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SENIOR VICE-PRESIDENT - NUCLEAR

May 8, 1989

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Docket No. 50-353

Subject: Limerick Generating Station, Unit 2
Independent Design Assessment
Inspection Report No. 50-353/88-203

Reference: Letter from S. A. Varga (NRC) to G. A. Hunger, Jr. (PECo) dated April 4, 1989.

Gentlemen:

Your letter of April 4, 1989, forwarded the results of the Nuclear Regulatory Commission (NRC) inspection of the Limerick Generating Station Unit 2 Independent Design Assessment being performed by Stone & Webster Engineering Corporation. These results included seven open items for which responses are provided as Attachment 1. The responses include a description of the review conducted and results.

Philadelphia Electric Company (PECo) also herewith confirms that the actions identified in Inspection Reports 50-353/88-200 and 88-201 have been completed. Attachments 2 and 3 discuss each of these actions and their disposition. If you have any questions or require any additional information, please let me know.

Sincerely,

John S. Kemper

Attachment

ERG/ct/05038900
Copy to: T. J. Kenny, LGS Senior Resident Inspector
W. T. Russell, Region I Administrator
R. J. Clark, LGS Project Manager

IE01
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NRC INSPECTION REPORT 50-353/88-203 (Jan. 3-6, 1989)

CLOSURE ACTION FOR IDENTIFIED OPEN ITEMS

1. NRC OPEN ITEM:

DAI-047 SWEC was requested to review the latest documents that Bechtel had obtained from General Electric about the first of December 1988, to verify the adequacy the design basis of the RHR pump/motor qualification.

Action Taken: The project response to DAI-047 described the specifications as being used for original equipment procurement only. Subsequent reevaluation for modified requirements, such as nozzle and hydrodynamic loads, are performed through a Loads Adequacy Evaluation Program and a Qualification Review (SQRT) program. These documents were not ready when the response was prepared, but the work for them was subsequently completed and reviewed by SWEC. The conclusion of this review was that there are no differences between Units 1 and 2 components which would affect the design adequacy. This is summarized in the SQRT form, GE document HH2-E11-C002, Revision 2. The Design Adequacy Summary Report is not yet finalized, but it will, for the RHR pumps, be essentially identical to the Unit 1 report, contained in GE document NEDC-30493, which was reviewed. The evaluation for DAI-047 was revised to reflect these results. DAI-047 was closed with no further action required.

2. NRC OPEN ITEM:

DAI-067 SWEC was requested to verify that parallel operation of the essential service water pumps was substantiated by the test data provided by Bechtel.

Action Taken: As previously stated by Bechtel, pump testing was performed for single pump operation only, and not for parallel pump operation. A further review by the SWEC pump specialist of pump data and characteristics affirmed the conclusion that if instability were to occur, the impact on the pump performance both hydraulic and mechanical would not be measurable if parallel operation is continued for as long as 30 minutes. This assessment has been included in the evaluation of DAI-067, which was closed with no further action required.

3. NRC OPEN ITEM:

DAI-076 SWEC was requested to verify the validity of the assumption used by Bechtel in the short circuit calculation that three-phase fault currents always control the design as opposed to line to ground faults because SWEC cited an exception for a solidly grounded substation terminal.

Action Taken: SWEC understood that the NRC concern was that, under certain conditions, a line-to-ground fault could be more severe than a three-phase fault; this point might not have been taken into account in the project calculations. Therefore, SWEC evaluated the conditions where line-to-ground faults might exceed the three-phase value. This could occur where the primary power supply to a delta-solidly grounded WYE transformer is relatively weak. This can occur when the delta primary is powered by the emergency generator, which constitutes a relatively weak power supply. In this case, the line-to-ground fault current would exceed the three-phase value at the transformer WYE secondary terminals. However, this higher line-to-ground fault current would still be less than the three-phase fault current that could occur under normal conditions. Because the system was designed to meet this more stringent three-phase fault current, SWEC foresaw no problem with equipment ratings. This evaluation was documented in an amended action item response from the project, and an amended SWEC evaluation of DAI-076, which was closed with no further action required.

4. NRC OPEN ITEM:

DAI-119 SWEC was requested to review the potential for a fire hazard associated with an undetected fault when the 4kV buses were connected to the emergency diesel generator. An undetected fault would be less than the 18 amps setting of the ground fault relay.

Action Taken: The above concern derives from the fact that the recommended industry practice is to limit ground faults to less than 10A. The existing scheme would allow a ground fault of up to 18A before tripping the protective device, with possible increased risk of fire due to arcing conditions.

In an amended response to this AI, the project stated that a possible increase in fire risk resulting from ground fault current above 10 amperes has not been demonstrated by industry experience or documented in technical literature, although the "18 Amps fault current" might increase the level of damage in the generator when a phase-to-ground fault is postulated in the generator windings. However, this type of fault will render the generator inoperable. The shutdown capability of the plant will still be maintained by the remaining three (3) diesel generators.

Pre-action sprinkler systems are provided to protect the diesel generators and enclosures from a postulated fire as described in Section 2.3 of the Fire Protection Evaluation Report (FPER). It is not expected that a postulated fire in one diesel generator building will propagate to the others. The analysis in FPER, Section 5.6, further demonstrates that the capability to achieve shutdown of the plant is not compromised if one diesel generator is lost to a postulated fire.

Further, the most likely effect of an 18 Amp ground fault would be to escalate into a phase-to-phase fault, which would be cleared by

phase-to-phase protective devices. During LOCA, phase-to-ground trip protection is by-passed, but the annunciation in the control room is still operative.

It was determined during the review that ground fault currents greater that 5 Amps will be annunciated in the control room. However, the duration of this annunciation may not be adequate. The project responded that no licensing requirement exists to maintain diesel generator ground fault annunciation following an alarm. SWEC believes that the annunciation should be further evaluated, since the relay is not rated by the vendor to remain operable for the maximum ground fault current, longer that 8 minutes, after which it could be damaged with resultant consequences. Therefore, annunciation of the faulted condition could be compromised. This evaluation was documented in DOI-113.

5. NRC OPEN ITEM:

DAI-261 SWEC was requested to review the consequences on the battery capacity of an undetected high-impedance fault at the discharge side of the inverter.

Action Taken: The NRC concern was that, in sizing the battery, the full rating of the inverter was not used as a load on the battery; instead only the actual load was used. Either the 100 percent rating of the inverter should have been used or some type of controlled procedure should have been instituted to ensure that if the inverter load was increased, the battery load would be reviewed.

A related concern with the battery calculation, was that an undetected high impedance fault in the 120 V ac circuits, supplied by the inverter, was not analyzed in the original design. This could load the battery beyond its design capability. After a review of the above two concerns and calculation 6600E.03 by the project, the project furnished supplemental data demonstrating that these batteries are adequate to accommodate the full load on the inverters. If a load demand on the inverter of 100 percent of its rating is postulated, the most heavily loaded battery, 1B1D101, still has a positive loading margin of 6.6 percent. This review is documented in Review Plan LK-D-1903-E.

6. NRC OPEN ITEM:

DAI-290 SWEC was requested to ensure that FSAR changes would be identified in the final IDA report. SWEC had committed to review consistency between the design and FSAR as defined in its Procedure 12.0, "Trending of Observation Reports," Revision 0, dated September 12, 1988. However, when Bechtel issued an FSAR change as a result of this action item, SWEC did not document the change on an observation report. SWEC was further requested to describe how its commitment would be accomplished and to provide assurance that any other types of changes resulting from the IDA review where observation reports were omitted would be captured in the IDA final report.

Action Taken: This issue was not raised during the NRC inspection, but subsequently during a telephone conversation between Mr. R. Parkhill of NRC and Messrs. Don Wille and Joe Bisti of SWEC. After a discussion of DAI-290, Mr. Parkhill requested specifically that any FSAR changes which resulted from IDA review be documented in the IDA final report, Volume II, Book 1, (for those cases where Observation Reports were not prepared). Only a small number of such cases were identified, and the individual discipline sections (Section 4, Design Assessment Details) specifically identify these cases where they occurred. Section 2.2.6 of Volume II, Book I of the IDCA Report documents that the requested action was taken. The total number of FSAR changes documented during the IDCA are indicated in Volume I, Book I, Executive Summary, Table 1.

7. NRC OPEN ITEMS:

Of the 12 previous inspection report items that were sampled for proper closure, as documented in Inspection Reports 50-353/88-200 and 88-201, the inspection team identified two items where additional action was required by SWEC. (1) Addendum Item 1.1.3 from Inspection Report 50-353/88-200 identified that SWEC had not verified the mechanical systems design input data for a control valve sizing review. SWEC completed the required review before the exit meeting and the inspection team closed this issue. (2) Addendum Item 1.1.8 from the same inspection report requested that SWEC review the actual test data that demonstrated compatibility with the valve accumulator design for the automatic depressurization system. If the test data was unavailable, SWEC was requested to review the engineering test specification including consideration of the check valve leakage rates.

Action Taken: SWEC reviewed the specified ADS accumulator check valve leakage rate and vendor test results and confirmed that the leakage rate values specified and the vendor test results meet the leakage rate criteria established in Calculation No. M-59-7 as follows:

Reference 1. Calculation M-59-7, ADS Valve Seismic I Gas Supply, Nitrogen Bottle Required, dated 7/15/83.

Reference 2. Design Specification For Soft Seated Check Valves 2" Size and Smaller In Nuclear Service, 8031-P-129, Revision 5.

Reference 3. Vendor Test Report No. 8031-P-129-4-1.

The ADS air supply check valve leakage rate criteria is established by Reference 1, sheet 2 of 4. The total leakage rate established by Reference 1, is 1SCFH (28.8 cu. in. per minute). The check valve design specification, Reference 2, Appendix 3, Section 2.4 specifies "maximum leakage after an accident to be not greater than 0.1 SCFH". Note that the specification shown "0.1 SCFO". This should read 0.1 SCFH (2.88 cu. in. per minute), per conversations with Bechtel. The vendor test report, Reference 3, Section IV, paragraph 4.1.1.2, specifies internal leakage not to exceed two cu. in. per minute for the functional test. The test results contained in Reference 3, Section 4.3 explains that specimens 1 and 2 had some leakage in the

horizontal position, "but it did not exceed the 2 cu. in. per minute maximum allowable". Therefore, the test results meet the design specification and the calculation check valve leakage rate design criteria.

NRC INSPECTION REPORT 50-353/88-201 (Oct. 3-7, 1988)

CLOSURE ACTION FOR IDENTIFIED OPEN FINDINGS

3.1 ITEMS NOT IDENTIFIED IN SWEC REVIEW

3.1.1.1 RHR Pressure Relief Valve Sizing

Action Taken: The items referred to in the NRC Inspection Report were added and addressed in DAI-080, Rev. 0. The concerns resulted in issuance of DOR-096.

3.1.1.2 Environmental Qualification of Non-Metallic Components in the RHR Pump

Action Taken: Action Item DAI-179 was issued to address material temperature limitations and was satisfactorily resolved.

3.1.1.3 Equipment Qualification (Seismic/Dynamic)

Action Taken, Item (1): The RHR pump/motor was qualified through a combination of analysis and test. The motor test documents (items 1 and 2 below) and the final analyses (items 3-6 below), and additional supporting documentation, were reviewed by IDA at GE, San Jose, and the results documented in Review Plan LK-D-1907-C. Reference documents reviewed included:

1. NEDE 30310, Limerick 1 and 2 ECCS (RHR and LPCS) Motor Data Comparison with Qualification Test Data, June 1983.

2. 6206-036, Rev. 2, Qualification Report BWR-3/4/5/6 ECCS Motor Data Comparison with NEBC and SACMD Data, 7/27/82.

3. DRF-E11-00016

4. DRF-E11-00022

5. DRF-E00-168-23

6. NEDC-30493, LGS Unit 1 NSSS New Loads Design Adequacy Evaluation Final Summary Report.

7. 6321-11-1, Seismic Stress Analysis for RHR Pump Motor Report ME-1008, McDonald Co.

8. DRF-E11-00013, and Supplements 1-4

9. HH1-E11-B001, Rev. 1, RHR Heat Exchanger Dynamic Qualification Summary.

Action Taken, Item (2): Action Item DAI-045 was issued to address this item. SWEC reviewed GE document DRF-E11-00016 and the vendor document DR-2500-4, and specifically checked to assure that the applicable pump characteristics had been utilized in the DRF analysis. In addition, DAI-042 questioned the ASME

Code applicability, the response to which indicated that, since the 1970 ASME III did not address Class 2 pumps, ASME VIII, Class C rules were used. This was the industry practice at the time. DAI's-042 and 045 were closed with no further action.

Action Taken, Item (3): Checklist 4.5.1 refers to a vendor report (Ref. 7) which was eventually superseded by DRF-E11-00016, as stated in the response to DAI-045. In this latter analysis, the allowable stress values in question are fully referenced.

Action Taken, Item (4): This question was raised in DAI-039 and GE's response (that the spectra were different due to enveloping), was verified by SWEC review of references 8 and 9. DAI-039 was closed with no further action.

3.1.1.4 RHR Service Water Pump Sizing

Action Taken: The review for the RHRSW pump minimum flow effects on pump/system performance, including the design adequacy of the minimum flow line, was added and addressed in the response evaluation for Action Item DAI-059, Revision 0, and the resulting Observation Report DOR-025, Revision 0.

RHRSW and ESW parallel pump operation was added and addressed in the response evaluation for Action Item DAI-059, Revision 0, and resulting Observation Report DOR-025, Revision 0. RHRSW and ESW parallel pump operation was also added and addressed in Review Plan LK-D-1903-MS, Revision 1, Section 4.1.5. The Action Item and Observation Report were satisfactorily closed.

3.1.1.5 RHR Service Water Pump Net Positive Suction Head

Action Taken: The review for RHRSW pump vortexing and the vendor's clearance requirements between the bottom of the RHRSW pump suction bell and the bottom of the wet pit was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.9. No DAI's were issued. The review regarding the inconsistency between the start-up field report (SFR-16A-23) and the vendor data was also added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.9. The result of this review was addressed in DAI-472, which was closed with no further action.

3.1.2.1 RHR Pump Motor Overcurrent Relay Setting

Action Taken: In this inspection, the NRC noted that in 4kV Switchgear and Motor Protection Calculation 6900-05B, the trip settings of the overload relays were based on 80 percent voltage for the RHR pump motors. However, in the FSAR, Sections 8.1 and 8.3, stated that voltage at motor terminals could be as low as 75 percent. Subsequently, DAI-150 and DOR-042 were issued to address this discrepancy.

In its reponse to DOR-042, the Project provided documentation that the voltage at the motor terminals would not be less than 80 percent; this concern was resolved and the Observation Report was closed.

3.1.2.2 Overcurrent Relays Selection and Coordination

Action Taken: In this inspection, the NRC noted that non-Class 1E loads were connected to 480V Class 1E MCCs, and were shunt tripped in the event of a LOCA. When Load Study Calculation 6300E.18 was reviewed, it did not address a postulated condition of a loading increase on the Class 1E bus, due to a single failure of the breaker feeding the non-1E faulted load. The main concern was with the capacity of the start-up transformer to accommodate this increased loading.

The review of the above concern indicated the capacity of the 14MVA Safeguard Transformer would be sufficient, based on the following:

An uncleared fault greater than 2400A at the non-Class 1E load, supplied from the MCC, will be cleared by the breaker in 0.4 sec. Therefore, the closest approximation to a sustained load, due to a fault at the 480V level, is a value of less than 2400A. This is the shortest time at which the load center will trip and this value of current corresponds to a value of 280A at 4160V. The transformer can withstand a maximum through fault value of 29,715A for 2.5 sec., based on the calculation. Accordingly, the full load seen by the transformer will be approximately 1900A full load, plus 280A fault load for a total of 2180A which, when compared with the short term rating of 29,715A, shows the transformer has adequate capability for this scenario. Based on the review of the transformer protection scheme, the transformer is adequately protected from higher 480V fault current levels.

3.1.2.3 Electrical Power Load Stand-by

Action Taken: In this inspection, the NRC noted the following, concerning Safeguard Auxiliary System Phase Overcurrent Selection and Coordination Calculation 6900E.02:

a. Justification appeared not to be provided for tap and time dial settings and the accuracy could not be verified in the absence of bases and supporting data.

b. The calculation had been reviewed for specific items, but the items were not clearly identified in the review plan. If only parts of the calculation were reviewed, the review plan should clearly state this.

The review of the above concerns indicated the following:

a. Calculations 6900E.02 and E.09 identified the bases of the overcurrent relay settings for the main and diesel generator breakers, which were 1600A and 960A, respectively. Pickup and time dial settings are justified in the calculation, since they provide complete coordination. There is sufficient conservatism in the setpoints to eliminate concern regarding accuracy and tolerances of the relays.

b. The review plan was revised to clearly indicate which items in the calculation were reviewed, which were the diesel generator and the main bus breaker. This review is documented in Review Plan LK-D-1903-E

3.1 3.1 Verification Diesel Loading Time

Action Taken: Diesel loading times for equipment samples reviewed were verified consistent between elementary diagrams and other drawings. The times were also compared to the time delay settings established in Bechtel voltage regulation calculations of record and found consistent. The results are documented in Review Plan LK-D-1905-C.

3.1.3.2 Single Failure Review of Schematic Diagrams

Action Taken: An evaluation of the tripping diodes determined that the diodes were adequately sized for this application to provide sufficient margin for peak reverse voltage and current carrying capacity. Additionally, the periodic performance of surveillance test ST-1-051-102-1 provides reasonable basis to believe that a failure of the tripping diode would be detected, thus significantly minimizing the probability of a common mode failure occurrence. In addition, no such diode failures have been identified during surveillance testing of Unit 1.

It was also found that, in order for the RHR pump breaker to close, the charging springs must be charged prior to the initiation of the "breaker close" signal. Failure of the spring to charge would be readily detected during the surveillance test. Therefore, it was concluded that such failure would be detected.

The results of these evaluations were included in Review Plan LK-D-1905-C.

3.1.3.3 FSAR Commitments and Discrepancies

Action Taken: Item (1), which referred to I&C requirements found in other FSAR chapters, was evaluated and closed during the inspection. For item (2), FSAR discrepancies, Action Item DAI-485 was issued and was closed with no further action.

3.1.4.1 Pipe Stress Calculation 2-10-13, Rev. 2

Action Taken: Action Items DAI-151 and DAI-152 were issued to address the cited problems with the calculation, and were closed with no further action.

3.1.4.2 Pipe Stress Calculation 2-10-06, Rev. 3

Action Taken: Action Item DAI-175 was issued to question use of the Unit 1 calculation and was closed with no further action.

3.1.4.3 Pipe Support Design Criteria

Action Taken: Action Item DAI-468 was issued to question the cited item and was closed with no further action.

3.1.5.1 Review Supporting Documents in the Bechtel Response Before Closing AI

Action Taken: FCR C-93 was not considered to be relevant to the evaluation of the Action Item. SWEC subsequently reviewed FCR C-93 and confirmed this.

3.1.5.2 Revisions to Codes and Standards

Action Taken: The codes and standards cited in the specifications were generally in conformance with those cited in the FSAR. In the few instances when there were later dates in the specifications, these codes and standards were reviewed and differences were evaluated not to have significant impact on the plant licensing basis documentation. During the balance of the review, no instances of the use of incorrect codes were found.

3.2 CHECKLIST DISCREPANCIES

3.2.1.1 Environmental Qualification of RHR Pump Non-Metallic Components

Action Taken: Checklist Attribute 12 was revised to reflect the results of the evaluation of DAI-179.

3.2.1.2 Equipment Qualification (Seismic/Dynamic)

Action Taken, Item (1): Attribute 4(d) of the Checklist is part of Section 4, entitled 'Specification Review'. The negative check to this attribute and the corresponding Note 4, explains that the acceptance criteria (in the specification) are different from those of DMB-1652. Hence, DAI-040 was written to question why the specification does not contain current seismic/dynamic criteria, and the issue was satisfactorily resolved.

Therefore, the checklist is correct and the action item was issued.

Action Taken, Item (2): Attribute 3(a), entitled 'Procedure' is part of Section 3, 'Review of Vendor Reports'. The intent of this attribute was to check any test procedure, in the event that the vendor document reported on dynamic testing; since the document in question (DRF-E11-00013) was an analysis, the 'Procedure' attribute was checked 'Not applicable'.

3.2.2.1 Single Checklist used for Multiple Calculations

Action Taken: In the majority of cases, individual checklists were used to document review of individual calculations. However, there are two categories where a single checklist was used for multiple calculations, since the simultaneous review of several calculations aided the reviewer's understanding of the completeness of the design process and the adequacy of the final conclusions.

The first category included cases where loading calculations were required inputs to equipment sizing and rating calculations.

The second category included certain protective relaying calculations, where simultaneous review assisted in showing that protection provided was complete and coordinated. In all cases, items reviewed in calculations were clearly indicated and documented in accordance with IDA procedures and no additional actions were required.

3.2.3.1 Improper References Provided in Checklists

Action Taken: It was re-emphasized to engineers to use greater care during the completion of checklists to clearly indicate those portions of documents reviewed for each attribute evaluated.

NRC INSPECTION REPORT 50-353/88-200 (August 8-12, 1988)

CLOSURE ACTION FOR OPEN FINDINGS (ADDENDUM I TO REPORT)

1. NRC-Recommended Changes to Design Discipline Review Plans (Summarized)

1.1 Mechanical Systems Discipline

1.1.1 RHR Heat Exchanger Sizing

Action Taken: The review of the RHR and spent fuel pool cooling heat exchanger was added to Review Plan LK-D-1903-MS, Revision 1, Sections 4.1.11 and 4.1.12.

1.1.2 Relief Valve Sizing

Action Taken: The review of relief valve sizing was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.10.

1.1.3 Control Valve Sizing

Action Taken: The review of control valve sizing was added to I&C Review Plan LK-D-1906-C, Revision 1. Interfacing data was added to Mechanical Systems Review Plan LK-D-1909-MS, Revision 1, Section 4.2.

1.1.4 Leak Rate Testing Connections

Action Taken: The review of the leak rate testing connections was added to Review Plan LK-D-1905-MS, Revision 1, Section 4.1.

1.1.5 RHR Pump Vendor Documents

Action Taken: The review for filtration of the RHR pump seal water cooling supply was added to Review Plan LK-D-1906-MS, Revision 1, Section 4.1.1.

1.1.6 Vendor Test Reports - Valves

Action Taken: The review of these vendor test reports was added to Review Plan LK-D-1913-MS, Revision 1, Section 4.0.

1.1.7 Steam Hammer Review

Action Taken: The review of steam hammer was included in Review Plan LK-D-1903H-MC, Revision 1, Section 4.0.

1.1.8 Valve Accumulator Design

Action Taken: The review of the ADS accumulator was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.13.

1.1.9 ATWS Conditions

Action Taken: The review regarding (ATWS) conditions was added to Review Plan LK-D-1909-MS, Revision 1, Section 4.3.

1.1.10 RHR System Flushing Provisions

Action Taken: The RHR flushing provision review was added to Review Plan LK-D-1904-MS, Revision 1, Section 4.1.

1.1.11 Small Bore Isometric Piping

Action Taken: This review was added to Review Plan LK-D-1904-MS, Revision 1, Section 4.1.5.

1.1.12 Orifice Sizing

Action Taken: The orifice sizing review was added to I&C Review Plan LK-D-1906-C, Revision 1, Section 4.1. The process data review for the Mechanical Systems interface was added to Review Plan LK-D-1909-MS, Revision 1, Section 4.2.

1.1.13 A/E-Designed Spray Headers

Action Taken: The review of the HPCI turbine exhaust sparger was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.14.

1.1.14 HELB Pressure and Temperature Profiles

Action Taken: Review for the transmittal of HELB pressure and temperature profiles to the Civil/Structural discipline was added to Review Plan LK-D-1909-MS, Revision 1, Section 4.4.

1.1.15 Radiological Design of the RHR and Service Water Heat Exchanger

Action Taken: Review of the RHR/RHRSW system interface with regard to radiation detection equipment was added to Review Plan LK-D-1909-MS, Revision 1, Section 4.2.

1.1.16 RHR Pump Room Cooler Sizing

Action Taken: The worst case heat load, including heat gain from RHR pump motor inefficiency, was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.6.

1.1.17 RHRSW Pump Quality Standards

Action Taken: The RHRSW pump quality standards review was added to Review Plan LK-D-1901-MS, Revision 1, Section 4.1.1.

1.1.18 Unstable RHRSW Pump Operation

Action Taken: The potential for unstable pump operation review was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.5.

1.1.19 Pump Performance

Action Taken: The review of pump performance regarding electrical power requirements for pump run-out flow conditions was included in Review Plan LK-D-1909-E, Revision 1, Section 4.4.

1.1.20 Spray Pond Water Quality

Action Taken: The review of spray pond water chemistry regarding the RHRSW system particulate size for the pump bearing and cooling water, including the review of the RHRSW pump intake screen size were added to Review Plan LK-D-1906-MS, Revision 1, Section 4.1.2. The review of spray pond water chemistry was also added to Review Plan LK-D-1902-MS, Revision 1, Section 4.1.

1.1.21 Pump Testing

Action Taken: The review of pump performance data, with regard to the vendor tested performance, as compared to design requirements, was added to Review Plan LK-D-1913-MS, Revision 1, Section 4.0.

1.1.22 RHRSW Pump Performance

Action Taken: The review for the effect of RHRSW system pump column losses with regard to pump performance calculations was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.5. The review for the possibility of dissolved gases coming out of solution and affecting pump performance was added to Review Plan LK-D-1903-MS, Revision 1, Sections 4.1.2 and 4.1.5.

1.1.23 NPSH Calculation

Action Taken: The review of the RHRSW pump NPSH calculation was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.9.

1.1.24 Pump Vortexing

Action Taken: The review for pump vortexing was added to Review Plan LK-D-1903-MS, Revision 1, Section 4.1.9.

1.1.25 Spray Pond Design Calculations

Action Taken: The Ultimate Heat Sink review was added by Review Plan LK-D-1915-MS, Revision 2.

1.1.26 Total Dynamic Head Calculation

Action Taken: Review Plan LK-D-1903-MS, Revision 1, Section 4.1.3, Attribute 1 changed "pipe" to "pump" to correct this typographical error.

1.2 Electrical Power Systems Discipline

1.2.1 Scope of Electrical Design Review Plans

Action Taken, Item (a): A review of station service transformer

loading and relay protection (degraded grid) calculation was added to Review Plan LK-D-1903-E. Review of the bus transfer scheme was added to Review Plan LK-D-1903-E.

Action Taken, Item (b): Review Plan LK-D-1903-E was revised to add review of two loads outside RHR for load rating and sequencing.

Action Taken, Item (c): Review Plan LK-D-1903-E was revised to add review of the Diesel Generator protection; the remainder was already addressed in that Review Plan.

Action Taken, Item (d): The review of medium voltage penetration circuits was added to Review Plan LK-D-1903-E.

Action Taken, Item (e): Review Plan LK-D-1903-E was revised to add the review of two circuits that operate during the first load block.

Action Taken, Item (f): Review Plan LK-D-1903-E was revised to include review of the battery short circuit calculation.

Action Taken, Item (g): An analysis was made of the interconnection between Class 1E supplies to non-Class 1E loads, where the loads were not disconnected by an accident signal. The analysis was included in DRP-1905E, One Line Diagrams. The reviewed non-Class 1E equipment included the non-Class 1E inverter power supply, public address panels, fire alarm panels, and dry-well coolers.

Action Taken, Item (h): Review Plan LK-D-1903-E was revised to include review of cable pulling tension calculations.

1.2.2 FSAR Commitments

Action Taken: For Regulatory Guide 1.73, refer to Inspection Report item number 1.3.8; Regulatory Guide 1.22 was included in Review Plan LK-D-1901-C and 1905-C.

1.2.3 Review of Elementary Wiring Diagrams

Action Taken: Refer to Inspection Report item number 1.3.18.

1.2.4 Reference Standards

Action Taken: The issue referred to the applicable version of IEEE-323 to be used for the review of Limerick 2. However, the basic guideline for this review was taken to be 10CFR50.49, which encompasses the requirements of IEEE-323-1971 or 1974, as appropriate. This was discussed during the inspection, and it was agreed that dates need not be included.

1.2.5 Discipline to Group Interface

Action Taken: This subject was already partially covered in Review Plan LK-D-1909-MS; additional attributes were added in Review Plan LK-D-1909-E to address the remainder.

1.3 Instrument and Control Systems Dicsiplines

1.3.1 Instrument Power

Action Taken: Determined not to be applicable to I&C because of dual power supplies to critical instruments, and no additional action was required.

1.3.2 Main Control Board Internal Wiring

Action Taken: Attribute 5 was added to Review Plan LK-D-1914-C, to require review of a main control room internal wiring for separation with specific attention to cable tying with fiberglass tape and thermoflex sleeving.

1.3.3 Instrument Tubing Characteristics

Action Taken: An in-depth review of instrument tubing clamps and/or supports was added to Review Plan LK-D-1904-C, for selected instruments. An attribute for separation was already included in Review Plan LK-D-1904-C.

1.3.4 Control Circuits

Action Taken: Elementary diagram review section of Review Plan LK-D-1905-C added Attribute 12 for the review of sneak circuits or relay races.

1.3.5 Circuit Protection Device

Action Taken: Attribute 29 was added to the elementary diagram section of Review Plan LK-D-1905-C, to review the acceptability of protective devices.

1.3.6 Alarm Circuits

Action Taken: Attribute 29 was added to the elementary section of Review Plan LK-D-1905-C, to include review of the validity of annunciator circuit design for the proper indication of alarm conditions and the avoidance of nuisance alarms.

1.3.7 Calculations

Action Taken: The sizing of restriction orifices FO-49-1D005A & B, flow element FE-51-2N014B and control valve LV-C51-2F053B were included in Review Plan LK-D-1906-C. Attribute 5 to Review Plan LK-D-1908-C checklist for vendor drawings/documents associated with LV-C51-2F053B discussed the review of vendor calculations for restriction orifice plate sizing and control valve sizing for adequacy. An attribute was added to Review Plan LK-D-1906-C for review of sizing of a flow element (FE-51-2N014B).

1.3.8 FSAR Commitment

Action Taken: An attribute was added to Review Plan LK-D-1907-C, to address compliance to Regulatory Guide 1.73.

1.3.9 Motor Operated Valves

Action Taken: Additional valves were selected for review under Review Plan LK-D-1907-C, to increase the sample review to three MOV's.

1.3.10 SCEW Data

Action Taken: An attribute was added to Review Plan LK-D-1907-C, to address this item during the E/Q walkdown.

1.3.11 Vendor Documents

Action Taken: This issue referred to the verification that applicable requirements given in vendor operating and installations were correctly translated to plant maintenance and surveillance instructions so that equipment qualification and performance could be maintained. Ultimately, the maintenance attribute was included in Review Plan LK-D-1907-C, and surveillance instructions were evaluated on a sample basis for several pieces of equipment.

1.3.12 Discipline Interfaces

Action Taken: The interface aspect of operational requirements was included in Review Plan LK-D-1909-C for the interface of I&C with Mechanical Systems (Mechanical to I&C). Evaluation of sample instrument tap location was included in Review Plan LK-D-1909-C for interface of I&C to Mechanical Systems. The review of power quality (power supply requirements) against a sample instrument was evaluated in the Review Plan LK-D-1909-C, interface review checklist for the interface between I&C/Electrical. The process by which I&C identifies which loads require Class 1E power is evaluated in Review Plan LK-D-1909-C interface review checklist for I&C to Electrical.

1.3.13 RHRSW Process Monitor

Action Taken: The evaluation of the background for the RHRSW radiation monitors for the prevention of an undesirable automatic isolation of the RHRSW system was added to the interface review checklist for the interface between I&C/Mechanical System. The review is documented in Review Plan LK-D-1909-C, Section 4.1.

1.3.14 Design Change Documentation

Action Taken: Attribute 5 was added to Review Plan LK-D-1910 (all disciplines) to provide the requested evaluation.

1.3.15 Instrument Line Pulsation Dampeners

Action Taken: Attribute 8 of the checklist for instrument installation details section of Review Plan LK-D-1904-C, included review of pulsation dampeners in the RHR mode systems, where applicable.

1.3.16 Computer-Based, Safety-Related Systems

Action Taken: Attribute 6 was added to Review Plan LK-D-1908-C checklist for vendor drawings/documents to verify and validate that real time computer software had been adequately implemented. Attribute 6.7 of Review Plan LK-D-1906-C checklist for procurement specifications also reviewed this aspect. The review focused on the radiation monitoring system.

1.3.17 Instrumentation Channels

Action Taken, Item (a): Previously discussed in item 1.3.13.

Action Taken, Item (b): Previously discussed in item 1.3.7.

Action Taken, Item (c): Additional checklists were added in Review Plan LK-D-1905-C, to provide a review of RHRSW pump control.

Action Taken, Item (d), (e): Review Plan LK-D-1905-C checklist for equipment nos. PT-42-2N090B&F and PT-42-2N094B&F evaluated the system design for manual heat removal (CHR mode). Details described in Attachment 3. The Review Plan LK-D-1905-C checklist for equipment LT-42-2N080A-D (reactor level 3) and PT-42-2N078A-D (reactor pressure) evaluated the design adequacy to verify the reactor pressure interlock for the protection for the protection of the low pressure piping system associated with the shutdown cooling mode was satisfactory. These actions satisfied the intent of the concerns.

Action Taken, Item (f): Attribute 25 of the elementary section and Attribute 12 of the logic/FCD section of Review Plan LK-D-1905-C include a review of the remote shutdown/Appendix R interface.

Action Taken, Item (g): Attribute 30 of the elementary diagram checklist of Review Plan LK-D-1905-C was added to include a review of isolation devices with respect to electrical surge suppressions.

1.3.18 Additional Clarifications

Action Taken: Addressed as applicable in individual review plans. Consistency of wiring identification was verified in Review Plan LK-D-1905-C, between the elementary/schematic diagrams and the Electrical Circuit Schedule in lieu of wiring diagrams. Bechtel does not prepare wiring diagrams.

1.4 Mechanical Components Discipline

1.4.1 Piping Analysis Overlap Techniques

Action Taken: SWEC added an attribute in Review Plan LK-D-1902-MC and later followed up with DAI-064.

1.4.2 Seismic Qualification of RHR Heat Exchanger

Action Taken: SWEC expanded the EQ Review Plan LK-D-1907-C,

to include review of the seismic qualification of the RHR heat exchanger and supports and MOV's HV-51-2F047B, HV-51-2F048B, HV-51-2F017B and AOV HV-51-258B. SWEC added review of ADS accumulator tank and supports under Review Plan LK-D-1908-MC, for vendor document review.

1.4.3 Internally-Generated Missiles

Action Taken: SWEC pointed out that the attribute was already covered in Review Plan LK-D-1912-MC (Attributes 2, 3, 4, 5). No further action was required. SWEC added attribute 8 in the site walkdown Review Plan LK-D-1914-MC.

1.4.4 Multi-Discipline Hazards Analysis Review

Action Taken: No SWEC action required. SWEC explained that various checklists in Mechanical Systems and Mechanical Components discipline do include all above attributes, and that multiple-discipline involvement will be required in the process of completing the review and the checklists.

1.4.5 Field Audits

Action Taken: The design related attributes were added to Review Plans LK-D-1901-MC (Section 4.1.2, Attribute 3), 1903A-MC (Attribute 12), 1903B-MC (Attributes 6, 7, 8), and 1904-MC (Attribute 2) to address the recommendation.

1.4.6 Design Criteria Documents

Action Taken: Modified Attribute 21 to clarify the intent.

1.4.7 Pipe Stress Analysis

Action Taken: No SWEC action required. SWEC explained that there is already an Attribute (#10b) in Review Plan LK-D-1903A-MC to address this.

1.4.8 Pipe Support Design, Weld Length

Action Taken: SWEC explained that the attribute for evaluating actual stresses was to be checked for all pipe supports, since there was no * marked against it. All other characteristics were addressed in various attributes, but were clarified or expanded as necessary within Review Plan LK-D-1903B-MC as follows:

a. Attribute #29
b. Attribute #34
c. Attribute #35
d. Attribute #40
e. Attribute #49
f. Attribute #62, 63 and Review Plan LK-D-1904-MC for drawings.

1.4.9 Support Amplification

Action Taken: This aspect is already covered by inclusion of the review of seismic qualification of heat exchanger and supports, and the review of vendor calculation for Accumulator

tanks, including supports. No additional action was required.

1.4.10 Additional Clarifications

Action Taken: Specific FSAR sections were appropriately listed in the review plans as a result of this comment.

1.5 Civil/Structural Discipline

1.5.1 Floor Slab Flexibility

Action Taken: An attribute was added to Review Plan LK-D-1903-S (Section 4.6, Attribute 12) to address this issue.

1.5.2 SRV Hydrodynamic Loads

Action Taken: A platform above the suppression pool, which is subjected to pool swell loads, was selected for review under Review Plan LK-D-1903-S. Structures in the reactor building, which were selected, were reviewed to ensure that all loads, including SRV loads, were considered in the design.

1.5.3 Category I Structures

Action Taken: No SWEC action required. Interaction of non-seismic buildings with seismic Category I buildings was considered in the review by reviewing the structural design criteria to determine if provisions are made to consider the possibility of interaction. This was already included in Review Plan LK-D-1902-S. Design of the steel framing, which supports one of the main steam relief valve air accumulator tanks, located at El. 279'-6" in the reactor building, was selected for review. Completion of this action was verified by the NRC during the week of January 3, 1989.