Docket No.: 50-341

AUG 16 1985

Dr. Wayne Jens
Vice President - Nuclear Operations
The Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48225

Dear Dr. Jens:

Subject: Errata for Appendix R - NUREG-0798 Supplement No. 6

Enclosed are twenty copies of an Errata for Appendix R of NUREG-0798 Supplement No. 6, Safety Evaluation Report related to the operation of Fermi-2. Twenty copies of this report were forwarded to you by cover letter, dated July 30, 1985.

Please insert this Errata in SER Supplement No. 6 for easier reading of Appendix R.

Sincerely,

(5)

B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing

Enclosure: Errata for Appendix R
of NUREG-0798

cc: See next page

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ERRATA SHEET

Report Number: NUREG-0798
Supplement No. 6

Report Title: Safety Evaluation Report related to the operation of Fermi-2

Prepared by: Office of Nuclear Reactor Regulation

Date Published: July 1985

Instructions: Portions of pages R-2, R-4, R-5, R-6, R-7, R-8, and R-9 did not print. Please replace with the attached pages.

Division of Technical Information
and
Document Control

Cygna accomplished these goals by conducting a "vertical" technical design review consisting of: (1) a multi-disciplined technical review consisting of three elements of the residual heat removal (RHR) system, including the mechanical, electrical and civil design and the interface activities of the licensee and those contractors who assisted in the design; and (2) a plant walkdown to verify that the final design of the three elements are reflected in the "as-built" configuration.

The three elements of the RHR system referred to above are: (1) the primary shutdown path suction line components from the interface with the recirculation system up to and including the outboard isolation valve; (2) the primary components in the fluid path of the RHR service water system to one of the two RHR cooling towers; and (3) one of the RHR cooling towers.

Our evaluation in this appendix of Cygna's independent review focuses on three disciplines; e.g., mechanical engineering, structural engineering and quality assurance. We concluded from our review of Cygna's IDVP report that we agreed with Cygna's conclusion that the electrical systems were properly designed. Since the electrical systems represented a small portion of Cygna's independent effort, we did not rely on a review of the electrical systems to provide a basis for our evaluation of Cygna's independent review.

II MECHANICAL ENGINEERING

A. Introduction and Discussion

We reviewed those potential finding reports (PFRs) identified in Section 7.6 of the final Cygna report to assess whether we could reach conclusions similar to those of Cygna that the PFRs have been reasonably resolved. In the area of piping and pipe supports, Cygna identified PFR-06 and PFR-07. Both of these potential finding reports are related to the design of containment penetration flued heads.

In PFR-06, Cygna found that in the design report for a containment penetration flued head, the stress summary for the emergency condition (Service Level C) compared the maximum stress intensity to a stress allowable of 3.0 Sm. The maximum stress included the combination of peak, non-linearized primary membrane, primary bending and secondary stress intensities. The ASME Code requires a primary stress evaluation for level C service limits to meet a stress allowable of 1.8 Sm (no secondary stresses are required to be included). Furthermore, the ASME Code requires for level A and B service limits, an evaluation of primary plus secondary stresses to meet a stress allowable of 3.0 Sm with thermal stresses included. The concern identified by Cygna was that the required ASME Code evaluation of the maximum primary membrane plus primary bending stress intensity might exceed the 1.8 Sm allowable for the emergency condition.

Cygna's review of the summaries of all the flued heads found that there was sufficient design margin to preclude any impact on safety except for the flued heads identified as X-13A & B. Cygna stated that for flued heads X-13A & B, an additional evaluation for the emergency condition should be conducted to assure compliance with the ASME Code allowable stresses.

a. "Further Cygna review has indicated that the postulated impingement and surge loads on the RHR system should not be considered since the source of the loads is the broken line to which the RHR line is attached."

However, we did not find the justification adequate since this statement addresses only "postulated impingement and surge loads" and does not address annulus pressurization loads. The AP loads can be generated from a double-ended rupture of the main steam, feedwater, or the reactor recirculation piping which is postulated to be broken and which is on the other side of the vessel.

b. Cygna stated, "In evaluating faulted conditions in general, Reference 3.2 (General Electric Design Specification 22A3773), Article 4.5 states '... LOCA does not create temperature or pressure surges in the piping systems of any significance and therefore it is not evaluated for this event.'"

We did not find this justification to be acceptable since this statement addresses only temperature and pressure surges in the piping system and does not apply to the dynamic effects associated with a LOCA (i.e. annulus pressurization loads).

c. Cygna stated, ". . . (General Electric Design Specification 22A3773) also states in Article 4.7 that, 'pipe stress due to Annulus Pressurization is not required to be included in the Code analysis and stress report.'" We found this statement to be irrelevant. Although the GE design specification states that the pipe stress due to AP loads is not required to be included in the ASME Code analysis and stress report, we require that the safety-related piping be designed to accommodate the effects of a postulated accident including loss-of-coolant accidents in compliance with General Design Criterion 4 (GDC 4) of Appendix A to 10 CFR Part 50.

d. Cygna stated, "Supplemental review has revealed that a separate report from the ASME Design Report was generated to assess the impact of annulus pressurization on piping and structures. This approach has been agreed to with the NRC because annulus pressurization was not in the original design basis for Fermi-2. Nevertheless, the piping supports are designed to accommodate the additional loads predicted by this analysis."

We found Cygna had only provided assurance that the piping supports are designed for AP Loads. The adequacy of the supports for AP loads was never an issue with us since in PS-01-03, Cygna found that AP loads were indeed considered for pipe supports but not for piping.

B. Evaluation

As discussed above, we found that Cygna had not provided a reasonable basis for concluding that the the RHR piping had been properly evaluated for faulted (i.e., annulus pressurization) loads. Our concern was that according to Cygna's review procedures as stated in Section 3.3 of the final report, all observations were to have been reviewed by a project team to determine their potential impact on plant safety. It appeared from Cygna's resolution of this observation that Cygna did not evaluate the impact of the observation on plant safety but, rather, appeared to have closed out the observation based on irrelevant statements extracted from a General Electric design specification. Accordingly, we could

not support Cygna's rationale for accepting a deviation from our requirements and believed that further investigation was warranted to assure that the requirements of GDC 4 had been met. Furthermore, we believed that the scope of the investigation should have been expanded by Cygna to determine whether faulted (AP) loads had been considered in the piping stress evaluation for other safety-related piping systems attached to the reactor coolant pressure boundary. We conveyed our concerns in a letter dated March 27, 1984, to W. Jens (DECo) and L.L. Kammerzell (Cygna).

Subsequently, we met with Cygna and the licensee on April 17 and May 11, 1984, to discuss a viable approach for the resolution of the AP issue. During the April 17, 1984 meeting, the licensee indicated that the piping systems were analyzed for AP loads in 1978 as part of a LOCA asymmetric loads assessment study. It was agreed that the licensee should confirm that its previous AP Loads assessment study was still valid since Cygna had identified differences between the as-modelled and as-built piping configurations used for the initial AP loads analysis.

In its letter dated September 27, 1984, the licensee provided the results of its evaluation stating that it had completed a reanalysis of the reactor recirculation and RHR piping for the combination of AP loads and design basis earthquake loads using the as-built piping configuration. This reanalysis showed that all piping stresses are within ASME Code allowables for the faulted condition. All piping support loads were within their load ratings with the exception of one support which exceeded its rating by 4.4 percent. The licensee has made minor modifications to the structural steel for three supports to assure compliance with code allowable weld stress limits. Additionally, the licensee has reviewed the AP analyses of all other large bore piping systems with a nominal pipe size equal to or greater than 4 inches which are connected to the reactor coolant pressure boundary. The analytical model was compared with the as-built configuration and the existing analyses were found to adequately represent the as-built condition. The licensee concluded that for the combined loadings of AP plus the design basis earthquake, there will be no loss of structural integrity of the piping systems.

In its letter to B.J. Youngblood (NRC) and W.F. Colbert (DECo) dated May 17, 1985, Cygna provided its evaluation of the licensee's letter on this matter dated September 27, 1984. Cygna concluded that the structural integrity of the as-built recirculation and drywell piping and their supports would be assured based on the resultant stresses from a combined annulus pressurization and design basis earthquake loading remaining within the Level D service limits (i.e., the faulted condition). Additionally, Cygna supported the licensee's conclusion that the results of the original annulus pressurization analyses for other reactor coolant pressure boundary piping systems would remain valid provided the analyses input accurately reflected the as-built configuration. We concur with Cygna's conclusions. Based on the results presented in the licensee's letter dated September 27, 1984, we conclude that the corrective actions taken by the licensee to address the issue identified in PI-01-11 was appropriate. Accordingly, we find that the technical and safety concerns associated with observation PI-01-11, including the generic implications of the AP loads issue, have been acceptably resolved as a result of the actions taken by the licensee.

C. Conclusion

The objective of the independent design verification program was to assess the overall adequacy of the design and the design control process used for the Fermi-2 facility. With respect to the design control process in the area of piping and pipe supports, we find from our review of the observations and potential finding reports identified by Cygna, that the design control process appears to be adequate. Our conclusion is based on the fact that there appears to be no recurring deviations of a similar nature which could be indicative of an overall inadequacy in the design process.

III STRUCTURAL ENGINEERING

A. Introduction

In Cygna's IDVP report, it indicates that its review encompassed the structural analysis and design of the main structural members of the residual heat removal (RHR) complex building. The scope of this review ranged from an examination of the actual design to the design control activities. The review criteria are a composite of licensing commitments, project design requirements and appropriate industry practice; these review criteria are divided into design control criteria and design criteria.

CYGNA's structural review approach is embodied in the following activities: (1) a review of the appropriate criteria documents; (2) a selection of the controlling load combinations; (3) a review of the seismic analysis; (4) a selection of the major structural elements; (5) a review of the structural analysis; (6) a review of the overall design (7) a review of results and conclusions; and (8) a review of the design drawings.

B. Discussion

Cygna's review was performed by a structural review team. On the basis of the review criteria and the approach cited above, Cygna identified 33 non-conformance items (i.e., observations) in its initial review which might have had a potential safety impact in the structural area. These items ranged from a lack of documentation of the design criteria, improper application of either the loads or the load factor, inadequate structural capacity to poor workmanship in actual construction. The non-conformance items initially identified as observations were then reviewed in more detail to determine if they had any potential safety impact. The result of this review in depth identified only two of the observations as having any potential safety impact; these were then classified as potential finding reports (PFRs). However, after the senior review team's review of these PFRs, Cygna determined that there was no item which had any safety impact. Accordingly, all of the structural PFRs were closed after review by both the project team and the senior review team.

C. Evaluation

We have reviewed Cygna's 33 structural observations and Cygna's rationale for resolving these observations. Cygna has basically used the structural design criteria and methodology established by the licensee in the Fermi-2 FSAR as its review criteria. For any deviations from the licensee's commitments, Cygna

provided reasonable bases to justify such deviations. In some of the areas where we were concerned about the adequacy of the structural design, Cygna provided either more detailed information or its own independent analysis. For those observations which had generic implications, Cygna expanded its scope of review so that the effect of the observed deficiency was assessed. For example, a misinterpretation of the computer analysis could have indicated some shortcomings in the licensee's QA/QC procedure in the design process for the Fermi-2 facility. After an expanded review, Cygna found that out of 42 computer runs, errors of this type occurred five times. However, Cygna verified the structural design for these five cases and found that the design met the design criteria despite these errors. Considering the depth and the extensive nature of Cygna's review of the RHR complex without finding any serious deviations, we agree with Cygna's conclusion that the design and the design control activities for the Fermi-2 facility have been adequately performed in accordance with the licensee's commitments and with standard engineering practice. Furthermore, we agree with Cygna's conclusion that there is reasonable assurance that the public health and safety will be protected. Cygna's overall conclusion is based on the following factors:

1. The design control program in place for the Fermi-2 facility adequately addresses the licensee's commitments and there is objective evidence that this program is being effectively implemented.

2. The licensee's commitment to fully implement a directive issued to its engineering staff to resolve certain potential findings.

3. The licensee's management has demonstrated an active commitment to assure the quality of the design and the safety of the plant.

D. Conclusion

On the basis of our discussions with the Cygna personnel involved in the Fermi-2 IDVP in a number of meetings and on site visit and our favorable evaluation of the responses to our questions regarding Cygna's findings, we find that the structural aspects of the Fermi-2 IDVP has been conducted in a satisfactory manner.

IV. QUALITY ASSURANCE

A. Introduction

Cygna evaluated the design activities of the licensee and Sargent & Lundy, Stone & Webster and General Electric. This review involved an assessment of the accuracy and the completeness of the information at various stages of the design process, including the flow of information from the preliminary design stage to the "as-built" condition. This review process also included collecting design documents and control procedures; developing review criteria, procedures, and checklists; conducting program and design reviews against commitments in the Fermi-2 FSAR; escalating the review process to project review teams and senior review teams; conducting walkdown inspections of the as-built configuration; identifying observations and evaluating these for potential findings and impact on safety; and documenting the results in the IDVP report.

Whenever, during the course of its review, Cygna determined that an item was inadequately addressed, the item was noted as an observation. Each observation which had a potential impact on safety was identified as a potential finding. During its review, Cygna noted 108 observations. Of the 108 observations, 98 had no potential impact on safety. The remaining 10 were identified as potential findings which were eventually resolved and also determined by Cygna not to impact safety.

After completion of its evaluation, Cygna submitted to us their final report, No. 83021-1, which included an executive summary, a description of the program, the results of the assessment, a description of each observation and potential finding, and a description of how each was resolved.

Cygna's overall conclusion was that the design control at the Fermi-2 facility was adequate and appeared to have been successfully implemented resulting in an acceptable design and acceptable as-built conditions.

B. Evaluation

We performed a review of the quality assurance portion of the Cygna final report, including the observations and potential findings to determine their significance and to assess the resolution of each. We met with representatives of Cygna and the licensee on June 15, 1983 and May 11, 1984, to discuss the results of Cygna's evaluation. We concluded that additional background information was needed so that Cygna could complete its original review and we could evaluate Cygna's efforts. Cygna provided a supplement in November 1983 to its original report, clarifying and expanding its basis for resolving the observations and potential findings.

This additional effort by Cygna included an evaluation of each observation to determine if it dealt with a programmatic issue or had a potential for impacting other plant designs. Over one-third of the valid observations required an expanded review to determine the impact on the Fermi-2 design. We concluded from the additional information submitted by Cygna that the report was still deficient in that it did not provide an adequate description of the root causes of the valid observations and potential findings. As a result of this concern and other technical concerns, Cygna performed additional studies and responded by providing the requested additional information in a second supplement in November 1984 to its IDVP report. In this second supplement, Cygna identified the root causes of each observation and potential finding and the generic impact on safety and the acceptability of the overall design.

Our review of this material resulted in requesting Cygna to provide a clarification of the conclusion of certain observations and potential findings identified as having generic implications. We also asked Cygna to provide a correction to the root cause and classification list.

Based on our review of Cygna's IDVP report and its two supplements, we find that the IDVP was structured in a disciplined, controlled manner using procedures, checklists, and multi-tier reviews. Cygna's investigations into the observations and potential findings appear to be thorough, and its conclusions appear to be soundly based. Cygna's overall conclusion is that sufficient assurance exists that the design activities on Fermi-2 facility were adequately and properly performed.

Based on our review of the quality assurance aspects of Cygna's IDVP, we conclude that the IDVP provides additional confidence in the acceptability of the Fermi-2 design.

C. Conclusion

The licensee has agreed to add the lube oil system and the combustion air intake system and make other minor clarifications to the list of items subject to the operational QA program. Cygna has agreed to provide a clarification of its overall conclusions related to the acceptability of those observations identified as potential findings. Cygna also agreed to update its root cause classification list by categorizing the root cause of the design control observations.

We will confirm the completion of these items in a future supplement to the SER. In the interim, we find that the quality assurance aspects of Cygna's independent review provide reasonable assurance that its conclusions are valid.

V. NRC SUMMARY EVALUATION AND CONCLUSION

On the basis of our review of Cygna's IDVP report and our meetings with Cygna, we conclude that the depth and scope of the IDVP conducted by Cygna provide reasonable assurance that its conclusions regarding the design of the Fermi-2 facility and the design process itself, are valid.