF MAINTENANCE REQUIREMENTS

59. An example of a component which is qualified for 40 years but requires periodic activity to sustain its qualification, is 1AV208. The equipment maintenance instructions recommend
W. J. Boyer periodically checking electrical connection tightness. This activity has been assigned procedure number PMQ-600-001, and will be performed every two years.

60. An example of an item which does not have a designated life of 40 years is the sealant compound used in the Standby Gas Treatment System air heaters. This sealing compound requires
W. J. Boyer replacement every 10 years, in accordance with the EQRR. This replacement activity will be described in procedure PMQ-600-002, and will be performed at the specified interval.

61. Maintenance activities will be scheduled using an existing computer program. This program is used to forecast maintenance
W. J. Boyer tasks over the relevant time interval, and facilitates proper preplanning, manpower scheduling and assurance of spare-parts availability.

CONCLUSION

62. Thus, for Limerick Generating Station, 10 CFR 50.49 has not expanded the scope of equipment required to be environmentally qualified, and the failure of equipment which has not been
W. J. Boyer environmentally qualified will not mislead the plant operators or prevent the achievement of the safety function objectives cited in 10 CFR 50.49 subsection (b)(1). Also there are no inadequacies in the Environmental Qualification Report due to maintenance requirements which have not been addressed.

63. Environmental qualification requirements for two of the three subsets of equipment defined by 10 CFR 50.49 have been formally recognized by Philadelphia Electric Company since March, 1981. At Limerick Generating Station, there is no equipment in the remaining subset of equipment defined by 10 CFR 50.49 due to a conservative Q-List classification philosophy. This fact has been verified by the independently performed Component Classification Program.

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64. The failure of equipment which has not been environmentally qualified will not mislead the operators because they will be aware of harsh environment conditions and will be instructed by plant procedures to use the environmentally qualified equipment. Finally, actions necessary to assure that the environmental qualification of electrical equipment will be sustained over the lifetime of the facility are incorporated in the plant maintenance program.

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REFERENCES

(1) IEEE 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations"

(2) Regulatory Guide 1.97, Rev. 2 "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident"

(3) Regulatory Guide 1.75, "Physical Independence of Electric Systems"

(4) Proposed Revision 1 to Regulatory Guide 1.89, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants", May 1983.

(5) ANSI/IEEE-ANS-7-4.4.3.2-1982 Application Criteria for Programmable Digital Computer Systems in Safety Systems of Nuclear Power Generating Stations

(6) SER on Emergency Procedures Guidelines transmitted by letter from D. G. Eisenhut to T. Dente, 2/4/83.

(7) USNRC Regulatory Guide 1.26, Quality Group Classifications Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants, 2/76

(8) USNRC Regulatory Guide 1.29, Seismic Design Classification, 9/78

(9) USNRC Regulatory Guide 1.97, Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident, 12/80

(10) USNRC Proposed Regulatory Guide 1.XYZ, Nuclear Power Plant Structures, Systems, Components, and Activities Subject to a Quality Assurance Program, 3/76, unissued

(11) ANSI/ANS 52.1-1978, Nuclear Safety Criteria for Design of Stationary BWRs

(12) ANSI/ANS 56.2-1976, Containment Isolation Provisions for Fluid Systems (ANS N271)

(13) ANSI/ANS 4.5-1980, Accident Monitoring Functions in LWR's

(14) ANS N212, Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants, draft 4, 5/74

(15) LGS FSAR Section 7.5.2.5.1.1.2

(16) LGS FSAR Table 7.5-5

(17) LGS FSAR Section 8.1.6.1.14

ATTACHMENT 1

SYSTEMS REVIEWED FOR INCLUSION IN THE
COMPONENT CLASSIFICATION PROGRAM

High Pressure Coolant Injection
Nuclear Boiler Instrumentation
Residual Heat Removal
Core Spray
ADS
Nuclear Boiler System (Reactor Vessels and Auxiliaries, and Main Steam Piping and Valves)
Nuclear Steam Supply Shutoff
MSIV Leakage Control
Reactor Water Cleanup
Reactor Protection
S/R Valve Position Indication
Reactor Recirculation
Leak Detection
Reactor Core Isolation Cooling
Standby Liquid Control
Control Rod Drive Hydraulic
Fuel Pool Cooling, Cleanup System and Refueling Pool
Process Radiation Monitoring
Neutron Monitoring System (APRM, IRM, SRM)
Containment Atmosphere Control included Containment Purge, Containment Vacuum Relief, Combustible Gas Control, Containment Isolation Gas
Reactor Manual Control including Rod Sequence Control, Refueling Interlock and Rod Position Information
Feedwater Control
Area Radiation Monitoring
Fuel Handling
Main Steam System
Solid Radwaste
Liquid Radwaste
Gaseous Radwaste Recombiners and Filters including Offgas
Standby Gas Treatment
Control Enclosure Unit Coolers including Chilled Water System
Spray Pond Pump Structure HVAC
Pressure Regulator and Turbine Generator
Cable Spreading/Auxiliary Switchgear Room HVAC
Emergency Switchgear, Battery and Inverter HVAC
Safety Parameter Display System
Primary Containment including Penetrations
Drywell HVAC (Cooling)
Safeguard Piping Fill
Radwaste Enclosure HVAC
EHC Turbine Stop Valve
Reactor Enclosure Main Crane
Refueling Interlocks
Control Enclosure HVAC

Refueling Floor HVAC
Non-Safeguard DC Power (125 & 250 VDC)
208V/120V Vital AC and Instrument AC
Safeguard DC Power (125V/250V)
13.2 kV Auxiliary Power
4 kV Power
2.3 kV Power (Non-Safeguard)
440V Load Centers and MCCS
Service Water
Emergency Service Water
RHR Service Water
Fire Protection
Reactor Enclosure Cooling Water
Service Air
Instrument Air
Primary Containment Instrument Gas
Low Pressure Air
Diesel Generator and Auxiliaries (including Fuel Oil and Lube Oil)
Diesel Generator Enclosure HVAC
Fuel Oil Transf. Enclosure HVAC
Emergency Fresh Air Supply
Control Room HVAC
Reactor Enclosure HVAC
Circulating Water
Condensate Storage and Transfer
Main Condenser Evacuation System
Condensate Cleanup
Feedwater Heater Vents and Drains
Equipment and Floor Drains
Demineralized Water Makeup including Demineralizer
Drywell Chilled Water
Post Accident Sampling
Auxiliary Equipment Room HVAC
SGTS Equipment Compartment HVAC
RHR, HPCI, RCIC, and CS Rooms HVAC
Reactor Enclosure Isolation
Suppression Pool Cleanup
Remote Shutdown
Process Sampling

FACILITY: LGS UNIT: DOCKET: EQRR:

PREPARED BY: DATE: REVISION DATE:

REVIEWED BY: DATE:

SYSTEM: ACCY:SPEC: LOCATION:

DEMON:

PLANT ID: REF: RACK/PANEL:

COMPONENT: MODEL NO.:

ASSOC COMP: ASSOC M/N: ASSOC. DWG:

ASSOC COMP: ASSOC M/N:

MANUFACTU: SERIAL NO:

ASSOC MANF: ASSOC S/N:

ASSOC MANF: ASSOC S/N:

SERVICE:

P.O. NO:

FUNCTION:

SUBMERGENCE:

CHEMICAL SPRAY:

PARAMETER	ENVIRONMENT		DOCUMENTATION REFERENCE		QUALIFICATION METHOD	OUTSTANDING ITEMS
	SPECIFICATION	QUALIFICATION	SPECIFICATION	QUALIFICATION		
OPERATING TIME						
TEMPERATURE (F)						
PRESSURE (PSIA)						
RELATIVE HUMIDITY (%)						
RADIATION						
AGING		'B'				

DEFICIENCY RESOLUTION:

INTERFACES:

MAINTENANCE REQUIREMENTS:

'A'

REMARKS:

ATTACHMENT 2

Professional Qualifications
William J. Boyer
Senior Engineer
Philadelphia Electric Company

My name is William J. Boyer. I am a Senior Engineer in the Electrical Engineering Division of Philadelphia Electric Company. I am the group leader for the Environmental Qualification Group of the Nuclear Generating Branch. In that capacity I am responsible for the environmental qualification of all electrical equipment important to safety for both Limerick Generating Station and Peach Bottom Atomic Power Station.

I have a Bachelor of Science degree in Electrical Engineering and a Master of Engineering degree from The Pennsylvania State University. I am a Licensed Professional Engineer in the Commonwealth of Pennsylvania.

I have been employed by Philadelphia Electric Company since 1968. My responsibilities have included field engineering assignments at both Peach Bottom and Limerick and system start-up at Peach Bottom. I have served in my present capacity since January, 1980. Immediately prior to that time, I was responsible for responding to various NRC Circulars and Bulletins on environmental qualification. I am the PECO representative to the EPRI Utility Advisory Group on Equipment Qualification and the AIF Subcommittee on Equipment Qualification. I also chaired the Utility Equipment Qualification - BWR Owners Group during its active period from June, 1980 through March, 1982.

Professional Qualifications
Daniel J. Thompson, Jr.
Engineer
Philadelphia Electric Company

My name is Daniel J. Thompson, Jr. I am an Engineer in the Electrical Engineering Division of Philadelphia Electric Company. I am responsible for the environmental qualification of NSSS electric equipment at Limerick Generating Station and Peach Bottom Atomic Power Station.

I have a Bachelor of Science in Electrical Engineering from Drexel University.

I have been employed by PECO since 1967. My responsibilities have included Special Tester Class A assignments in the Protective Relay Branch of the Research and Testing Division and engineering assignments in the Computer and Controls Section of the Electrical Engineering Division. I have served in my present capacity since January 1980. I have chaired the EPRI Utility Advisory Group Subcommittee on Comsip Delphi analyzer qualification and was a contributing author to the NSAC Guide to Qualification of Electrical Equipment for Nuclear Power Plants.

Professional Qualifications
John Doering
Senior Engineer
Philadelphia Electric Company

My name is John Doering. I am a Senior Engineer in the Electric Production Division of Philadelphia Electric Company. Within that division I am the Operations Engineer at the Limerick Generating Station. In that capacity I am responsible for the day-to-day operations of the power plant. I have the responsibility for the organization which includes all of the power plant operators and the Shift Technical Advisors for a total of approximately 90 persons.

I have a Bachelor of Science degree in Mechanical Engineering from the University of Pennsylvania. I have held a Senior Reactor Operators License for the Peach Bottom Atomic Power Station and am currently applying for the same at Limerick Generating Station.

I have been employed by Philadelphia Electric Company since 1972 and have been involved in nuclear plant operations since 1973, accumulating 11 years of boiling water reactor operating experience. I have served in my present capacity since December of 1982. During the past four years I have served on the Boiling Water Reactor Owners Group Emergency Procedures Committee and have played a major role in the development of the Generic Boiling Water Reactor Symptomatic Emergency Procedures Guidelines.

Professional Qualifications
Thomas E. Shannon
Senior Engineer
Philadelphia Electric Company

My name is Thomas E. Shannon. I am a Senior Engineer in the Mechanical Engineering Division of Philadelphia Electric Company. Within that division I am in charge of the Nuclear Steam Supply Branch of the Power Plant Design Section and have served in this capacity since June of 1982. As such I am responsible for the design of the nuclear steam supply system at Limerick as well as certain balance-of-plant systems.

I have a Bachelor of Science degree in Mechanical Engineering from Drexel University and a Masters in Business Administration degree from Drexel University. I am a Registered Professional Engineer in the Commonwealth of Pennsylvania. I am also a member of the American Society of Mechanical Engineers and the American Nuclear Society.

I have been employed by Philadelphia Electric Company since 1968 and have been involved in nuclear related design activities since that time. During this period I was the Responsible Design Engineer for the nuclear steam supply systems. I have reviewed and approved numerous design documents for each of these systems. These documents included: specification, piping and instrument diagrams, quality assurance diagrams, material requisitions, etc.

Professional Qualifications
Edward F. Sproat, III
Senior Engineer
Philadelphia Electric Company

My name is Edward F. Sproat, III. I am a Senior Engineer in the Electrical Engineering Division of Philadelphia Electric Company. I currently hold the position of Electrical Project Engineer on the Limerick Project. In this capacity, I am responsible for the design, procurement and licensing of the electrical systems and equipment at Limerick.

I have a Bachelor of Science degree in Electrical Engineering from the University of Pennsylvania. I am also a Registered Professional Engineer in the Commonwealth of Pennsylvania.

I have been employed by Philadelphia Electric Co. since 1973 and have been on the Limerick Project for the entire time except for two years while on loan to Gas Cooled Reactor Associates in La Jolla, CA. My involvement on the Limerick Project has included review of specifications, design calculations, purchase orders, single line diagrams, control schematic diagrams and vendor drawings. I have generated or reviewed and revised the project electrical construction standards drawings. I have authored portions of Section 8 of the FSAR and the answers to a number of the NRC Staff questions.

I have directed two test programs and authored one test report concerning separation criteria for electrical cabling and internal panel wiring.

I am a member of the Institute of Electrical and Electronics Engineers (IEEE) and a member of Subcommittee #2 (Equipment Qualification) of the Nuclear Power Engineering Committee of the Power Engineering Society of the IEEE. I have been a member of Working Group 2.14 of the above subcommittee since 1974 and authored portions of IEEE Standard 649-1980, IEEE Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations. I am currently the Chairman of this working group.

Professional Qualifications
Wesley W. Bowers
Supervising Engineer
Philadelphia Electric Company

My name is Wesley W. Bowers. I am a supervising engineer in the Electric Engineering Division of Philadelphia Electric Company. I am in charge of the Nuclear Control Branch of the Control Engineering Section. In that capacity I am responsible for the design of the instrumentation and controls at Limerick.

I have a Bachelor of Science in Electrical Engineering from the Pennsylvania State University and a Masters of Science in Systems Engineering from the University of Pennsylvania. I am a Registered Professional Engineer in the Commonwealth of Pennsylvania.

I have been employed by the Philadelphia Electric Company since 1971 and have been involved in the design of instrumentation and controls for nuclear power plants since that time. I have been responsible for the design and licensing of modifications to operating plants and for the review of the design of plants under construction to assure adequacy of design, operability, safety, reliability, and licensability.

In addition to the above activities for plants owned and operated by Philadelphia Electric Company, I have been active in the resolution of problems generic to boiling water reactors. I have served as chairman of a committee dealing with systems, instrumentation, and controls within the Boiling Water Reactor Owners' Group and am currently a member of the inadequate core cooling committee of this same group.

I am Vice-Chairman of Subcommittee 6 of the Nuclear Power Engineering Committee within the Institute for Electrical and Electronics Engineers (IEEE). This subcommittee is responsible for development of IEEE standards for safety-related systems in nuclear power plants.

Professional Qualifications
Loren Stanley
President
Zytor, Inc.

My name is Loren Stanley. I am President and Principal Consultant for Zytor, Inc. located in San Jose, California. I obtained a Bachelor of Science in Electrical Engineering in 1956, a Masters in Business Administration in 1970, and a California Professional Engineers' license in Electrical Engineering in 1975.

Professional Experience Abstract:

2/83-Present Zyton, Inc.

Performed accident monitoring analyses for a BWR utility for USNRC R.G. 1.97. Performed Instrumentation and Control Integrated Design inspections of two PWR plants, and an electrical construction audit of one PWR plant.

3/74-2/83 Quadrex Corporation, Campbell, CA.

Group Manager, Licensing and Systems Analysis Department. Supervised consulting activities in licensing, design review, safety classification of plant components, and probabilistic risk assessment. Directed a technical review for HL&P of South Texas Project engineering work.

Deputy Director, Engineering Services.

Prepared technical proposals, reviewed assignments of technical personnel to engineering projects, and performed technical design reviews of engineering output for client projects.

Director, Project Services.

Supervised consulting activities in Licensing and Safety, Quality Assurance, Environmental Services, Reliability and Risk Assessment, Records Management, and Project Management. Participated in a MFTF fusion reactor reliability improvement program, a TNS fusion reactor licensing criteria evaluation, and an EPRI study of PWR feedwater steam generator level spurious trips.

Manager, Licensing, Safety, and Reliability.

Supervised FSAR reformat with added technical content for six BWR plants. Developed and implemented Q-List methodology to identify and classify safety-related components and spare parts for BWR and PWR plants. Supervised an accident monitoring instrumentation study of a typical Westinghouse PWR and a pressure sensor response time verification program for EPRI. Prepared Failure Mode and Effects Analyses for TMI 1/2 ECCS, BWR 5/6 ECCS, High Temperature Gas Cooled Reactor Steam Dump System, ATR Plant Protection System Upgrade, and LMFBR secondary control rod system and test facility. Performed hazard analysis and Mean Time Between Failure estimates for the ATR PPS Upgrade program.

4/63-3/74 General Electric Company, San Jose, CA.

Manager, Nuclear Instrumentation and Protection Systems. Supervised initial conversion of the BWR safety systems to a solid-state design, and design of safety-related control systems. Prepared technical

system descriptions, compliance analyses, and technical responses to USNRC licensing questions.

Technical Leader, Control and Electrical Systems. Performed design improvements for BWR control rod drive and reactor protection systems. Designed instrumentation for the process computer system, rod worth minimizer, and a prototype RWM system at Dresden 1. Participated in the development and testing of intermediate range neutron monitoring system equipment.

6/56-4/63 General Electric Company, Utica, NY.

Lead Electrical Engineer, Polaris Guidance Electronics and Orbiting Astrological Observatory Electronics. Assisted in the initial design of the Apollo guidance computer, and Polaris guidance and fire control computers.

Field Service and Senior Field Service Engineer Provided technical training and maintenance supervision for Polaris guidance electronics equipment and airborne ARR-39A data link electronics equipment.

Professional Affiliations:

Senior Member, IEEE

Member, IEEE/PES Nuclear Power engineering Committee, 1971-Present

Chairman, IEEE/PES/NPEC SC6, Safety-Related Systems, 1972-1975.

Member, American Nuclear Society

Chairman, ANS 4.5 Writing Group, Criteria for Accident Monitoring Functions, in LWRs, 1979-1980.

Member, ANS Nuclear Power Plant Standards Committee, 1981-1983.

Member, IAEA Work Group on Safety System Safety Guide SG-D3, Vienna, 1976.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED USNRC

Before the Atomic Safety and Licensing Board

'84 MAR 26 A10:43

OFFICE OF SECRETARY DOCKETING & SERVICE BRANCH

In the Matter of	:	Docket Nos. 50-352
	:	
PHILADELPHIA ELECTRIC COMPANY	:	50-353
	:	
(Limerick Generating Station	:	
Units 1 and 2)	:	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing Applicant's Transmittal of Testimony Relating to Contention I-42, Environmental Qualification of Electrical Equipment, including the Testimony referred to therein, were served on the following by deposit in the United States mail, first-class postage prepaid on this 22nd day of March, 1984.

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Washington, D.C. 20555

* Administrative Judge Richard F. Cole
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* Administrative Judge Peter A. Morris
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* Served by hand delivery
** Served by Federal Express on March 21, 1984