December 14, 2005

MEMORANDUM TO: File

FROM: Deirdre W. Spaulding, Project Manager **/RA/**
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

SUBJECT: DUANE ARNOLD ENERGY CENTER - TRANSMITTAL
RELATED TO TAC NOS. MC8713, MC9784 AND MC8785

On November 29, 2005, the enclosed questions were transmitted via e-mail to the Nuclear Management Company, LLC (the licensee) regarding the Nuclear Regulatory Commission staff's review of three relief requests dated July 29, 2005. The email forwards questions to be discussed via conference call.

Enclosure: As stated

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DISCUSSION POINTS
RELIEF REQUESTS
TAC NOS. MC8713, MC8784, MC8785

Relief Request VR-01

1. The relief request references the Duane Arnold Energy Center (DAEC) Technical Specification Amendment No. 230 approved by the Nuclear Regulatory Commission (NRC) on December 29, 1999. This amendment references the Boiling-Water Reactor (BWR) Owners Group Topical report B21-00658-01, "Excess Flow Check Valve Testing Relaxation" as a basis for the relaxation. By letter dated March 14, 2000, the NRC submitted comments concerning generic application of excess flow check value (EFCV) testing relaxation to the BWR Owner's Group on this Topical Report and requested that the report be revised accordingly. General Electric NEDO-32977-A dated June 2000, submitted in response to the NRC comments concluded that individual licenses will develop their own EFCV performance criteria. This conclusion considered that DAEC has included the EFCVs as a subset within the Maintenance Rule. As identified in the March 14, 2000, letter to the BWR Owners Group, the EFCV performance criteria should be based on sound reliability modeling that is consistent with generally expected performance of the EFCVs. Further, the corrective action program must evaluate equipment failures and establish appropriate corrective actions to comply with the performance criteria. Such performance criteria and the basis, once developed, will be subject to staff review. Due to the plant-specific nature of the performance criteria, it is considered expeditious and appropriate to review this testing relaxation as a plant-specific relief request, as opposed to an American Society of Mechanical Engineers (ASME) Code Case. However, the relief request should reference this NEDO report to clarify that this testing relaxation, although generic in nature, applies plant-specific evaluation criteria. To clarify current guidance from the BWR Owners group, the licensee is requested to reference NEDO-32977-A as a basis for this relief request and clarify that the evaluation, including performance criteria and Maintenance Rule inclusion, are plant-specific commitments.

2. The basis for the relief request does not address recent industry wide experience with the EFCVs and the NEDO report identifies confidence levels presumably based on testing prior to the year 1998. The NEDO report includes conservatism to account for a potentially unknown change in the valves failure rate. The licensee is requested to either confirm that recent EFCV testing trends are within bounds of the analysis, or revise the analysis to consider recent test data.

3. Section 4.1 of NEDO-32977-A speculates that most EFCVs fail to close due to sticking and Attachment A testing data identifies 21 failures on BFN-2 and 5 failures on BFN-3 due to crud buildup and sticking after extended outages. Table 4-1 of NEDO-32977-A shows that both BFN and DAEC use the same make of EFCV. Considering that NEDO-32977-A indicates DAEC has included the EFCVs as a subset within the Maintenance Rule, clarify the type of preventive maintenance, if any, performed on the EFCVs to prevent sticking and, if no maintenance is performed, explain why such failures reported with similar make valves are not expected in the future when the valves are not exercised as frequently.

4. Attachment B to NEDO-32977-A includes the radiological analysis of the consequences of an unisolable instrument line break. The consequences of several EFCVs sticking open following potential damage to multiple instrument lines caused by postulated high-energy line breaks outside containment have not been evaluated in the relief request. The licensee is requested to discuss the consequences of such postulated failures on multiple instrument lines that depend upon closure of excess flow check valves for isolation.

Relief Request PR-01

1. The relief request does not identify an industry consensus standard as a technical basis for deviating from the acceptance criteria identified in Table ISTB-5100-1 for this pump. NUREG-1482 Revision 1 identifies that the acceptance criteria identified in the O&M Code is based on an evaluation of empirical data and various acceptance criteria for pump vibration velocity established by U.S. industries, academia, international industry and foreign agencies. The licensee is requested to identify if an industry consensus standard exists that includes a technical basis for applying a relaxation in acceptance criteria from the O&M Code. The technical basis may include criteria from industry standards such as Hydraulics Institute, ISO, etc. or other sources such as manufacturer's recommendations, vibration analysis or Electric Power Research Institute.

2. The information included with the basis for relief identifies that DAEC has many years of in-service test data showing that baseline vibrations of 0.4 in/sec represent acceptable pump operation and that vibration levels have not trended up. The licensee states that DAEC has had these vibration levels analyzed by an engineering consultant that specialized in vibration analysis and their analysis shows that this pump can operate at vibration levels up to 0.700 in/sec. The licensee is requested to identify the details of this vibration analysis and test data trends from when the pump was new or reference values, including the basis for the acceptance criteria. The licensee is also requested to clarify if spectral analysis has been applied and if the vibration analysis has been reviewed and accepted by the pump manufacturer as an alternative to recommended modifications.

3. No compensatory actions have been identified to justify accepting a higher level of vibration. The licensee is requested to explain how potential degradation in components will be detected. For example, clarify if an oil analysis or inspections will be performed to detect degradation in bearings.

4. Based on a review of manufacturer's information and other licensee relief requests, it appears that high vibration levels are common to this type of pump. The licensee is requested to identify the results of any industry technical inquiries with the ASME Code Committee on vibration acceptance criteria and clarify why a code case is not more appropriate to evaluate a generic deviation from the O&M Code acceptance criteria. For example, complex configurations may require special guidance.

5. The licensee has not demonstrated that compliance would result in hardship or unusual difficulty. The licensee is requested to identify specific alternatives considered to lower

the vibration level and their estimated costs. For example, the pump manufacturer has recommended that the most cost-effective solution is to replace the impeller if the alert limits are exceeded. The results of any industry experience where other licensees have performed such modifications or other corrective actions should be addressed.

6. The licensee does not identify if the new alert range vibration velocity is in rms or peak. The applicant is requested to confirm that the acceptance criteria requested is peak.

7. If other techniques, such as displacement monitoring, acceleration monitoring or acoustic detection, have been applied to monitor vibration levels, the licensee should submit the results of such monitoring.

8. To completely understand the nature of the vibration levels and the impact on operational readiness of the high-pressure coolant injection pump, the licensee is requested to provide additional information regarding the pump operating history, bearing analysis, root cause analysis, wear rates, water temperature effects, fatigue considerations, maintenance practices and planned activities to reduce vibration levels to within the Code acceptance criteria.

Relief Request PR-02

1. In the section entitled Basis for Relief, the licensee states that meeting the procurement and calibration requirements for these instruments to cover the range to the lower extreme (4.3 Hz) is impractical due to the limited number of vendors supplying such equipment and the level of sophistication and cost of the equipment. The availability of these instruments might have been impractical a decade ago. However, it appears that these instruments are readily available from several vendors today at reasonable cost. Please discuss your reasons for determining the impracticality of meeting this Code requirement today.