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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

August 9, 1984

Alan Samelson, Esq.
Assistant Attorney General
Environmental Control Division
500 South Second Street
Springfield, Illinois 62706

In the Matter of
ILLINOIS POWER COMPANY, et al.
(Clinton Power Station, Unit 1)
Docket No. 50-461 OL

Dear Mr. Samelson:

Enclosed for your information is the NRC staff's response to Illinois Power Company's Revision 1 of the Clinton Independent Design Review Program Plan.

Sincerely,

Richard J. Goddard
Counsel for NRC Staff

Enclosure: As Stated

cc: (w/enclosure)
Richard Hubbard
Sheldon A. Zabel, Esq.

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NUCLEAR REGULATORY COMMISSION
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AUG 6 1984

Docket No. 50-461

Mr. D. P. Hall
Vice President
Illinois Power Company
Clinton Power Station
Post Office Box 678
Clinton, Illinois 61727

Subject: Clinton Independent Design Review (IDR) Program Plan

Dear Mr. Hall:

Your letter to me of July 17, 1984 stated that your review of Bechtel Power Corporation's (Bechtel) proposed Independent Design Review (IDR) Program Plan had identified several improvements which were being incorporated by Bechtel in accordance with Mr. J. D. Geier's letter to Mr. C. W. Dick dated July 17, 1984. You further stated that Bechtel was expected to complete incorporating those improvements and to submit a revision to its IDR Program Plan by July 20, 1984. You requested that the NRC review and approve the IDR Program Plan. Subsequent to your letter of July 17, 1984, Bechtel submitted the revised IDR Program on July 19, 1984. The revised IDR Program Plan is identified as Revision 1 and is the subject of this letter.

We note that Illinois Power Company's letter of July 17, 1984 to Bechtel concerning improvements to the Program Plan result in an expansion in scope of the IDR. We also note that Illinois Power Company specifically instructed Bechtel to assure that the reviews to be performed are broad enough for Bechtel to reach meaningful conclusions regarding the overall design of Clinton. We see such actions and statements as positive signs of Illinois Power Company's commitment to the assurance of quality in the design process for Clinton.

The staff has reviewed Revision 1 of the Clinton IDR Program Plan and finds it acceptable subject to satisfactory resolution of the attached comments. As you are aware, when we held the public meeting on June 28, 1984 the Program Plan was still under development. Had the Program Plan been available, I am sure many of the comments would have been resolved at that meeting.

As you may be aware, Mr. Samelson, Assistant Attorney General, Environmental Control Division, State of Illinois, in a July 18, 1984 letter indicated that on March 5, 1984, the State of Illinois submitted an independent audit proposal for the parties' consideration in the course of settlement negotiations on Contention 2 in the Clinton Licensing Hearings. Mr. Samelson has requested an opportunity to discuss the terms of the proposed independent audit program.

Mr. Goddard, NRC staff attorney for Clinton has spoken with Mr. Samelson and with Mr. Zabel, representing Illinois Power Company, and a meeting of all of the parties to discuss the State of Illinois' views has been tentatively scheduled for late August.

Sincerely,

A. Schwencer, Chief
Licensing Branch #2
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure:
Staff Comments

NRC STAFF COMMENTS ON REVISION 1 OF THE CLINTON IDR PROGRAM PLAN

1. For the vertical portion of the IDR, two systems have been selected: the high pressure core spray (HPCS) and the Class 1E ac electrical distribution system. The HPCS is a relatively simple system without redundancy requirements. Issues such as single failure protection and high energy line break protection are relatively minor issues if the scope of the IDR is limited in the mechanical design area to the HPCS. In addition, the HPCS may have been extensively pre-engineered by General Electric. A selection of a mechanical system substantially independent of General Electric influence may provide a better cross section to examine the design process employed by the Architect Engineer. However, it is also important to examine General Electric/Sargent and Lundy interface requirements. Thus, there are competing requirements for mechanical system selection. Therefore, it is the staff's position that another mechanical system substantially independent of General Electric influence and also representative of complexity of other systems at Clinton be added to the IDR or justification be provided for not doing so.

2. Page ii - The definition of an observation should be expanded to include all errors, inconsistencies, or procedural violations. The current definition does not appear to include such items. For example, deviations from established design control procedures should be identified as an observation. Regardless of the impact on the design it is important to know that design control procedures were adhered to. If the independent design review identifies numerous instances of design control procedural violations, then one has a data point useful in arriving at a conclusion concerning unreviewed safety-related systems. Conversely, if the independent design review identifies few design control procedural violations and no design deficiencies, then one can reasonably conclude that other portions of the designs are adequately controlled.

3. Page 4 - It is stated that implementing procedures will comply with the applicable requirements of the quality assurance program, and some will be based upon the standard Bechtel Engineering Department Procedures (EDPs). Please provide a description of those implementing procedures not based on EDPs, and indicate who will approve the procedures.

4. Page 5 - It is stated that the review will cover mechanical, electrical, environmental, instrumentation and control, plant arrangements, and fluid system aspects of the design of each system, as well as relevant nuclear engineering and structural design. Please describe in further detail how the civil/structural aspects of design will be covered. It was agreed during the June 28, 1984 meeting (transcript pages 89-90) that the IDR would evaluate the adequacy of the structure housing the system (mechanical system) with regard to loads being safely transmitted into the building. This aspect is not described in the IDR Program Plan. In this regard, we would expect the review to evaluate the safe load path from the system support to the building foundation.

5. Page 6 - Although the Program Plan states that the extent of the review in any given area will depend upon the importance to safety of the area and what is found during the review, the Program Plan is not clear whether the review team will look at the same design aspect within another safety-related system given significant deficiencies or recurring observations. The IDI team's experience indicates that if a certain design aspect is deficient or improperly handled on one system it is necessary to examine the same design aspect on another system to ascertain whether or not a generic deficiency exists. We believe Bechtel should do enough examination of design to determine if generic deficiencies exist.

6. Page 8 - Note 1 of Table 1 of the Program Plan appears to be incomplete. The note attempts to provide information with respect to what is included in the review of a subject area. The note should be annotated to indicate that the listings which follow are typical and not complete. Many design documents are not included such as logic diagrams, piping and instrumentation diagrams, piping layout drawings, piping isometric drawings, stress isometric drawings, etc.

7. Page 9 - It is stated that the review team will compare the list of design requirements to the inputs used by Sargent and Lundy in developing designs or other documents, such as specifications. The Program Plan further states that in doing the above, due recognition will be given that there are many ways design requirements may be specified and where interpretations of requirements are made, the justifications for apparent deficiencies will be sought. It is not clear why the Program Plan contains these qualifiers. The American National Standards--ANSI N45.2.11 and NQA-1--related to quality assurance for design requires that design inputs be identified, documented, and their selection reviewed and approved. Changes from specified design inputs including the reasons for changes are also required to be identified, approved, documented, and controlled. If Bechtel intends something different than the above, this should be clarified.

8. Page 11 - Bechtel describes in general terms how the accuracy and completeness of design documents will be judged. It is stated that "in judging accuracy and completeness of design documents, due recognition will be given to established professional engineering practices and other precedents established in the nuclear industry. This judgement will consider the level of detail needed to link design requirements with the output documents, and the process employed." IE Information Notice No. 84-54 indicates that a common finding in Integrated Design Inspections (IDIs) conducted by the Office of Inspection and Enforcement has been deficiencies in design base documentation and calculations for nuclear power plant structures, systems, and components. In some instances, the design activities were based on engineering judgements or assumptions rather than supporting calculations. The problems primarily concern the availability of valid up-to-date calculations supporting the design rather than the design itself.

   The Program Plan should be revised to state that where required calculations were not accomplished and where the design was apparently based on engineering judgements, these instances will be evaluated and documented in IDR reports.

9. Page 12 - It is indicated that the latest design revision will be considered as the basis of the review but an April 1, 1984 cut-off date will be established to permit valid assessment of previous work. Where design revisions beyond April 1, 1984 are used as a basis for review, these instances should be clearly identified in IDR reports. Bechtel should provide justification on an individual case basis in its IDR reports for consideration of design work beyond April 1, 1984. Bechtel should be prepared to assess whether the design review of sample systems selected was biased by work performed beyond April 1, 1984.

10. Page 13 - Sub-Task 2E describes Bechtel's field as-built review. The Program Plan is very general in this area and should be expanded or an example review plan prepared describing the field as-built review.

11. Page 14 - It is stated that in the event there are activities for which procedures were not followed, the actual practices used will be evaluated. The Program Plan should be revised to state that such instances will be documented and included in IDR reports.

12. Page 15 - It is stated that where procedural requirements are not available, the actual process will be evaluated to determine the extent to which the design is adequately controlled. The Program Plan should be revised to state that such instances will be documented in IDR reports.

13. Page 16 - Sub-Task 3F identifies elements of the design process which will be reviewed by the IDR team. Illinois Power has committed to follow ANSI N45.2.11 in the design process. Accordingly, we have the following comments concerning the list provided on page 16:

    - The documentation of design analyses and calculations should be in sufficient detail to permit verification and auditing as prescribed in ANSI N45.2.11.

    - Interface design control has been limited to external interface control (i.e., between Sargent and Lundy and General Electric and other design contractors). The sub-task element should be expanded to include internal interface design control. The control of design information between organizational units within the same contractor organization has been a recurring finding on IDIs.

    - Item 4 of sub-task 3F indicates that the IDR will evalaute the design reviews performed by Sargent and Lundy for technical adequacy. The IDR should also examine the design reviews performed by Illinois Power Company. Design reviews are only one of at least three acceptable verification methods. This element of the sub-task should be revised to ensure that design verification requirements as prescribed in ANSI N45.2.11 are fulfilled as a minimum.

    - The Program Plan does not identify that the design process system will be reviewed with respect to control of design documents. Both the IDI and CAT inspection teams have identified the failure to have the latest issue of drawings and other design documents at work locations. The consequence has been design errors and oversights. The IDR should contain some effort to ensure that design organizations have maintained proper control of documents used in their design efforts.

14. Page 18, Processing of Observations - All potential observations should be retained regardless of where in the process the observation was closed out.

15. The Program Plan does not provide sufficient detail to conclude that the interim and final report will provide the detail needed by the NRC reviewers to reach a conclusion as to the adequacy of the independent review. The NRC staff will discuss its recommendations for IDR Report content at a later date. Resolution of this comment is not a condition of approval of the Program but a detail to be addressed prior to publication of the final report.

16. Protocol - Item 3 of the protocol should not be construed as limiting discussions with the NRC. (The protocol need not be changed).

17. Protocol - Item 4 of the protocol should not be construed to apply to NRC inspection of IDR program implementation. NRC may visit Illinois Power, Bechtel, and Sargent and Lundy for its review of program implementation. These visits will be conducted without participation of the other parties involvement. Illinois Power Company and the party visited will receive prior notice. (The protocol need not be changed).

18. Example Review Plans - By its letter to Mr. Geier of July 10, 1984, Bechtel provided example review plans to illustrate, in more detail, the extent of what it planned to review under the Program Plan. Bechtel indicated the plans may be revised in order to be responsive to evolving developments in the review program. Based on our review of the example review plans it is obvious that an attempt has been made to do a detailed review of the design. However, our experience from the IDI program shows that substantial effort is required to do a detailed vertical review in a given area. It would require a tremendous level of effort in terms of staff to accomplish a vertical review of substance for the numerous items that the example review plans imply will be reviewed. The example review plans may be intended to convey what will be covered in a combined horizontal and vertical review. However, we are not certain how the checklists are to be used, i.e., for vertical review purposes, for horizontal review, or for combined horizontal and vertical review. It is requested that further details be provided on use of the example review plans. Additional information is needed for the example review plans to convey the depth of review in the vertical portion of the IDR and to provide confidence that a meaningful review will be conducted. Attachments 1 and 2 provide examples of the level of detail expected for two items -- HELB, page 3 and Electrical Separation, page 12 -- of the example review plans.

High Energy Line Break

OBJECTIVE

The objective of this portion of the inspection is to assess the adequacy of protection against high energy piping failures. To accomplish this objective a detail review of a sample of high energy line break locations inside and outside containment will be performed. The detail review will examine determination of break locations, determination of jet impingement loads and targets, determination of pipe whip loads and targets, engineering evaluation of the need for protection, and confirmation of affected targets by field inspection.

CRITERIA

ANSI/ANS 58.2-1980	Design Basis for Protection of Light Water Nuclear Power Plants Against Effects of Postulated Pipe Rupture.
General Design Criterion 4	Environmental and Missile Design Basis

INSPECTION DETAILS

a. Determine the design requirements per the licensing commitments in the FSAR, the responses to NRC questions, NSSS interface documents, and internal design instructions.

b. Select pipe break locations within the selected systems which have significant interaction with other safety-related systems. Consider selecting pipe break locations that have the selected system as a target, if the selected system does not contain high energy piping or break locations with significant affects on other essential systems. It may also be appropriate to evaluate interactions not involving the selected system in order to assess analyses of significant pipe break/target interactions.

c. Review design analysis which determine circumferential and longitudinal break locations. In particular for a circumferential break, examine the analysis which determines the limit on separation. Review analysis or experimental data used to arrive at the discharge coefficient. For a longitudinal break examine the analysis or test data used to arrive at the discharge area, diameter, and discharge coefficient. Verify that break opening time is consistent with the FSAR commitment.

d. For each selected break location review the evaluation of pipe whip effects for the following:

    1. Examine the method for determining fluid forces. Review the method of establishing the various flow and fluid transient characteristics in the selected pipes. Confirm that assumptions for the conditions (i.e., 102% reactor power or highest enthalpy) are used. Review and verify assumptions used to take credit for flow resistance losses between the break and the pressure reservoir. Compare critical flow model used to establish maximum flow through breaks and restricted regions of piping with the FSAR commitment.

2. Verify that the evaluation of piping response to fluid dynamic forces includes an evaluation which demonstrates that the total energy acquired would be dissipated in piping, restraints, and supporting structure and that the system would satisfy the requirements of static equilibrium.

3. If the postulated ruptured pipe is considered not to whip, verify that analysis exists to document the load carrying capacity of the pipe.

4. Confirm that the pipe whip loading has been transmitted to the appropriate disciplines for evaluating design adequacy of components and structures.

5. Review analysis to evaluate the consequences of pipe whip upon list of targets.

6. Confirm that the list of targets is complete by field verification.

e. For one break location examine the design of the pipe whip restraint. If the pipe whip restraint also serves as a pipe support confirm that the appropriate design rules from ASME B & PV have been applied.

f. For each selected break location review the evaluation of jet impingement effects for the following:

1. Examine the jet shape and direction and confirm that the model conforms to FSAR commitments. Verify that consideration was given to the movement of the jet centerline due to pipe movement from pipe-restraint interaction (including pipe whip).

2. Review jet target calculations which include the determination of jet loading.

3. Confirm that the jet loading has been transmitted to the appropriate disciplines for evaluating design adequacy of components and structures.

4. Review analysis to evaluate the consequences of jet impingement upon list of targets.

5. Confirm that the list of targets impacted is complete by field verification.

g. If significant deficiencies are found in the sample break locations, expand the inspection to include additional break locations.

Electrical Separation

OBJECTIVE

To examine the design provisions for electrical separation and physical independence of class 1E circuits.

CRITERIA

FSAR
REGULATORY GUIDE 1.75 REV. 2
IEEE 384 (74)
IEEE 420 (82)

INSPECTION DETAILS

a. Determine FSAR commitments made to regulatory criteria and industry standards by reviewing the FSAR and the electrical separation design criteria. Evaluate the separation criteria for conformance to regulatory commitments.

b. Review whether non-class 1E loads are supplied from class 1E buses. Determine adequacy of design features provided to ensure that non-class 1E loads will not degrade class 1E buses.

c. Review (on a random basis) interconnection drawings and cable tabulation lists to determine whether cables of the redundant division or non safety related cables are terminated in a panel which has divisional circuits. Perform a review of the related elementary and analog diagrams to determine whether isolation has been maintained between circuits of different separation groups.

d. Determine if "associated" circuits exist. Determine treatment of associated circuits. Is the design adequate?

e. Review analysis conducted to demonstrate acceptability of separation violations. Is the analysis detailed? Are all potential degrading effects on the class 1E circuits by the non 1E circuits properly analyzed?

f. Review the electrical construction specification to determine requirements provided to the contractor regarding electrical separation. Is the information provided to the contractor adequate and correct?

g. Perform a field walkdown to determine adequate separation group identification of equipment, cables, conduit, trays.

h. Perform a field walkdown to determine if separation was maintained for raceways (conduit and trays) in general plant areas and cable spreading areas.

i. Review separation criteria for cables in "free air." For example, cables exiting trays in the cable spreading areas and running to panel cable entrances.

j. Perform a field walkdown of randomly selected panels to determine if separation violations exist for internal panel writing.

k. Perform a random review of the location of safety related electrical equipment to determine adequacy of separation.

l. If significant deficiencies are found in the sample inspections performed above, expand the inspection sample to determine if a generic problem exists.