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JOHN S. KEMPER
VICE-PRESIDENT
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January 16, 1984

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

Docket Nos. 50-352
50-353

Subject: Limerick Generating Station, Units 1 and 2
Environmental Qualification Report

Reference: Letter from A. Schwencer to E. G. Bauer, Jr.
dated December 19, 1983

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

The reference letter transmitted requests for additional information (RAI) from the Environmental Qualification Section. Enclosed are our responses to these RAI. As an aid to your review of the response to RAI 270.7, we have enclosed the report referenced in the response, Drywell Temperature Response to a Small Steam Break.

These responses will be included in Revision 1 of the Environmental Qualification Report scheduled to be submitted in April, 1984.

Sincerely,

J. S. Kemper

JLP/gra/010984435

Enclosures

Copy to: See Attached Service List

cc: Judge Lawrence Brenner (w/enclosure)
Judge Peter A. Morris (w/enclosure)
Judge Richard F. Cole (w/enclosure)
Troy B. Conner, Jr., Esq. (w/enclosure)
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James Wiggins (w/enclosure)

Additional Information Required
Limerick Environmental Qualification Program

Q 270.1 (SRP 3.11)

Correlate the systems listed in Table 3.2-1 of the FSAR with the systems listed in Appendix A, "List of Systems Important to Safety," of the environmental qualification (EQ) program submittal of October 1983. Provide justification for any system listed in Table 3.2-1 which is excluded from Appendix A (e.g., all components of the system are located in a mild environment, etc.). Identify the Class 1E function for any systems which are added to Appendix A.

Response

The requested systems correlation is shown on the following pages.

SYSTEM CORRELATION

TABLE 3.2-1 SYSTEMS		ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
I	NSSS		
A.	Reactor System	Not included	Does not contain electrical equipment.
B.	Nuclear Boiler System	Nuclear Boiler System Nuclear Boiler Instrumentation Nuclear Steam Supply Shutoff System	Not applicable.
C.	CRD Hydraulic System	Same	Not applicable.
D.	Recirculation System	Reactor Recirculation System	Not applicable.
E.	Reactor Water Cleanup System	Same	Not applicable.
F.	Traversing Incore Probe (TIP) System	Not included except TIP drive isolation valves which are included in Primary Containment Instrument Gas System.	Not required to mitigate the effects of a Design Basis Event.
II	Engineered Safety Features		
A.	Reactor Core Isolation Cooling (RCIC) System	Same	Not applicable.
B.	Residual Heat Removal System	Same	Not applicable.
C.	Core Spray System	Same	Not applicable.
D.	High-Pressure Coolant Injection (HPCI) System	Same	Not applicable.
E.	Standby Liquid Control System	Same	Not applicable.
III	Fuel Storage and Handling: Reactor Vessel Servicing	Not included except RHR intertie valves which are included in Residual Heat Removal (RHR).	Not required to mitigate the Effects of a Design Basis Event.
IV	Radioactive Waste Management	Not included.	Not required to mitigate the Effects of a Design Basis Event.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
V Water Systems		
A. Service Water System	Not included	All equipment located in a mild environment area.
B. Emergency Service Water System	Same	Not applicable.
C. RHR Service Water System	Residual Heat Removal (RHR)	Not applicable.
D. Reactor Enclosure Cooling Water System	Reactor Enclosure Cooling Water - Iso Valves	Not applicable.
E. Turbine Enclosure Cooling Water System	Not included.	All equipment located in a mild environment area.
F. Circulating Water System	Not included.	All equipment located in a mild environment area.
VI Diesel Generator System	Not included.	All equipment located in a mild environment area.
VII Heating, Ventilating, and Air Conditioning Systems		
A. Control Structure	Not included.	All equipment located in a mild environment area.
B. Reactor Enclosure and Refueling Area		
1. Reactor Enclosure and Refueling Area	Reactor Enclosure HVAC Recirc. Mode	Not applicable.
2. Refueling Floor HVAC System (Normal Operation)	Not included.	Not required to mitigate the Effects of a Design Basis Event.
3. Reactor Enclosure Air Recirculation System	Reactor Enclosure HVAC Recirc. Mode.	Not applicable.
4. Standby Gas Treatment System	Same	Not applicable.
5. RHR, HPCI, RCIC and CS Rooms HVAC	ECCS Pump Room HVAC	Not applicable.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
C. Primary Containment		
1. Drywell Cooling System	Drywell HVAC	Not applicable.
2. Purge System	Containment Atmospheric Control System (CAC)	Not applicable.
3. Hydrogen Recombiner	Added	Note 1
4. Vacuum Relief System	Not included.	Does not contain safety-related electrical equipment.
D. Radwaste and Offgas Enclosure	Not included.	All equipment located in a mild environment area.
E. Turbine Enclosure	Not included.	All equipment located in a mild environment area.
F. Diesel-Generator Enclosure	Not included.	All equipment located in a mild environment area.
G. Spray Pond Pump Structure	Not included.	All equipment located in a mild environment area.
H. Miscellaneous Pump Structures Schuylkill, Perkiomen, Circulating Water	Not included.	Does not contain safety-related electrical equipment.
I. Miscellaneous Structures (Auxiliary Boiler, Fuel Oil Transfer, Water Treatment, Sewage Treatment)	Not included.	Does not contain safety-related electrical equipment.
J. Administration Building	Not included.	Does not contain safety-related electrical equipment.
K. Hot Maintenance Shop	Not included.	Does not contain safety-related electrical equipment.

Note 1 - Although the manufacturer has conducted an environmental qualification test for this system, the BWR Owners Group has demonstrated that the Hydrogen Recombiners are not required to serve any safety function in BWR's with inerted containments. This position is expressed in BWR Owners Group letter to D. G. Eisenhut (NRC) dated 8/13/82 and NUSCO letter to W. J. Dircks (NRC) dated 8/6/82. The NRC Staff is continuing its consideration of this issue (ref. SECY-83-292). The Hydrogen Recombiners may be deleted from the Environmental Qualification Report Appendix A & B lists subsequent to an NRC Staff decision.

TABLE 3.2-1 SYSTEMS		ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
VIII	Main Steam and Power Conversion System	Not included	All equipment located in a mild environment area.
IX	Instrumentation and Control Systems		
A.	Reactor Protection (Trip) System	Nuclear Boiler System	Not applicable.
B.	Engineered Safety Features System		
	1. Emergency core cooling Systems:		
	High pressure coolant injection.	Same	Not applicable.
	Automatic depressurization system.	Nuclear Boiler System	Not applicable.
	Core spray	Same	Not applicable.
	Low pressure coolant injection (RHR)	Residual Heat Removal (RHR)	Not applicable.
	2. Primary containment and reactor vessel isolation control system.	Not included	All equipment location in a mild environment area.
	3. Class 1E power system	4 kV Power 440 V Load Centers and MCC's	Not applicable.
	4. RHR containment spray mode.	Residual Heat Removal (RHR)	Not applicable.
	5. Service water systems:		
	RHR service water	Residual Heat Removal (RHR)	Not applicable.
	Emergency service water	Same	Not applicable.
	6. Containment atmospheric control systems:		
	Combustible gas control system	Containment Atmospheric Control System	Not applicable.
	Combustible gas monitoring system	Containment Atmospheric Control System	Not applicable.
	Primary containment vacuum relief system	Containment Atmospheric Control System	Not applicable.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
7. Main steam line isolation valve leakage control system.	Main Steam Isolation Valve-Leakage	Not applicable.
8. RHR suppression pool cooling system.	Residual Heat Removal (RHR)	Not applicable.
9. Reactor enclosure re-circulation system.	Reactor Enclosure HVAC-Recirc. Mode	Not applicable.
10. Reactor enclosure isolation system.	Reactor Enclosure HVAC-Recirc. Mode	Not applicable.
11. Habitability and control room isolation	Not included.	All equipment located in a mild environment area.
12. Standby gas treatment filter room and access area unit coolers.	Not included.	All equipment located in a mild environment area.
13. Diesel-generator enclosure ventilation system.	Not included.	All equipment located in a mild environment area.
14. Spray pond pump structure ventilation system.	Not included	All equipment located in a mild environment area.
15. ESF switchgear and battery rooms cooling system.	Not included	All equipment located in a mild environment area.
16. Emergency core cooling system pump compartment unit coolers.	ECCS Pump Room HVAC	Not applicable.
17. Drywell unit coolers	Drywell HVAC	Not applicable.
18. Control enclosure chilled water system.	Not included.	All equipment located in a mild environment area.
19. Auxiliary equipment room ventilation system.	Not included.	All equipment located in a mild environment area.
20. Standby gas treatment system.	Same	Not applicable.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
C. Safety-Related Display Instrumentation.	Various Systems - Identified by Note 0 in EQR.	Not applicable.
D. Systems Required for Safe Shutdown.		
1. Reactor core isolation cooling system.	Same	Not applicable.
2. Standby liquid control system.	Same	Not applicable.
3. Reactor shutdown cooling mode of the RHR system.	Residual Heat Removal (RHR)	Not appliable.
4. Remote shutdown system	Not included.	All equipment located in a mild environment area.
E. Control Systems Not Required for Safety.	Not included.	Not required to mitigate the Effects of a Design Basis Event.
1. Reactor pressure vessel instrumentation.		
2. Reactor manual control system.		
3. Recirculation control system.		
4. Feedwater control system.		
5. Pressure regulator and turbine generator system.		
6. Neutron monitoring system Traversing incore probe Rod block monitor Source range monitor		
7. Reactor water cleanup system.		

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
8. Spent fuel pool cooling and cleanup system.		
9. Radwaste system Gaseous radwaste system Liquid radwaste system Solid radwaste system		
10. Area radiaion monitoring system.		
11. Process computer.		
12. Containment instrument gas system.		
13. Refueling interlocks.		
14. Leak detection system.		
15. Fire protection and suppression system.		
16. Non-Safety-Related equipment area cooling ventilation systems.		
17. Process radiation monitoring system.		
18. Rod sequence control system.		
X Electric Systems		
A. Engineered Safety Features AC Equipment		
1. 4 kV switchgear, including safeguard bus feeder breakers, protective relays, control panels.	4 kV Power	Not applicable.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
2. 440 V load centers, including 4160/440 V transformers, protective relays, control panels.	440 V Load Centers and MCC's	Not applicable.
3. 440 V motor control centers.	440 V Load Centers and MCC's	Not applicable.
B. Engineered Safety Features DC Equipment		
1. 125 V and 125 V/250 V station batteries and racks, battery chargers.	Not included	All equipment located in a mild environment area.
2. Motor control center and distribution panels, including protective relays.	Safeguard DC Power	Not applicable
C. 120 V Vital AC System Equipment		
1. 120 V distribution panels	Not included.	All equipment located in a mild environment area.
D. Electric Cables for Safety-Related Equipment		
1. 5 kV power cables	Class 1E Power Interfaces	Not applicable.
2. 600 V power cables, including all dc power cables.	Class 1E Power Interfaces	Not applicable.
3. Control and instrumentation cables.	Class 1E Power Interfaces	Not applicable.
E. All Other Instrumentation Systems Required for Safety		
1. Process radiation monitoring system.	Same	Not applicable.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
2. Neutron monitoring system	Not included	Required for RG 1.97, however, it performs its safety function prior to exposure to harsh environment. System exempted in its entirety. Not required to mitigate the Effects of a Design Basis Event.
3. Safety relief valve position indication.	Same	Not applicable.
4. Leak detection systems Main steam line leak detection RCIC system leak detection RWCU system leak detection HPCI system leak detection	Plant Leak Detection	Not applicable.
5. Containment instrument gas system-ADS control	Primary Containment Instrument Gas	Not applicable.
6. Deleted		
7. High-pressure/low-pressure systems interlock.	Residual Heat Removal (RHR) Core Spray	Not applicable.
8. Safeguard piping full system.	Same	Not applicable.
F. Miscellaneous Electrical		
1. Primary containment enclosure electrical penetration assemblies.	Class 1E Power Interfaces	Not applicable.
2. Raceway systems, safety-related.	Not included	Environmental qualification not required for metallics.
3. Emergency lighting related	Not included.	Not required to mitigate the Effects of a Design Basis Event.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
4. Emergency lighting systems	Not included.	Not required to mitigate the Effects of a Design Basis Event.
5. Emergency communications systems	Not included.	Not required to mitigate the Effects of a Design Basis Event.
6. Motors, non safety-related	Not included.	Not required to mitigate the Effects of a Design Basis Event.
7. Inverters		
8. Valve operators	Miscellaneous Systems	Not applicable.
G. Offsite Power Systems	Not included.	Not required to mitigate the Effects of a Design Basis Event.
XI Auxiliary Systems		
A. Safeguard Piping Fill System Including Feed-water Fill System.	Safeguard Piping Fill System	Not applicable.
B. Suppression Pool Cleanup System.	Same	Not applicable.
C. Demineralized Water Makeup System.	Not included.	Not required to mitigate the Effects of a Design Basis Event.
D. Drywell Chilled Water System.	Drywell Chilled Water - Isolation Valves	Not applicable.
E. Control Structure Chilled Water System.	Not included.	All Equipment located in a mild environment area.
F. Compressed Air and Instrument Gas System.	Not included.	Not required to mitigate the Effects of a Design Basis Event.
G. Sampling System.	Containment Atmospheric Control	Not applicable.
H. Equipment and Floor Drains	Same	Not aplicable.
I. Fire Protection System	Not included.	Not required to mitigate the Effects of a Design Basis Event.

TABLE 3.2-1 SYSTEMS	ENVIRONMENTAL QUALIFICATION REPORT	JUSTIFICATION FOR EXCLUSION
J1. Nitrogen System	Containment Atmospheric Control System (CAC)	Not applicable.
J2. Generator External Hydrogen System	Not included.	Not required to mitigate the Effects of a Design Basis Event.
K. Post-Accident Sampling System	Containment Atmospheric Control System (CAC)	Not applicable.
XII Enclosures	Not included.	Does not contain electrical equipment.
XIII Spray Pond	Not included.	All equipment located in a mild environment area.

Q 270.2 (SRP 3.11) Identify, by categories listed in NUREG-0737, the components included in the qualification program in response to TMI Action Plan Requirements.

Response

The NUREG-0737 components included in the qualification program are summarized on the following pages.

Q 270.2
(SRP 3.11)

NUREG 0737 Clarification Item	Component-Plant I.D. Number
II.B.1	PSV-41-F013A
	PSV-41-F013H
	PSV-41-F013J
	PSV-41-F013N
	PSV-41-F013S
	HV-41-1F001*
	HV-41-1F002*
	HV-49-1F007
	HV-49-1F008
	HV-55-1F002
	HV-55-1F003
II.D.3	ZE-41-115A-1
	B-1
	C-1
	D-1
	E-1
	F-1
	G-1
	H-1
	J-1
	K-1
	L-1
	M-1
	N-1
	S-1
	ZT-41-115A-1
	B-1
	C-1
	D-1
	E-1
	F-1
	G-1
	H-1
	J-1
	K-1
	L-1
II.F.1	LT-42-115A
	115B
	1N085A*
	PT-42-101
	103A*
	103B*
	PT-57-101
	121

Q270.2
(SRP 3.11)

NUREG 0737 Clarification Item	Component-Plant I.D. Number
II.F.1 (cont'd.)	AE-57-151
	AIT-57-151
	AE-57-188
	AIT-57-188
II.F.2	TE-42-104A*
	104B*
	104C*
	104D*
	105 *
II.I.e	PT-49-1N035A*
	1N035E*

*These items were not identified in the 10/83 revision of the EQR, however, all are qualified and will be incorporated within the next revision of the EQR.

Q 270.3 (SRP 3.11) Provide a statement that 1E equipment located in areas which experience a significant increase in radiation during a LOCA has been reviewed for possible damage to solid state devices.

Response

All areas which experience a significant increase in radiation during a LOCA are considered a harsh environment by the Equipment Qualification Program. Accordingly, all Class 1E equipment located in these areas including solid state devices have been reviewed for possible damage due to radiation.

Q 270.4 (SRP 3.11) Indicate your compliance with a one hour time margin for equipment with operability times less than 10 hours, or provide justifications for reduced margins.

Response

The Environmental Qualification Report indicates compliance with the one hour time margin for equipment with operability times less than 10 hours except for the P-300 series Environmental Qualification Review Records (EQRR). Justification for this exception is based on 1) an adequate degree of margin with respect to the specified operating time requirement (see response to question Q 270.10), 2) the subsequent failure of these instruments will not cause other safety-related equipment to malfunction and 3) the subsequent failure of these instruments will not mislead the plant operator.

Q 270.5 (SRP 3.11) Final rule, 10 CFR 50.49, states that equipment required to remain functional during and following design basis events be included in the qualification program. Indicate that all design basis events (e.g. moderate energy line breaks, fuel handling accident, etc.) as defined in the rule, have been considered in the development of the list of systems and equipment submitted.

Response

All design basis events as defined in 10CFR 50.49 have been considered in the development of the LGS Environmental Qualification Report Appendix A systems list and Appendix B equipment list. Section 2.0 has been changed to provide additional information.

2.0 EQUIPMENT REQUIRING ENVIRONMENTAL QUALIFICATION

Equipment important to safety as defined in 10CFR50.49 includes both safety-related and non-safety-related equipment plus post-accident monitoring equipment. Safety-related equipment is defined as that equipment which is relied upon to remain functional during and following design basis events to ensure (a) the integrity of the reactor coolant pressure boundary, (b) the capability to shut down the reactor and maintain it in a safe shutdown condition, and (c) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines of 10CFR Part 100. Also identified as important to safety is non-safety-related equipment whose failure under postulated environmental conditions could prevent the satisfactory accomplishment of required safety functions by safety-related equipment. Components required for display information and to perform post-accident sampling and monitoring and radiation monitoring (Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident", Rev. 2, Category I and II Equipment) and TMI upgrades (NUREG-0737, "Clarification of TMI Action Plan Requirements", Rev. 1, Equipment) have been included to the extent required therein. Specifically included, in accordance with NRC guidance, are those systems 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
6. Prevention of Significant Release of Radioactive Material to the Environment.

Limerick has established a comprehensive, systematic program for identifying electrical equipment required to be environmentally qualified. As discussed above, safety-related equipment is identified according to the safety function objectives of 10CFR50.49(b)(1), and is placed on the Limerick Project Q-List.

With respect to non-safety-related electrical equipment whose failure could prevent achieving these safety function objectives (see Paragraph (b)(2) of 10CFR50.49), a review of systems interactions has been performed to ascertain which components fall into this category. This systems interactions review took into account the following various studies and analyses:

a. Separation Review Program
   (1) High Energy Line Break analysis
   (2) Moderate Energy Line Break and Flooding study
   (3) Fire Hazard (Appendix R) Safe Shutdown study
   (4) Electrical Equipment Separation per Regulatory Guide 1.75

b. Common Sensor Failure study
c. Control Systems Failure study
d. Reactor Vessel Water Level Instrumentation study
e. Nuclear Safety Operational Analysis
f. Control Room Design Review

In addition, a study of the effects of high energy line breaks on control systems is in progress in response to IE Information Notice 79-22. Any components identified by these studies whose failure could prevent attainment of the safety function objectives are included on the project Q-List as appropriate.

A separate program to verify the equipment important to safety has been completed. This program, the PECO Component Classification Program, was initiated as a sub-program of the LGS Environmental Qualification Program and it addressed all Nuclear Steam Supply (NSS) and Balance of Plant (BOP) systems and components. The Classification Program involved a re-review of the following documents:

1. FSAR
2. QAD's
3. P&ID's
4. Instrument Index
5. Equipment Index
6. Electrical Drawings
7. System Descriptions and Operating Manuals

The postulated event analyses in Chapter 15 of the FSAR were reviewed to identify systems which have a safety-related function or support in any manner a safety-related function. A matrix of required systems versus postulated events was prepared and non-safety-related systems were identified. A classification sheet for each safety-related component was prepared on a system basis. Each of the component's functions in support of the Chapter 15 events were identified on the classification sheets and a five digit classification code was determined for each function. Then an overall component code was derived based on hierarchical order.

During the course of identifying the equipment which requires qualification, equipment important to safety was identified which is both subject to a harsh environment and for which exception is taken with respect to qualification to that harsh environment. In these instances the equipment meets one or more of the following exceptions:

1. Equipment is not required to perform its safety function to mitigate the effects of any design basis accident in the harsh environment, and equipment failure in the harsh environment will not adversely impact safety functions or mislead the operator.

2. Equipment is required to perform its safety function to mitigate the effects of a specific DBA, but is not subjected to a harsh environment as a result of that DBA.

3. Equipment performs its function before its exposure to the harsh environment, and the adequacy of the time margin provided is justified; subsequent failure of the equipment as a result of the harsh environment will not degrade other safety functions or mislead the operator.

4. The safety function can be accomplished by some other designated equipment that has been adequately qualified and satisfies the single-failure criterion.

Appropriate justification for the determination of one of the above categories is provided on an equipment-specific basis.

Subsequent to identifying equipment requiring qualification, equipment locations were identified using design drawings and later verified by field inspection. All equipment locations are identified by architectural room numbers which have defined boundaries.

Appendix A, Table 1 contains the Master Systems List categorized by system safety function objective. Appendix B contains the list of electrical equipment encompassed by the Environmental Qualification Program. The equipment list identifies equipment by system included in Electrical Equipment Qualification Program. Additionally Regulatory Guide 1.97 equipment is identified on the equipment list by a note 0.

Q 270.6 (SRP 3.11) Verify that your EQ program includes, without exception, all Reg. Guide 1.97, Rev. 2 Category 1 and 2 equipment in a harsh environment which is currently installed or which will be installed prior to fuel load.

Response

All Reg. Guide 1.97, Rev. 2 Category 1 and 2 equipment located in a harsh environment is included in the EQ program. This equipment is identified by a Note 0 in Appendix B of the Environmental Qualification Report except the Neutron Monitoring System which is exempted as noted in the response to Question 270.1 (SRP 3.11).

Q 270.7 (SRP 3.11) The temperature profile, Figure 3C, shown on page C-30 of your October 1983 submittal is not consistent with that in the FSAR. Also, the method and results of the temperature calculation in the FSAR are expected to be amended in accordance with Section 6.2.1.3.3 of the Limerick SER (NUREG-0991). Revise Figure 3C in the EQ program and applicable portions of the FSAR to be consistent with the temperature profile accepted by the NRC staff in NUREG-0991.

Response

The temperature profile, Figure 3C, shown on page C-30 of the Environmental Qualification Report is consistent with both the transient analyses for the main steam line break, recirculation line break, and intermediate size line break as discussed in section 6.2.1.1.3.3 and the transient analysis for small primary steam break as discussed in the report "Drywell Temperature Response to a Small Break, A Realistic environmental Qualification Envelope, Limerick Generating Station, Units 1 and 2", General Electric Company, November 1983. As discussed in the EQR, this composite temperature profile envelopes these primary containment transients. FSAR Sections 3.11 and 6.2 are being changed to reference this report for environmental qualification considerations following a small steam break.

within the normal limits which are shown in the EQR. FSAR Section 9.4 describes the HVAC system.

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 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 are identified, and refurbishment and/or replacement is incorporated into the Limerick Preventive Maintenance/Surveillance Program. Known susceptibility to aging degradation, results of inspections and manufacturer's recommendations are factored into the Maintenance/Surveillance Program.

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

3.11.3.2 Accident Environmental Conditions

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

The primary containment time dependent pressure and temperature profiles calculated for the spectrum of postulated LOCAs and MSLBs have been calculated using NRC approved NRC methodology. Information on the generation of these profiles is contained in FSAR Section 6.2 and References 3.11-2.

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

Post-LOCA radiation doses inside primary and secondary containments were calculated in accordance with NUREG-0737, item II.B.2. The source terms are consistent with those

270.7

3.11.9 SPARE AND REPLACEMENT PARTS

Safety-related equipment and 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.

3.11.10 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.

3.11.11 References

Added from LDCN # FS-437

3.11-1 EQR

3.11-2 D.V. Nguyen and D.D. Jones, "Drywell Temperature Response to a Small Steam Break, A Realistic Environmental Qualification Envelope, Limerick Generating Station, Units 1 and 2", General Electric Company (November 1983).

for drywell design purposes. Reference 6.2-25 discusses the transient associated with small steam breaks for environmental qualification considerations.

270.7 1

6.2.1.1.3.3.5 Small Size Breaks

6.2.1.1.3.3.5.1 Reactor System Blowdown Considerations

(Insert A above)

This section discusses the containment transient associated with small primary system line breaks. The sizes of primary system ruptures in this category are those that do not result in reactor depressurization due either to loss of reactor coolant or automatic operation of the ECCS equipment. Following the occurrence of a break of this size, it is assumed that the reactor operators will initiate an orderly plant shutdown and depressurization of the reactor system. The thermodynamic process associated with the blowdown of primary system fluid from such a break is one of constant enthalpy. If the primary system break is below the water level, the blowdown flow will consist of reactor water. Blowdown from reactor pressure to the drywell pressure will flash approximately one-third of this water to steam and two-thirds will remain as liquid. Both phases will be at saturation conditions corresponding to the drywell pressure. Thus, if the drywell is at atmospheric pressure (for example) the steam and liquid associated with a liquid blowdown would be at 212°F.

If the primary system rupture is located above the RPV water level so that the blowdown flow consists of reactor steam only, the resultant steam temperature in the containment is significantly higher than the temperature associated with liquid blowdown. This is because the constant enthalpy depressurization of high-pressure, saturated steam results in superheated conditions. For example, decompression of 1000 psia saturated steam to atmospheric pressure results in 298°F superheated steam (86°F of superheat).

A small reactor steam leak (resulting in superheated steam) imposes the most severe temperature conditions on the drywell structures and the safety equipment in the drywell. For larger steam line breaks, the superheat temperature is nearly the same as for small breaks, but the duration of the high temperature condition is less for the larger break. This is because the larger breaks depressurize the reactor more rapidly than the orderly reactor shutdown that is assumed to be initiated for the small break.

6.2.1.1.3.3.5.2 Containment Response

For drywell design considerations, the following sequence of events is assumed to occur. With the reactor and containment operating at the maximum normal conditions, a small break occurs that allows blowdown of reactor steam to the drywell. The resulting pressure increase in the drywell leads to a high drywell pressure signal that scrams the reactor and activates the containment isolation system. The drywell pressure continues to

Evaluation of NUREG-0737, Item II.E.4.2(7)," dated June 14, 1982.

6.2-23 Topical Report OCF-1, Nuclear Containment Isolation System, Owens - Corning Fiberglas Corporation (January 1979)

6.2-24 J.E. Krueger and R.C. Sansone, "Purge and Vent Valve Operability Qualification Analysis, Report 6-06-83, Prepared for Philadelphia Electric Co. Limerick Generating Station Unit 1", Clow Corporation (June 1983).

6.2-25 D.V. Nguyen and D.D. Jones," Drywell Temperature Response to a Small Steam Break, A Realistic Environmental Qualification Envelope, Limerick Generating Station, Units 1 and 2", General Electric Company, (November 1983).

Q 270.8 (SRP 3.11) Provide information on the specific maintenance/surveillance activities to be performed on 1) Cables located inside containment, 2) Limitorque valve operators, 3) ASCO solenoid valves, 4) Conax electrical penetrations, 5) temperature/pressure/level sensors and transmitters.

Response

1) Part of the environmental qualification program for cables includes pre-aging the test specimens at elevated temperatures for a duration based on Arrhenius calculations. The pre-aging simulates at least 40 years service temperature exposure within the LGS primary containment. Based on the successful completion of testing, periodic replacements of cables are not required due to age related degradation. It should also be noted that the testing is conservative in view of the fact that the pre-aging was performed in an air environment whereas the actual environment will normally be inerted with nitrogen. Although maintenance of cable is not indicated based on the qualification test results, the electrical equipment in primary containment is periodically tested via surveillance tests and is periodically maintained as required by the plant maintenance program. The results of the surveillance tests prove the operability of not only the equipment, but also the electrical cable and interface devices. The equipment maintenance work also enables the maintenance personnel to physically inspect the cable and interface devices. Degradation which is detected during these inspections will be evaluated and appropriate actions taken.

2) Based on an evaluation of the environmental qualification of Limitorque valve operators and Peach Bottom operating experience, PECO initiated a comprehensive inspection and rework program for the operators. This program has been in-progress during Limerick construction and will be completed before plant start-up. It is our judgment that this program will preempt the necessity for any unusual maintenance beyond normal lubrication requirements which are identified in the plant maintenance procedures. The valve operators are periodically tested via surveillance tests and the opening and/or closing time of critical valves is measured thus providing a mechanism to detect changes in the operator characteristics which bear investigation. In addition, following certain maintenance activities, the drive motor load current is measured thereby providing another means to evaluate operability and identify unusual conditions which warrant investigation.

3) ASCO solenoid valves have also been environmentally qualified by a program which included thermal pre-aging. Component replacements are based on an evaluation of the in plant service conditions as compared to the test bases. Requirements which are identified by the comparison are identified in the EQR and then incorporated into the computerized plant maintenance program. In general, plant surveillance tests periodically exercise the solenoid valves and prove operability.

4) The Conax penetrations have been analyzed for susceptibility to thermal degradation based on material tests and the Limerick specific service conditions. The result of the analysis is that the penetrations have a qualified life in excess of 40 years therefore specific qualification related surveillance tests have not been developed, however, as indicated in the preceding response pertaining to cables in primary containment, equipment surveillance tests prove the operability of electrical interface devices in addition to the equipment itself.

5) Instrumentation has been environmentally qualified in a program which includes thermal pre-aging. Maintenance requirements for all equipment in the Limerick Environmental Qualification Program are provided on the individual Environmental Qualification Review Records. This information is reviewed by plant personnel who then incorporate the specific requirements into the computerized plant maintenance program. Instrumentation operability is checked periodically via surveillance tests.

Q 270.9 (SRP 3.11) A number of EQRR sheets state that deficiency resolutions are to be completed by December 1, 1983. Please provide the revised qualification status and EQRR for those component items for which the deficiencies have been resolved.

Response

Revisions have been made to the EQRR sheets for which deficiencies have been resolved. In general most deficiencies are expected to be resolved by February 13, 1984. An exception will be one test program on Veam/Litton in line plug connectors (ref. EQRR 44) which will be in progress with an expected completion of 6/1/84.

Q 270.10 (SRP 3.11) A number of discrepancies have been noted in the EQRR sheets, for example:

EQRR 1, pages 766 through 777, states that the required accuracy is to be determined yet the equipment is listed as qualified with no outstanding items.

EQRR 142, pages 495 through 568, reference 119 is used as the qualification document for ASCO solenoid release model X8018A4. This model could not be located in reference 119.

EQRR 182, pages 569 through 588 and 1246 through 1255, the accuracy requirement is not specified yet the equipment is listed as qualified with no outstanding items.

EQRR P311, page 1095, shows inadequate margin for operating time and radiation. EQRR P106, page 1300, specified radiation is not enveloped.

EQRR pages 815 and 853 show deficiencies in temperature and/or pressure but no resolution is stated.

These and all other similar discrepancies must be eliminated. Revised EQRR sheets should be resubmitted prior to the site audit to reflect any changes in the qualification status.

Response

The EQRR sheets which contain discrepancies or are incomplete have been changed to provide current status.

Q 270.11 (SRP 3.11) Appendix C, table 1 of the EQ submittal references notes in superscript letters appearing in columns titled "pressure", "temperature" and "humidity". These reference notes appear to have been omitted. Please provide reference notes a through q.

Response

Only superscript letters a through g are used to identify the particular line break accident resulting in the values of temperature, pressure and relative humidity given in Table 1. The identification of these breaks is provided as Note 4 of Table 1 on page C-11 of the EQR. These same letters (except capitals) are used on the Appendix E EQRR sheets.

Q 270.12 (SRP 3.11) Indicate what actions will be taken for equipment items whose "qualified life" is less than 40 years.

Response

Qualification maintenance requirements are identified on the individual EQRR sheets. This information is reviewed by plant operating personnel who incorporate the specific requirements into the computerized plant maintenance program. This computerized program ensures that required maintenance is automatically brought to the attention of responsible plant personnel so that appropriate refurbishment can be performed to maintain the equipment's qualified life.

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