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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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LICENSEE: Duke Energy Corporation (DUKE)

FACILITY: Oconee Nuclear Station, Units 1, 2, AND 3

SUBJECT: TRIP REPORT: OCONEE NUCLEAR STATION SCOPING AND SCREENING METHODOLOGY SITE-VISIT

On October 27, 1998, members of the NRC staff visited the Duke Energy (Duke) Corporate Office in Charlotte, NC. The objective of this visit was to review the license renewal scoping and screening methodology and justification for the Oconee Nuclear Station (ONS) license renewal application (LRA). The following is a summary of the site-visit activities and results. On October 30, 1998, the site-visit team exited in a public meeting, the list of attendees are attached.

SSC Engineering Study

The ONS was originally designed with essential systems that were designed to provide barriers to prevent the release of fission products to the environment. These essential systems that made up the ONS original design basis included the Reactor Coolant System, Reactor Vessel Internals, Reactor Building, Engineering Safeguards Systems, and Emergency Electrical Power Systems. These systems were categorized as Quality Assurance (QA)- 1 Systems. Over time, additional systems and components were added to the QA-1 list for various reasons. These added systems and components included Emergency Feedwater System, Anticipated Reactor Trip System, select groups of instrumentation, Reactor Coolant System hot leg and reactor vessel high point vents, portions of the standby shutdown facility, etc. Although the number of systems relied upon to support the basic ONS design requirements have changed over time, the original design criteria have not.

The design criteria to which ONS was originally built do not include all systems, structures, and components that need to be included under the "safety related criteria" defined by 10 CFR 54.4(a)(1), and the "non-safety related criterion" defined under 10 CFR 54.4(a)(2). Therefore, ONS relied on a design study to identify the systems and components that are needed to fulfill the "safety related criteria" as defined under 10 CFR 54.4(a)(1). The additional mechanical and electrical components identified under this design study beyond those components already identified as QA-1 have or will be designated as QA-5 components by Duke.

The site-visit team discussed this design study and the process used to identify the QA-5 components with Duke as part of its scoping methodology review. The basic process, as described by Duke, involved identifying all the mechanical and electrical systems that meet the "safety related criteria" under 10 CFR 54.4(a)(1). Evaluation boundaries were established for the portions of those mechanical systems required to perform the system functions that satisfied the specified criteria. All the components within the evaluation boundaries that were not already classified as QA-1 components were classified as QA-5 components. In addition, Duke stated that it had reviewed the non-safety related mechanical and electrical systems whose failure could prevent the successful completion of the safety functions for the QA-1 and QA-5

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components. Again, evaluation boundaries were established for the components of these non-safety related systems and the components within those evaluation boundaries that were not already identified as QA-1 were identified as QA-5 components.

The team concluded that the process, as described by the applicant, appears to be a reasonable approach for identifying a supplemental list of systems, structures and mechanical components to complement Duke's design basis to meet the scoping criteria under 10 CFR 54.4 (a)(1) and (a)(2). The team concluded that the design study Duke described and relied upon to fulfill the scoping requirements for license renewal is not fully described in the license renewal application (LRA).

Structural Review

The structures scoping process began with a complete list of ONS structures identified through a review of the updated final safety analysis report (UFSAR), ONS site drawings, non-nuclear facility drawings, and the "Quality Standards Manual." A list of 12 structural-level intended functions was developed from the scoping criteria under 54.4(a) and applied to each identified structure. Those structures that meet one or more of the 12 intended functions were determined to be within the scope of the rule. In general, all structures already classified as Class 1 and Class 2, based on the original design criteria that make up the ONS current licensing basis (CLB), satisfied the scoping criteria under 54.4(a)(1) and (a)(2), respectively. In addition to the criteria under 54.4 (a)(1) and (a)(2), the "regulated events," as defined under 54.4 (a)(3), were also assessed by Duke. Duke identified the applicable ONS structures through a review of the commitments made for each of the five events. The structures required for compliance with the regulated events were also identified and documented as being within the scope of the rule.

The list of structures determined to be within the scope of the rule is provided in the LRA, § 2.7.1. The structural intended functions identified by Duke are also provided in the LRA, Tables 2.7-1 to 2.7-8. The 12 structural intended functions include the following three functions:

- "provide structural and/or functional support to safety related equipment"
- "provide shelter/protection to safety related equipment (including radiation shielding)"
- "provide structural and/or functional support to non-safety related equipment where failure of this structural component could directly prevent satisfactory accomplishment of any of the required safety-related functions."

Duke stated that they did not determine whether any components within the scope of the rule are located in any Class 3 structures. On the bases of the three intended functions listed above, if any component within the scope of the rule is found in a Class 3 structure, that structure may warrant some aging management review since some of the QA-5 components, that have been identified, have not been assessed based on location. Duke informed the team that this review was done for QA-5 mechanical components that have already been identified, but not for electrical components. The team concluded that all newly identified QA-5 components should be reviewed and a process established to control and document these review activities.

The screening process began with the development of a list of structural component types from the structures determined to be within the scope of the rule and the "NUMARC Containment and

Class I Structures Industry Report." Other structural components were added from the review of the Duke commitments made with respect to the "regulated events" identified under 10 CFR 54.4(a)(3). Duke also reviewed design basis specifications and structural drawings to complete its list of structural components within the scope of the rule. To verify that the list was complete, an independent review was performed by ONS structural experts.

Duke then identified structural component-level intended functions from information in the UFSAR, ONS site specification, licensee commitments to design basis events, regulated events, or from input by staff structural experts. This resulted in a list of component-level intended functions that supported the structural-level intended function plus some additional intended functions unique to individual components. For example, the spent fuel storage racks have a component specific intended function to provide separation to prevent criticality which does not match the Auxiliary building intended functions. Duke then removed those structural components identified as being active in the rule and in Appendix B of NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule." Duke then removed all structural components that are replaced based on qualified life or specified time period. The remaining components left Duke with a list of structural components requiring an aging management review. A list of components and its intended functions for the reactor building (containment) can be found in Table 2.3-2 of the LRA and in Tables 2.7-1 through 2.7-8 for the balance of structures within the scope of the rule.

The team did not identify any deficiencies in the LRA information reviewed that related to the scoping and screening methodology for structures. In addition, the on-site supporting information reviewed did contain the necessary details to verify the implementation of and adherence to that process.

There was one exception noted for a Class 2 structure that did not meet the scoping criteria under 54.4 (a)(1) and (a)(2). An underwater weir has been classified as a Class 2 structure since initial licensing of ONS, but it is in the process of being changed to a Class 3 structure. The weir was originally designed to ensure that sufficient water was available during a three-unit steam generator boil-off event with a loss of Keowee Lake water level. Duke has subsequently determined that the water trapped in the condenser intake and discharge piping on loss of Keowee Lake water level below a certain elevation was adequate to supply the three ONS units with makeup water for steam generator boil-off for a period of 37 days. The staff did not have a concern with this determination for the purpose of scoping structures for license renewal. The technical adequacy of available makeup is being reviewed separately under 10 CFR Part 50.

The team's review of structural scoping activities identified a concern with the exclusion of the 100kV Lee transmission line and associated transformer CT5 from the scope of license renewal. Because the 100 kV System is an electrical system, concerns relating to this determination will be addressed under the electrical scoping process.

Mechanical Systems and Components Review

The site-visit focused on the method used by Duke to identify and list the mechanical components as well as the technical justification for the identification process. The review also encompassed the examination of selected portions of the applicable Duke specifications used to

describe the methodology associated with the identification of mechanical systems and its intended functions.

As described in the LRA, the ONS mechanical scoping methodology included the following steps: identifying all systems and their intended functions as listed in design basis event (DBE) mitigation calculations; identifying all passive boundaries required for the systems identified in DBE mitigation calculations; identifying portions of selected mechanical systems whose failure to maintain their pressure boundary or to remain structurally intact would result in adversely impacting the function of any essential system or component. In addition, the mechanical scoping methodology addressed the "regulated events" identified under 10 CFR 54.4(a)(3).

The output of the mechanical scoping and screening process included a set of high-lighted ONS flow diagrams that was used to define the evaluation boundaries of the license renewal related equipment. These highlighted drawings identified the fluid flow paths required to be functional during and following design basis events, and the components necessary for the systems to accomplish its intended function(s). Interfacing flow paths, which share a common pressure boundary with the principal path, or non-safety related flow paths whose failure could prevent satisfactory accomplishment of any of the safety related functions under 10 CFR 54.4(a) were also included. The high-lighted flow diagrams were color-coded to distinguish between Class 1 and Non-class 1 seismic piping.

After the evaluation boundaries were established, the process is designed to identify those components within the evaluation boundaries that require an aging management review primarily by eliminating those components excluded by the rule. Duke also identified the component-level intended functions that are required to fulfill the system-level intended functions as required under 10 CFR 54.4(a). The resulting list of components, and groups of component types subject to aging management review were presented in the LRA, Subsections 2.5.3 through 2.5.14 and the associated tables. These tables also contained the intended functions and the materials of construction for each of the mechanical components.

The staff noted one concern during its review of the mechanical scoping and screening methodology. The on-site documentation contained open items noted in its text (e.g., assumptions that needed verification). Follow-up discussion relating to these open items identified the lack of a formal tracking system to ensure tracking and resolution of the different items. Further inquiries determined that similar open items exists throughout the license renewal methodology.

The site visit team did not identify any deficiencies in the LRA information necessary to describe and assess the scoping and screening methodology for mechanical components. In addition, the supporting information reviewed did contain the necessary details to verify the implementation of and adherence to the scoping and screening methodology as presented in the LRA. The staff has no additional concerns with the scoping and screening methodology for mechanical components.

Electrical System and Component Review

The electrical systems scoping and component screening was not performed using the same methodology used for scoping mechanical and structural components. Instead, Duke opted to develop a different process that did not follow the industry guidance. The process used by Duke was confusing and difficult to follow.

Duke's scoping and screening process for electrical components began with a complete list of electrical component-types used at ONS. For this list of component types, Duke identified the "basic component-type" intended function(s). Using these basic functions, Duke eliminated the active electrical component-types from the list of ONS electrical component-types. Then, Duke identified the location of the remaining components and eliminated all components not located in Class 1 and Class 2 structures. Duke also added certain electrical components not supported by any structure (e.g., direct buried cables). Duke then eliminated individual components that did not meet the criteria under 54.4(a) based on the system-level function. Finally, the remaining electrical component types were screened for components that have *"time-based component lives and provisions for replacing them"* before they reach end of life. These steps resulted in a list of four electrical component types requiring an aging management review.

Although the above process describes the basic steps, the actual implementation of the electrical scoping and screening process was an iterative process that was often difficult to follow. The staff had a number of concerns with the process as described in the LRA and the associated documentation retained at the plant. The team concluded that the LRA did not describe the process well enough for the team to assess its implementation in the on-site records.

Duke's current electrical screening methodology involves an active/passive screening of components using "basic component-type" intended function. Subsection 54.21(a)(1) of the rule states that *"[s]tructures and components subject to an aging management review shall encompass those structures and components-- (i) [t]hat perform an intended function , as described in §54.4, without moving parts or without a change in configuration or properties."* NEI 95-10 interpret this to mean that the screening of active components must be performed based on the component-specific intended functions and not on the higher-level system functions. Although not clearly defined, in discussions with Duke, the staff found the use of "basic component-type functions" to be very broad and not consistent with the staff's and the industry's interpretation as documented in NEI 95-10, § 4.1.2. The justification Duke gave for identifying active components using "basic component-type" intended function was that they were "more bounding" in the screening of these component types. However, the team is concerned that the use of these broader/higher level intended functions was less conservative, and may have inappropriately excluded some passive components from an aging management review. The team concluded that the use of "basic component type" intended functions does not appear to be consistent with the rule, and additional justification may be needed during the staff's review of this aspect of the renewal application.

The electrical scoping and screening methodology also used system-level intended functions to eliminate individual components that did not meet the criteria under 54.4(a). The team similarly concluded that this aspect of the screening does not appear to be consistent with the staff's and

industry's interpretation of the requirement of the rule under 54.21(a)(1)(I) for the same reasons discussed above.

The staff also raised a concern related to the use of component location to eliminate electrical components from the scope of the rule. The ONS design basis definition is different from the scoping criteria under 10 CFR 54.4 (a)(1). Duke is performing a design study to identify additional QA-5 components that meet the scoping criteria of the rule, and additional electrical components appear to have been identified. However, it was not apparent to the team that efforts were taken to verify whether QA-5 electrical components are installed in any location other than Class 1 and Class 2 structures at ONS.

Another example of Duke's reliance on location to eliminate components from the scope of the rule was the classification of the structures associated with the 100 k V transmission line and transformer CT5 (not previously classified) as Class 3 structures simply because they were not classified as Class 1 or Class 2 in the ONS UFSAR. Duke then determined the electrical components associated with the 100kV transmission line and Transformer CT5 as not being within the scope of license renewal because they were located in or on these Class 3 structures. The team was also concerned with the omission of these components without a documented basis.

The "Oconee Electrical Component Aging Management Review for License Renewal," specification OSS-0274.00-00-0006, Subsection 3.1.5, contains the following statement: *"time-based component life and has provisions to replace the component prior to the end of its life."* This is not the same terminology used in the rule or NEI 95-10 to describe those components that can be eliminated because they are replaced based on qualified life or specified time period.

The applicant presented a sound approach for the scoping and screening of mechanical and structural components that is consistent with the industry guidance as documented in Regulatory Guide 1047. However, the scoping and screening process for electrical components did not follow the same methodology. During this site-visit, we obtained the information needed to develop the "request for additional information" that will allow the staff to assess the scoping and screening methodology, and to make the necessary finding required under 10 CFR 54.29.

/S/

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