The Light company Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

September 13, 1983
ST-HL-AE-1003
File Number: C22/G2/G25

Mr. Thomas M. Novak
Assistant Director of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Novak:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Isolation Valve Cubicle Roof Design

On July 14, 1983 representatives of Houston Lighting & Power Company (HL&P) and Bechtel met with members of your staff to discuss the South Texas Project (STP) proposed design for the roof of the Isolation Valve Cubicle (IVC). As a result of that meeting, the NRC requested that supplemental information be provided. HL&P committed to provide a description of the various design/analysis alternatives which were evaluated as part of the IVC design and a detailed report regarding the probabilistic evaluations for hurricane and tornado-generated missiles. The attachments to this letter provide the requested information. A summary of the attachments is discussed below.

Attachment #1 provides a comparison of the various design alternatives which were considered, including estimates of the cost and schedule implications for each. In addition, the advantages and disadvantages of each alternative are provided. Based upon this comparison, we believe the IVC roof design without tornado missile protection to be justified.

Attachment #2 provides a report regarding the probabilistic evaluation of hurricane-generated missiles and their potential impact to the IVC roof. The results indicate that hurricane-generated missiles are not a significant hazard to the IVC and that no physical barriers are required for the roof. Hurricane Alicia is not addressed in this analysis. However, preliminary information obtained from the National Weather Service indicates that this hurricane would not affect the outcome of the analysis. A straight-line wind of at least 180 m.p.h. is required to generate a missile of the type that was identified and evaluated in the study performed by the Electric Power Research Institute (EPRI). Therefore, only tornadic winds pose a potential for missile generation that needs to be considered in the probabilistic evaluation.

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Lastly, Attachment #3 provides a report regarding the probabilistic evaluation of tornado-generated missiles and their potential impact on the IVC roof. The results indicate that tornado-generated missiles are not a significant hazard to the IVC and that no physical barriers are required at the top of the IVC to protect equipment located in the IVC from potential tornado-generated missiles. The median value for the probability for tornado missile damage to the IVC equipment of $2x10^{-10}$ per year is well within the NRC acceptance criteria of 10^{-7} to 10^{-6} per year (as identified in the Standard Review Plan (SRP), Section 2.2.3).

It should be noted that significant conservative assumptions are used in the probability analysis. As summarized on pages 3 and 4 of Attachment #3 these conservatisms provide significant added justification for the proposed IVC roof design. In particular, the design of individual compartment walls up to the IVC roof level substantially decreases the probability that a single missile would be capable of damaging more than one train. Furthermore, the assumption of severe damage associated with any missile strike is itself an additional highly conservative effect. Thus a requirement to provide missile protection for the IVC roof is associated with an event that has a vanishingly small probability of occurrence. Indeed, the probability of IVC missile damage is significantly less than the normal acceptance criteria associated with aircraft hazard analyses. To our knowledge, protection for these types of events with extremely low probability of occurrence has not been required. The resources that would be required to provide missile protection can better be used on other features of plant design with a more direct bearing on the safety of operation of the plant.

The attached reports should provide sufficient information for the NRC staff to complete their review of our proposed design. In light of construction milestones which impact the IVC, your immediate review and concurrence is requested. Resolution of this matter is required by September 30, 1983 so as not to impact the design and construction schedule.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713)877-3281.

Very truly yours,

J. H. Goldberg

J. H. Goldberg
Vice President
Nuclear Engineering & Construction

MEP/mg
Attachments (3)

cc: G. W. Oprea, Jr.
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J. G. Dewease
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S. M. Dew
J. T. Collins (NRC)
A. Vietti (NRC)
W. M. Hill, Jr. (NRC)
M. D. Schwarz (Baker & Botts)
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Revision Date 07-05-83

Note: Due to the bulk of the attachments, they were sent only to the addressee, J. T. Collins, A. Vietti, Office of I&E and members of the ASLB. Others on the cc list received the transmittal letter only.

Comparison of Alternatives for
IVC Roof Design

During the meeting with the NRC on July 14, 1983 to discuss the STP proposal to design the Isolation Valve Cubicle structure without a tornado missile protection roof, the NRC requested that certain supplemental information be provided. Included in this request was a desire on the part of the NRC staff to see a comparison of the various design alternatives which had been considered, including estimates of the cost and schedule implications for each alternative, and advantages and disadvantages of each.

The five distinct alternatives which were evaluated included the following (some combinations were also investigated):

1. Eliminate interior walls separating main steam and main feedwater lines.

   Advantages:
   - More volume available for venting.
   - More layout space made available.
   - HVAC requirements could potentially be simplified.
   - Standard design approach used in numerous other plants.
   - Potentially lower overall construction cost.

   Disadvantages
   - Departure from the full compartmentalization concept.
   - Necessity to address the full range of systems interaction issues including pipe break dynamic effects, internally-generated missiles, fire hazards and environmental qualification (EQ).
   - Component supports at interior locations made more difficult.
   - Highest anticipated total cost/schedule impact due to significant change in overall structural design and large exposure to necessary systems interaction protection features and EQ concerns.

2. Provide localized tornado missile protection to essential components only.

   Advantages
   - Potentially allow for increased vent area by providing missile barriers only where needed.
   - Potentially allows for maintaining full compartmentalization.

   Disadvantages:
   - More detailed missile damage assessment necessary.
   - Localized layout problems likely to occur.
   - Local missile barrier requirements likely to require more complicated case-by-case structural design leading to schedule delays in release for construction.
   - Pressurization analyses will be more dependent on the postulated location of pipe breaks.
   - Complex barrier design efforts on a case-by-case basis is anticipated to have a high cost and schedule impact on both design and construction.

3. Provide roof grating as a tornado missile barrier.

Advantages:
- o Maintains full compartmentalization concept.
- o With respect to missile barrier design, provides a relatively simple structural design.
- o Has good design and licensing precedents.
- o If removable, would allow for better operational access for maintenance.

Disadvantages:
- o Requires weather protection
- o Grating thickness required to provide full design basis tornado missile protection is too great to allow adequate vent area. (Note: grating cross-section provides a restriction to flow as a function of mesh spacing and grating bar thickness).
- o Additional vent area would need to be provided by further structural design of missile protected openings in side walls.
- o Anticipated to have moderate to high cost and schedule impact related to optimizing structural design to balance venting and barrier protection design features.

4. Fully vented complex roof design with missile penetration barriers provided

Advantages:
- o Meets the design basis tornado deterministic protection requirements of R.G. 1.76 and SRP 3.5.
- o Meets the vent area requirements for postulated pipe breaks.
- o Maintains full compartmentalization concept.
- o Provides for the full spectrum of design basis protection against external hazards, including non-limiting case sources.
- o Although not fully developed, appears to be an achievable design concept.

Disadvantages:
- o Complicates seismic design sensitivity due to larger massses at higher elevations .
- o Creates some layout problems associated with interferences with required vent openings.
- o More difficult and costly to construct because of complex geometry, and more cumbersome forming and support requirements.
- o Restricts operational access because of needed reinforced concrete roof design.
- o Anticipated to have a lower overall cost and schedule impact than previously presented alternatives.

5. Simple roof with no tornado missile barrier design

Advantages:
- o Maintains full compartmentalization concept
- o IVC walls meet the intent of R.G. 1.76 and SRP 3.5 deterministic protection criteria.
- o Probabilistic assessment using SRP 2.2.3 acceptance criteria justifies the elimination of roof barrier protection.

- o Better operational access for maintenance.
- o Simpler structural design and construction.
- o Better space envelope for internal layout considerations.
- o Lowest cost and least schedule impact likely due to simpler design.
- o Design now ready for release to support current construction schedule.

Disadvantages:

- o Requires weather protection.
- o Requires detailed assessment of non-limiting external hazards, e.g. hurricane missiles, light aircraft, etc.
- o Weather protection must be compatible with postulated pressurization loads.

CONCLUSIONS

Although definitive cost and schedule estimates have not been developed for each alternative, they have been ranked in order of projected descending cost/schedule impact. Alternatives 1, 2 and 3 were considered to have too great an exposure to major cost and schedule impacts; therefore, these options were rejected early in the evaluation process as unacceptable. Only alternatives 4 and 5 were evaluated to the point of developing preliminary designs. Each was considered feasible for implementation without major schedule impact. An order of magnitude estimate of the cost differential for these two options indicates that alternative 4 (complex roof) is anticipated to have a greater than $1,000,000 higher cost for two units, when considering only the cost for construction of a more massive, complex concrete structure at a higher elevation.

Alternative 5 involving a simple roof design without tornado missile protection is considered to be fully justified and preferred with respect to minimized cost/schedule impact.