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Additional Information Regarding NRC Unresolved Item From Safety System Design And Performance Capability Inspection

References: 1) NRC Inspection Report 050000331/2004006(DRS)
2) C. Shiraki (USNRC) to L. Liu (IEL&P), "Station Blackout Rule Conformance Evaluation (TAC NO. M68541)," November 22, 1991.
3) G. Van Middlesworth (NMC) to USNRC, "Response To Request For Additional Information (RAI) To Technical Specification Change Request TSCR-042 – Extended Power Uprate (TAC # MB0543)," NG-01-0909, August 16, 2001.
4) M. Peifer (NMC) to USNRC, "Transmittal of Revision 17 of the DAEC Updated Final Safety Analysis Report and the Current DAEC Technical Specification Bases," NG-03-0698, October 20, 2003.
5) B. Mozafari (USNRC) to G. Van Middlesworth (NMC), "Duane Arnold Energy Center - Issuance Of Amendment Regarding Extended Power Uprate (TAC NO. MB0543)," November 6, 2001.

In Reference 1, the Staff documented an Unresolved Item (URI) from the recent Safety System Design and Performance Capability Inspection conducted at the Duane Arnold Energy Center (DAEC) (Ref. URI 05000331/2004006-01). Nuclear Management Company, LLC (NMC) would like to provide the Staff with some additional information to assist in the resolution of this URI. This information will demonstrate that the plant's containment response to a Station Blackout (SBO) event was not significantly changed by the Extended Power Uprate (EPU).

The URI deals with the DAEC SBO analysis conducted for the EPU. The URI discusses two related conditions regarding the primary containment temperature response that result in questions about the ability to maintain adequate core cooling for the duration of the 4-hour coping period of the SBO event, per the DAEC's licensing basis.

One condition is that the drywell shell temperature is predicted to reach the design limit (281 °F) at 3.7 hours into the event. The other condition is that the suppression pool temperature is predicted to reach the Heat Capacity Temperature Limit (HCTL) in the Emergency Operating Procedures (EOPs) at 3.5 hours into the event. The Inspectors concluded that both conditions would trigger the Operators to perform an Emergency

Depressurization (ED) in accordance with the EOPs. Performing an ED would lower reactor vessel pressure below the Reactor Core Isolation Cooling (RCIC) system isolation pressure. This would also be true for the High Pressure Coolant Injection (HPCI) system. Thus, neither RCIC nor HPCI would be available for injection to maintain reactor vessel level. As this is an SBO event, no AC power is available; consequently, HPCI and RCIC are the only AC-independent injection sources available to cope with an SBO event. The NRC Inspection Team was concerned that adequate core cooling might not be available for the required 4 hour coping period for the SBO event.

Based upon the results of the re-analysis of the SBO event conducted as part of the DAEC's EPU program, procedures were modified during EPU implementation to address both of the stated concerns. Specifically, the Abnormal Operating Procedure (AOP) for SBO, AOP 301.1 contains a specific Note and follow-up actions that address the potential for suppression pool temperature to reach the HCTL and the impact of the resulting ED on the loss of vessel injection. This Note and actions instruct the Operator to actively monitor the key parameters (reactor pressure and suppression pool temperature) and to lower reactor pressure to avoid exceeding the HCTL, including a provision to install a bypass on the RCIC low pressure isolation instrumentation (referred to in the procedure as EOP Defeat 1) to maintain injection capability. However, while specific cautions regarding EPU response have been added to the AOP and EOP Bases documents, the basic EOP actions for Primary Containment Control (EOP-2) are consistent with those prescribed by the procedures prior to EPU. Based upon the EPU analysis results, the Operators would only need to make a small adjustment in pressure, well within the prescribed limits in the AOP Note, in order to stay below the HCTL curve. With this procedural direction to the Operators, we are confident that the HCTL would not be exceeded during the SBO event and that an ED would not be required. Consequently, RCIC would remain fully available for vessel injection for the entire 4-hour coping period of the SBO.

Similarly, the bases document for the EOP for Primary Containment Control (EOP-2) was also modified based upon the EPU re-analysis of SBO to address the impact of the increased drywell temperatures with respect to performing an ED. The EOPs (and AOP) allow the drywell air temperature to exceed the 281 °F design limit for the drywell shell during an SBO event, without requiring the ED to be performed, provided the drywell air temperature remains below the Environmental Qualification temperature of 340 °F for the Automatic Depressurization System (ADS) valves and Safety/Relief Valves (S/RVs) and containment integrity is not otherwise challenged. The EPU re-analysis results show that the peak drywell air temperature during the 4-hour coping period is only 308 °F, with a corresponding pressure of 9 psig (design limit of 54 psig). Thus, the Operators would not be required to perform an ED during the SBO, even though the drywell air temperature is above the drywell shell temperature limit of 281 °F, because, as noted in the URI, the containment integrity is not challenged due to the short duration of the temperature peak and accompanying low drywell pressure. Consequently, RCIC would remain fully available for vessel injection for the entire 4-hour coping period of the SBO.

It should be noted that both of the above results are not significantly different from those presented in the pre-EPU analysis, which was reviewed by the Staff in Reference 2. The drywell air temperature also exceeded the design temperature in the pre-EPU analysis.

While the HCTL was not challenged in the pre-EPU analysis, the EPU analysis indicates that the HCTL could be exceeded, but only by a couple of degrees, absent Operator intervention. However, the Operators would be expected to follow the specified directions in the revised AOP and avoid the HCTL. Consequently, NMC did not view either of these issues as significant changes in results that warranted explicit discussion in the Power Uprate Safety Analysis Report (PUSAR) submitted with our EPU application. Only those changes in SBO analysis assumptions and results that were significantly different from pre-EPU were discussed in detail.

The Staff in their Request for Additional Information (RAI) on the PUSAR (Reference 3), noting the impact of the increased decay heat due to EPU, asked about the increase in inventory requirement needed to assure adequate core cooling. The increase in decay heat also impacts the suppression pool temperature response during the event, as noted in the Staffs SE (Reference 5). However, the Staff did not question the containment response to the SBO event in their RAI.

Because the PUSAR is intended to be an overview of the detailed evaluations supporting the EPU application, NMC does not view the exclusion of these minor analysis details in our PUSAR as significant; especially given the similar nature of the pre-EPU analysis results and that the Staff clearly understood the impact of the increased decay heat on the SBO analysis results, as stated in the RAI.

We do want to provide a clarifying point regarding the PUSAR statement that the drywell temperature remains below the design temperature: while the drywell air temperature does remain below its design temperature (340 °F), the drywell shell temperature does slightly exceed its design temperature (281 °F) at the end of the SBO event. However, as noted above, this result also existed pre-EPU, and was evaluated by NMC as not representing a challenge to containment integrity. The purpose of the PUSAR statement was to draw such a conclusion - that containment integrity was still assured during an SBO for the EPU conditions.

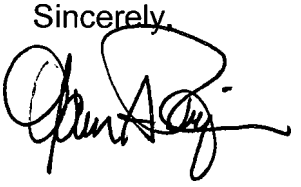
As required by 10 CFR 50.71(e), the SBO evaluation for EPU was included in the DAEC's most-recent Updated Final Safety Analysis Report (UFSAR) revision (Reference **4).** This update, which was prepared well before the inspection occurred, includes the specific analysis details regarding both of the above issues arising from the EPU re-analysis of the SBO event.

Based upon the above, NMC believes that the information, as presented to the Staff during the EPU review, was sufficient for the Staff to reach a sound conclusion regarding the SBO coping capability, as documented in the final EPU Safety Evaluation (Reference 5).

Please feel free to contact Mr. Steve Catron, Manager, Regulatory Affairs - DAEC, if you have any further questions regarding this matter.

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

Sincerely,



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cc: Regional Administrator, Region III, USNRC
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