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Duane Arnold Energy Center
Docket 50-331
License No. DPR-49

Additional Information Regarding Unresolved Item 5000331/2005002-02

Reference: Duane Arnold Energy Center Integrated Inspection Report
5000331/2005002, dated April 29, 2005

The referenced inspection report opened unresolved item (URI) 5000331/2005002-02. As discussed in the inspection report, in March of 2005, Nuclear Management Company, LLC (NMC) identified that piping calculations associated with previously installed modifications of the Primary Containment Vent and Purge Exhaust lines did not include thermal movement of the Primary Containment (i.e., Drywell). The inspection report states that, pending a review of the extent of condition and the overall effect on the existing designs, this issue is considered unresolved (URI 5000331/2005002-02).

While the identified conditions were repaired during the last refuel outage (Spring 2005), the inspection raised questions regarding the past Operability of the Primary Containment. To assist the Staff in the resolution of this URI, NMC is providing the Staff with additional information regarding the determination of past Operability.

Please feel free to contact Mr. Steve Catron at (319) 851-7234, DAEC Nuclear Safety Assurance Manager, if you have any further questions regarding this matter.

This letter makes no new commitments or changes to any existing commitments.



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Enclosure

cc: Administrator, Region III, USNRC
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Enclosure

Background

The Duane Arnold Energy Center (DAEC) design requirements for Drywell penetrations and associated piping require that the Primary Containment (i.e., Drywell) will not lose function during and after a Design Basis Accident (DBA) as a result of transient loads, such as pressure and thermal loadings. To assure that structural supports and other attachments to the Primary Containment will not cause failure of the containment in the event of a DBA, loading conditions shall include DBA transient loads, as well as normal operating loads. Piping systems attached to the Containment shall be designed to absorb or resist movement caused by thermal expansion and associated loadings, or similar movements imposed by other sources.

In March of 2005, Nuclear Management Company, LLC (NMC) identified that certain calculations of record for modifications performed on the Containment Vent and Purge Exhaust piping did not include containment thermal anchor movements in the analytical stress models. Thermal loads were considered in the original analysis of the vent piping; however, the original analysis did not require application of the anchor loads because of configuration. Subsequently, a modification to the 2" bypass line, which is attached to the main (18") vent line, installed an anchor on the small bypass line which did not consider potential thermal movement of the Drywell. This was identified as a non-conforming condition and entered into the DAEC Corrective Action Program as CAP035317.

NRC Inspection Report 5000331/2005002 identifies this issue as Unresolved Item (URI) 5000331/2005002-02.

Resolution of Nonconformance

NRC Inspection Manual Part 9900¹ provides guidance regarding determining Operability for nonconforming conditions in piping systems. Section 6.13 of that guidance states that:

~~Upon discovery of a nonconformance with piping and pipe supports, licensees may use the criteria in Appendix F of Section III of the ASME Code for operability decisions. These criteria and use of Appendix F are valid until the next refueling outage when the support(s) are to be restored to the FSAR criteria.~~

The identified penetration was modified during RFO 19 to restore it to Updated Final Safety Analysis Report (UFSAR) criteria prior to startup (May, 2005). Extent of condition was also considered, as discussed below.

The initial scope for an extent of condition review included the drywell penetrations in the cylinder region of the Mark I containment due to larger vertical drywell shell movements (because the drywell is fixed at the bottom) and because several modifications had been implemented. Within this initial scope, additional issues were identified with regard to

¹ At the time of this evaluation, the version of the Part 9900 manual chapter used for Operability determinations ("Operable/Operability: Ensuring the Functional Capability of a System or Component") was that transmitted with Generic Letter 91-18. The current version, transmitted with RIS 2005-20 is essentially the same (See Section C.10).

physical installation (configuration may not accommodate drywell shell movements) and calculations of record (drywell shell movements based on operating temperature/pressure instead of design temperature/pressure). Based on the additional issues, the scope was expanded to include all drywell penetrations.

Drywell penetrations and associated piping were assessed against the design requirements based on Engineering review of calculations, drawings and field walk downs. Prior to startup from the refuel outage, modifications to piping and/or pipe supports were identified and installed for those drywell penetrations needing additional flexibility to accommodate drywell shell movements.

Based on the extent of condition performed prior to plant startup from RFO 19, additional configuration control actions (calculation revisions, drawing updates, guidance for performing piping calculations, etc.) were deemed appropriate and are currently being performed.

Operability Considerations

Operability was assessed using the Part 9900 guidelines quoted above. Appendix F of Section III of the ASME Code (1977 Edition/1978 Summer Addenda) states in paragraph F-1310(c) that "Only limits on primary stresses are prescribed. Thermal stresses resulting from Level D Service Limits need not be considered."

Note: this Edition/Addenda, which was referenced in the NMC determination of Operability (CAP035317), is the current DAEC Code of Record for the Primary Containment². Appendix F of the cited Edition/Addenda does not require performance of evaluations of secondary stresses for piping and pipe supports (Paragraph F-1310(c)) and Paragraph F-1370 (Component Supports) does not require consideration of thermally-induced stresses.

The evaluation documented in CAP035317 therefore concluded that the nonconformance (i.e., not accounting for thermal movement of the Drywell on the Vent line) was not an Operability concern, using the Part 9900 guidelines and the DAEC Code of Record.

Following this determination of Operability, questions were raised during the inspection as to which Code Edition/Addenda should be used when evaluating Operability using the Part 9900 guidelines. Specifically, later versions of Appendix F of the Code (e.g., 1989) would require consideration as primary stresses, those from the constraint of free end displacement and anchor point motion, in the evaluation of component supports. Therefore, such stresses, even when thermally-induced, would be considered to be primary stresses, unlike the earlier versions of the Code.

To help resolve the issue, NMC obtained a review of this question by an external peer, who is recognized as knowledgeable in the ASME Code. The external peer concluded that the use of Appendix F from the 1977 Code with Summer 1978 Addenda (DAEC's Code of Record) was acceptable for use in the NMC's Operability determination.

Thus, the Operability determination performed under CAP035317 is deemed valid.

² Incorporated by reference into the DAEC UFSAR, see Reference 25 to Section 6.2. The Code of Record was revised as part of the Mark I Containment Long-Term Program from the original Code of Construction.