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April 24, 2014

MEMORANDUM TO: Sher Bahadur, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

FROM: Kriss M. Kennedy, Director ***/RA/***
Division of Reactor Projects
Region IV

SUBJECT: TASK INTERFACE AGREEMENT – CONCURRENCE ON FORT CALHOUN TORNADO MISSILE PROTECTION LICENSING BASIS (TIA 2013-07)

This Task Interface Agreement (TIA) documents Region IV's position regarding Omaha Public Power District's (OPPD) evaluations performed in accordance Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, tests, and experiments," related to proposed plant modifications and associated changes to the current licensing basis (CLB) for tornado missile protection for Fort Calhoun Station (FCS), as well as, the FCS Operability Form NOD-QP-31, 2013-14393. Concurrence on this memo by the Office of Nuclear Reactor Regulation (NRR) indicates their review and approval of Region IV's regulatory position. The NRC staff concludes that the 10 CFR 50.59 evaluations performed by OPPD do not provide an adequate basis for making changes to the tornado missile protection as described in the FCS Updated Safety Analysis Report (USAR) without prior NRC approval. Further, the staff disagrees with the FCS conclusion in NOD-QP-31 2013-14363 that the affected non-conforming systems and components are operable.

Introduction

To address a number of identified tornado missile protection deficiencies, the licensee proposed implementing plant modifications to protect plant equipment using a different design methodology than that described in their USAR. Specifically, the licensee proposed to replace its CLB methodology for evaluating the impact of tornado generated missiles on plant equipment with the "methodology" of RG 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants." Following review of this evaluation, the NRC concluded that the licensee had inappropriately concluded that prior NRC review and approval was not required for the change. The licensee performed another 50.59 evaluation for implementing plant modifications to protect equipment. This evaluation concluded that the original design was based on the premise that only structures were required to survive impacts of tornado missiles. Protecting plant equipment located outside the structures would be an upgrade to improve plant safety margins. To protect the equipment, the licensee planned to use a different design methodology than that described in the USAR and concluded that prior NRC review and approval was not required. The NRC reviewed this evaluation and again determined that the

licensee inappropriately concluded that prior NRC review and approval was not required for the change. Subsequently, the license performed an operability evaluation that concluded the affected equipment was operable on the basis that tornado missile protection was limited to structures and not equipment located outside these structures. The NRC reviewed this evaluation and concluded the licensee's basis for operability was not adequate and that certain equipment located outside structures are required to be tornado missile protected to ensure a safe shutdown following a tornado. The licensee then submitted an exigent licensing amendment request to change the tornado missile protection design basis requirements described in the USAR. The NRC approved the license amendment on July 26, 2013 (ADAMS Accession No. ML13203A070). The amendment revised the USAR for the design basis tornado (DBT) and tornado missiles to include NRC Regulatory Guide 1.76, Revision 1, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," and Bechtel Power Corporation, Topical Report BC-TOP-9A, Revision 2, September 1974, "Design of Structures for Missile Impact." The changes revised the current licensing basis pertaining to protection from tornadoes and tornado-generated-missiles.

The following background information provides the NRC's assessment of the licensee's evaluations.

Background

The following provides background information regarding the licensee's current licensing bases related to tornado missile protection design requirements.

The FCS USAR, Appendix G, FCS Design Criteria, Criterion 2 – Performance Standards, states in part:

> The systems and components of the Fort Calhoun Station, Unit No. 1 reactor facility that are essential to the prevention or mitigation of accidents that could affect public health and safety are designed, fabricated, and erected to withstand without loss of capability to protect the public, the additional forces that might be imposed by natural phenomena such as tornadoes. The facility is designed so that the plant can be safely shutdown and maintained in a safe shutdown condition during a tornado.

The FCS USAR, Section 5.8.2.2, "Tornado Generated Missiles," states, in part, that the design basis tornado wind speed was 500 miles per hour which resulted in the most critical projectile being a 3 inch diameter, 10 feet long pipe moving at a velocity of 640 feet per second. As with the turbine generated missiles, using the present state-of-the-art missile penetration data, it is determined that the tornado generated missiles would not perforate the containment.

The FCS USAR, Section 5.11.3, "Design Criteria, Class 1 Structures," states, in part that Class I structures, other than the containment, were designed to withstand a tornado with a maximum wind velocity of 300 miles per hour.

NRC Review of Licensee's 50.59 and Operability Evaluations

Licensee June 27, 2013, 50.59 Evaluation

On June 27, 2013, the licensee approved a 10 CFR 50.59 evaluation as part of Engineering Change EC 60974, "Tornado Missile Protection Methodology Change," Revision 0, as the means of adopting Regulatory Guide 1.76. In this evaluation, the licensee determined that the information contained in Regulatory Guide 1.76 constituted a new method of evaluation, and went on to identify that this method had been previously reviewed and approved for use at another facility via a safety evaluation report. Based on this evaluation, the licensee determined that Regulatory Guide 1.76 could be implemented at FCS without prior NRC approval.

This change would consist of different types of tornado generated missiles than those described in the licensee's USAR and different missile velocities. For example, the FCS USAR, Section 5.11.3, "Design Criteria, Class 1 Structures," states, in part that Class I structures, other than the containment, were designed to withstand a tornado with a maximum wind velocity of 300 miles per hour. This change would reduce the tornado wind speed velocity to 230 miles per hour.

NRC Conclusion of the June 27, 2013, 50.59 Evaluation

Consistent with the Statements of Consideration (SOC) for the Final Rule for 10 CFR 50.59 and RG 1.187, which endorses NEI 96-07, Revision 1, "Guidelines for 10 CFR 50.59 Implementation," the staff concludes that the licensee's June 27, 2013, evaluation did not provide an adequate basis for making changes to the tornado missile protection as described in the FCS USAR without prior NRC approval.

RG 1.76 describes how to select the values for the design-basis tornado and tornado-generated missile spectrum for use in a licensee's USAR described method of evaluation. Consistent with the SOC for the 50.59 rule, the values in RG 1.76 are an element of a method of evaluation. As such, these values, when used in an NRC-approved method of evaluation, should demonstrate that margins that exist from the conservatisms in the method of evaluation ensure that design basis requirements are met.[1]

Additionally, in accordance with Section 3.8 of NEI 96-07, RG 1.76 values are an *element of a methodology* because:

> The development or approval of a methodology was predicated on the degree of conservatism in a particular input parameter or set of input parameters. In other words, if certain elements of a methodology [method of evaluation] or model were accepted on the basis of the conservatism of a selected input value, then that input value is considered an element of the methodology.

[1] 64 FR 53599, SOC examples 1, 4, and 5 provide additional insight on changes to elements of a method of evaluation described in the USAR.

The staff concludes that the licensee's evaluation fails to properly address the requirements of 10 CFR 50.59(a)(2)(i) and the guidance in NEI 96-07, Sections 3.8 and 4.3.8.1. In general, licensees can make changes to elements of a methodology without first obtaining a license amendment if the results are essentially the same as, or more conservative than, previous results. In this example the licensee proposed to use a tornado wind speed, referenced in Regulatory Guide 1.76, as a design input that was less than the wind speed described in the CLB. Based on this, the NRC cannot determine whether or not the change results are essentially the same, or more conservative than, previous results using the CLB wind speed.

Licensee July 12, 2013, 50.59 Evaluation

Following the June 27, 2013, 50.59 evaluation, and based on discussions with the NRC, on July 12, 2013, the licensee approved a 10 CFR 50.59 evaluation as part of EC 61354, "VA-71A & B Battery Room Ventilation Tornado Missile Protection," Revision 0. In this evaluation, the licensee took the position that while USAR Draft Criterion 2 stated that licensee's would protect systems and components, the station's response documented in both Appendix G to the USAR, and to NRC questions, stated that only structures would resist the forces of tornados and tornado missiles. Therefore, the licensee concluded that the adoption of the additional requirement to protect systems and components did not require prior NRC approval. The licensee concluded that this new method of evaluation for modifications being made to the facility included:

1. Adoption of Regulatory Guide 1.76 Revision 1, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," that provides the regionalized selection of the design basis tornado and tornado missiles.

2. Use of Bechtel Topical Report (TR) BC-TOP-9A Revision 2, "Design of Structures for Missile Impacts," dated November 25, 1974. This topical report provides the general procedures and criteria for design of structures and components against the effects of impact of missiles, including the evaluation of local effects due to missiles impacting both concrete and steel structural elements, and procedures used to evaluate the overall structural response to missile impact loads. The TR was approved by the Atomic Energy Commission (AEC) staff in November 1974.

3. Use of Standard Review Plant (SRP) Section 3.5.3, Revision 3, that provide NRC endorsed acceptance criteria for the design basis tornado missile impact, e.g., verification that FCS provides adequate barrier thickness to prevent perforation and to prevent spalling or scabbing when protection from spalling or scabbing is considered necessary.

NRC Conclusion of the July 12, 2013, 50.59 Evaluation

The licensee's conclusion that USAR Draft Criterion 2 does not apply to systems and components is unsupported by the criterion wording requiring the protection of systems and components and the licensee's USAR statement that Draft Criterion 2 is met. The means of protecting many of the systems and components essential to the prevention of accidents was the use of structures, but the protection of such systems and components

is still a requirement of the criterion. The licensee contends that the CLB requires tornado missile protection only for *structures*. However, based on its review of the CLB, the staff concludes that the CLB requires tornado missile protection for *structures, systems, and components.*

Consistent with Regulatory Guide 1.187, which endorses NEI 96-07, Revision 1, the staff concludes that the licensee's July 12, 2013, evaluation does not provide an adequate basis for making changes to the tornado missile protection as described in the FCS USAR without prior NRC approval. Specifically, the staff concludes that:

> As previously discussed, RG 1.76 is an element of a method of evaluation. The licensee's evaluation does not properly address the requirements of 10 CFR 50.59(a)(2)(i) and the guidance in NEI 96-07, Sections 3.8 and 4.3.8.1, specifically, whether or not the change yields results that are conservative or essentially the same.
>
> Topical Report BC-TOP-9A, Revision 2, is an AEC-approved methodology that provides general procedures and criteria for design of nuclear power plant structures and components against the effects of impact of missiles, including the evaluation of local effects due to missiles impacting both concrete and steel structural elements, and procedures used to evaluate the overall structural response to missile impact loads. The AEC Regulatory Position in its approval of the TR states that the report may be referenced in future case applications provided that the following specific information reviewed and approved by the Regulatory staff is included in the individual safety analysis report:
>
> a. Parameters that define postulated missiles such as striking velocity, weight, missile configurations and impacting area, etc.
> b. Structures, shields and barriers that are required to be designed for missiles with their pertinent characteristics.
> c. Information justifying the use of a ductility ratio greater than 10.
> d. The evaluation of punching shear effect due to the impact of unconventional missiles...should be adequately addressed in the individual plant SAR.
>
> The licensee's evaluation does not address the staff's conditions for using the Topical Report methodology, as would be necessary to conform to Section 4.3.8.2 of NEI 96-07. In addition, the licensee's evaluation appears to substitute alternatives to the conditions of use. For example: (1) in lieu of the CLB values in the USAR, the licensee's evaluation substitutes the input values from RG 1.76, and (2) in lieu of the TR BC-TOP-9A conditions of use, the licensee's evaluation substitutes the acceptance criteria of SRP 3.5.3. The licensee's evaluation does not fully address the requirements of 10 CFR 50.59(a)(2)(i) and the guidance in NEI 96-07, Section 4.3.8.2, that states that, "The licensee should address these and similar considerations, as applicable, and document in the 10 CFR 50.59 evaluation the basis for determining that a method is appropriate and approved for the intended application."

> SRP Section 3.5.3, Revision 3, does not provide an approved methodology for licensees to reference or use in the context of 10 CFR 50.59, as evidenced by the fact that the SRP does not have an associated safety evaluation report. The licensee asserts that the CLB requires tornado missile protection only for *structures*. However, the SRP includes acceptance criteria that require protection of *structures, systems, and components*.

In summary, 10 CFR 50.59(a)(2)(ii) permits licensees to change from a method of evaluation described in the USAR to an NRC-approved method of evaluation without a license amendment provided that the method of evaluation was approved for the type of analysis being conducted, generically approved for the type of facility using it, and that all terms and conditions for use of the method are satisfied. The licensee proposes to combine RG 1.76, TR BC-TOP-9A, and SRP Section 3.5.3 to create a replacement method of evaluation for tornado missile protection as described in the FCS USAR. Based on the NRC staff's review, it is not apparent that the licensee is referencing an NRC-approved method of evaluation comprised of these components. Thus, the licensee's proposal is inconsistent with the requirements of 10 CFR 50.59 and the guidance in NEI 96-07, Section 4.3.8.2.

Licensee July 20, 2013 Operability Determination

Following the July 12, 2013, 50.59 evaluation, and based on discussions with the NRC, on July 20, 2013, the licensee completed an operability evaluation documented as NOD-QP-31.1. This evaluation evaluated the non-conforming condition that systems and components required for safe shutdown do not meet the USAR Draft Criterion 2 for tornado missile protection. This evaluation concluded that affected systems and components that were not adequately protected from tornado generated missiles are OPERABLE but degraded, nonconforming, or unanalyzed, and that compensatory measures must be implemented to maintain operability. The compensatory measures consisted of protecting the affected equipment with tornado missile protection features using the methodology contained in the 50.59 evaluation dated July 12, 2013.

NRC Conclusion of the July 20, 2013, Operability Evaluation

Operable or operability is defined in the FCS Technical Specifications as:

> A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power sources, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its specified safety function(s) are also capable of performing their related support function(s).

The following definitions are provided in Inspection Manual Chapter Part 9900: Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety:"

Current Licensing Basis (Section 3.1)

The current licensing basis (CLB) is the set of NRC requirements applicable to a specific plant, plus a licensee's docketed and currently effective written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis, including all modifications and additions to such commitments over the life of the facility operating license.

Fully Qualified (Section 3.4)

A structure, system or component (SSC) is fully qualified[2] when it conforms to all aspects of its CLB, including all applicable codes and standards, design criteria, safety analyses assumptions and specifications, and licensing commitments. An SSC is considered "not fully qualified," i.e., degraded or nonconforming, when it does not conform to all aspects of its CLB, including all applicable codes and standards, design criteria, safety analyses assumptions and specifications, and licensing commitments.

The SSCs that TS require to be operable are designed and operated, as described in the CLB, with design margins and engineering margins of safety to ensure, among other things, that some loss of quality does not result in immediate failure to meet a specified function. The CLB includes commitments to specific codes and standards, design criteria, and some regulations that also dictate margins.

Operable/Operability (Section 3.8)

Operable/Operability is defined and its meaning is discussed in the context of the CLB design by the following statement:

> In order to be considered operable, an SSC must be capable of performing the safety functions *specified by its design*, *within the required range of design physical conditions*, initiation times, and mission times.

Compensatory Measures (Section 7.3)

Compensatory measures may be used to restore "inoperable SSCs to an operable but degraded or nonconforming status. In general, these measures should have minimal impact on the operators or plant operations and should be relatively simple to implement."

Change to Facility or Procedures in Lieu of Full Restoration (Section 7.4.1)

In this situation, the licensee's proposed final resolution of the degraded or nonconforming condition includes other changes to the facility or procedures to cope with the uncorrected or only partially corrected degraded or nonconforming

[2] The NRC does not have specific qualification requirements for SSCs, except for electric equipment important to safety, as set forth in 10 CFR 50.49.

condition. Rather than fully correcting the degraded or nonconforming condition, the licensee decides to restore capability or margin by making another change. In this case, the licensee must evaluate the change from the UFSAR-described condition to the final condition in which the licensee proposes to operate its facility. If the 10 CFR 50.59 screening and/or evaluation concludes that a change to the TSs is involved or the change meets any of the evaluation criteria specified in the rule for prior NRC approval, a license amendment must be requested, and the corrective action process is not complete until the approval is received or some other resolution occurs.

Use of Alternative Analytical Methods in Operability Determinations (Appendix C.4)

When performing operability determinations, licensees sometimes use analytical methods or computer codes different from those originally used in the calculations supporting the plant design. This practice involves applying engineering judgment to determine if an SSC remains capable of performing its specified safety function during the corrective action period. The use of alternative methods is not subject to 10 CFR 50.59 unless the methods are used in the final corrective action. Section 50.59 is applicable upon implementation of the corrective action.

The NRC staff disagrees with the FCS conclusion that the affected systems and components are "OPERABLE**,** but degraded, nonconforming or unanalyzed…" Systems and components required to be operable by FCS TS must be capable of performing their specified safety functions before, during, and after postulated tornado events as defined in the FCS current licensing basis.

The discovery of a degraded or nonconforming condition may call the operability of one or more SSCs into question. A subsequent determination of operability should be based on the licensee's "reasonable expectation," from the evidence collected, that the SSCs are operable and that the operability determination will support that expectation. In order to be considered operable, a structure, system or component must be capable of performing the safety functions specified by its design, within the required range of design physical conditions, initiation times, and mission times. Therefore, upon discovery that safety systems and components required to be operable by FCS TS are unprotected against natural phenomena, FCS cannot conclude, based on a reasonable expectation of operability, that the affected systems and components are capable of performing their specified safety functions during and after a postulated tornado event as defined in the FCS current licensing basis.

With respect to the corrective action to construct barriers to correct the identified nonconforming conditions, FCS may implement compensatory measures to establish the operability of affected systems and components. Standards for constructing tornado missile barriers should be consistent with the current licensing basis. If the compensatory measure involves a change to the facility, as was the case with FCS, then the change must be evaluated in accordance with 10 CFR 50.59. If the screening and/or evaluation of the compensatory measure concludes that a change to the TSs is involved or the change meets any of the evaluation criteria specified in the rule for prior NRC

approval, a license amendment must be requested, and NRC approval received before the compensatory measure can be implemented. The corrective action process is not complete until the approval is received or some other resolution occurs.

NRC Overall Conclusion

In summary, the NRC staff reviewed the June 27 and July 12, 2013, 10 CFR 50.59 evaluations performed by the licensee and concluded that these evaluations do not provide an adequate basis for making changes to the tornado missile protection as described in the FCS USAR without prior NRC approval. Further, the NRC staff disagrees with the FCS conclusion in the July 20, 2013 Operability Evaluation that the affected systems and components are "OPERABLE**,** but degraded, nonconforming or unanalyzed..." Systems and components required to be operable by FCS TS must be capable of performing their specified safety functions before, during, and after postulated tornado forces as defined in the FCS current licensing basis.

MEMORANDUM TO: Sher Bahadur dated

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