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Duane Arnold Energy Center
Operated by Nuclear Management Company, LLC

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

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

SUBJECT: Response To The Staff's Request For Additional Information (RAI) Related To Technical Specification Change Request (TSCR-029) To Adopt Four Nuclear Regulatory Commission – Approved Generic Changes To Improved Technical Specifications

REFERENCES: (1) Letter from Nuclear Management Company, LLC to Document Control Desk, "Technical Specification Change Request (TSCR-029): 'Adoption Of NRC Approved Generic Changes To Improved Technical Specifications'," NG-04-0037, dated January 28, 2004

(2) Letter from NRC to Nuclear Management Company, "Duane Arnold Energy Center RE: Request For Additional Information Related To Technical Specification Change Request (TSCR-029) To Adopt Four Nuclear Regulatory Commission Approved Generic Changes To Improved Technical Specifications (TAC NO. MC2023)," dated October 18, 2004

In Reference 1, Nuclear Management Company, LLC (NMC) submitted a request for revision to the Duane Arnold Energy Center (DAEC) Technical Specifications to adopt the following NRC approved generic changes to the Improved Technical Specifications (ITS) NUREGS:

Technical Specification Task Force (TSTF) 264, deletion of flux monitors specific overlap surveillance requirements;

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TSTF-273, Revision 2, Safety Function Determination Program Clarifications;
TSTF-284, Revision 3, Add "Met" versus "Perform" to Specification 1.4, Frequency;
TSTF-299, Administrative Controls Program 5.5.2.b Test Interval defined and allowance for 25 percent extension of frequency.

In order to complete their review, on October 18, 2004 the Staff issued a request for additional information (RAI) (Reference 2) regarding NMC's submittal. Specifically, the RAI addresses the proposed Technical Specifications revisions regarding TSTF-264.

Enclosed is NMC's response to the RAI questions. Please contact this office if you have any further questions regarding this matter.

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

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 22, 2004.

Mark A. Peifer
Site Vice President, Duane Arnold Energy Center
Nuclear Management Company, LLC

Enclosure: (1)

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Resident Inspector, DAEC, USNRC
D. McGhee (State of Iowa)

ENCLOSURE

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING TSCR-029

(1) The staff approved the use of TSTF-264, Rev. 0, which states "... IRMs [intermediate range monitors] are above mid-scale on range 1 before SRMs [source range monitors] have reached the upscale rod block." Since the agreement criterion includes an expectation of one decade of overlap, the staff believes that the values cited in TSTF-264, Rev. 0, ensure that there is sufficient overlap when transitioning between neutron flux instrumentation. However, in the proposed change to TS Surveillance Requirement (SR) 3.3.1.1.1, the application cites the plant's design basis as a basis for deviation from TSTF-264, Rev. 0, regarding the overlap between SRMs and IRMs. The application states, "Overlap between SRMs and IRMs similarly exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are indicating at least 5/40 on range 1 before SRMs have reached 10^6 counts per second" and "The agreement criteria includes an expectation of sufficient overlap when transitioning between flux instrumentation."

(a) Define "sufficient overlap" as stated in your proposed Insert 4 to TS Bases B 3.3.1.1.

NMC Response

Per the DAEC UFSAR, section 7.6.1.4.1, "The SRM subsystem is designed so that SRM channels are on scale when the IRM subsystem first indicates neutron flux during a reactor startup." Therefore, the required overlap is defined as the SRMs being on-scale (i.e., less than full scale or < 10^6 counts per second) when the IRM subsystem first indicates neutron flux (i.e., above downscale or 5/40 of scale on IRM range 1). Per the DAEC Technical Specification bases Surveillance Requirements section SR 3.3.1.1.6 and SR 3.3.1.1.7, overlap between SRMs and IRMs exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are indicating at least 5/40 on range 1 before SRMs have reached 10^6 counts per second.

(b) Provide a detailed justification why DAEC's nuclear instrumentation cannot satisfy TSTF-264, Rev. 0, as written with respect to SRM/IRM overlap. In your justification specifically address why IRM Range 1 might not read at least mid-scale prior to SRM reaching the rod block set point and why the expectation of a one decade overlap may not be satisfied. Also explain which specific hardware problems and/or limitations prevent DAEC from satisfying TSTF-264, Rev. 0, as written with respect to SRM/IRM overlap.

NMC Response

The original DAEC TS did not have a Surveillance for demonstrating SRM and IRM overlap. This provision was added by Amendment 193 in 1993, as part of an upgrade of the DAEC TS sections on instrumentation. One of these provisions was the introduction of "channel checks" for the IRMs, which included an overlap provision with the SRMs. The specified overlap was "for at least ½ decades." No additional requirements as to indicated levels, ranges, etc. were specified.

During the conversion of the DAEC TS to the Improved Standard TS (ITS), this footnote was deleted as a "Relocated Detail" from the DAEC TS and moved to the BASES. The ITS Bases for SR 3.3.1.1.6 were modified to add the footnote requirement for ½ decade overlap to the ITS definition of "IRMs are above mid-scale on range 1 before SRMs have reached the upscale rod block." However, shortly after implementation of the DAEC ITS, DAEC received an external operating experience (OE) notice from another BWR in the process of ITS conversion that they were having difficulty with the ITS BASES definition of SRM/IRM overlap. This OE prompted DAEC to re-evaluate the DAEC BASES. This re-evaluation determined that the DAEC would also likely have difficulties with this definition of SRM/IRM overlap, in particular, the "add-on" requirement of ½ decade overlap. It should be noted that the DAEC performed an on-line implementation of its ITS and thus, by license condition, was "grandfathered" from performing SR 3.3.1.1.6 until the next specified frequency, i.e., the next plant startup. Thus, DAEC never actually attempted to perform the SR to these requirements. As a result of the DAEC evaluation of the external OE, a BASES change was made to revise the definition of overlap to the current language. The current language better conforms to the original DAEC design and licensing basis, versus the default definition in NUREG-1433.

DAEC currently does not have the capability of recovering the plant data to accurately create a figure of SRM and IRM range overlap. In addition, it is expected that the correlation between range, counts per second, and percent core thermal power would fluctuate with respect to core loading, rod pattern, and cycle exposure.

TSTF-264, Rev. 0, Insert 4 states, "The agreement criteria includes an expectation of one decade of overlap when transitioning between neutron flux instrumentation. The overlap between SRMs and IRMs must be demonstrated prior to withdrawing SRMs from the fully inserted position since indication is being transitioned from the SRMs to the IRMs. This will ensure that reactor power will not be increased into a neutron flux region without adequate indication."

At DAEC, it is expected that the IRM system range 1 will reach midpoint prior to obtaining the SRM rod block. IRM range 1, in its entirety, senses approximately

one decade of counts, ~10^4 to ~10^5 counts per second. In order to verify one decade overlap between the IRM and SRM systems, the decade would include both range 1 and range 2 on the IRMs prior to withdrawing SRMs from the fully inserted position. Furthermore, it is not expected that one decade of range is contained between the midpoint of range 1 and the SRM rod block.

The intent of the requirement is to ensure that the IRM system is operating properly prior to the SRM system reaching its upscale limit. Since IRM range 1 senses approximately one decade of counts, the DAEC system design does not allow for a half decade pre-requisite and an additional observation of a full decade of range overlap. All IRM ranges greater than range 1 are considered on scale when they read greater than 1.6/40 or 5/125. Therefore, the evaluation for the TS bases change justified using 5/40 of scale for IRM range 1 as a more restrictive lower end of the range. Per the current DAEC Technical Specification bases, overlap between SRMs and IRMs exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are indicating at least 5/40 on range 1 before SRMs have reached 10^6 counts per second.

(2) Describe your licensing and design basis (both current and past) with respect to SRM/IRM overlap.

NMC Response

Background

As noted in the Response to Question 1b above, this was not an original TS Surveillance Requirement for the DAEC, but was added and expanded over the years, as the DAEC TS was upgraded to more closely conform to the Standard TS.

DAEC Design and Licensing Basis

A search was conducted to find requirements and/or guidelines regarding SRM and IRM overlap. It was found the overlap between the SRMs and IRMs was discussed in Regulatory Guide 1.68. Both the original version, "Preoperational and Initial Startup Test Programs For Water-cooled Power Reactors," (Nov. 1973) and the current version, "Initial Test Programs For Water-cooled Nuclear Power Plants," (Rev. 2, Aug. 1978) were reviewed. The original version was reviewed, as it would be more applicable to the original licensing of the DAEC in 1974, and the current version for additional changes or insights that might be relevant.

From Rev. 0, Section C. Low-Power Tests, Item 2 - Tests Applicable to Boiling Water Reactors, sub-item e:

Determination of source and intermediate-range neutron monitor overlap and calibration of intermediate range monitor with power.

The Rev. 2 version of the above was expanded (Section 4, Item d.):

Determination of adequate overlap of source-and intermediate-range neutron instrumentation exists and verification that proper operations of associated protective functions and alarms provide for plant protection in the low-power range (if not previously performed).

The pertinent point of the above criteria is that there is "adequate overlap." However, the guidelines do not define what is "adequate." This is left to the licensee to determine.

The original startup testing program for the DAEC, as described in UFSAR Section 14.2, addresses the Regulatory Guide item for demonstrating overlap.

From Table 14.2-1, Fuel Loading and Low Power Tests at Atmospheric Pressure:

6. Source Range Monitor (SRM) Performance

Adequate performance of the source range monitors was established from data taken with the operational neutron sources in place. The system performance was compared to criteria on noise, signal-to-noise ratio, and response to changes in core reactivity.

7. Intermediate Range Monitor (IRM) Calibration

The intermediate range monitors were initially calibrated to give useful readings and to supply protection for this phase of the test program. This initial calibration was made by comparing the IRM readings to the SRM readings in the overlap region.

From Table 14.2-2, Tests During Heatup from Ambient to Rated Temperature and Pressure:

1. IRM Calibration

The IRM subsystem was recalibrated during heatup to make the IRM readings proportional to a known heat input to the reactor coolant. The proportionality was determined by measuring the reactor coolant temperature rise produced by pump heating and by nuclear heating.

2. SRM Performance

SRM performance was determined by checking for the proper overlap with the IRM subsystem.

The determination of "adequate" overlap is defined in the DAEC UFSAR. For the SRMs, the design basis requirement is found in Section 7.6.1.4.1, Item 4:

> The SRM subsystem is designed so that SRM channels are on scale when the IRM subsystem first indicates neutron flux during a reactor startup.

Similarly, for the IRMs, the design basis requirement is found in Section 7.6.1.5.2, Item 2:

> The IRM subsystem is designed so that overlapping neutron flux indications exist with the SRM subsystem and power range monitoring subsystems.

The above UFSAR requirements are unchanged from the original FSAR, other than the Section numbers (original FSAR Section 7.5.4.1(SRMs) and 7.5.5.2 (IRMs)).

In addition, both the original FSAR (7.5.4.3) and current UFSAR (7.6.1.4.5) contain further clarification of the overlap requirement, stating that examination of the sensitivity of the SRM detectors and their operating ranges of 10^6 nv indicates that the IRM subsystem is on scale before the SRM reaches full scale.

The FSAR/UFSAR requirements are consistent with the original General Electric design requirements for the neutron monitoring system (i.e., APED-5706, "In-Core Neutron Monitoring System for General Electric Boiling Water Reactors," W. R. Morgan, November 1968, as revised April 1969).

For the SRMs:

2.1 Operational Design Basis

4. The SRM subsystem shall be designed so that the SRM channels are on scale when the IRM subsystem first indicates neutron flux during a reactor startup.

For the IRMs:

3.1 Operational Design Basis

2. The IRM subsystem shall be designed so that overlapping neutron flux indications exist with the SRM and Power Range Monitoring Subsystems.

Per the original DAEC design and licensing basis, the required overlap is defined as the SRMs being on-scale (i.e., less than full scale or < 10^6 counts/sec) when the IRM subsystem first indicates neutron flux (i.e., above downscale or 5/40 of scale on IRM range 1).

Thus, the existing TS Bases definition for adequate overlap is fully consistent with both the DAEC current licensing basis and the pertinent regulatory guidelines.

Consequently, the revision of the Standard Technical Specification Bases to conform to the DAEC-specific design and licensing basis is fully compliant with the DAEC Technical Specification Bases Control Program requirements, as specified in TS Section 5.5.10, and 10 CFR 50.59.