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ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

March 21, 1985

Docket 50-461

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Clinton Independent Design Review

Dear Mr. Schwencer:

Illinois Power Company (IP) has reviewed the final report of the Independent Design Review (IDR) of the Clinton Power Station issued by Bechtel Power Corporation in January, 1985. As stated at the meeting in Chicago on March 7, 1985, IP considers that the objectives of the IDR have been achieved and concurs in the basic conclusions reached by Bechtel as to the adequacy of the Clinton design and design process.

This letter is in reply to your letter of March 1, 1985 which requested certain specific action. Attachment 1 addresses each of the four sections of your letter. Section 3 of Attachment 1 provides responses to each of your specific questions or requests for clarification; Section 4 contains the results of our review of the 10 categories of causes tabulated by Bechtel in Table 2-2. In each instance where IP believes that the cause does not represent a trend, the basis for this conclusion is provided; where we believe a trend has been identified, specific corrective action measures are described with respect to future design activities.

From the review of the IDR a total of one hundred twenty-eight commitments were developed and included in the commitment control program at Clinton. A scheduled completion date has been entered for each commitment. The commitments were developed from three sources: (1) the commitments made in resolution of Observation Reports (OR's); (2) information that was being developed, or other work in progress that was referred to in responses to Bechtel's requests for information (RFI's); and (3) construction conditions identified by Bechtel during field walkdowns.

The managements of Sargent & Lundy and Illinois Power will follow the close-out of the identified commitments to assure quality and completeness. In addition, we will assure that the corrective actions associated with trends that involve new procedures, standards, training, etc., as described in Section 4 of Attachment 1 are fully and properly implemented.

Encls
To: Milhoan QAB
Imbro QAB
Goddard DELD
B. Siegel
Reg File
NRC POR
NSIC

B001
1/10

All of our activities necessary to close out the commitments discussed earlier are scheduled for completion during 1985, with one exception - hot gap measurements - which cannot be completed until after reactor start-up. The corrective actions relating to trends are already being implemented.

Illinois Power believes that successful completion of the NRC's forthcoming visits to Sargent & Lundy and Bechtel will complete Bechtel's performance of the IDR. We understand that it will be Illinois Power's responsibility to close out the IDR with the NRC.

Please do not hesitate to contact me or J. D. Geier if you have any further comments or requests for information.

Sincerely yours,

D. P. Hall
Vice President

JDG/lab

Attachment

cc: See attached distribution list

Clinton Power Station

Independent Design Review
Standard Distribution List

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Rev. 2
01/03/85

ILLINOIS POWER's
RESPONSE TO INITIAL NRC STAFF ASSESSMENT

1. Items Requiring Additional Action

In this section of the March 1, 1985 letter the NRC referred to 13 specific ORs which remain open for reasons indicated. Each of these ORs is currently being tracked through the IP Commitment Control System. Attachment 2 to this letter includes the pertinent status and scheduling information related to these items. All such work, with the one exception of hot gap measurements, is expected to be completed by the end of 1985.

Also listed by the NRC are 20 ORs which entail FSAR changes. These will be covered in FSAR Amendments 34 and 35 which are scheduled for submittal to the NRC in June and September 1985 respectively.

2. Items for Further Evaluation

IP has no comments on this section of the NRC letter pending the outcome of the NRC inspections presently scheduled at Bechtel in late March and S&L in early April of this year. It is our belief that the areas to be reviewed will be adequately covered by information which will be available at these inspections and other information presented at the March 7 meeting in Chicago. In the event additional information is required, it will be provided.

3. Specific Questions or Clarifications

A written response was requested for the items listed in this section of the NRC letter. Accordingly the following paragraphs address each item listed therein.

MECHANICAL DISCIPLINE

OR No.	Question/Clarification
21	Will as-built verification use the new standard that verifies perpendicular friction forces?

OR No.

Response:

Yes. S&L will include perpendicular friction forces, per the new standards, for supports that will be reassessed during the as-built verification program.

25 Question/Clarification

Did S&L find any valves not meeting the rigidity criteria?

Response:

Yes. S&L identified some cases of flexible valves. These are being qualified using the methodology below:

S&L has performed a generic study. Representative piping systems were considered using a detailed finite element representation of the valve assembly to account for its flexibility. The results of this study were compared with similar cases where the valves were modelled as rigid in the piping analysis. Amplification factors resulting from this comparison will be used to evaluate flexible valves. S&L will use the results of this study to qualify the flexible valves.

30/79 Question/Clarification

A) Were backseat leakage tests actually performed by the vendor?

B) If timing tests were not performed at design differential pressure, how are FSAR committments regarding time requirements demonstrated?

Response:

A) Backseat leakage tests were performed by the vendor. The valves were required to comply with ASME Code requirements which includes MSS-SP-61. MSS-SP-61 requires seat closure testing. Procedures submitted by the vendors include mainseat and backseat leakage test requirements based on valve design. Representative code data packages have been reviewed which confirm that mainseat and backseat leakage testing was performed.

B) The purchase specifications for these valves require that they be functionally tested to verify operation which includes cycling (opening/closing) times. In addition, IP, as part of their preoperational testing, also verifies that valve opening/closing times meet the FSAR commitments. There are no Code or regulatory requirements which require valve timing tests at differential pressure. Valve procurement specifications include requirements for valve opening and closing times, and in addition, the design conditions for which

OR No.

the valve must operate including differential pressure. Vendors' compliance with specification requirements is demonstrated through a combination of documentation review, shop testing, preoperational testing, and experience with comparable valves.

33 Question/Clarification

What were the results of the S&L review?

Response:

S&L has completed their evaluation of Section F4.7.6 of Checklist MAS-CQD-2.3 for all Class 1E Electrical Equipment Qualification (EQ) packages. The results show that the original qualification status of the equipment was not affected or changed due to this review. Checklist entries in Section F4.7.6 for 10 EQ packages from a total of 75 were revised to specifically reflect the information provided in the vendor test report. This work will be done by September 1, 1985.

36 Question/Clarification

Is there a calculation to document this information? Was the non-safety piping analyzed for seismic II/I? If so, what was the methodology of this analysis?

Response:

Sargent & Lundy's commitment on the Clinton Project regarding seismic II/I is that all non-safety related systems, structures and components in seismic category I buildings will not fail after a seismic event in such a way as to impair the operability of safety-related equipment. Areas where this is evaluated include piping, HVAC supports, electrical supports, electrical/mechanical equipment, anchorage, conduit supports, galleries, etc.

Bechtel reviewed S&L's calculations in these areas and they were all found to be acceptable except for OR 36 regarding non-category I MCC's, HVAC fans and CO2 control panels.

Calculations were performed to design the anchorage of non-seismic category 1 equipment in seismic category 1 buildings for dynamic loads which include the Safe Shutdown Earthquake (SSE). However, calculations are not performed to assess the structural integrity (except for the anchorage) of non-seismic category I equipment in seismic category I buildings. In the three cases discussed in the OR, (MCC's, HVAC fans and CO2 control panels), the equipment vendors assured S&L through documented telephone calls that the non-seismic category I equipment was fabricated similar to the seismic category I equipment. S&L has performed a field walkdown of the non-category I MCCs and HVAC fans and found them to be similar to category I MCCs and HVAC fans. S&L has also reviewed vendor drawings for the

OR No. non-category I CO2 panel with category I panels and found them to be similar. The above equipment is representative of non-seismic category I equipment in seismic category I buildings.

In regard to the methodology of the analysis of non-safety piping for seismic II/I, refer to the response to the NRC question/ clarification regarding Appendix D; page D.2-63.

43/48 Question/Clarification

What provisions for corrosion protection were made for non-buried ferritic pipe? What corrosion allowance or other corrosion protection was employed?

Response:

Those ORs' specifically addressed non buried ferritic pipe in the SSW system. The corrosion allowance for this pipe in the CPS design, except as noted below, was at least 0.08". This result is based upon internal pressure calculations. All ferritic valves in the system were specified and procured with the same minimum corrosion allowance - 0.08".

Area replacement calculations for two stub-in connections were performed in accordance with the ASME Code Section III formula by the piping contractor using zero corrosion allowance. There are no code or regulatory requirements stipulating that a corrosion allowance is required. This is the responsibility of the designer. The available technical literature indicates that the empirical formula used is conservative. This conservatism is also supported by operating experience with piping designed in accordance with the formula.

45 Question/Clarification

Identify the specific water levels or criteria used to assure that seal design and testing is adequate.

Response:

Sargent & Lundy calculation MAD-84-617-751 determined the maximum static head of oil and water that the seal would encounter. This level was determined to be approximately 10 inches of water. This amount of water is contained by the curbing provided in the day tank room. This amount of static head was reviewed against the Bisco test report for the seal configuration utilized in the opening. The review of the Bisco test report determined that with approximately 10 inches of water, the leakage through the seal was less than 0.1 standard cubic feet per hour of air and therefore considered acceptable, since the equivalent leakage of water is negligible.

47 Question/Clarification

Were all plant penetrations evaluated or were only SSWS penetrations evaluated?

OR No.

Response:

The review performed by Sargent & Lundy included all plant penetrations which contain safety-related piping greater than 2" in diameter.

Bechtel reviewed the stress analysis results for all ASME Section III Class 2 & 3, 2½" and larger diameter penetrations of the type in question based on a list furnished by S&L. This OR does not apply to ASME Section III Class 1 penetrations.

58 Question/Clarification

Has it been confirmed that measured pump shut-off head pressure is less than design pressure through actual test data?

Response:

Yes, the pump shut-off head used to calculate the design pressure has been confirmed by pump tests performed by the vendor (Byron Jackson).

62 Question/Clarification

What documentation was reviewed by BPC in arriving at its conclusion?

Response:

The response spectra and the additional supporting documentation cited in S&L's response as Design Criteria Status Report from SED/SAD, submitted on January 4, 1985, was reviewed by BPC as follows:

1. Response Spectra Design Criteria DC-SD-02, Rev. 1 through 5
2. Memo from SED dated April 13, 1976
3. Memo from SD&DD dated July 14, 1977
4. Memo from SPE dated August 26, 1977
5. Letter SLS-N-13 dated August 26, 1977
6. Letter SLS-N-16 dated April 24, 1978
7. Letter SLS-N-39 dated September 17, 1979
8. Memo from SD&DD dated July 16, 1979
9. Memo from SD&DD dated July 17, 1979
10. Memo from SAD dated April 1, 1980
11. Memo from SAD dated February 13, 1980
12. Memo from SD&DD dated February 27, 1980
13. Memo from SD&DD dated May 14, 1980
14. Memo from SPE dated May 15, 1980
15. Notes of meeting - June 2, 1980

The above package included response spectra distribution memoranda and letters to General Electric, acknowledgement of receipt forms, and meeting notes that documented assessments.

OR No.

68 Question/Clarification

Will the drawing be revised or will the support be removed?

Response:

S&L has instructed the contractor to remove the external angular vertical plate in accordance with the strainer manufacturer's directions.

80 Question/Clarification

What was done to demonstrate the integrity of the epoxy coating?

Response:

The vendor has furnished epoxy coating to meet the design operating requirements of S&L Specification K-2880. This coating is used in similar water service applications, and the epoxy is applied under documented quality control procedures, which S&L has reviewed. Vendor experience with similar applications provides confidence in the acceptability of this application.

App D
D.2-10 Question/Clarification

Why was no OR prepared relative to the status of Safe Shutdown Analysis Report U-0586 being out of date and not available for review?

Response:

An OR was not prepared on the status of the Clinton Safe Shutdown Analysis Report since this was considered in process. The report was, however, reviewed from the point of view that it established an acceptable process for assuring that safe shutdown capability was adequately addressed. Bechtel did establish that the design procedure as described in the Safe Shutdown Analysis did represent a logical sequence of steps for verifying that safe shutdown capability is maintained following a fire and would satisfy the Appendix R requirements when updated.

App D
D.2-36 Question/Clarification

What is the basis for accepting the position that no pipe whip protection is needed for the post-accident sampling and monitoring system when this system is required to function post-accident?

OR No.

Response:

S&L does not protect the post-accident sampling and monitoring system from the effects of pipe breaks because it is designed as a non-safety related and non-seismically qualified informational system. The IDR team accepted this because;

°There are several diverse post-accident sampling and monitoring methods to provide the operator with information on the integrity of the fuel and the severity of an accident.

°Post-accident diagnostic information will be available to the operator without specifically protecting this system from localized pipe break effects.

°The Post-Accident Sampling and Monitoring System (PS) is not required to provide safe shutdown or to mitigate accident consequences. Thus, protection against pipe break effects is not required.

°A search of Clinton FSAR (Sections 3.6, 6 and 7) could find no commitment to protect PS. Examination of NUREG 0800 (Standard Review Plan) and Regulatory Guide 1.97 revealed no clear cut requirement to protect.

App D.
D.2-59

Question/Clarification

How are non-seismic floor drains protected from blockages by being pinched or due to collapse during a safe shut-down earthquake, since they are relied upon for flood control?

Response:

Piping floor drains at the Clinton Nuclear Power Station are supported to meet the requirement for ANSI-B31.1. A significant portion of this piping is embedded in concrete. For these piping sections which are essentially continuously supported, no credible failure mode exists. For the remaining piping sections, S&L calculation EMD-035270, Rev. 01, 8/27/82 demonstrates that piping supported to meet the requirements of ANSI-B31.1 will remain intact when subjected to the Clinton safe shut-down earthquake. Furthermore, detailed studies, which included actual model testing (Reference 1) conclude that there is insufficient energy in typical seismic motions to cause the formation of primary collapse mechanisms. The results of this study are consistent with the fact that no such damage was reported in 33 fossil plants throughout the United States which have experienced major earthquakes.

OR No.

It is Sargent & Lundy's position that based on the aforementioned studies and historical experience, the non-seismic floor drains at the Clinton Nuclear Power Station are sufficiently protected from blockages during an SSE and can be relied upon for flood control.

Reference 1; EPRI Piping and Fittings Reliability Program, RP-1543-9.

App D
D.2-63

Question/Clarification

What is the justification for the statement that non-safety-related pipe and supports in Seismic Category I building meet Seismic II/I criteria when they are designed to meet ANSI B31.1?

Response:

Calculation EMD-035270, Rev. 01, 8/27/82 is an assessment of the possibility of damage to safety-related items due to the interference of non-safety-related piping during the plant dynamic events. The assessment selected 17 representative piping models which were supported to meet only the requirements of ANSI-B31.1. Each model was analyzed for the combined loading of weight, thermal expansion, safe shutdown earthquake and pool dynamic events. This assessment concludes that piping designed in accordance with the requirements of ANSI B31.1 will remain intact when subjected to the Clinton safe shutdown earthquake condition. However, due to movement which could result in a potential impact to safety-related items, a walkdown program was established and is outlined in Clinton Project Instruction PI-CP-034.

Bechtel reviewed the S&L calculation EMD-035270 and found the assumptions, methodology, and conclusions acceptable. Bechtel also reviewed the Clinton Program for assessing and resolving potential interactions in the field. It was found that the Clinton instructions provided an acceptable and controlled method for establishing clearance requirements between safety and non-safety items and for resolving potential interactions.

App D
D.3.1-8

Question/Clarification

Identify the steps taken to prevent spurious actuation of valve actuators.

Response:

The updating of the Clinton Power Station Fire Protection Safe Shut-Down Analysis has not been completed. Hence it is not possible at this time to identify the specific steps to be taken should it be necessary to prevent spurious actuation of valve actuators. This will be addressed in the final Fire Protection Report.

OR No.

App D
D.3.2-5

Question/Clarification

What criteria was used for determining safe shutdown equipment?

Response:

The design process for providing adequate MELB spray protection to safety-related equipment was described in S&L Calculation 01ME4, Rev. 0, 7/15/82 which referenced GE document 22A7193, Rev. 0, "Mechanical Equipment Separation for Engineering Safety Features." The calculation consisted of an area-by-area review of the plant by systematically reviewing mechanical, electrical and instrumentation color-coded composite drawings covering each area of the safety-related buildings. All safety-related equipment was identified and entered on one of two tables for each area. The first table is a list of the safe shutdown equipment in each separation division. The second is a list of safety-related equipment in each separation division. The Safe Shutdown equipment were those identified in Clinton's Safe Shutdown Analysis for Fire Protection and GE Document 22A7193. Both the safe shutdown and safety-related equipment in a MELB area were postulated to be subjected to a MELB and the impact was assessed to assure that the plant could be safely shut down.

App D
D.3.5-25

Question/Clarification

Is there documentation to support the judgements that certain non-safety HVAC duct for the drywell cooling system will withstand SSE loads?

Response:

The IDR Team reviewed twelve calculations for the drywell cooling system HVAC duct supports and found them acceptable.

Computer models were used by S&L to analyze the HVAC supports. The IDR Team determined that appropriate seismic accelerations and damping values were used. The members and connections were then analyzed to determine the total applied stresses. All stresses were found to be below the allowable values. Therefore, the drywell cooling system's HVAC duct supports were judged by the IDR team to be adequately designed for seismic loading (SSE) and will not pose a potential II/I concern.

The non-safety ducts for this system are sized and designed to the same requirements as those for safety-related ducts.

OR No.

ELECTRICAL I&C DISCIPLINE

1 Question/Clarification

What is the basis for not revising the logic diagram to include a significant function like the time delay relay?

Response:

The specific function of the time delay relay is to allow voltage to be restored to the bus after a voltage loss and provide a delay for diesel generator load sequencing prior to automatically restarting the Shutdown Service Water (SX) pump. This function is an implementation detail associated with the diesel generator load sequencing and not with the SX pump operation. Therefore, it should not be shown with the logic functions for initiating SX pump operation.

10 Question/Clarification

What was the rationale for the design change in view of the discussion in OR-10?

Response:

The design was revised to fully comply with the FSAR commitment.

32 Question/Clarification

Is there a formal program to analyze associated circuits to ensure 1E circuits are not degraded?

Response:

Yes. When analyses of associated circuits are required to ensure that Class 1E circuits are not degraded below an acceptable level, calculations are performed in accordance with Sargent & Lundy Quality Assurance Procedure 3.08, Design Calculations.

34 Question/Clarification

Was voltage drop due to maximum cable length considered in resolving this observation?

Response:

Yes. The voltage at terminals of the solenoid valves was considered to resolve the OR. This included consideration for voltage drop due to the cable resistance for the maximum cable lengths.

OR No.

56 Question/Clarification

In the event of a fire, will the alarm in the Control Room activate if the Cardox System fails to inject carbon dioxide?

Response:

Yes. In the event of a fire in a Diesel Generator Room, the fire alarm in the Main Control Room will activate if the Cardox system fails to inject carbon dioxide.

76 Question/Clarification

Did BPC review the calculation that developed the 49,561 amp short-circuit current?

Response:

Yes. BPC reviewed Calculation 4536-EAD-1, Rev. 4 that developed the 49,561 amps.

App G
G-5
Item B Question/Clarification

Specifically what was the approved design commitment?

What criteria was applied with respect to separation distance between barriers and wiring external to the barriers?

Response:

The specific FSAR/Licensing commitments reviewed relative to separation and the documents reviewed to assess these commitments are listed in the IDR Final Report Appendix B-1, pages B.1-12 and B.1-13.

The criteria applied with respect to separation between barriers and wiring external to the barriers was S&L design criteria DC-ME-10-CF, GE Specification 22A7472 and the applicable notes on the installation drawings.

STRUCTURAL DISCIPLINE:

61 Question/Clarification

What safety factor did BPC calculate? What is the justification for using the SRSS method?

OR No.

Response:

1. The safety factor for the governing condition of normal water at El. 690' and SSE was calculated by BPC to be 1.013>1.0 on ABSUM basis. This calculation was conservative in that the analytical model:

   - Did not incorporate seven openings for bar grills and screens, i.e., enclosed tank was assumed.
   - Did not use one-half of passive soil resistance, but only earth-at-rest for the soil resistance was assumed.
   - Considered the side fill adhesion for stiffer clay in the lower range of data in Table 10-1 given in USN Design Manual NAVFAC DM-7 (1971).

2. SRSS method was used by S&L because they assumed that the building structure and soil mass have fundamentally different dynamic characteristics, and each have a separate dynamic response which are not in phase. This is shown by comparison of the fundamental frequencies of the soil mass (4 HZ), and the building (18 HZ) which shows that the dynamic response of the building and soil would be well separated. Hence S&L considered the SRSS combination appropriate.

66 Question/Clarification

What is meant by "seismic live load"?

Response:

Seismic live load is a uniform load on slab or grating areas with a magnitude of 50 PSF which is based on expected occupancy during plant operation. This load is the live load used in seismic, abnormal and extreme environmental load combinations.

Questions/Clarification

70 Was the mass of the diesel generator included in the dynamic system?

Response:

Yes. 115K for the diesel generator #524 and 200K for the diesel generator #78A were correctly included in the dynamic system analysis.

71 Question/Clarification:

The write up doesn't clearly describe exactly what the problem is. Further clarification is requested.

OR No.

Response:

a. The allowable bending moment capacities for the reinforcing steel arrangements were tabulated on page 1.2 of Calculation SD-Q30-21DG04, Rev. 0. Due to a misinterpretation of the code, some of the moment capacities listed were reduced to 25% less than allowed by ACI 318-71. A review of computer analysis showed that the design moments at locations in the base mat exceeded the reduced moment capacities. Formal documentation of the adequacy of the reinforcement was not available for review by the IDR Team.

   Subsequent review by S&L and the IDR team has shown that the design reinforcement is adequate.

b. The Structural Design Criteria DC-SD-01-CP, Rev. 6, Section 7.7.3 require that the finite element model be verified by a computer plot of the mesh with the soil pressure contours plotted on the mesh drawings. Such drawings were not available to the IDR Team. Therefore, it was unclear how the reinforcing was placed and what governed the extent (i.e. the cut-off location) of the reinforcing bars on Drawing S22-1010, Rev. F.

75 Question/Clarification

If the requirement is deleted, what is the maximum allowed strain in the concrete containment?

Response:

The requirement that the maximum limit for concrete deformation is up to 0.002 in./in. will be deleted from FSAR Section 3.8.4.4 for concrete structures other than the containment, drywell structure, containment pools and equipment rooms.

The maximum allowed strain in the concrete containment will remain unchanged, limited to 0.002 in./in. as stated in FSAR sections 3.8.1.5.1 and 3.8.3.5.1 consistent with the requirement of ASME B&PV Code, Section III, Division 2, Section CC-3400.

83 Question/Clarification

Why was the roof thickness originally established as two feet?

Response:

The roof thickness for CWSH was originally established in Calculation SD-Q10-04AG03, Rev. 0, dated 5/15/80 to be 1'6" to resist missile impact. FSAR Table 3.5-6 was added later for record purposes in Amendment 3, dated April 1981, where incorrectly one value of 2'0" for the roof and walls thickness was shown instead of separate values of 2'0" for the walls and 1'6" for the roof as designed. This table will be revised.

4. On-Going Corrective Action

Table 2-2 in Section 2 of the IDR Report provides a tabulation of ten causes of IDR Observation Reports.

In response to Section 4 of the NRC letter of March 1, 1985, Table 2-2 has been reviewed. For each of the ten causes either a trend has been identified and the following responses describe specific corrective action; or the cause does not represent a trend and the responses identify the basis for such a conclusion.

Our analysis of the ten causes indicates that the trends are:

1. Engineering Judgement Documentation
2. Document Change Control
3. FSAR Control
4. Design Communication
5. Vendor Document Review

Our analysis of the 10 causes indicates that the following are not trends:

1. Code Compliance
2. FSAR Commitment/Design Requirements
3. Other Isolated Items
4. Definition of Interfaces
5. Definition of Design Inputs/Outputs

Our review of each of the above items follows:

A. Trends

1. Engineering Judgment Documentation*

Bechtel found a number of situations where it believed Sargent & Lundy's judgments were not appropriately documented, or where documentation left some doubt about the ability of an independent reviewer to reach the same conclusions as Sargent & Lundy. When Sargent & Lundy engineers performed calculations or analysis to confirm their judgments, the design checks confirmed that the design is capable of performing the required function.

Thus, the trend identified by the IDR Team pertained to the absence of documentation of the engineering judgments and not to the adequacy of the judgments made by Sargent and Lundy.

Sargent and Lundy has recognized the need for improvements in the area of documentation of design work, especially documentation of engineering judgment. By revising the QA Procedure on Design Calculations (GQ-3.08 1/31/85), and three Departmental Standards on Design Calculations (SAS-22 5/11/84, MAS-22 6/25/84 and ESI-253 8/6/84) S&L has strengthened the requirements for proper documentation of design bases, including assumptions, formulas, steps used in the design, and the appropriate use and documentation of engineering judgment.

Training in the documentation of calculations and design input is provided to S&L engineers engaged in the design of nuclear facilities. Such training includes training on QA procedures by the QA division pursuant to Procedure GQ-2.04 and training by each engineering department on departmental standards and procedures and on Project Instructions pursuant to Procedures GQ-2.05 and GQ-2.07.

*OR's 5, 6, 18, 19, 21, 23, 36, 38, 40, 44, 55, 57. 59. 60. 61, 62. 63, 64, 66, 71, 72, 73, 77, 81

2. Document Change Control *

Bechtel attributed fifteen observations to lack of rigorous document change control.

Although we agree with the IDR Team's conclusion that, considering the number of changes involved in the design of a nuclear plant, in general, the S&L process for documenting changes is effective and provides adequate control, a number of steps are being implemented on the project to provide improved document control.

On the Clinton project, the project design criteria documents are maintained current. The Clinton Action List has recurring action items for the S&L Project Manager to notify the project team of the need to review their respective design criteria for any changes and to issue revisions as required.

A new project instruction, PI-CP-071, dated March 1, 1985 (Procedure for Incorporating Changes into Affected Documents) has been issued to assure that, when a field design change is made, the affected documents are identified and the incorporation of the change into these documents is monitored. In addition, the effect of the change on the FSAR, the calculations, the technical specifications and any other design documents is identified. This procedure supplements the procedures which are already in place.

A revised design change control procedure in the form of a new Project Instruction (PI-CP-073, Procedure for Preparation of Design Change Package) is also being implemented which provides the requirements for the preparation of Design Change Packages. These packages will be prepared whenever a major design change is identified. The packages will then be reviewed to determine when and how they will be implemented. This procedure provides improved control of design changes.

To assure compliance with licensing commitments, a design review group is being established to evaluate the effects of future changes on the project criteria for separation, postulated pipe rupture, flooding and other common requirements.

These actions will improve document change control in connection with any future design changes.

*OR's 1, 15, 24, 28, 29, 38, 43, 46, 55, 57, 59, 64, 67, 69, 73

3. FSAR Control *

Bechtel identified a number of discrepancies between the FSAR and design documents. In each case resolution of the discrepancy required a modification of the FSAR rather than a design change. Bechtel concluded that the nonconformances identified did not appear to affect design adequacy.

Assuring that the FSAR is consistent with the actual design of the plant is an ongoing Sargent & Lundy commitment. Although, as noted by Bechtel, it is not uncommon for the FSAR to lag slightly behind the actual design of the plant, steps are being taken to assure the FSAR accurately describes the design.

Prior to the IDR an FSAR Certification Program was initiated for Clinton. In addition, as described previously under Document Change Control, procedures have been adopted to assure that all design changes are reviewed to determine if they have an effect on the FSAR and to assure that all FSAR commitments are satisfied.

The FSAR Certification Program and the improved document change control procedures should assure the accuracy of the FSAR and that the FSAR will reflect any future changes in design.

* OR's 7, 12, 14, 17, 24, 30, 46, 63, 69, 70, 72, 75, 79, 83

4. Design Communication *

Bechtel found that "in some cases, there was some doubt that the design intent will always be properly communicated to affected design groups." Nevertheless, it concluded that "...overall, where this situation seems to have been the cause of the observation, close examination of the context of each item revealed that the overall design process was functioning properly and the specific design conditions were adequate and in conformance with the design criteria and licensing commitments."

Sargent & Lundy has taken actions to enhance the design communication process in specific areas through the additional documentation requirements detailed in the responses to individual observations.

In addition, Sargent & Lundy has issued a new procedure on design information transmittal (GQ-3.17 (5/1/84)), to formalize the transmittal of design information between project team members in the various disciplines. This procedure covers the transmittal of design input which is not already addressed in existing standards or procedures. It requires documentation of the basis for design information, including identification of preliminary design inputs.

These actions should improve communications of design requirements between groups in future design work.

* OR's 13, 20, 21, 38, 39, 43, 46, 51, 52, 55, 57, 64, 73

5. Vendor Document Review *

Upon review of a large number of equipment qualification packages, Bechtel identified six instances where vendor document review was not complete or accurate. Three instances pertained to equipment dynamic qualification, and three pertained to environmental qualification. In each instance Bechtel concluded that sufficient qualification data were provided by the vendor or developed by Sargent & Lundy to support the qualification of the equipment.

With respect to seismic qualification, Sargent & Lundy had underway an on-going program to review seismic qualification packages in accordance with a revised Checklist MAS-CQD-2.4 (11/11/82) in preparation for the Seismic Qualification Review Team (SQRT) audit. Several discrepancies identified by Bechtel were found with respect to items not yet reviewed under the revised checklist. Sargent & Lundy has committed to continue the planned evaluation of seismic qualification in accordance with the revised checklist. This should preclude those discrepancies identified by Bechtel. The only other discrepancies relating to seismic qualification involved isolated instances where additional calculations were obtained or developed to reinforce previous conclusions of equipment acceptability.

In summary, for the environmental qualification area, S&L took the following steps to assure that the program was sound.

1) management attention was given to reviewing the questions contained in the Checklist to assure S&L that the questions were precise.

2) training was instituted on the section of the Checklist which was inconsistent with the vendor reports, and

3) one section of all completed EQ packages as identified by the IDR was reviewed for inconsistencies.

The foregoing actions should improve equipment qualification document review in connection with any additional procurement.

* OR's 29, 33, 34, 65, 74, 82

B. Non-Trends

1. Code Compliance*

Bechtel identified six observations where compliance with the ASME Code was not evident in the design documentation reviewed by the IDR Team. One observation involved a code case that had been initiated prior to the IDR, and had been approved by the ASME Main Committee. The remaining observations either involved different interpretations of the code and the design was found to meet both interpretations, or involved a need for additional calculations to justify the initial work.

Bechtel concluded that the design was adequate in each case and that the conditions were of a random nature.

Illinois Power and Sargent & Lundy have reviewed each observation and also conclude that the instances are random. It is the policy of both organizations to adhere to Code requirements in accordance with licensing commitments. Successful implementation of this policy at Clinton is demonstrated by the limited number of observations found in the IDR Team's review of the many ASME items.

Accordingly no trend concerning Code compliance has been identified at Clinton and no corrective action is necessary.

* OR's 9, 16, 22, 23, 47, 84

2. FSAR Commitments/Design Requirements: *

Bechtel identified five observations in which FSAR commitments and/or design requirements were not fully met. For one observation, a design change was made to resolve the concern. For three observations, the concern was resolved by clarifying the FSAR, while the remaining concern was referred to the manufacturer.

The one observation involving a design change (OR10) resulted in changing the power source on two diesel generator "non-critical" protective trip device bypass relays to non-interruptible power supplies to eliminate a ten second time delay during a coincident loss of off-site power and loss of coolant accident. Bechtel concluded that this condition was not safety significant. Sargent & Lundy has also performed a documented review of other safety-related circuits to determine if conditions similar to those found in OR10 existed elsewhere. This review concluded that no other design changes were necessary.

Three OR's (4,43,48) involved discrepancies between the FSAR and other design documents.

OR 4 represented a concern that the analysis of piping systems and components in the diesel generator/control building did not consider the combination of seismic and hydrodynamic loads specified in the FSAR. An analysis by S&L found that the loads under review could be considered negligible and that this concern should be resolved by clarification of the FSAR.

ORs 43 and 48 involved the application of a corrosion allowance. An evaluation showed that all piping and valves in the SX system had an allowance for corrosion consistent with the FSAR, except for two fabricated fittings. However, these two fittings were shown to meet code requirements.

OR 11 represented a concern that electrical separation requirements in the FSAR, Reg. Guide 1.75 and IEEE 384-1974 did not appear to have been met. This has been resolved by a General Electric Company analysis issued to IPC with GE letter IP-2520, dated January 23, 1985 which concluded that no changes are required.

Based on the above discussion, there does not appear to be a common basis or one root cause for these ORs, and no trend could be identified.

* OR's 4, 10, 11, 43, 48

3. Other Isolated Items - Mistakes or Errors in Judgment *

Bechtel concluded that five observations in this category are not significant because the importance of each item was not great.

Three observations (OR's 11, 76, 80) contained no design error and no corrective action was required. OR 39 involved the question of interfaces between the Sargent & Lundy design disciplines and OR 47 related to the selection of a stress intensity factor. In both these OR's, the designs were shown to be adequate.

We have reviewed these findings, and identified no deficiencies which are significant to safety. This review confirmed Bechtel's conclusions that these were isolated deficiencies and indicated no trend.

* OR's 11, 39, 47, 76, 80

4. Definition of Interfaces *

Bechtel noted that numerous complex interfaces exist in the design of a nuclear power plant. Part of one observation (OR 43) involved an unclear definition of an interface. In this case, inconsistencies were cited among various documents. However, these inconsistencies occurred in the area of reference information. The design information (non-reference) was correct and was properly implemented.

This observation has not identified any inconsistency between design documents that was significant to safety. Since this was an isolated instance, no trend was established.

* OR 43

5. Definition of Design Inputs/Outputs *

Bechtel noted that, with multiple design interfaces and voluminous calculational requirements, "it is not uncommon to find less than perfect definition of design inputs and/or outputs." OR 27 describes the inertia between upper and lower tier battery cells and the adequacy of seismic load capacity at the battery terminals. Since the batteries were not installed per the vendor's drawing that was referenced on the S&L drawing, it was necessary for Sargent & Lundy to calculate the seismic loads of the bus tie cables on the battery terminals for the actual lengths of cables installed. These calculations demonstrated that the system as installed was acceptable. No further corrective action is necessary since the design was shown to be adequate. As such, this OR does not indicate a trend.

* OR 27