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Serial: RA-17-0009
February 13, 2017

10 CFR 50.90

U.S. Nuclear Regulatory Commission
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CATAWBA NUCLEAR STATION, UNIT NOS. 1 AND 2
DOCKET NOS. 50-413 AND 50-414
RENEWED LICENSE NOS. NPF-35 AND NPF-52

SUBJECT: RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION (RAI) RELATED TO A LAR TO REVISE THE UPDATED FINAL SAFETY ANALYSIS REPORT TO REFLECT ELECTRICAL POWER SYSTEM ALIGNMENTS FOR SHARED SYSTEMS

REFERENCES:

1. Duke Energy letter, *License Amendment Request Proposing an Updated Final Safety Analysis Report (UFSAR) Revision to Reflect Electrical Power Systems Alignments for Shared Systems at Catawba Nuclear Station*, dated May 26, 2016 (ADAMS Accession No. ML16147A105).

2. NRC letter, *Catawba Nuclear Station, Units 1 and 2 - Request for Additional Information Regarding License Amendment Request for Electrical Power Systems Alignments for Shared Systems (CAC Nos. MF7748 and MF7749)*, dated January 12, 2017 (ADAMS Accession No. ML16337A332).

Ladies and Gentlemen:

In Reference 1, Duke Energy Carolinas, LLC (Duke Energy) submitted a license amendment request (LAR) for Catawba Nuclear Station (CNS), Units 1 and 2. The request for amendment proposed to add descriptions to several sections of the Updated Final Safety Analysis Report (UFSAR) to clarify how a shutdown unit supplying either its normal or emergency power source may be credited for operability of shared components supporting the operating unit. In Reference 2, the Nuclear Regulatory Commission (NRC) requested additional information (RAI) regarding the original Duke Energy submittal. The enclosure to this letter provides Duke Energy's response to the NRC RAI requested in Reference 2.

There are no new regulatory commitments contained in this letter.

In accordance with 10 CFR 50.91, Duke Energy is notifying the State of South Carolina of this license amendment request by transmitting a copy of this letter and enclosures to the designated State Official. Should you have any questions concerning this letter, or require additional information, please contact Cecil Fletcher at 803-701-3622.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 13, 2017.

Sincerely,

Tom Simril
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Enclosure: Response to NRC Request for Additional Information

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Enclosure

Response to NRC Request for Additional Information

NRC Request for Additional Information:

By letter dated May 26, 2016 (Agencywide Documents Access and Management System Accession No. ML16147A105), Duke Energy, Inc. (the licensee) requested approval for an updated final safety analysis report (UFSAR) change for the Catawba Nuclear Station (CNS), Units 1 and 2. CNS proposes to add descriptions to several sections of the UFSAR to clarify how a shutdown unit supplying either its normal or emergency power source may be credited for operability of shared components supporting the operating unit.

The U.S. Nuclear Regulatory Commission staff needs the following additional information to complete its review of the license amendment request (LAR).

Request for Additional Information (RAI) 5

With a single line diagram, please explain how the electrical systems for each unit (power sources (both alternating current (ac) and direct current (dc), ac medium voltage buses and switchgears, distribution panels, load centers, motor control centers, and shared loads) are configured. For the following operating configurations, please identify (1) the applicable electrical-related technical specification (TS) requirements for each unit; (2) the operability of each shared structure, system, and component (SSC) (i.e., nuclear service water system (NSWS), control room area ventilation system (CRAVS), control room area chilled water system (CRACWS), and the auxiliary building filtered ventilation exhaust system (ABFVES)); and (3) the applicable TS required actions:

a. When both units are in Modes 1-4;

b. When both units are in Modes 1-4 and Train A of one unit is undergoing engineered safety feature (ESF) testing;

c. When both units are in Modes 1-4 and Train A of both units is undergoing ESF testing, if performed;

d. When one unit (Unit 1) is in Modes 1-4 and the other unit is in Modes 5-6; and

e. When one unit (Unit 1) is in Modes 1-4 and the other unit is in Modes 5-6 and undergoing ESF testing.

Duke Energy Response to RAI 5:

Figures 1 and 2 below show the 4160v and 600v electrical power systems for CNS Unit 1 A train. Unit 2 A train and both Unit 1 and 2 B trains are similar, with the exception being the shared 600v motor control center 2EMXH. Motor control center 2EMXH would be in the same location as 1EMXG on the B train. Normally 1EMXG is powered from Unit 1 A train via load center 1ELXA and 2EMXH is powered from Unit 2 B Train via load center 2ELXB. 1EMXG can also be powered from Unit 2 A train via load center 2ELXA and 2EMXH can be powered from Unit 1 B train via load center 1ELXB.

a. When both units are in Modes 1-4;

    1) With both Units in Modes 1-4, the applicable Technical Specifications are 3.8.1 (AC Sources - Operating) and 3.8.9 (Distribution Systems - Operating). TS 3.8.1 requires

two off-site circuits and two emergency diesel generators to be operable for the essential buses and TS 3.8.9 requires all associated lower voltage buses (i.e., AC safety buses, DC buses, DC trains and AC vital buses) to be operable.

2) The NSWS, CRAVS, CRACWS, and ABFVES shared components are fully operable provided they have an operable normal AND emergency power source.

3) There are no required TS required actions for normal operation in Modes 1-4.

b. When both units are in Modes 1-4 and Train A of one unit is undergoing engineered safety feature (ESF) testing;

Catawba Nuclear Station only performs ESF testing for the applicable Unit in Modes 5 and below, therefore this scenario is not applicable.

c. When both units are in Modes 1-4 and Train A of both units is undergoing ESF testing, if performed;

Catawba Nuclear Station only performs ESF testing for the applicable Unit in Modes 5 and below, therefore this scenario is not applicable. Furthermore, Catawba Nuclear Station does not perform ESF testing on both units simultaneously.

d. When one unit (Unit 1) is in Modes 1-4 and the other unit is in Modes 5-6;

1) When Unit 1 is in Modes 1-4, the applicable Technical Specifications are 3.8.1 (AC Sources - Operating) and 3.8.9 (Distribution Systems - Operating). TS 3.8.1 requires two off-site circuits and two emergency diesel generators to be operable for the essential buses and TS 3.8.9 requires all associated lower voltage buses (i.e., AC safety buses, DC buses, DC trains and AC vital buses) to be operable. For the unit in Modes 5-6 (Unit 2), the applicable TSs are 3.8.2 (AC Sources - Shutdown) and 3.8.10 (Distribution Systems - Shutdown). TS 3.8.2 requires one off-site circuit and one emergency diesel generator to be operable. TS 3.8.10 requires the lower voltage buses (i.e., AC safety buses, DC buses, DC train and AC vital buses) associated with that train to be operable to support equipment required to be operable.

2) The NSWS, CRAVS, CRACWS, and ABFVES shared SSCs are fully operable provided they have an operable normal AND emergency power source. Assuming Unit 2 is in Modes 5-6, CNS would have shared motor control center 2EMXH (which provides power to “B train shared NSWS, CRAVS, CRACWS, and ABFVES SSCs) powered from load center 1ELXB which is supported by an operable 4.16kV ESF bus 1ETB, 1B off-site power and 1B DG. This would be the required alignment because CNS is currently unable to credit the emergency power source (i.e., 2B DG) from the unit in Modes 5-6 (Unit 2 in this case) to support operability of the NSWS, CRAVS, CRACWS, and ABFVES shared SSCs.

3) There would be no required Technical Specification actions for the alignments described.

e. When one unit (Unit 1) is in Modes 1-4 and the other unit is in Modes 5-6 and undergoing ESF testing;

1) When Unit 1 is in Modes 1-4, the applicable Technical Specifications are 3.8.1 (AC Sources - Operating) and 3.8.9 (Distribution Systems - Operating). TS 3.8.1 requires two off-site circuits and two emergency diesel generators to be operable for the essential buses and TS 3.8.9 requires all associated lower voltage buses (i.e., AC safety buses, DC buses, DC trains and AC vital buses) to be operable. For the unit in Modes 5-6 (Unit 2), the applicable TSs are 3.8.2 (AC Sources - Shutdown) and 3.8.10 (Distribution Systems - Shutdown). TS 3.8.2 requires one off-site circuit and one emergency diesel generator to be operable. TS 3.8.10 requires the lower voltage buses (i.e., AC safety buses, DC buses, DC train and AC vital buses) associated with that train to be operable to support equipment required to be operable.

2) The shared NSWS, CRAVS, CRACWS, and ABFVES shared SSCs associated with the train undergoing ESF testing are inoperable because they don't have an operable off-site AND emergency power source. Assuming Unit 2 is the unit in Modes 5-6 undergoing ESF testing for the “B” train, Catawba Nuclear Station would have shared motor control center 2EMXH (which provides power to “B” train shared NSWS, CRAVS, CRACWS, and ABFVES SSCs) powered from load center 2ELXB. The 2B emergency diesel generator provides the emergency power for essential bus 2ETB and load center 2ELXB. Therefore, CNS wouldn’t meet the shared system operability definition in the TS Bases for having an operable normal AND emergency power source because according to the CNS current licensing basis, crediting a DG and offsite power circuit associated with the Modes 5 and below unit (in this case the 2B DG) is not allowed.

3) The applicable TS required actions for this scenario are:

    - LCO 3.7.8 (NSWS), Required Action A.1 (“Restore NSWS train to OPERABLE status.”) with a Completion Time of 72 hours
    - LCO 3.7.10 (CRAVS), Required Action A.1 (“Restore CRAVS train to OPERABLE status.”) with a Completion Time of 7 days
    - LCO 3.7.11 (CRACWS), Required Action A.1 (“Restore CRACWS train to OPERABLE status.”) with a CT of 30 days.
    - LCO 3.7.12 (ABFVES), Required Action A.1 (“Restore ABFVES train to OPERABLE status.”) with a CT of 7 days.

Figure 1: Unit 1 "A" Train 4160VAC Electrical Power System

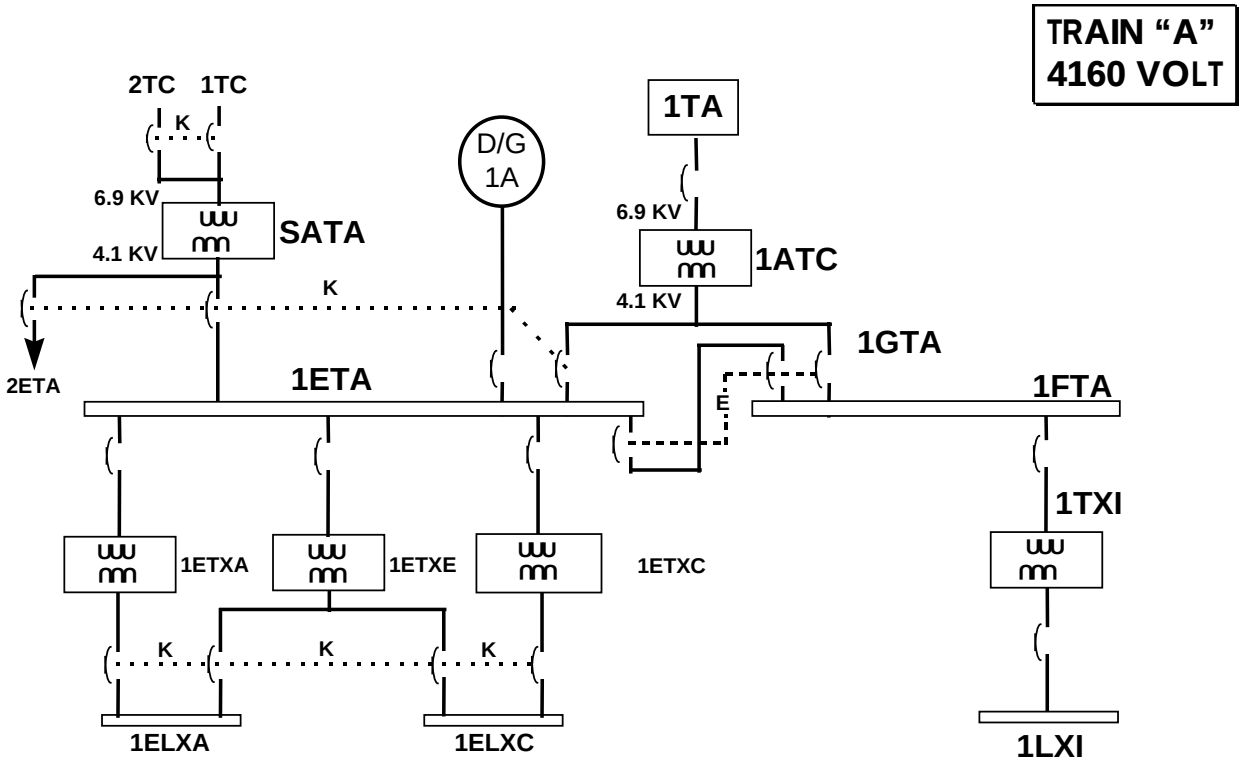
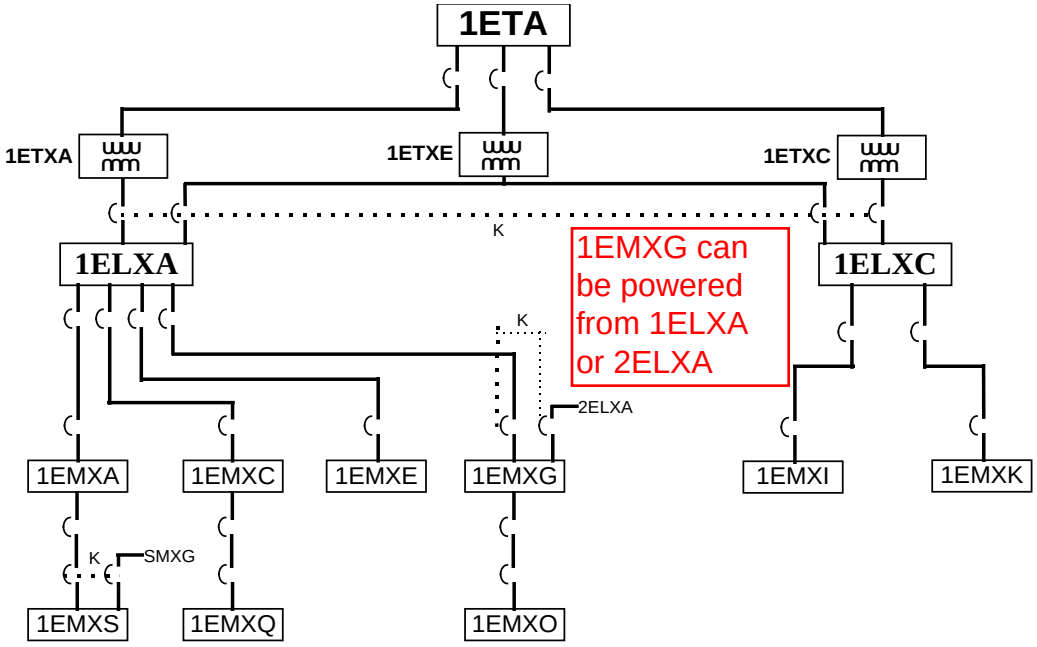


Figure 2: Unit 1 "A" Train 600VAC Electrical Power System



600 Volt Essential Power System - Train "A"

RAI 6

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36(c)(2)(ii)(C), "Criterion 3," states that a TS LCO must be established for:

> A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

1) Please review the following scenarios as an example:

a. Both units are in Mode 1 requiring all four EDGs to be OPERABLE to meet TS 3.8.1 for each unit. CNS, Unit 2, suffers a loss of coolant accident (LOCA) and both units suffer a loss of offsite power (LOOP).

   CNS, Unit 2, needs at least one CNS, Unit 1, EDG (either 1A or 1B) and the distribution systems to mitigate the LOCA, assuming a single failure of either 2A or 2B EDGs. However, TS 3.8.1 for CNS, Unit 2, does not include the CNS, Unit 1, EDGs (i.e., TS 3.8.1 does not require all four EDGs), nor does TS 3.8.9 for CNS, Unit 2, include the CNS, Unit 1, power distribution systems. Even without postulating a single failure (i.e., EDG failure), CNS, Unit 2, still needs at least one of the CNS, Unit 1, EDGs to mitigate the LOCA.

   Please explain how compliance with 10 CFR 50.36(c)(2)(ii)(C) is achieved in this scenario considering that a CNS, Unit 1, EDG is required to mitigate a CNS, Unit 2, LOCA, or provide proposed TS changes.

b. CNS, Unit 1, is in Mode 5 with 1A EDG inoperable and meets TS 3.8.2. CNS, Unit 2, is in Mode 1 and meets TS 3.8.1 and TS 3.8.9. Neither unit is in a TS ACTION statement.

   CNS, Unit 2, suffers a LOCA and both units suffer a LOOP. The 2B EDG fails, leaving only the 1B and 2A EDGs OPERABLE.

   Depending on the lineup of the current power supply (both medium and low voltage buses) and valve lineup of the shared systems (NSWS, CRAVS, CRACWS, and ABFVES), CNS, Unit 2, may need the 1B EDG and associated distribution systems to mitigate the LOCA. However, TS 3.8.1 does not include the CNS, Unit 1, EDGs; TS 3.8.9 does not include any CNS, Unit 1, power distribution systems; nor are any required conditions for the shared systems in the CNS, Unit 2, TS.

   Please explain how compliance with 10 CFR 50.36(c)(2)(ii)(C) is achieved in this scenario considering that a CNS, Unit 1, EDG is required to mitigate a CNS, Unit 2, LOCA, or provide proposed TS changes.

2) Please provide a discussion of why the existing CNS TSs for electric systems (both ac and dc) are conservative to support dual unit operation considering the operability requirements for shared systems when a CNS unit is operating or provide proposed TS changes in accordance with (10 CFR) 50.36(c)(2)(ii)(C).

Duke Energy Response to RAI 6:

First, it is necessary to briefly describe the CNS licensing basis for electrical power to shared components. The power source operability requirements for the NSWS, CRAVS, CRACWS and ABFVES shared components currently reside in the TS Bases for each respective shared system. The TS Bases 3.7.8 (NSWS), 3.7.10 (CRAVS), 3.7.11 (CRACWS) and 3.7.12 (ABFVES) each specify that normal and emergency power must be operable for operability of the shared system. This requirement is also discussed in TS Bases 3.8.1 (AC Sources - Operating) and 3.8.2 (AC Sources - Shutdown). The licensing basis power source operability requirement for shared systems was added to the CNS TS Bases during conversion to Improved Technical Specifications (ITS) in lieu of adding the operability requirements, limiting conditions for operation and required actions for the opposite unit's shared system power sources to TS 3.8.1. The power source operability requirements for the shared systems has remained unchanged since the conversion to ITS.

The following discussion demonstrates how compliance with 10 CFR 50.36 is achieved for scenarios a. and b. above.

Given the aforementioned licensing basis requirement for AC power to shared components and scenario (1).a. above, the LOOP on both units would render all shared components (train "A" and "B) inoperable for both Units 1 and 2 because normal power to those components is inoperable and both units are in the Mode of Applicability for the NSWS, CRAVS, CRACWS and ABFVES (i.e., Modes 1, 2, 3 and 4). Both Unit 1 and Unit 2 would be required to enter LCO 3.0.3 regardless of any EDG single failures. For the sake of completeness, with a single failure of either the 2A or 2B EDG, a total of 3 AC sources would be inoperable on Unit 2 (2A and 2B off-site power are the two other inoperable AC sources). LCO 3.8.1, Condition J would be entered for three or more AC sources inoperable and the Required Action would be to enter LCO 3.0.3 immediately for Unit 2. The single remaining Unit 2 EDG is fully capable of providing the required power to shut down the reactor and maintain it in a safe shutdown condition following the LOCA/LOOP event. Each diesel is subjected to Engineered Safety Features (ESF) testing to verify that the diesel is fully capable of operating all equipment (pumps, valves, etc.) required to bring a unit to a safe shutdown condition following a LOCA, LOOP or LOCA/LOOP.

Given the aforementioned licensing basis requirement for AC power to shared components and scenario (1).b. above, the LOOP on both units would render all shared components (train "A" and "B) inoperable to support Unit 2 since normal power to those components is inoperable and Unit 2 is in the Mode of Applicability for the NSWS, CRAVS, CRACWS and ABFVES. The TS Bases (i.e., licensing basis) for the NSWS, CRAVS, CRACWS and ABFVES requires that normal and emergency power be operable to shared components. Unit 2 would be required to enter LCO 3.0.3 because both trains of shared components would be inoperable for Unit 2. Furthermore, with a LOOP on Unit 2 and a failure of the 2B EDG, LCO 3.8.1, Condition J would be entered for three or more AC sources inoperable and the Required Action would be to enter LCO 3.0.3 immediately for Unit 2. Since one train of Engineered Safety Features equipment is capable of safely shutting down a unit to Mode 5, the 2A EDG that is operable in the scenario provided above is sufficient to mitigate the Unit 2 LOOP/LOCA because it is capable of supplying all necessary "A" train shared components. Unit 2 does not need the 1B EDG and associated distribution systems to mitigate the LOOP/LOCA. As previously mentioned, each EDG is subjected to ESF testing to verify that the diesel is fully capable of operating all equipment (pumps, valves, etc.) required to bring a unit to a safe shutdown condition following a LOCA, LOOP or LOCA/LOOP.

Part (2)

The CNS TSs for electric systems are conservative to support dual unit operation because of the requirement that was added to the TS Bases for shared systems during conversion to ITS to have an operable normal and emergency power source to shared components. The Safety Evaluation that was issued by the NRC staff for Catawba's conversion to ITS explicitly states in part in the introduction that "the NRC staff finds that the CNS ITS and MNS ITS issued with these license amendments comply with Section 132a of the Atomic Energy Act of 1954, as amended (the Act), *10 CFR 50.36*, and the guidance in the Final Policy Statement; and that they are in accord with the common defense and security and provide adequate protection of the health and safety of the public." The NRC concluded that "the ITS satisfy Section 182a of the Act, *10 CFR 50.36*, and other applicable standards. On this basis, the NRC staff concludes that the proposed ITS for Catawba and McGuire are acceptable." (emphasis in italics) Because the portion of the licensing basis that is the subject of this RAI question hasn't been altered since the SE for CNS conversion to ITS was issued, CNS is in compliance with the licensing basis that the NRC staff approved.

The CNS proposed change to credit an offsite power circuit and a DG associated with a shutdown unit for normal and emergency power of shared components supporting an online unit does not change the licensing basis power requirement for shared systems that was reviewed and approved by the NRC staff at the time of conversion to ITS. With the proposed change, CNS will still be required to have both an operable normal and emergency power source to support operability of shared components because of statements in the TS Bases for shared systems.

RAI 7

UFSAR Section 8.3.1.1.2.3.2, "Periodic Testing," states, in part:

> The normal and emergency AC power distribution systems for both units at Catawba are separate during normal operation. During testing on Unit 2, the power systems on Unit 1 will be lined up in their normal operating configurations, which will assure that cross-ties are not present which could affect availability of emergency power to Unit 1 during testing on Unit 2.

a. Please clarify whether there are any cross-tie between CNS, Unit 1, and CNS, Unit 2, and between divisions within each unit. If cross-ties exist, explain how CNS meets 10 CFR Part 50 Appendix A, General Design Criterion 5, "Sharing of structures, systems, and components."

b. Please explain, with a diagram, how the above UFSAR statement is met during normal operation with ESF testing and also when one unit's EDG is inoperable.

Duke Energy Response to RAI 7:

a. In accordance with the above UFSAR statement and other statements in Chapter 8 of the CNS UFSAR, there are not any cross-ties between Units 1 and 2 and between divisions within each unit. General Design Criterion (GDC) 5 deals with the sharing of structures, systems and components that are important to safety. GDC-5 specifically

states that “Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.” The CNS DGs and offsite circuits are not shared between units and each train of the 4.16 kV Essential Auxiliary Power System remains separate and independent and capable of supplying power to the Class 1E loads required to safely shut down a unit following a design basis accident. As alluded to in Duke’s response to RAI 1 in a letter dated November 10, 2016 (ADAMS Accession No. ML16315A411), motor control centers 1EMXG and 2EMXH are referred to as “shared” MCCs in terms that they can be aligned to either Unit 1 or Unit 2 to provide normal or emergency power to shared SSCs (i.e., those that do meet GDC-5).

b. Referencing Figures 1 and 2 provided in the response to RAI 5, the units are electrically separated by use of interlocks to prevent the units from being electrically tied together. CNS employs several Kirk Key Interlock schemes that allow only one circuit breaker to be closed at a time using “break-before-make” procedural actions. The ESF testing alignment requires CNS to power the shared 600v MCCs 1EMXG and 2EMXH from the essential bus undergoing the ESF test. For example, Unit 2 essential bus 2ETA undergoing ESF testing would require 1EMXG (“A” train) to be aligned to 2ETA via load center 2ELXA. Shared MCC 1EMXG would be transferred to 2ELXA via a procedure that would de-energize 1EMXG by separating power from load center 1ELXA, and then re-energize 1EMXG from 2ELXA. Unit power separation is maintained at all times.

RAI 8

During Train A load sequence testing, please state which shutdown unit’s diesel generator would be credited as OPERABLE to support Train A equipment to satisfy the following proposed UFSAR statement:

> The credited offsite power circuit and emergency diesel generator associated with the shutdown unit meet applicable TS 3.8.1 requirements...

Please describe how this statement would avoid an “unnecessary TS 3.0.3 entry” if a Train B component was discovered inoperable on the operating unit.

Duke Energy Response to RAI 8:

Assuming Unit 1 “A” train (i.e., essential bus 1ETA) is undergoing ESF testing, Unit 1 would have to be in Modes 5-6. The 1A DG would be credited in this scenario as the emergency power source to support operability of the “A” train shared NSWS, CRAVS, CRACWS and ABFVES SSCs.

Under the CNS current licensing basis, all of the “A” train shared NSWS, CRAVS, CRACWS and ABFVES SSCs would be inoperable while the 1A DG is supplying the shared 600v MCC 1EMXG during Unit 1 “A” train ESF testing. If a “B” train SSC associated with the NSWS, CRAVS, CRACWS or ABFVES were to become inoperable for some reason, TS 3.0.3 would be required to be entered since the “A” train SSC is inoperable due to the electrical alignment for the ESF testing. If CNS were able to credit the 1A DG in this scenario as an operable emergency power source while in Modes 5-6, TS 3.0.3 would not be required to be entered if a “B” train shared SSC were to become inoperable during the time the 1A DG is supplying

emergency power. The 1A DG would remain operable in the ESF testing alignment and would still be able to perform its safety function.

RAI 9

Is CNS LCO 3.0.9 ever applied to the CNS safety related electrical systems? If yes, please describe the circumstances.

Duke Energy Response to RAI 9:

CNS LCO 3.0.9 is provided below for convenience.

The CNS LCOs for the safety related electrical systems, including associated ACTIONS, always apply to each unit individually in accordance with the first line of LCO 3.0.9 (“LCOs including the associated ACTIONS shall apply to each unit individually...”). However, none of the exceptions a.-c. of LCO 3.0.9 are applied to the CNS safety related electrical systems. In particular, exception a. does not apply because the safety related electrical systems are not shared by both CNS units, which is the criterion for that exception to apply. Therefore, the ACTIONS associated with safety related electrical systems LCOs do not apply to both units simultaneously. LCOs for safety related electrical systems always apply to both units and thus exception b. does not apply to the safety related electrical systems. Finally, none of the Specifications for the safety related electrical systems contain operating parameters and/or setpoints which are different for each CNS unit. Therefore, exception c. does not apply to the CNS safety related electrical systems.

“LCO 3.0.9 LCOs including the associated ACTIONS shall apply to each unit individually unless otherwise indicated as follows:

a. Whenever the LCO refers to systems or components which are shared by both units, the ACTIONS will apply to both units simultaneously;

b. Whenever the LCO applies to only one unit, this will be identified in the Applicability section of the Specification; and

c. Whenever certain portions of a Specification contain operating parameters, setpoints etc., which are different for each unit, this will be identified in parentheses or footnotes. (For example, "...flow rate of 54,000 cfm (Unit 1) or 43,000 cfm (Unit 2)...").”

RAI 10

The TS bases for the NSWS, CRAVS, CRACWS, and ABFVES currently state, in part,

> A shutdown unit supplying its associated emergency source (1EMXG/2EMXH) cannot be credited for OPERABILITY of components supporting the operating unit.

According the supplemental letter dated November 10, 2016 (ADAMS Accession No. ML16315A411), the licensee plans to remove the above statement from the TS bases upon approval of the LAR.

Please identify and discuss the reasons and intent for the TS bases statement above that does not allow crediting a shutdown unit supplying its associated emergency source (1EMXG/2EMXH) to be credited for OPERABILITY of components supporting the operating unit.

Duke Energy Response to RAI 10:

The above statement was added to the TS Bases for the NSWS, CRAVS, CRACWS and ABFVES in 2011 via 10 CFR 50.59 to document a Catawba interpretation that changing from Mode 4 (“online”) to Mode 5 (“shutdown”) on a unit makes the NSWS pump discharge valves inoperable even when the valves are powered from an operable DG on that unit. The practice continues to this day to be to declare those valves and all other shared components inoperable when changing from Mode 4 to Mode 5.