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July 20, 2017

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

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

MCGUIRE NUCLEAR STATION, UNIT NOS. 1 AND 2
DOCKET NOS. 50-369 AND 50-370
RENEWED LICENSE NOS. NPF-9 AND NPF-17

SUBJECT: SUPPLEMENT TO LICENSE AMENDMENT REQUEST PROPOSING CHANGES TO CATAWBA AND MCGUIRE TECHNICAL SPECIFICATION 3.8.1, "AC SOURCES - OPERATING"

REFERENCES:

1. Duke Energy letter, *License Amendment Request Proposing Changes to Catawba and McGuire Technical Specification 3.8.1, "AC Sources - Operating"*, dated May 2, 2017 (ADAMS Accession No. ML17122A116).

2. Nuclear Regulatory Commission letter, *McGuire Nuclear Station, Units 1 and 2 and Catawba Nuclear Station, Units 1 and 2 - Supplemental Information Needed for Acceptance of Requested Licensing Action RE: License Amendment Request Proposing Changes to Technical Specification 3.8.1, "AC Sources - Operating" (CAC Nos. MF9667 through MF9674*, dated June 30, 2017 (ADAMS Accession No. ML17167A317).

Ladies and Gentlemen:

By letter dated May 2, 2017 (Reference 1), Duke Energy Carolinas, LLC (Duke Energy) submitted a License Amendment Request (LAR) for Catawba Nuclear Station (CNS), Units 1 and 2 and McGuire Nuclear Station (MNS), Units 1 and 2.

The Nuclear Regulatory Commission (NRC) staff reviewed this application and concluded that additional information is necessary to enable the NRC staff to make an independent assessment regarding the acceptability of the proposed amendment in terms of regulatory requirements and the protection of public health and safety and the environment. By letter dated June 30, 2017 (Reference 2), the supplemental information was requested. The Duke

Energy responses to the supplemental information request are provided in the Enclosure to this letter.

The conclusions of the original Significant Hazards Consideration Determination and Environmental Considerations contained in the May 2, 2017 LAR (Reference 1) are unaffected as a result of this supplemental response.

This document contains no new regulatory commitments.

Should you have any questions concerning this letter, or require additional information, please contact Art Zaremba at 980-373-2062.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 20, 2017.

Sincerely,

Kelvin Henderson
Senior Vice President, Nuclear Corporate

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Enclosure

Supplemental Information Needed for Acceptance of Requested Licensing Action

(47 pages)

NRC SUPPLEMENTAL INFORMATION NEEDED:

By letter dated May 2, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17122A116), Duke Energy Carolinas, LLC (Duke Energy, the licensee) submitted a license amendment request (LAR) for the McGuire Nuclear Station, Units 1 and 2 (McGuire) and the Catawba Nuclear Station, Units 1 and 2 (Catawba). The proposed LAR would extend the Completion Time (CT) of Technical Specification (TS) 3.8.1 Required Action B.4 for an inoperable emergency diesel generator (EDG) (risk-informed submittal) and add a new Required Action B.4 for Condition B (one inoperable EDG) to ensure that at least one train of shared components has an operable emergency power supply (not risk-informed).

The U.S. Nuclear Regulatory Commission (NRC) staff's acceptance review of this LAR was performed to determine if there is sufficient technical information in scope and depth to allow the NRC staff to complete its detailed technical review. The acceptance review is also intended to identify whether the application has any readily apparent information insufficiencies in its characterization of the regulatory requirements or the licensing basis of the plant.

Consistent with Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), an amendment to the license (including the technical specifications) must fully describe the changes requested, and following as far as applicable, the form prescribed for original applications. Section 50.34 of 10 CFR addresses the content of technical information required. This section stipulates that the application address the design and operating characteristics, unusual or novel design features, and principal safety considerations.

The NRC staff has reviewed your application and concluded that the information delineated in the enclosure to this letter is necessary to enable the NRC staff to make an independent assessment regarding the acceptability of the proposed amendments in terms of regulatory requirements and the protection of public health and safety and the environment.

SUPPLEMENTAL INFORMATION NEEDED (ITEM 1):

The NRC staff position provided in RIS 2007-06 expects licensees to fully address all the scope elements consistent with Revision 2 of RG 1.200 in the licensee's PRA model that is used as the basis for risk-informed LARs. In March of 2009, the NRC issued Revision 2 of RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," which endorsed industry standards for PRAs for internal events, internal floods, fires, and external events (i.e., seismic, external flooding, high winds, etc.).

Section 2.3.1, "Technical Adequacy of the PRA," of RG 1.177, Revision 1, states:

> The technical adequacy of the PRA must be compatible with the safety implications of the TS [technical specification] change being requested and the role that the PRA plays in justifying that change. That is, the more the potential change in risk or the greater the uncertainty in that risk from the requested TS change, or both, the more rigor that must go into ensuring the technical adequacy of the PRA.

The licensee may address the technical adequacy of the PRA by conforming to the peer review and self-assessment processes in RG 1.200, Revision 2. This regulatory guide provides one approach acceptable to the NRC for determining the technical adequacy of the PRA model. Regulatory Guide 1.200 endorses, with certain clarifications and qualifications, Addendum A to the American Society of Mechanical/American Nuclear Society (ASME/ANS) RA-Sa 2009, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications" ("PRA

Standard"). Section 4.2, "Licensee Submittal Documentation," of RG 1.200 states, in part, that the application should discuss the resolution of the peer review facts and observations (F&Os) that are applicable to the parts of the PRA required for the application.

In Attachment 6, Section 6.1.3 of the LAR, "PRA Quality/Technical Adequacy," the licensee indicates that most of the F&Os found during the June 2015 peer review of the internal events PRA (excluding large early release frequency (LERF)) were assessed by an independent review team in January 2016 to be resolved adequately based on the updated internal events PRA. As such, these F&Os were not submitted in the LAR. However, as discussed with the licensee on a request for additional information clarification call on May 17, 2017, concerning the submission of these F&Os for the McGuire LAR for Integrated Leakage Rate Test, the close-out of these F&Os appear to have occurred well before the guidance on this process was finalized and accepted by NRC letter dated May 3, 2017 (ADAMS Accession No. ML17079A427). Therefore, it is unclear whether the licensee closed these F&Os consistent with NRC-accepted guidance, and that these F&Os should have been submitted as part of the LAR.

To be consistent with Section 4.2 of RG 1.200, Revision 2, and to demonstrate the technical adequacy of the McGuire internal events PRA (excluding LERF) against RG 1.200 at Capability Category II, the NRC staff requests that the licensee provide (a) or (b) below for acceptance of this application for McGuire:

a. Please provide all F&Os characterized as findings from the June 2015 peer review of the internal events PRA (excluding LERF). For each F&O, include details of its disposition or why not meeting the corresponding Capability Category II requirements has no impact on the application.

b. Alternatively, please discuss the close out of the F&Os by the January 2016 independent review of the internal events PRA (excluding LERF), which evaluated the technical adequacy of the additional analysis performed to address the F&Os from the 2015 peer review. This discussion should be consistent with that of the "Final Report" developed in accordance with Section X.1.3, "Close Out F&Os by Independent Assessment," of the Nuclear Energy Institute letter dated February 21, 2017 (ADAMS Accession No. ML17086A431).

DUKE ENERGY RESPONSE TO SUPPLEMENTAL INFORMATION NEEDED (ITEM 1):

Duke Energy has chosen path (b) above in responding to this supplemental information request and to demonstrate the technical adequacy of the McGuire internal events PRA (excluding LERF) against RG 1.200 at Capability Category II.

In a phone call with the NRC on May 17, 2017, Duke Energy agreed to update its F&O close-out assessment reports for McGuire due to the NRC's acceptance of the industry's F&O close-out process on May 3, 2017.

As a result of References 1, 2 and 3, of this enclosure, Duke Energy conducted additional F&O closure independent reviews for Internal Events, Internal Flooding and Large Early Release Frequency against the guidance and documented the results. These reviews consisted of additional assessments comparing the original independent assessments conducted prior to issuance of the final guidance and NRC expectations, to the guidelines and expectations defined by References 2 and 3. These reviews were conducted by the same independent contractor team members that performed the original F&O closure effort. Each F&O was reviewed to determine if the resolution constituted an “upgrade” that would require a peer review. No upgrades were identified and the conclusions of this F&O closure was documented in accordance with Appendix X.

The results of these additional assessments indicated that the conclusions of the original F&O independent assessments remained valid, the F&Os were appropriately closed in accordance with the guidelines and expectations as provided in References 2 and 3, and there were no new methods or upgrades.

Duke Energy will support the NRC’s audit of McGuire’s implementation of the Appendix X F&O closure process and final independent assessment reports (two reports).

SUPPLEMENTAL INFORMATION NEEDED (ITEM 2):

The LAR requests extension of CT for an inoperable DG in TS 3.8.1 (Condition B) from 72 hours to 14 days. In Section 1.0 of the LAR the licensee states that “This LAR provides both a deterministic and a risk-informed technical justification for extending the CTs and has been developed using the guidelines established in NUREG-0800, Branch Technical Position (BTP) 8-8, Regulatory Guide 1.174 and Regulatory Guide 1.177 (References 1, 2, and 3).”

Please provide technical justification for the duration of the requested 14-day AOT [allowed outage time] (actual hours plus margin based on plant-specific past operating experience).

DUKE ENERGY RESPONSE TO SUPPLEMENTAL INFORMATION NEEDED (ITEM 2):

<u>Catawba</u>

The table below provides a summary of major maintenance work planned for the Emergency Diesel Generators on a per-calendar year basis. If the ESPS diesel were installed on site - in many cases - this work could be bundled into a single diesel outage window and performed in its entirety. The hours in the left most column are estimates which define the duration of out-of-service time for the most limiting diesel during the calendar year.

Potential emergent maintenance is not included in Table 1 below. There are feasible situations where a full 14 day window would be required to repair an emergent problem. For instance, to replace a camshaft would take between 10-14 days of total inoperability time.

Table 1: Catawba Projected EDG Work, 2018 - 2023.

Planned Diesel Outages	DG 1A	DG 1B	DG 2A	DG 2B
2018 (1A DG is limiting, estimated to be 287 hours)[1]	• Outage Mechanical Maintenance • 12 Year Engine Maintenance • 6 Year Engine Maintenance • Complete Slow Start Modification • Replace Connecting Rod Bearings #3 & #6 • Mid-Cycle Down Day • Pre-Outage Down Day	• Mid-Cycle Down Day • Pre-Outage Down Day	• Pre-Outage Down Day • Mid-Cycle Down Day	• Outage Mechanical Maintenance • Replace Voltage Regulator • Pre-Outage Down Day
2019 (2B DG is limiting, estimated to be 215 hours)[2]	• Mid-Cycle Down Day	• Mid-Cycle Down Day	• Outage Mechanical Maintenance • Governor Mechanical Actuator • Replace Connecting Rod Bearing #1 • Pre-Outage Down-Day	• 6 Year Engine Maintenance • Replace Connecting Rod Bearing #4 • Mid-Cycle Down Day • Pre-Outage Down Day

2020 (1B DG is limiting, estimated to be 333 hours)[3]	• Replace Connecting Rod Bearing #7 • 12 Year Generator Maintenance • 6 Year Generator Maintenance • Pre-Outage Down-Day	• Outage Mechanical Maintenance • 6 Year Engine Maintenance • Voltage Regulator Upgrade • Replace Connecting Rod Bearings #1, #2, & #7. • Pre-Outage Down Day	• Mid-Cycle Down Day	• Mid-Cycle Down Day
2021 (1A DG is limiting, estimated to be 275 hours)[4]	• Outage Mechanical Maintenance • Replace Connecting Rod Bearings #4 & #8 • Voltage Regulator Upgrade • Mid-Cycle Down Day • Pre-Outage Down Day	• 12 Year Engine Maintenance • 12 Year Generator Maintenance • Mid-Cycle Down Day • Pre-Outage Down Day	• Replace RB Turbo • 12 Year Generator Maintenance • 6 Year Generator Maintenance • Pre-Outage Down Day	• Outage Mechanical Maintenance • Pre-Outage Down Day • Mid-Cycle Down Day
2022 (2A DG is limiting, estimated to be 215 hours)[5]	• Mid-Cycle Down Day	• Mid-Cycle Down Day	• Outage Mechanical Maintenance • 6 Year Engine Maintenance • Mid-Cycle Down Day • Pre-Outage Down Day	• Replace Right Bank Turbo • 12 Year Generator Maintenance • Pre-Outage Down Day

2023 (1A DG is limiting, estimated to be 213 hours)[6]	• Replace Right Bank Turbo • Replace Left Bank Turbo • Pre-Outage Down Day	• Outage Mechanical Maintenance • 6 Year Generator Maintenance • Pre-Outage Down Day	• Mid-Cycle Down Day	• Mid-Cycle Down Day

Notes:

1. 2018 Basis : 180 hour maintenance window for longest duration job, 24 hours allotted for clearance hang & lift, 24 hours for break-in runs, and 59 hours for historical mid-cycle & pre-outage down day unavailability.
2. 2019 Basis : 108 hour maintenance window for longest duration job, 24 hours allotted for clearance hang & lift, 24 hours for break-in runs, and 59 hours for historical mid-cycle & pre-outage down day unavailability.
3. 2020 Basis : 252 hour maintenance window for longest duration job, 24 hours allotted for clearance hang & lift, 24 hours for break-in runs, and 33 hours for historical pre-outage down day unavailability.
4. 2021 Basis : 180 hour maintenance window for longest duration job, 24 hours allotted for clearance hang & lift, 12 hours for post-maintenance testing, and 59 hours for historical mid-cycle & pre-outage down day unavailability.
5. 2022 Basis : 108 hour maintenance window for longest duration job, 24 hours allotted for clearance hang & lift, 24 hours for break-in runs, and 59 hours for historical mid-cycle & pre-outage down day unavailability.
6. 2023 Basis : 150 hour maintenance window for longest duration job, 24 hours allotted for clearance hang & lift, 6 hours for post-maintenance testing, and 33 hours for historical pre-outage down day unavailability.

McGuire

Table 2 below provides a summary of major Maintenance work on the Emergency Diesel Generators on a per-calendar year basis. If the ESPS diesel were installed on site, this work could be bundled into a single diesel outage window and performed in its entirety. The hours in the leftmost column are estimates and define the duration of out-of-service time for the most limiting diesel during the calendar year.

Table 2: McGuire Projected EDG Work, 2018 - 2023

Planned Diesel Outages	DG 1A	DG 1B	DG 2A	DG 2B
2018 (2A DG is limiting, estimated to be 179 hours)	• Replace critical relays	• 2 year major engine PM (innage) • Replace critical relays • Replace ventilation filters • 10 year Battery charger refurbishment • Voltage regulator inspection	• 10 year fuel tank clean and inspect • 6 year mechanical maintenance • Replace critical relays • Replace ventilation filters • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test • 10 year Battery charger refurbishment • Voltage regulator inspection	• 2 year major engine PM (innage) • 10 year fuel tank clean and inspect • Replace critical relays • Replace ventilation fan motor • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test
2019 (1B DG is limiting, estimated to be 179 hours)	• 2 year major engine PM (innage) • Replace critical relays • Replace ventilation fan motor • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test • Voltage regulator inspection	• 6 year mechanical maintenance • Replace critical relays • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test	• 2 year major engine PM (innage) • Replace critical relays	• Replace critical relays • Voltage regulator inspection • 10 year 4160 V breaker refurbishment

2020 (2B DG is limiting, estimated to be 191 hours)	• 12 year mechanical maintenance • Replace critical relays • Replace ventilation filters • 18 month engine, generator inspection • 18 month Battery service test • 10 year Battery charger refurbishment	• 2 year major engine PM (innage) • Replace critical relays • 18 month engine, generator inspection • 18 month Battery service test • Voltage regulator inspection	• Replace critical relays • Replace ventilation fan motor • 18 month engine, generator inspection • 18 month Battery service test • Voltage regulator inspection	• 12 year mechanical maintenance • 9 year governor replacement • 2 year major engine PM (innage) • Replace critical relays • 18 month engine, generator inspection • 18 month Battery service test • Replace ventilation filters • 10 year Battery charger refurbishment
2021 (2B DG is limiting, estimated to be 179 hours)	• 2 year major engine PM (innage) • Replace critical relays • Voltage regulator inspection	• Replace critical relays • Replace ventilation filters • Replace ventilation fan motor	• 9 year governor replacement • 2 year major engine PM (innage) • Replace critical relays • Replace ventilation filters • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test • 10 year 4160 V breaker refurbishment	• 6 year mechanical maintenance • Replace critical relays • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test • Voltage regulator inspection

2022 (1A DG is limiting, estimated to be 191 hours)	• 6 year mechanical maintenance • 9 year governor replacement • 15 year jacket water & intercooler pump motor replacement • Replace critical relays • Replace ventilation fan motor • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test	• 2 year major engine PM (innage) • Replace critical relays • 3 year engine PM • 18 month engine, generator inspection • 18 month Battery service test	• Replace critical relays • Voltage regulator inspection	• 2 year major engine PM (innage) • Replace critical relays
2023 (1B DG is limiting, estimated to be 149 hours)	• 2 year major engine PM (innage) • Replace critical relays • Replace ventilation filters • 18 month engine, generator inspection • 18 month Battery service test • Voltage regulator inspection • 10 year 4160 V breaker refurbishment	• 9 year governor replacement • Replace critical relays • 18 month engine, generator inspection • 18 month Battery service test	• 2 year major engine PM (innage) • Replace critical relays • 18 month engine, generator inspection • 18 month Battery service test	• Replace critical relays • Replace ventilation filters • 18 month engine, generator inspection • 18 month Battery service test • Voltage regulator inspection

Notes:

1. Basis for 179 hours is 120 hours Maintenance window for longer duration jobs, 12 hours allotted for Clearance hang & lift, 47 hours historical PM implementation time for remainder of smaller jobs.
2. Basis for 191 hours is 120 hours Maintenance window for longer duration jobs, 12 hours allotted for Clearance hang & lift, 12 hours for governor tuning and 47 hours historical PM implementation time for remainder of smaller jobs.
3. Basis for 149 hours is 90 hours Maintenance window for longer duration jobs, 12 hours allotted for Clearance hang & lift, 47 hours historical PM implementation time for remainder of smaller jobs.

SUPPLEMENTAL INFORMATION NEEDED (ITEM 3):

NRC BTP 8-8 and NUREG 1431 were written for a single unit and does not fully account for shared systems and emergency power supplies from other units.

Please clarify that the CT extension LCO is entered for only one EDG per site to avoid loss of safety functions for shared systems.

DUKE ENERGY RESPONSE TO SUPPLEMENTAL INFORMATION NEEDED (ITEM 3):

Duke Energy hereby clarifies that the CT extension LCO will be entered for only one EDG per site to avoid loss of safety functions for shared systems. Only one ESPS will be installed at each station.

Attachment 3 (Catawba Technical Specification Bases Marked Up Pages) and Attachment 4 (McGuire Technical Specification Bases Marked Up Pages) of the LAR submittal (ADAMS Accession No. ML17122A116) states, in part, the following (emphasis in italics):

> Manual actions are required to align the ESPS to the station and *only one of the station's four onsite Class 1E AC Distribution System trains can be supplied by the ESPS at any given time*.

Furthermore, LAR Attachments 3 and 4 also state the following:

> The ESPS is not used to extend the Completion Time for more than one inoperable DG at any one time.

SUPPLEMENTAL INFORMATION NEEDED (ITEM 4):

Currently, Catawba and McGuire TS LCO 3.8.1 requires two EDGs per unit (i.e., EDGs 1A and 1B for Unit 1 or EDGs 2A and 2B for Unit 2) capable of supplying the Onsite Essential Auxiliary Power Systems to be operable during modes 1-4. According to Catawba TS 3.7.8 and McGuire TS 3.7.7, NSWS (a shared system) requires two trains of NSWS to be operable.

The McGuire NSWS system is different than the Catawba in that the McGuire NSWS pumps are unitized, i.e. not shared. But the supply to the McGuire NSWS pumps from the Ultimate Heat Sink (UHS) including the motor operated valves (MOVs) that operate during a DBA are shared. The emergency power supply to these MOVs and the implication of sharing the supply from the UHS to the NSWS pumps was not addressed or discussed in the application. The LAR did not address the differences between Catawba and McGuire in regards to shared systems.

If both CNS and MNS need two NSWS pumps on each NSWS loop at any time (e.g. to mitigate the effects of an accident on one unit while the other unit is in Modes 1-4) and each NSWS pump only receives emergency power from a single emergency bus powered by a single DG in the case of a LOOP, then it is not apparent how proposed Required Action B.4 effectively "...[moves] the operability requirements from the TS bases to TS 3.8.1" as stated on page 38 of the LAR.

It is not apparent how the licensee's proposed changes are sufficient to meet the TS definition of operability for the various possible configurations of shared systems because it appears the proposed changes do not adequately consider emergency power sources to shared components needed.

Please clarify how 10 CFR 50.36(c)(2) would be met with your proposed changes without a conforming change to the LCO and/or remedial Actions table for the required number of DGs.

Additionally, the NRC staff requests the following:

a. Provide in detail the effects of a loss of each DG would have upon the shared SSCs of the Catawba and McGuire NSWS system to evaluate the effect upon each unit.

b. Provide a listing of shared components in both Catawba and McGuire and the associated DG that powers each shared component.

c. Provide details (preferably in tabular format) of the differences between Catawba and McGuire, in regards to electric power supplies and shared systems.

d. Please identify (preferably in tabular form) the emergency power sources (DGs) associated with each train ("A" and "B" trains) of each shared system (e.g., NSWS, Control Room Area Ventilation System (CRAVS), Control Room Area Chilled Water System (CRACWS), and Auxiliary Building Filtered Ventilation Exhaust System (ABFVES)) for both units at Catawba and McGuire.

e. For each TS associated with a shared system at both Catawba and McGuire, identify any DG that would not be necessary to mitigate a design basis accident with (i.e., site wide loss of offsite power and a loss of coolant accident with a single failure). For each DG identified as not necessary, discuss why it would not be needed.

f. For McGuire and Catawba, please provide a detailed justification on how the proposed TS changes would satisfy 10 CFR 50.36(c)(2)(ii)(C), Criterion 3.

g. For McGuire and Catawba, please provide detailed descriptions of all additional sources of AC power that are required to be operable from the opposite units in TS LCO 3.8.1 as a means of emergency power sources for each unit.

DUKE ENERGY RESPONSE TO SUPPLEMENTAL INFORMATION NEEDED (ITEM 4):

The following discussion is intended to demonstrate how Duke Energy's proposed change in the May 2, 2017 amendment request is sufficient to meet the TS definition of operability for the various possible configurations of shared systems and also to demonstrate how 10 CFR 50.36(c)(2) will be met with the proposed change. The CNS and MNS TS 1.1 definition of OPERABLE - OPERABILITY is provided below for convenience.

> "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, 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 proposed change meets the above definition in that normal or emergency power will always be available and aligned to the shared equipment. Otherwise, the shared equipment without a normal or emergency power supply will be declared inoperable and, as long as that condition exists, the appropriate Required Actions of the associated Conditions will be met within the required Completion Times.

In order to ensure continued operability of the individual shared components of the NSWS, CRAVS, CRACWS and ABFVES, surveillance testing is performed in accordance with the individual system's TS Surveillance Requirement(s) (SR). Should any of the performance parameters fail to meet the surveillance criteria, then the individual component (and potentially the entire system), is declared inoperable because the LCO is considered not met. These SRs are located in each of the TSs for the four shared systems at each station, as follows: TS 3.7.8 (CNS) and TS 3.7.7 (MNS), NSWS; TS 3.7.10 (CNS) and TS 3.7.9 (MNS), CRAVS; TS 3.7.11 (CNS) and TS 3.7.10 (MNS), CRACWS; and TS 3.7.12 (CNS) and TS 3.7.11 (MNS), ABFVES. Failure to meet a particular SR, or any apparent physical failure, would result in the station not meeting the LCO for that shared system and would then require the station to complete the Required Actions of associated Conditions within the appropriate Completion Times.

To ensure continued operability of the normal or emergency power supply to the shared components with the proposed change, the stations will monitor the LCO of TS 3.8.9 (Distribution Systems - Operating). All of the shared components receive normal and emergency power from this distribution system which includes the 4160V Essential Buses (ETA and ETB), the 600V Essential Load Centers and the 600V Essential Motor Control Centers. With all of the buses and motor control centers required to be operable by LCO 3.8.9 properly aligned and with the proper voltages, the supported equipment, including the shared components, are considered to be operable. By meeting the LCO of TS 3.8.9, the stations ensure the availability of AC, DC, and AC vital bus electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or postulated DBA, and also ensure that the redundancy incorporated into the design of Engineered Safety Features (ESF) is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent the safe shutdown of the reactor.

Additionally, the proposed change to add a new Required Action B.4 further ensures that the "emergency electrical power" portion of the TS definition of operability is always satisfied. With the proposed change to add a RA B.4 ("Confirm that at least one train of shared components has an OPERABLE emergency power supply."), if there is not an operable emergency power supply to at least one train of shared components (one train of shared components is required to reach cold shutdown) when a DG is inoperable, then the stations will initiate a prompt shutdown (i.e., within 1 hour). Thus, the proposed RA B.4 provides additional assurance that at least one train of shared components will be supported by an operable emergency power supply in Modes 1-4 at both stations.

Also, it is important to note that should CNS and MNS fail to perform proposed RA B.4 within 1 hour and every 12 hours thereafter, then the stations enter the Condition for both units that requires shutdown to Mode 3 within 6 hours and to Mode 5 within 36 hours.

The following TS LCOs for shared systems with their most limiting Completion Times for one train inoperable are listed below:

- Nuclear Service Water System (NSWS): LCO 3.7.7 (MNS) and 3.7.8 (CNS) has a Completion Time of 72 Hours for an inoperable NSWS train. Also allowed is another 36 hours from failure to meet this required Completion Time to get the affected unit to Mode 5, for a total time of 108 hours allowed before a unit would have to be in Mode 5.
- Control Room Ventilation System (LCO 3.7.10 at CNS and LCO 3.7.9 at MNS) allows 7 Days from discovery of an inoperable train plus an additional 36 hours to get to Mode 5, for a total of 204 hours allowed before the units would have to be in Mode 5.

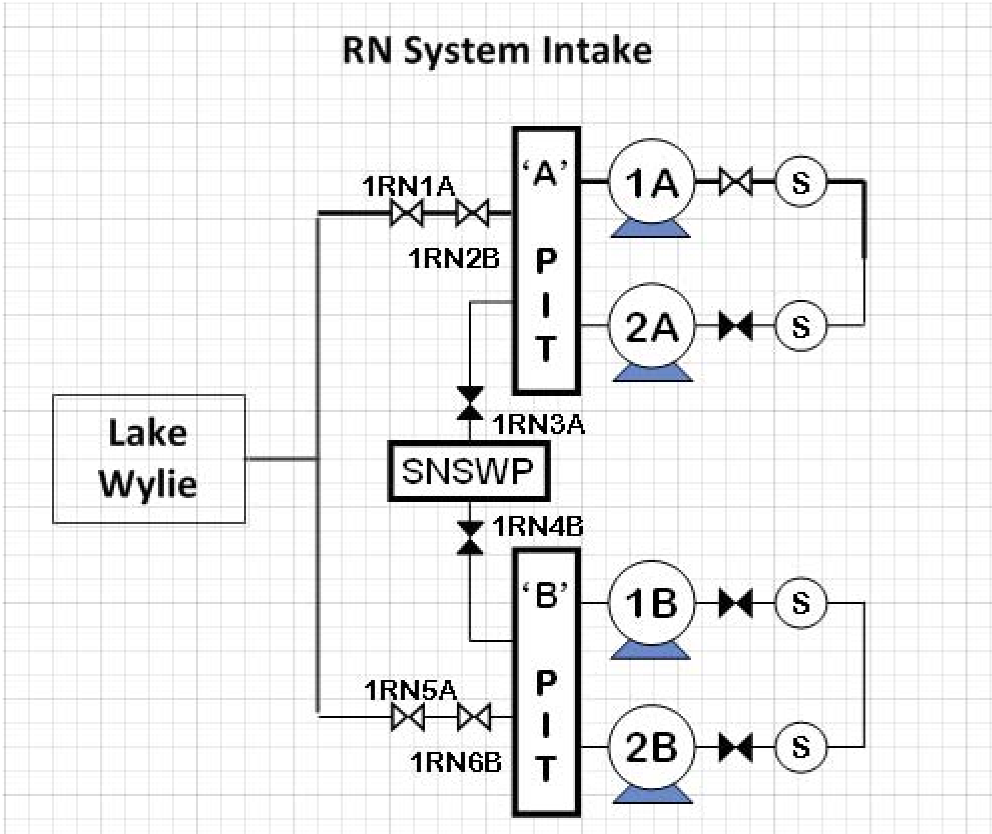
- Control Room Area Chilled Water System (LCO 3.7.11 at CNS and LCO 3.7.10 at MNS) has a completion time of 30 days from discovery of an inoperable train (plus the 36 hours to get to Mode 5).
- Auxiliary Building Ventilation (LCO 3.7.12 at CNS and LCO 3.7.11 at MNS) has a completion time of 7 days plus the 36 hours to get to Mode 5, for a total of 204 hours allowed before the units would have to be in Mode 5.

The proposed change to TS 3.8.1 greatly reduces the amount of time that the units would be allowed to stay at power if neither train of shared components has an operable emergency power supply. The 1 hour allowed by new RA B.4 plus the 6 hours allowed by the Completion Time of RA G.1 is a reasonable amount of time to make plant alignments to provide an emergency power source to at least one train.

In order to clarify how 10 CFR 50.36(c)(2) is met with the proposed change, it is necessary to elaborate on the AC power sources that directly power shared components and the LCO that contains those power sources. The shared components at both CNS and MNS are powered from 600V Essential Motor Control Centers (MCCs), which in turn are powered from Essential Load Centers that are supported by either unit's operable 4160V Essential Bus, ETA or ETB. It should be noted that at CNS only, the NSWS pumps themselves are shared, and are powered directly by the 4160V Essential Buses. In order to be considered operable, the shared components rely on the operability of the 600V MCCs, Essential Load Centers and 4160V Essential Buses. In Modes 1-4, the 600V MCCs, Essential Load Centers and 4160V Essential Buses that power shared components are required to be OPERABLE by the LCO for TS 3.8.9, "Distribution Systems - Operating." These AC distribution subsystems of LCO 3.8.9 are each considered 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 analysis that assumes the failure of or presents a challenge to the integrity of a fission product barrier" in accordance with 10 CFR 50.36(c)(2)(ii)(C), Criterion 3. The TS 3.8.9 Bases for both CNS and MNS state that "The distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii)." To summarize, maintaining the power sources to the shared components in accordance with CNS and MNS LCO 3.8.9, satisfies Criterion 3 of 10CFR 50.36 (c)(2)(ii). This concept is further elaborated upon in the responses below and in the response to "f." in particular.

Duke Energy has provided responses to items 4.a.-4.g. below.

a. (Catawba Response) The following discussion addresses the impact of the Catawba NSWS (RN) upon the loss of a unit/train related emergency diesel generator. The discussion addresses the A train in circumstances where both units are specifically impacted. Otherwise, the 1A component(s) are addressed. Where 1A is addressed, the discussion is valid for trains 1B, 2A and 2B.



<u>Intake Section</u>

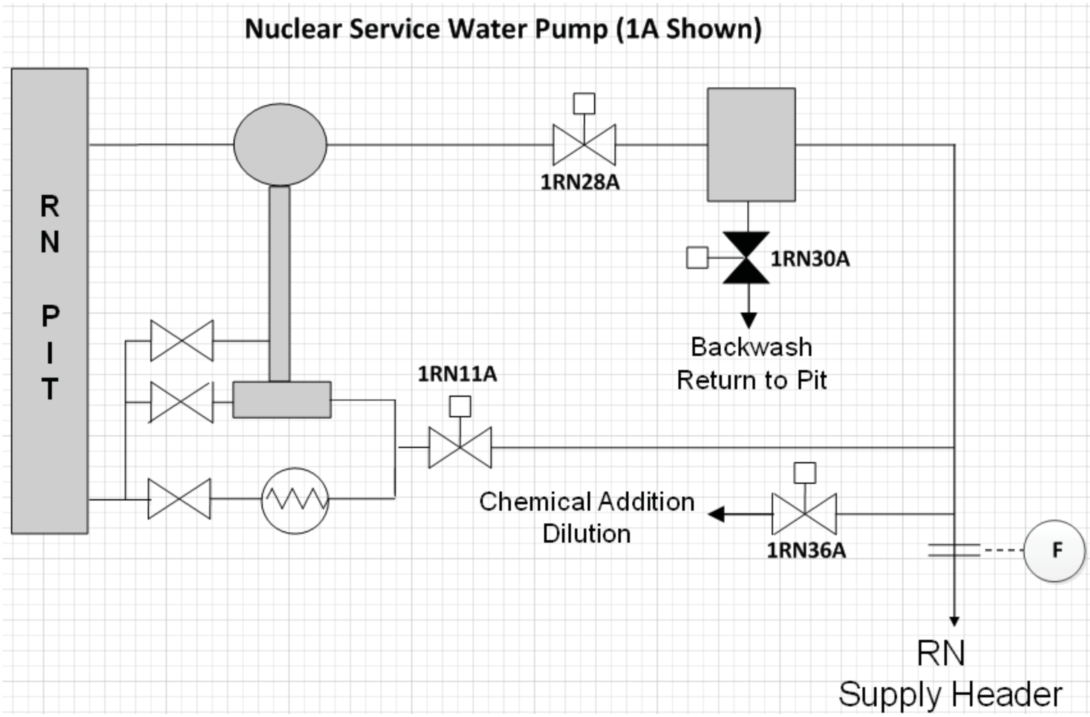
Valves 1RN1A and 1RN2B are normally open to align Lake Wylie to Nuclear Service Water Pump Intake Pit A. Nuclear service water pumps 1A and 2A draw suction from intake pit A. Valves 1RN1A and 1RN2B close on emergency low level in either RN pumphouse pit (based on 2 out of 3 logic from single pits level instruments) to isolate the RN System from Lake Wylie for RN alignment to the Standby Nuclear Service Water Pond (SNSWP).

1RN5A and 1RN6B perform the same function for the B intake pit.

A loss of the 1A EDG would potentially result in the inability of valves 1RN1A and 1RN5A to close if there was a concurrent loss of offsite power and a dam failure resulting in a low intake pit level. The corresponding B train valves, 1RN2B and 1RN6B, would close to prevent the drainage of the SNSWP to the empty Lake Wylie.

The single train related supply valves from the SNSWP, 1RN3A and 1RN4B, are normally closed. Upon receipt of a low intake pit level, these valves open to provide the assured RN system supply from the SNSWP. In the loss of EDG 1A and dam failure event, 1RN3A may remain closed; however, 1RN4B would open to supply water to the RN system.

The failure of one of the SNSWP isolation valves to open is the worst case single failure that is analyzed in site calculations for the RN system. If one EDG is out of service during an outage for maintenance, the single remaining RN pump is sufficient to respond to a LOCA on the operating unit and maintain shutdown on the outage unit.



RN Pump

The RN Pumps have been analyzed to supply both ESF sump recirculation (LOCA) mode for one unit simultaneous with cold shutdown requirements for the unaffected unit. The pumps start on a safety injection signal and loss of offsite power signal to provide required flow to mitigate the consequences of a design basis event. Upon receipt of an emergency low level in either RN pumphouse pit (based on 2 out of 3 logic from any single pit's level instruments), all RN pumps will receive a start signal.

Each pump's emergency power is supplied by its unit and train related emergency diesel generator (i.e., 1A RN Pump is supplied by 1A EDG).

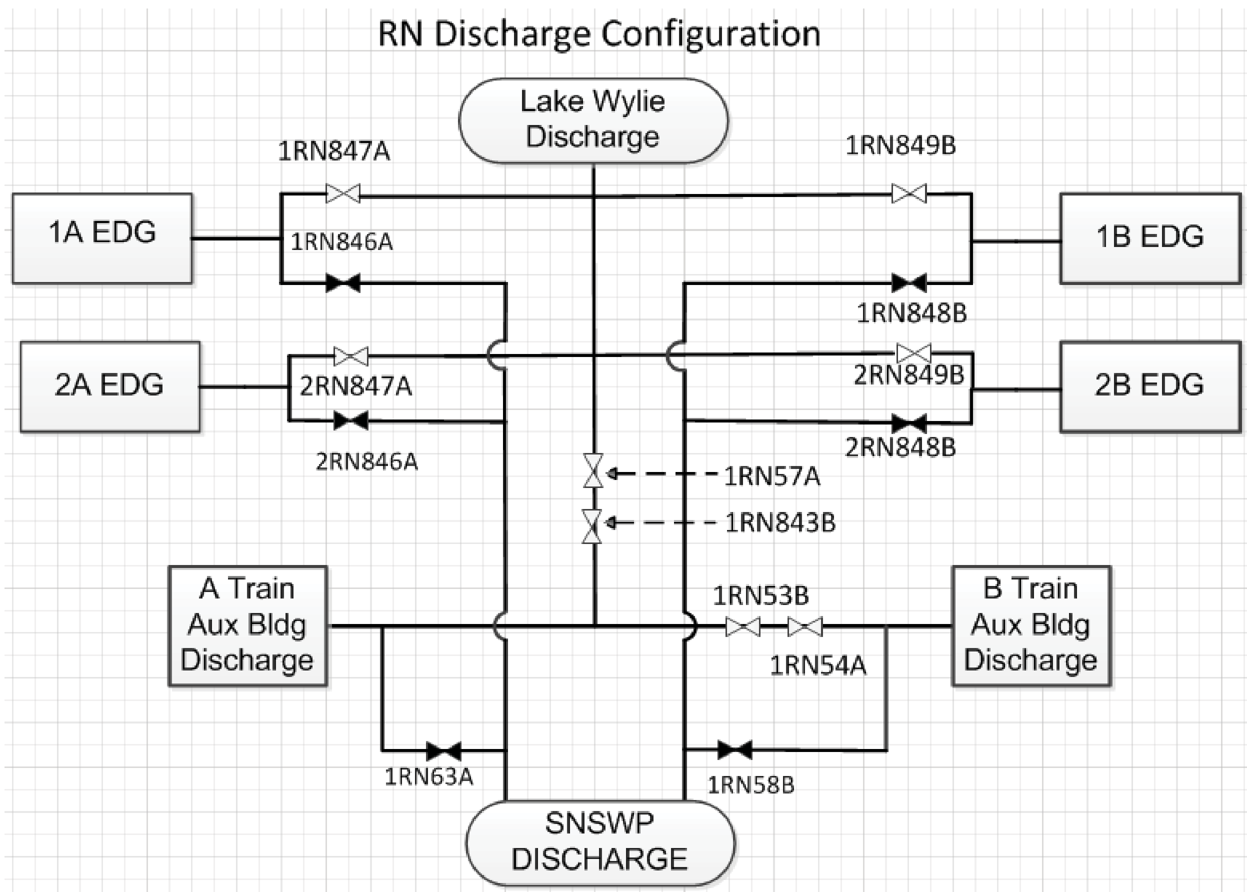
Valve 1RN11A is required to be open to provide cooling water to nuclear service water pump 1A motor cooler and upper bearing oil cooler when the pump is operating. Valve 1RN11A is interlocked to open when RN Pump 1A is running and close when RN Pump 1A is tripped. The valve does not receive an ESF signal; however, RN Pump 1A is started on a safety injection signal from either unit or loss of offsite power.

Valve 1RN28A is required to be open when nuclear service water pump 1A is operating. The valve is required to remain closed if nuclear service water pump 1A is idle to prevent diversion of flow from an operating RN pump. Valve 1RN28A is interlocked to open when RN Pump 1A is running and close when RN Pump 1A is tripped. The valve does not receive an ESF signal; however, RN Pump1A is started on a safety injection signal from either unit or loss of offsite power.

Valve 1RN30A opens to discharge RN strainer 1A backflush water to the train related RN intake pit. Valve 1RN30A is required to open via the RN strainer 1A backwash controls when the strainer is backwashing and close when the backwash cycle is complete. The backwash cycle is initiated by a timed cycle or by high differential pressure across the strainer. 1RN30A is required to perform its backwash function or to remain in an open position to meet RN Pump 1A operability requirements. Continuous flow through the backwash valve is accounted for in the system flow balance.

1RN36A provides dilution water for the system chemical addition system. It receives IE power and an ESF signal. Valve 1RN36A is normally open but closes upon receipt of a safety injection signal from either unit for train separation.

The loss of EDG 1A would prevent RN Pump 1A from receiving a start signal which would prevent 1RN28A and 1RN11A from opening. 1RN30A would be incapable of opening to support RN Pump 1A operability. 1RN36A would also not be capable of closing; however, the B train valve, 1RN37B, would close to meet train separation requirements.



Discharge Section

Valve 1RN63A is normally closed to isolate the RN A loop discharge line to the Standby Nuclear Service Water Pond. During normal plant operation, the RN return headers are aligned to Lake Wylie, as opposed to the SNSWP, to avoid unnecessary heating of the SNSWP. Valve 1RN63A opens on an containment high-high pressure signal (SP) signal from either unit or on emergency low level in either RN pumphouse pit (based on 2 out of 3 logic from any single pit's level instruments). The valve opens on an SP signal to provide an assured RN discharge flow path if the normal RN discharge flow path to RL is unavailable due to a failed isolation valve. The position of 1RN63A is not affected by a loss of offsite power event. Also applicable to 1RN58B.

Valves 1RN57A and 1RN843B are normally open to allow both trains of RN to discharge to Lake Wylie via the Low Pressure Service Water System. Both valves close on 2 /3 emergency low level in either RN pumphouse pit to align the RN system discharge flow to the Standby Nuclear Service Water Pond. These valves have no LOCA or LOOP responses but do receive 1E Power to allow operation in the event of an emergency low RN pumphouse pit level.

Valve 1RN54A is normally open to allow the B train RN return flow to discharge to Lake Wylie via the non-safety assured discharge header. Valve 1RN54A closes on emergency low level in either RN pumphouse pit (based on 2 out of 3 logic from any single pit's level instruments) to align the individual A and B train RN return headers to the Standby Nuclear Service Water Pond via 1RN63A and 1RN58B, respectively. However, when RN is aligned in either Single Supply Header Operation (TS 3.7.8 Condition B), the discharge crossovers are prevented from auto-closing by being in the open position with power removed. Therefore, RN trains A and B do not isolate and remain cross-connected. This ensures that NSW cooling water flow is available to all four essential headers while the RN system is aligned in Single Supply Header Operation alignment. This valve has no LOCA or LOOP response but does receive 1E Power to allow operation in the event of an emergency low RN pumphouse pit level. Also applicable to 1RN53B.

Valve 1RN847A is normally open to return the diesel generator 1A heat exchanger cooling water return flow to Lake Wylie. Valve 1RN847A will close on emergency low level in either RN pumphouse pit (based on 2 out of 3 logic from any single pit's level instruments) to isolate the lake return. Valve 1RN847A is interlocked with diesel generator 1A heat exchanger RN return to the SNSWP isolation valve 1RN846A such that only one return path may be isolated. 1RN846A opens on the same 2 out of 3 pit emergency low level logic. The corresponding valve for the 1B train are 1RN848B (SNSWP isolation) and 1RN849B (Lake Wylie isolation). Unit 2 valves maintain these same functions.

These diesel related valves do not receive any LOOP or LOCA signals but do receive 1E power to perform their pit supply swap functions, if required. Since these valves operate independently of the diesel, they are not impacted by the loss of a diesel since NSW flow to the diesel would be isolated upon diesel shutdown.

Miscellaneous RN Functions

Valve 1RN244A throttles flow to maintain a set refrigerant head pressure in the Control Room Area condensers, which is shared between units. This control is critical, as icing may occur if the condenser is overcooled. Because a fine degree of control is necessary at all times, this valve has an electrohydraulic actuator. Valve 1RN244A receives 1E power and will continue to modulate after loss of offsite power or LOCA. Should the electro-hydraulic actuator system fail, this valve will fail open. With power aligned to Unit 1, the loss of the 1A EDG would result in the loss of the throttling function of 1RN244A, potentially resulting in overcooling. The opposite train chiller/condenser would be available with adequate control. This applies to valve 1RN304B also.

Valves 1RN47A and 1RN48B are the supply header crossover valves which allow one pump to provide cooling water to both trains. They are normally open and automatically close on either a containment high-high pressure signal (SP) from Unit 1 or an emergency low level signal, based on 2 out of 3 logic from the opposite train's pit level instruments, i.e. 1RN47A closes on a B pit signal. The SP signal closure isolates the affected unit's non-essential header to conserve flow for essential header components. The low pit level signal serves to provide A and B train separation. Both valves receive 1E Power from their respective EDGs. The loss of either EDG would result in the opposite train valve providing train separation. The inability to isolate a the non-essential header via either of these valves upon receipt of an SP signal would be mitigated by the automatic closure of the common non-essential header isolation valves, 1RN49A or 1RN50B. The same configuration applies to Unit 2.

The non-essential return header also contains valves 1RN51A and 1RN52B which would also isolate the non-safety non-essential header from the normal return header such that failure of the non-safety header would not jeopardize essential header cooling.

a. (McGuire Response)

The effect of a loss of each DG on the shared NSWS SSCs depends on the initial alignment of the 600V Motor Control Centers (MCCs) 1EMXG, 1EMXH, 2EMXG and 2EMXH. The normal plant configuration at MNS is for “A” train shared NSWS SSCs to be powered from Unit 1 and “B” train shared NSWS SSCs to be powered from Unit 2. The Unit 1 and 2 NSWS Pumps, A and B Train, are powered from their respective Unit and Train essential bus, 1(2) ETA and 1(2) ETB, and are not shared between the Units.

For the shared components of the Nuclear Service Water System (NSWS):
The “A” train of shared NSWS valves are powered from two 600V Essential MCCs 1EMXH and 1EMXH-1. MCC 1EMXH-1 receives normal power from 1EMXH via 1EMXH-08A so for the remainder of this discussion both MCCs will be referred to as 1EMXH. 1EMXH can receive power from either unit but is normally powered from Unit 1 600V Essential Load Center 1ELXA with Unit 2 600V Essential Load Center 2ELXA being the alternate supply, refer to OP-MC-EL-EP Rev. 4 below. 1EMXH alignment is controlled by plant procedures and use of Kirk Keys on the normal and alternate Essential Load Center breakers to ensure it is aligned to only one unit essential power supply at a time. The Load Centers 1ELXA and 2ELXA received power from their respective unit's “A” train 4160V Essential Bus (1ETA and 2ETA).

The “B” train of shared NSWS valves are powered from one 600V Essential MCC 2EMXH. 2EMXH can receive power from either unit but is normally powered from the Unit 2 600V Essential Load Center 2ELXB with Unit 1 600V Essential Load Center 1ELXB being the alternate supply. 2EMXH alignment is controlled by plant procedures and use of Kirk Keys on the normal and alternate Essential Load Center breakers to ensure it is aligned to only one unit essential power supply at a time. The Load Centers 1ELXB and 2ELXB received power from their respective unit’s “B” train 4160V Essential Bus (1ETB and 2ETB).

It is also important to note that the NSWS is normally aligned with both trains receiving water from a common source (i.e., Low Level Intake of Lake Norman). The NSWS water then returns to Lake Norman via connection to the condenser cooling water system (RC). With that in mind and the above information, the following describes the effects of a loss of a DG would have upon the shared NSWS SSCs at MNS.

With the loss of the 1A DG and a Blackout (BO) of 1ETA bus, the shared "A" Train NSWS suction, discharge and train separation valves lose power and the ability to perform their safety function and are inoperable. With the A Train NSWS shared suctions , discharge and train separation valves inoperable, the 2A Train of NSWS is technically inoperable but available in this alignment, refer to drawing OP-MC-PSS-RN Rev. 54 below. The "B" Train NSWS shared valves are not impacted by the loss of 1A DG, valves receive power from Unit 2 MCC 2EMXH, and remain fully capable of performing their safety function of aligning "B" NSWS suction and discharge to the Standby Nuclear Service Water Pond, SNWSP and train separation.

With the loss of the 1A DG and a Loss of Offsite Power (LOOP) and concurrent Safety Injection (Ss) event on Unit 1, the above discussion remains true along with the 1B DG being started by the safety signals, BO and Ss, and loaded with required safety related loads by the sequencer.

With the loss of the 2B DG and a BO of 2ETB, bus the shared "B" Train NSWS suction, discharge and train separation valves lose power and the ability to perform their safety function and are inoperable. With the B Train NSWS shared suctions , discharge and train separation valves inoperable the 1B Train of NSWS is technically inoperable but available in this alignment, refer to drawing OP-MC-PSS-RN Rev. 54 below. The "A" Train NSWS shared SSC valves are not impacted by the loss of 2B DG, valves receive power from Unit 1 MCC 1EMXH and 1EMXH-1, and remain fully capable of performing their safety function of aligning "A" NSWS suction and discharge to the Low Level Intake, LLI, of Lake Norman and train separation.

With the loss of the 2B DG and a LOOP and concurrent Safety Injection (Ss) event on Unit 2, the above discussion remains true along with the 2A DG being started by the safety signals, BO and Ss, and loaded with required safety related loads by the sequencer.

With the loss of the 1B DG and BO of 1ETB bus the shared "B" Train NSWS suction, discharge and train separation valves are not affected. This is due to the NSWS shared SSCs being supplied by Unit 1 A Train and Unit 2 B Train essential power. With the loss of the 1B D/G and LOOP, and concurrent Safety Injection, Ss, event on Unit 1 the above discussion remains true along with the 1A D/G being started by the safety signals, BO and Ss, and is loaded with required safety related loads by the sequencer.

With the loss of the 2A DG and BO of 2ETA bus the shared "A" Train NSWS suction, discharge and train separation valves are not affected. This is due to the NSWS shared SSCs being supplied by Unit 1 A Train and Unit 2 B Train essential power. With the loss of the 2A DG and LOOP, and concurrent Safety Injection, Ss, event on Unit 2 the above discussion remains true along with the 2B DG being started by the safety signals, BO and Ss, and is loaded with required safety related loads by the sequencer.

The tables below of NSWS shared components are intended to assist the staff's review of the discussion above and also to help understand the drawings that are included below.

McGuire "A" Train NSWS Shared Components

Valve	Purpose	Safety Function	Normal / Alternate Essential Power Supply
0RN-3A	1A and 2A RN Pump Supply from RC	Close to isolate Safety Class suction from non-safety class	D/G 1A / DG 2A
0RN-7A	1A and 2A RN Pump Supply from SNSWP	Close to isolate "A" Train suction from SNSWP	D/G 1A / DG 2A
0RN-14A	1A and 2A RN Suction Header to "B" Train Cross Connect	Close for Train Separation	D/G 1A / DG 2A
0RN-13A	1A and 2A RN Pump Supply from Low Level Intake (LLI)	Open to align "A" suction to LLI	D/G 1A / DG 2A
0RN-150A	1A and 2A RN Discharge to B Train Cross Connect to SNSWP	Close for Train Separation	D/G 1A / DG 2A
0RN-149A	1A and 2A RN Discharge to SNSWP	Close to prevent A Train discharge to SNSWP	D/G 1A / DG 2A
0RN-10AC	Low Level Supply B Shutoff Valve	Close for Train Separation on Ss and isolate SNSWP from Lake	D/G 1A / DG 2A
0RN-148AC	1A and 2A RN Train discharge to RC	Open to align discharge to lake	D/G 1A / DG 2A
0RN-12AC	1A and 2A RN Pump Supply from Low Level Intake (LLI)	Open to align "A" suction to LLI	D/G 1A / DG 2A
0RN-4AC	1B and 2B RN Pump Supply from RC	Close to isolate Safety Class suction from non-safety class	D/G 1A / DG 2A
0RN-147AC	1A and 2A RN Train discharge to RC	Open to align discharge to lake	D/G 1A / DG 2A

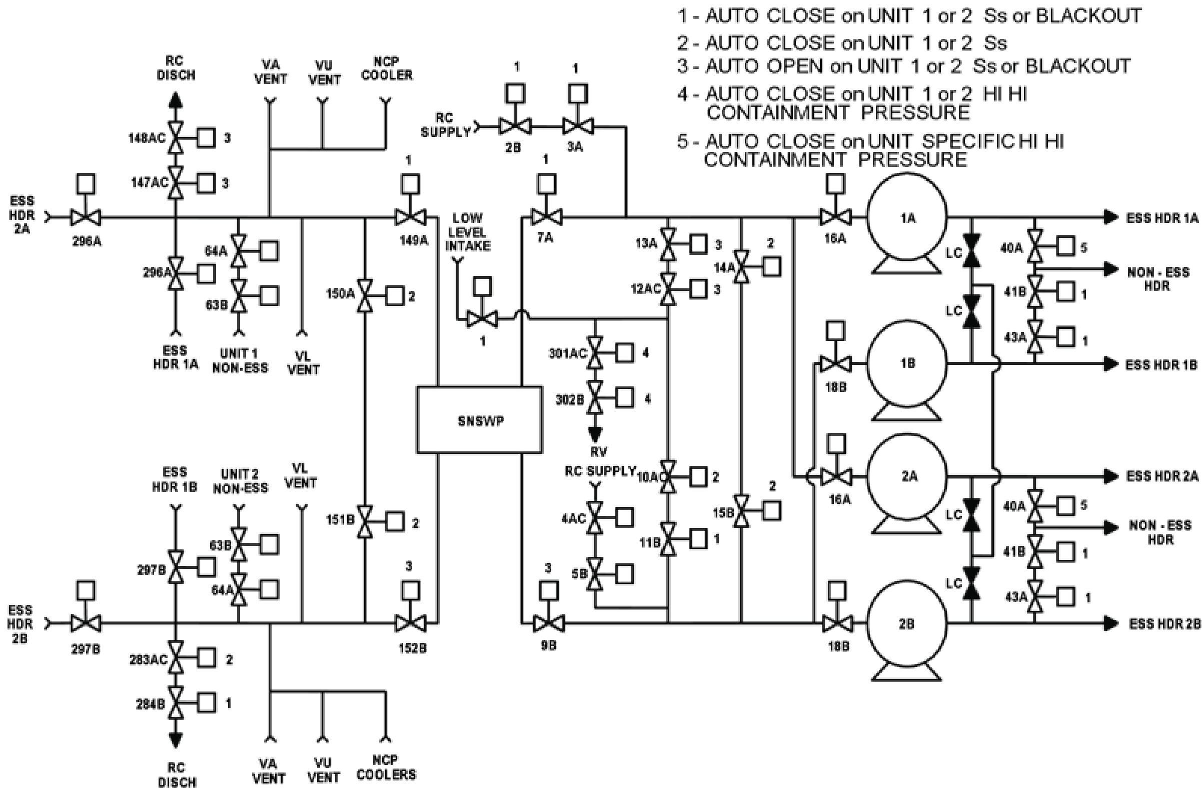
0RN-283AC	1B and 2B RN Train discharge to RC	Close to protect SNSWP level	D/G 1A / DG 2A
0RN-301AC	Containment Ventilation System Supply Isolation	Close to isolate Safety Class suction from non-safety class	D/G 1A / DG 2A

McGuire “B” Train NSWS Shared Components

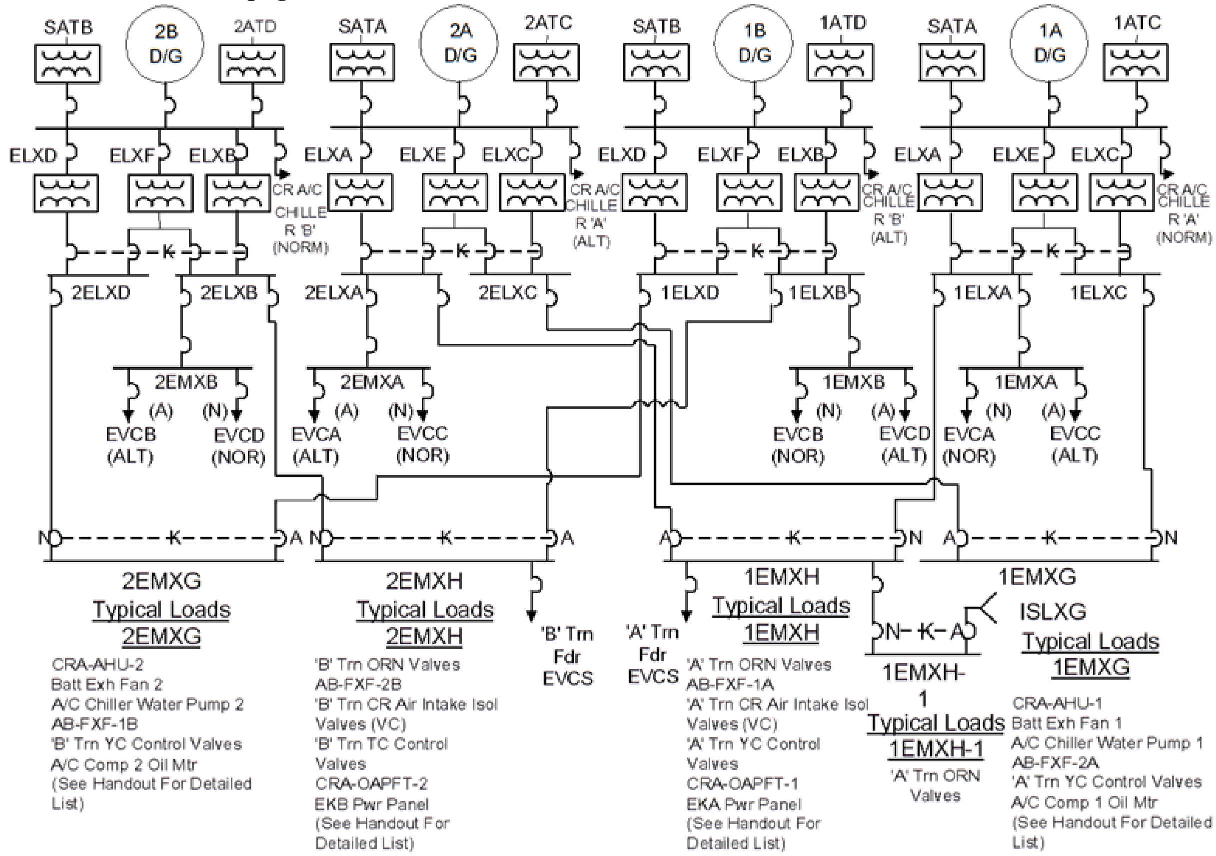
Valve	Purpose	Safety Function	Normal / Alternate Essential Power Supply
0RN-2B	1A and 2A RN Pump Supply from RC	Close to isolate Safety Class suction from non-safety class	D/G 2B / DG 1B
0RN-9B	1B and 2B RN Pump Supply from SNSWP	Open to align B Train suction to SNSWP	D/G 2B / DG 1B
0RN-15B	1B and 2B RN Suction Header to “A” Train Cross Connect	Close for Train Separation	D/G 2B / DG 1B
0RN-151B	1B and 2B RN Discharge to B Train Cross Connect to SNSWP	Close for Train Separation	D/G 2B / DG 1B
0RN-152B	1B and 2B RN Discharge to SNSWP	Open to align "B" Train Discharge to SNSWP	D/G 2B / DG 1B
0RN-11B	Low Level Supply B Shutoff Valve	CloseTrain Separation and isolate SNSWP from Lake	D/G 2B / DG 1B
0RN-5B	1B and 2B RN Pump Supply from RC	Close to isolate Safety Class suction from non-safety class	D/G 2B / DG 1B
0RN-284B	1B and 2B RN Train discharge to RC	Close to protect SNSWP level	D/G 2B / DG 1B
0RN-302B	Containment Ventilation System Supply Isolation	Close to isolate Safety Class suction from non-safety class	D/G 2B / DG 1B

The following drawings are from Operations approved lesson plans.

OP-MC-PSS-RN Rev. 54, page 59
NSWS actuation signals are train related. Reference OP-MC-PSS-RN Rev. 54, page 22



OP-MC-EL-EP Rev. 4, page 83



b. (Catawba Response)

The following systems have shared components that receive power from Essential Motor Control Centers (MCCs):

- Nuclear Service Water System (NSWS or RN)
- Control Room Area Ventilation System (CRAVS or VC)
- Control Room Area Chilled Water System (CRACWS or YC)
- Auxiliary Building Filtered Ventilation Exhaust System (ABFVES or VA)

There is one Essential MCC per train (1EMXG and 2EMXH) at CNS that supply all of the shared components on both units. The Essential MCC 1EMXG supplies the “A” train of shared equipment. The Essential MCC 2EMXH supplies the “B” train of shared equipment. The units are not allowed to be cross-connected at any time. Thus, only one DG can be associated with a particular train of shared equipment at a given time. Either 1A DG or 2A DG can be aligned as the emergency power supply for “A” train shared equipment, and either 1B or 2B DG can be aligned as the emergency power supply for “B” train shared equipment. Tables 3 and 4 below list each shared component, the component’s function, the DG that is the emergency power source for the shared component in a normal plant lineup and also the DG that can serve as an alternate emergency power source via realignment.

Table 3: Units 1 and 2 "A" Train Shared Equipment at CNS

Shared Equipment	Component Function	Emergency Power Source	
"A" Train Nuclear Service Water System Valves	These valves provide a common suction/return path for A train of the Nuclear Service Water System. Valve alignment and positioning in response to design events or accidents are detailed in the 4a response.	All power (normal and emergency) can be aligned to deliver power to the Essential Motor Control Center(s) that power the component. This is accomplished at the 4160V level (i.e., 1ETA or 2ETA), so emergency power and normal power supplies are always from the same unit. All of the train-related components will have the same power sources at any given time; that is, if 1EMXG is aligned to receive power from Unit 1 (normal alignment), then all of the components listed under 1EMXG will be powered from Unit 1. Likewise, if 1EMXG is aligned to receive power from Unit 2, then all of the components listed under 1EMXG will be powered from Unit 2.	
1EMXG	1EMXG provides power to all of the following equipment	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-3A	1A and 2A RN Pump Pit supply from SNSWP	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-1A	1A and 2A RN Pump Pit A isolation from Lake Wylie	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-5A	1B and 2B RN Pit B isolation from Lake Wylie	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-63A	A RN header return to SNSWP	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-47A	RN supply header cross over valve	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-57A	RN header discharge to Lake Wylie	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 1RN-54A	RN return header cross over valve	"Normal" DG is 1A	"Alternate" DG is 2A
VC Control Room AHU-1	Control room ventilation unit A train	"Normal" DG is 1A	"Alternate" DG is 2A
A VC Pressure Filter Train unit	Control room pressurization and filtration A train	"Normal" DG is 1A	"Alternate" DG is 2A
A YC Chilled water pump	Control room cooling water pump A train	"Normal" DG is 1A	"Alternate" DG is 2A
Control Room Area AHU-1	Control Room Area ventilation A train	"Normal" DG is 1A	"Alternate" DG is 2A

Shared Equipment	Component Function	Emergency Power Source	
1VC-8A and 2VC-8A	Pressure Fans cross connect	“Normal” DG is 1A	“Alternate” DG is 2A
1VC-6A	A Control Room area filter inlet isolation	“Normal” DG is 1A	“Alternate” DG is 2A
2VC-6A	B Control Room area filter inlet isolation	“Normal” DG is 1A	“Alternate” DG is 2A
A YC Control Power	A Control Room Chiller control power	“Normal” DG is 1A	“Alternate” DG is 2A
1A Auxiliary Building Filtered Exhaust Fan	Unit 1 Auxiliary Building exhaust filtration	“Normal” DG is 1A	“Alternate” DG is 2A
2A Auxiliary Building Filtered Exhaust Fan	Unit 2 Auxiliary Building exhaust filtration	“Normal” DG is 1A	“Alternate” DG is 2A

Table 4: Units 1 and 2 “B” Train Shared Equipment at CNS

Shared Equipment	Component Function	Emergency Power Source	
“B” Train Nuclear Service Water System Valves	These valves provide a common suction/return path to both Units’ “B” Nuclear Service Water Pumps. During an accident, the valves reposition as necessary to align suction and discharge to the SNSWP.	All power (normal and emergency) can be aligned to deliver power to the Essential Motor Control Center(s) that power the component. This is accomplished at the 4160 Volt level (i.e., 1ETB or 2ETB), so emergency power and normal power supplies are always from the same unit. All of the train-related components will have the same power sources at any given time; that is, if 2EMXH is aligned to receive power from Unit 2 (normal alignment), then all of the components listed under 2EMXH will be powered from Unit 2. Likewise, if 2EMXH is aligned to receive power from Unit 1, then all of the components listed under 2EMXH will be powered from Unit 1.	
2EMXH	2EMXH provides power to all of the following equipment	“Normal” DG is 2B	“Alternate” DG is 1B
Valve 1RN-4B	1B and 2B RN Pump Pit supply from SNSWP	“Normal” DG is 2B	“Alternate” DG is 1B
Valve 1RN-2B	1A and 2A RN Pump Pit A isolation from Lake Wylie	“Normal” DG is 2B	“Alternate” DG is 1B
Valve 1RN-6B	1B and 2B RN Pit B isolation from Lake Wylie	“Normal” DG is 2B	“Alternate” DG is 1B

Shared Equipment	**Component Function**	**Emergency Power Source**	
Valve 1RN-48B	RN supply header cross over valve	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 1RN-58B	B RN header return to SNSWP	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 1RN-843B	RN header discharge to Lake Wylie	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 1RN-53B	RN return header cross over valve	"Normal" DG is 2B	"Alternate" DG is 1B
VC Control Room AHU-2	Control room ventilation unit B train	"Normal" DG is 2B	"Alternate" DG is 1B
B VC Pressure Filter Train unit	Control room pressurization and filtration B train	"Normal" DG is 2B	"Alternate" DG is 1B
B YC Chilled water pump	Control room cooling water pump B train	"Normal" DG is 2B	"Alternate" DG is 1B
Control Room Area AHU-2	Control Room Area ventilation B train	"Normal" DG is 2B	"Alternate" DG is 1B
1VC-7B and 2VC-7B	Pressure Fans cross connect	"Normal" DG is 2B	"Alternate" DG is 1B
1VC-5B	A Control Room area filter inlet isolation	"Normal" DG is 2B	"Alternate" DG is 1B
2VC-5B	B Control Room area filter inlet isolation	"Normal" DG is 2B	"Alternate" DG is 1B
B YC Control Power	B Control Room Chiller control power	"Normal" DG is 2B	"Alternate" DG is 1B
1B Auxiliary Building Filtered Exhaust Fan	Unit 1 Auxiliary Building exhaust filtration	"Normal" DG is 2B	"Alternate" DG is 1B
2B Auxiliary Building Filtered Exhaust Fan	Unit 2 Auxiliary Building exhaust filtration	"Normal" DG is 2B	"Alternate" DG is 1B

b. (McGuire Response)

The following systems have shared components that receive power from Essential Motor Control Centers (MCCs):

- Nuclear Service Water System (NSWS or RN)
- Control Room Area Ventilation System (CRAVS or VC)
- Control Room Area Chilled Water System (CRACWS or YC)
- Auxiliary Building Filtered Ventilation Exhaust System (ABFVES or VA)

There are two Essential MCCs per train at MNS (for a total of four Essential MCCs) that supply all of the shared components on both units. These Essential MCCs are 1EMXG, 1EMXH, 2EMXG and 2EMXH. The Essential MCCs that are designated as "Unit 1" supply the “A” train of shared equipment. The Essential MCCs that are designated as “Unit 2” supply the “B” train of shared equipment. The units are not allowed to be cross-connected at any time. Thus, only one DG can be associated with a particular train of shared equipment at a given time. Either 1A DG or 2A DG can be aligned as the emergency power supply for “A” train shared equipment, and either 1B or 2B DG can be aligned as the emergency power supply for “B” train shared equipment. Tables 5 and 6 below list each shared component, the component’s function, the DG that is the emergency power source for the shared component in a normal plant lineup and also the DG that can serve as an alternate emergency power source via realignment.

Table 5: Units 1 and 2 “A” Train Shared Equipment at MNS

Shared Equipment	Component Function	Emergency Power Source	
“A” Train Nuclear Service Water System Valves	These valves provide a common suction/return path to both Units’ “A” Nuclear Service Water Pumps. During an accident, the valves reposition as necessary to provide train separation (i.e., 1A and 2A pumps will remain aligned to the Low Level Intake; 1B and 2B pumps align to the SNSWP).	All power (normal and emergency) can be aligned to deliver power to the Essential Motor Control Center(s) that power the component. This is accomplished at the 4160 Volt level (i.e., essential buses 1ETA or 2ETA), so emergency power and normal power supplies are always from the same unit. All of the train-related components will have the same power sources at any given time; that is, if 1EMXH is aligned to receive power from Unit 1 (normal alignment), then all of the components listed under 1EMXH and 1EMXH-1 will be powered from Unit 1. Likewise, if 1EMXH is aligned to receive power from Unit 2, then all of the components listed under 1EMXH and 1EMXH-1 will be powered from Unit 2.	
1EMXH (and sub-center 1EMXH-1)	1EMXH provides power to all of the following shared equipment	“Normal” DG is 1A	“Alternate” DG is 2A
Valve 0RN-3A	1A and 2A RN Pump Supply from the lake	“Normal” DG is 1A	“Alternate” DG is 2A
Valve 0RN-7A	1A and 2A RN Pump Supply from SNSWP	“Normal” DG is 1A	“Alternate” DG is 2A
Valve 0RN-14A	1A and 2A RN Suction Header to “B” Train Cross Connect	“Normal” DG is 1A	“Alternate” DG is 2A
Valve 0RN-13A	1A and 2A RN Pump Supply from Low Level Intake	“Normal” DG is 1A	“Alternate” DG is 2A
Valve 0RN-150A	1A and 2A RN Discharge to B Train Cross Connect to SNSWP	“Normal” DG is 1A	“Alternate” DG is 2A

Shared Equipment	**Component Function**	**Emergency Power Source**	
Valve 0RN-149A	1A and 2A RN Discharge to SNSWP	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 0RN-10AC	Low Level Supply B Shutoff Valve	"Normal" DG is 1A Note: the designator "AC" means that power to the valve can be aligned from the Standby Shutdown Facility	"Alternate" DG is 2A
Valve 0RN-148AC	CCW Discharge "A" Isolation Valve	"Normal" DG is 1A Note: "CCW" = Condenser Circulating Water (i.e., Lake Norman for MNS; Lake Wylie for CNS)	"Alternate" DG is 2A
Valve 0RN-12AC	Low Level supply A Shutoff Valve	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 0RN-4AC	CCW Supply "B" Shutoff Valve	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 0RN-147AC	CCW Discharge A Isolation	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 0RN-283AC	CCW Discharge B Isolation	"Normal" DG is 1A	"Alternate" DG is 2A
Valve 0RN-301AC	Containment Ventilation System Supply Isolation	"Normal" DG is 1A	"Alternate" DG is 2A
"A" Control Room AHU Supply Fan	Provides air conditioned ventilation to Control Room	"Normal" DG is 1A	"Alternate" DG is 2A
Auxiliary Building Filtered Exhaust Fan 1A	Transports potentially contaminated air thru filters to Unit Vent	"Normal" DG is 1A	"Alternate" DG is 2A
1VC-1A (Unit 1 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	"Normal" DG is 1A	"Alternate" DG is 2A
1VC-2A (Unit 1 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	"Normal" DG is 1A	"Alternate" DG is 2A
1VC-9A (Unit 2 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	"Normal" DG is 1A	"Alternate" DG is 2A

Shared Equipment	**Component Function**	**Emergency Power Source**	
1VC-10-A (Unit 2 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	"Normal" DG is 1A	"Alternate" DG is 2A
"A" Train Shared Components that receive power from 1EMXG	1EMXG is another Essential Motor Control Center that provides power to the following "A" Train Shared Components.	All power (normal and emergency) can be aligned to deliver power to the Essential Motor Control Center(s) that power the component. This is accomplished at the 4160 Volt level (i.e., essential buses 1ETA or 2ETA), so emergency power and normal power supplies are always from the same unit. All of the train-related components will have the same power sources at any given time; that is, if 1EMXG is aligned to receive power from Unit 1 (normal alignment), then all of the components listed under 1EMXG will be powered from Unit 1. It is possible, but not typical, to align 1EMXH and 1EMXG to different units. For example, while 1EMXH is aligned to Unit 1, 1EMXG <u>*could be*</u> aligned to receive power from Unit 2. And vice-versa. In this case, all of the 1EMXH listed components will be powered from Unit 1; 1EMXG components will be powered from Unit 2. That configuration is possible but is not standard practice.	
"A" Control Room Area AHU	Provides air conditioned ventilation to Battery Rooms and other important areas other than the Control Room itself.	"Normal" DG is 1A	"Alternate" DG is 2A
"A" Battery Room Exhaust Fan	Maintains ventilation of essential battery rooms	"Normal" DG is 1A	"Alternate" DG is 2A
"A" Control Area Chilled Water Pump	Circulates chilled water to Control Room AHU's and back to Control Room Chiller	"Normal" DG is 1A	"Alternate" DG is 2A
"A" Control Area Chiller Oil Pump	Provides lubrication to Control Room Chiller for bearing lubrication	"Normal" DG is 1A	"Alternate" DG is 2A

Shared Equipment	**Component Function**	**Emergency Power Source**	
2A Auxiliary Building Ventilation Filtered Exhaust Fan	Transports potentially contaminated air thru filters to Unit Vent	"Normal" DG is 1A	"Alternate" DG is 2A

Table 6: Units 1 and 2 "B" Train Shared Equipment at MNS

Shared Equipment	**Component Function**	**Emergency Power Source**	
"B" Train Nuclear Service Water System Valves	These valves provide a common suction/return path to both Units' "B" Nuclear Service Water Pumps. During an accident, the valves reposition as necessary to provide train separation (1A and 2A will remain aligned to Low Level Intake; 1B and 2B pumps align to SNSWP	All power (normal and emergency) can be aligned to deliver power to the Essential Motor Control Center(s) that power the component. This is accomplished at the 4160 Volt level (i.e., essential buses1ETB or 2ETB), so emergency power and normal power supplies are always from the same unit. All of the train-related components will have the same power sources at any given time; that is, if 2EMXH is aligned to receive power from Unit 2 (normal alignment), then all of the components listed under 2EMXH will be powered from Unit 2. (Note: Unlike Unit 1, there is NOT an Essential Motor Control Sub-Center, EMXH-1.)	
2EMXH	2EMXH provides power to all of the following shared equipment	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-2B	1A and 2A RN Pump Supply from the lake	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-9B	1B and 2B RN Pump Supply from SNSWP	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-15B	1B and 2B RN Suction Header to "A" Train Cross Connect	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-151B	1B and 2B RN Discharge to B Train Cross Connect to SNSWP	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-152B	1B and 2B RN Discharge to SNSWP	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-11B	Low Level Supply B Shutoff Valve	"Normal" DG is 2B	"Alternate" DG is 1B
Valve 0RN-5B	CCW Supply "B" Shutoff Valve	"Normal" DG is 2B Note: "CCW" = Condenser Circulating	"Alternate" DG is 1B

Shared Equipment	**Component Function**	**Emergency Power Source**	
		Water (i.e., Lake Norman for MNS; Lake Wylie for CNS)	
Valve 0RN-284B	CCW Discharge B Isolation	“Normal” DG is 2B	“Alternate” DG is 1B
Valve 0RN-302B	Containment Ventilation System Supply Isolation	“Normal” DG is 2B	“Alternate” DG is 1B
“B” Control Room AHU Supply Fan	Provides air conditioned ventilation to Control Room	“Normal” DG is 2B	“Alternate” DG is 1B
Auxiliary Building Filtered Exhaust Fan 2B	Transports potentially contaminated air thru filters to Unit Vent	“Normal” DG is 2B	“Alternate” DG is 1B
1VC-3B (Unit 1 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	“Normal” DG is 2B	“Alternate” DG is 1B
1VC-4B (Unit 1 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	“Normal” DG is 2B	“Alternate” DG is 1B
1VC-11B (Unit 2 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	“Normal” DG is 2B	“Alternate” DG is 1B
1VC-12B (Unit 2 Control Room Ventilation Outside Air Intake)	Isolates air intake on receipt of High Chlorine or Hi radiation	“Normal” DG is 2B	“Alternate” DG is 1B
“B” Train Shared Components that receive power from 2EMXG	2EMXG is another Essential Motor Control Center that provides power to the following “B” Train Shared Components.	All power (normal and emergency) can be aligned to deliver power to the Essential Motor Control Center(s) that power the component. This is accomplished at the 4160 Volt level (i.e., essential buses 1ETB or 2ETB), so emergency power and normal power supplies are always from the same unit. All of the train-related components will have the same power sources at any given time; that is, if 2EMXG is aligned to receive power from Unit 2 (normal alignment), then all of the components listed under 2EMXG will be powered from Unit 2. It is possible, but not typical, to align 2EMXH and 2EMXG to different units. For example,	

Shared Equipment	Component Function	Emergency Power Source	
		while 2EMXH is aligned to Unit 2, 2EMXG *could be* aligned to receive power from Unit 1. And vice-versa. In this case, all of the 2EMXH listed components will be powered from Unit 2; 1EMXG components, from Unit 1. That configuration is possible but is not standard practice.	
"B" Control Room Area AHU	Provides air conditioned ventilation to Battery Rooms and other important areas other than the Control Room itself.	"Normal" DG is 2B	"Alternate" DG is 1B
"B" Battery Room Exhaust Fan	Maintains ventilation of essential battery rooms	"Normal" DG is 2B	"Alternate" DG is 1B
"B" Control Area Chilled Water Pump	Circulates chilled water to Control Room AHU's and back to Control Room Chiller	"Normal" DG is 2B	"Alternate" DG is 1B
"B" Control Area Chiller Oil Pump	Provides lubrication to Control Room Chiller for bearing lubrication	"Normal" DG is 2B	"Alternate" DG is 1B
1B Auxiliary Building Ventilation Filtered Exhaust Fan	Transports potentially contaminated air thru filters to Unit Vent	"Normal" DG is 2B	"Alternate" DG is 1B

c. Before providing the differences between CNS and MNS in tabular form, it first should be noted that both stations have two trains of Essential Power, beginning at the 4160V level (the Essential Buses are designated ETA and ETB for each unit). These 4160V Essential Buses are normally powered from the respective train of offsite power through a series of buses and transformers. Each 4160V bus can also receive power from its associated DG during loss of offsite power conditions. There is also a provision to align the opposite unit's offsite power (train related) to the 4160V buses using Shared Auxiliary Transformer "A" or "B". The 4160V Essential Buses provide power to all of the 4160V ECCS equipment such as Nuclear Service Water Pumps, Safety Injection Pumps, Chemical and Volume Control Pumps, etc. They also each supply two 600V Essential Load Centers. These load centers provide power to the motor control centers (MCCs) discussed below. All of the shared components are powered from these MCCs, as listed, except for the Control Room Chillers at CNS and MNS, and the RN Pumps. The Chillers and the NSWS pumps are powered from the Unit's 4160V Essential Buses, ETA and ETB. The MCCs can be powered from either unit (e.g., MCC 1EMXH which provides power to all of the "A" Train Nuclear Service Water valves at MNS is normally powered from Unit 1, but can be aligned to receive power from Unit 2.) Through a series

of cables, breakers, transformer, and load centers, the MCC receives power from whatever source is powering the 4160V Essential Bus. If 1EMXH (MNS) or 1EMXG (CNS) is aligned to Unit 1, then ultimately, the MCC is receiving power from either "normal power" (i.e., 1A Offsite Power), "alternate power" (i.e., 2A Offsite Power via shared transformer SATA), or from "emergency power" (i.e., 1A DG). Thus, the normal and emergency power to shared equipment are always from the same unit.
Table 7 below lists the shared components at both CNS and MNS, differences between the two stations and then a column for any significant differences that exist between the two stations with respect to electric power supplies and shared systems.

Table 7: Differences Between CNS/MNS Shared Systems

Shared Components	CNS	MNS	Significant Difference(s)
RN Pump Suction Valves, "A" Train	Power from 1EMXG (600V)	Power from 1EMXH and 1EMXH1 (600 Volts)	There are essentially no differences in the method of supplying power (normal and emergency) to the shared suction valves, except for the motor control center names. In both cases, a 600V transformer(s) reduces the voltage from the 4160V Essential Load Center(s) to 600V, and delivers this power to unit specific Essential Load Centers. Either one of the unit Essential Load Centers can be aligned to supply 600V power to the Essential Motor Control Center (i.e., 1EMXG for CNS; 1EMXH for MNS). 1EMXH1 is sub-center and is powered from 1EMXH). All of the CNS and MNS Nuclear Service Water Valves are powered from their respective MCC; thus, swapping power supplies between the units at either station is a 100% swap. Components cannot have their power supplies swapped individually.
RN Pump Suction Valves, "B" Train	Power from 2EMXH (600 Volts) - no difference between CNS and MNS	Power from 2EMXH (600 Volts) - no differences between CNS and MNS	There are essentially no differences in the method of supplying power (normal and emergency) to the shared suction valves. In both cases, a 600V transformer(s) reduces the voltage from the 4160V Essential Load Center(s) to 600V and delivers this power to unit specific Essential Load Centers. Either one of the unit Essential Load Centers can be aligned to supply 600V power to the Essential Motor Control Center (i.e., 2EMXH for CNS; 2EMXH for MNS. All of the CNS and MNS NSWS valves are powered from their respective MCC; thus, swapping power supplies between the units at either station is a 100%

Shared Components	CNS	MNS	Significant Difference(s)
			swap. Components cannot have their power supplies swapped individually.
Suction Supplies and Return paths for the NSWS	CNS NSWS pumps take suction from suction pits, and returns to Lake Wylie. Both trains stay aligned to Lake Wylie unless suction pits level drops too low, at which time the Pit Supply valve swap from Lake supply to SNSWP supply.	In normal conditions, both trains are aligned to Lake Norman's Low Level Intake. On a Blackout or Safety Injection, the "B" Train aligns to the SNSWP while the "A" Train remains aligned to the Low Level Intake to provide Train Separation.	
NSWS Pumps	There are a total of 4 NSWS pumps, all of which contribute to an overall NSWS that is shared between both units	There are a total of 4 NSWS pumps, 2 per unit	Other than the shared suction and return lines, MNS has two discreet Nuclear Service Water Systems, one for each unit. The pumps themselves are not "shared". At CNS, the NSWS pumps are considered shared components.
NSWS Pump Power Supplies	The NSWS pumps are powered from 1ETA, 1ETB, 2ETA and 2ETB	The NSWS pumps are powered from 1ETA, 1ETB, 2ETA and 2ETB	No differences

Shared Components	CNS	MNS	Significant Difference(s)
Auxiliary Building Ventilation System (ABFVES)			The ABFVES for both stations is essentially the same.
Control Room Ventilation and Chill Water Systems (CRAVS and CRACWS)			The CRAVS and CRACWS for both stations is essentially the same

There are design differences between MNS and CNS (such as output voltages, layout of equipment, names of buses, etc.); however the two stations are quite similar in the design for powering shared equipment. Both stations use a unit Essential Motor Control Center to power all of the 600V components of the shared systems. MNS actually uses two Essential Motor Control Centers per train, but both of them are related to the same 4160V Essential Bus ETA or ETB. When any shared component is aligned to its alternate power supply, all of the components are affected. The 600V shared components cannot be aligned individually.

d. Please see the tables in Duke Energy's response to 4.b. above (both Catawba and McGuire responses) for the response to this request. That information is applicable here also as it identifies the emergency power sources (DGs) associated with each train ("A" and "B" trains) of each shared system (e.g., NSWS, Control Room Area Ventilation System (CRAVS), Control Room Area Chilled Water System (CRACWS), and Auxiliary Building Filtered Ventilation Exhaust System (ABFVES)) for both units at Catawba and McGuire.

e. (Catawba Response)

Assumptions

CNS is in a normal electrical alignment with the "A" Train of shared components powered from Unit 1 Essential Motor Control Center (MCC), 1EMXG (which is powered from Essential Bus 1ETA) and the "B" Train of shared components powered from Unit 2 Essential MCC, 2EMXH (which is powered from Essential Bus 2ETB).

The site wide loss of offsite power (LOOP), the Unit 1 loss of coolant accident (LOCA) and the loss of an emergency DG all occur simultaneously.

Both units are operating in Mode 1, with the "A" Train shared equipment in service in the normal configuration.

The CNS NSWS does not realign supply and return pathways or supply header cross-overs following either a Blackout or a Safety Injection. The repositioning of these valves only occurs following an event which involves the loss of Lake Wylie or any other event resulting in low NSWS pump house pit level or a high-high containment pressure signal (SP).

The 1A and 2A NSWS Pumps are running and both trains of NSWS are aligned to take suction from Lake Wylie and to return flow to Lake Wylie.

Case-by-Case Discussion

Case 1: Failure of 1A DG During the Unit 1 LOOP/LOCA and Unit 2 LOOP

It is important to note that on a Blackout or Safety Injection signal on either unit, the NSWS shared suction and return valves of both trains remain in their normal alignment.

In this scenario on Unit 1, the 1A DG is off as this DG is the assumed single failure. The 1B DG is running after it starts on the Blackout/Safety Injection signal. None of the 1A Emergency Core Cooling System (ECCS) equipment is running, including the 1A NSWS Pump. All of the 1B ECCS equipment is running, as controlled by the 1B Load Sequencer.

On Unit 2, both the 2A and 2B DGs are running after they start on the Blackout signal for Unit 2. All of the Unit 2 Blackout loads are running, since they are sequenced on by the Unit 2 Load Sequencers.

The effect on shared equipment for the accident, with a loss of the 1A DG, is as follows:

CNS LCO 3.7.8 (NSWS) Post Event Alignment

The “A” Train Shared RN Valves, without power, would remain in their pre-event position. The 1A RN Pump is off (no power), aligned to the suction supply from Lake Wylie. The 2A RN Pump is running and is receiving water from the Lake Wylie through the normally aligned valves, 1RN-1A and 1RN-2B. (These valves supply suction to both units’ “A” Train of RN). The train related supply headers remain connected via the supply cross-over valves which do not receive a signal to close on BO/SI. Both trains on both units remain aligned to return any flow back to Lake Wylie.

When the Unit specific Blackout signal was received, both 1B and 2B RN Pumps auto started (by their respective Load Sequencer) and remain aligned with supply and return to Lake Wylie. The 1B and 2B RN Pumps are supplying necessary cooling water to their respective essential headers to cool the equipment started by the Load Sequencer.

In this alignment, with the Shared Systems operating with both B Train pumps and the 2A pump in service, both units are able to be stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

CNS LCO 3.7.10 (CRAVS) Post Event Alignment

The CRAVS responds to the accident signal with the Control Room Pressure Filter Unit 2 (2CRA-PFT) starting off of the “B” Load Sequencer. Control Room Pressure Filter Unit 1 (1CRA-PFT) and all “A” train CRAVS AHUs cannot start because of loss of power.

In this alignment, with the CRAVS shared components operating only with “B” Train equipment, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

CNS LCO 3.7.11 (CRACWS) Post Event Alignment

Typically only one train of CRACWS (chiller compressors and chilled water pumps) runs at a time. There is a selector switch on the HVAC control board that selects which train will run. Had the "A" Train been selected at the onset of the accident, it would not restart (no power on 1ETA). Thus, following the accident, no chillers would be running. The operators are directed by procedure to check the status of the chillers and make alignments as necessary to get one chiller running. The "B" Chiller, had it been the operating (selected) chiller, will trip on the Black Out Signal on Unit 2, and will be sequenced back on within 15 minutes.

In this alignment, with the CRACWS shared components operating only with "B" Train equipment, both units are able to be stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

CNS LCO 3.7.12 (ABFVES) Post Event Alignment

Filtered Exhaust Fans 1A and 2A have no power (1EMXG was aligned to 1A DG which failed), so these two fans are off. Filtered Exhaust Fans 1B and 2B have power restored to them once the 2B Load Sequencer restores power to 2ELXB and 2ELXD from 2ETB. The associated filters will be placed in service (Bypass Damper closes). As part of the system design, the Unfiltered Exhaust fans and the Aux Building Supply Air Handling Units will stop. This assures that the Aux Building will remain under a slight negative pressure and all outflow air will be through a HEPA filter.

In this alignment, with the ABFVES shared components operating only with B Train equipment, both units are able to be stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

Case 2: Failure of 1B DG during the Unit 1 LOCA/LOOP and Unit 2 LOOP

Since the "A" Train shared equipment is aligned to receive power from Unit 1 and the "B" Train of shared equipment is aligned to receive power from Unit 2, the failure of the 1B DG has no impact on the shared equipment, except for the 1B NSWS Pump. The 1B NSWS Pump, considered to be a shared component at CNS, will not be running due to the loss of power on Essential Bus 1ETB.

The effect on shared equipment for the accident, with a loss of the 1B DG, is as follows:

CNS LCO 3.7.8 (NSWS) Post Event Alignment

When the Unit specific LOOP/Blackout signal was received, both 1A and 2A NSWS Pumps auto started (by their respective Load Sequencer) and remain aligned with supply and return to Lake Wylie. The 1A and 2A NSWS Pumps started off their Load Sequencers once DGs 1A and 2A restored power to Essential Buses 1ETA and 2ETA, respectively. The train related supply headers remain connected via the supply cross-over valves which do not receive a signal to close on LOOP/SI. The "A" train on both units remain aligned to return any flow back to Lake Wylie.

The “B” Train shared NSWS valves remain in their pre-event position. When the Unit specific LOOP/Blackout signal is received, the 2B NSWS Pump auto starts (off of its Load Sequencer) and is now aligned to receive flow from the Lake Wylie. The 2B NSWS Pump is supplying necessary cooling water to its respective essential headers to cool the equipment started by the Load Sequencer. Cooling water flow is also available to the “B” train from the “A” train since the supply header crossover valves remain open.

CNS LCOs 3.7.10, 3.7.11 and 3.7.12 (CRAVS, CRACWS and ABFVES) Post Event Alignment

The other shared components of the CRAVS, CRACWS and ABFVES are unaffected by the loss of the 1B DG and will respond to the event as designed. All shared components are still receiving power and will align as necessary.

In the alignments described for Case 2, with all of the “A” Train and Unit 2 “B” Train of shared equipment operating, both units are able to be stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

Case 3: Failure of 2A DG during the Unit 1 LOCA/LOOP and Unit 2 LOOP

Since the “A” Train shared equipment is aligned to receive power from Unit 1 and the “B” Train of shared equipment is aligned to receive power from Unit 2, the failure of the 2A DG has no impact on the shared equipment, except for the 2A NSWS Pump. The 2A NSWS Pump, considered to be a shared component at CNS, will not be running due to the loss of power on Essential Bus 2ETA.

The effect on shared equipment for the accident, with a loss of the 2A DG, is as follows:

CNS LCO 3.7.8 (NSWS) Post Event Alignment

The 2A NSWS Pump is off (no power), aligned to the suction supply from Lake Wylie. The 1A NSWS Pump also remains aligned to Lake Wylie. The 1A NSWS Pump is started by its Load Sequencer once the 1A DG has restored power to Essential Bus 1ETA. The 2A NSWS Pump is without power and is off. The train related supply headers remain connected via the supply cross-over valves which do not receive a signal to close on LOOP/SI. Both trains on both units remain aligned to return any flow back to Lake Wylie.

When the unit specific LOOP/Blackout signal was received, both 1B and 2B NSWS Pumps auto started (by their respective Load Sequencer) and remain aligned with supply and return to Lake Wylie. The 1B and 2B NSWS Pumps supply necessary cooling water to their respective essential headers to cool the equipment started by the Load Sequencers. Cooling water flow is also available to the “A” train from the “B” train since the supply header crossover valves remain open.

CNS LCOs 3.7.10, 3.7.11 and 3.7.12 (CRAVS, CRACWS and ABFVES) Post Event Alignment

The other shared components of the CRAVS, CRACWS and ABFVES are unaffected by the loss of the 2A DG and will respond to the event as designed. All shared equipment components are still receiving power and will align as necessary.

In the alignments described for Case 3, with all of the "A" Train and "B" Train of shared systems operating, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

Case 4: Failure of 2B DG during the Unit 1 LOCA/LOOP and Unit 2 LOOP

Since the "A" Train of shared components is aligned to receive power from Unit 1 and the "B" Train is aligned to receive power from Unit 2, the failure of the 2B DG will impact the "B" Train of shared equipment. The 2B NSWS Pump is not running and is not available due to the loss of power on Essential Bus 2ETB.

The effect on shared equipment for the accident, with a loss of the 2B DG, is as follows:

<u>CNS LCO 3.7.8 (NSWS) Post Event Alignment</u>

When the unit specific LOOP/Blackout signal is received, both 1A and 2A NSWS Pumps auto start (off their respective Load Sequencer) and remain aligned with supply and return to Lake Wylie. The 1A and 2A NSWS Pumps are started by their Load Sequencers once DGs 1A and 2A have restored power to Essential Buses 1ETA and 2ETA, respectively. The train related supply headers remain connected via the supply cross-over valves which do not receive a signal to close on a LOOP/SI. The "A" train on both units will remain aligned to return any flow back to Lake Wylie.

The "B" Train shared NSWS valves remain in their pre-event position. When the Unit specific LOOP/Blackout signal is received, the 1B NSWS Pump auto starts (off its Load Sequencer) and is now aligned to receive flow from Lake Wylie. The 1B NSWS Pump is supplying necessary cooling water to its respective essential headers to cool the equipment started by the Load Sequencer. Cooling water flow is also available to the "B" train from the "A" train since the supply header crossover valves remain open. Both trains will remain aligned to return any flow back to Lake Wylie. In summary, each unit is now operating with their "A" Trains of NSWS (and other shared components of the CRAVS, CRACWS and ABFVES) running and supplying their respective ESF loads. The 1B train NSWS pump is in service providing the Unit 1 cooling loads.

In the alignments described for Case 4, with all of the "A" Train and Unit 1B Train of shared systems operating, both units are able to be stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

e. (McGuire Response)

<u>Assumptions</u>

MNS is in a normal electrical alignment with the "A" Train of shared components powered from Unit 1 Essential Motor Control Centers (MCCs), 1EMXG and 1EMXH (which are powered from Essential Bus 1ETA via Load Centers 1ELXA and 1LXC) and the "B" Train of shared components powered from Unit 2 Essential MCCs, 2EMXG and 2EMXH (which are powered from Essential Bus 2ETB via 2ELXB and 2ELXD).

The site wide loss of offsite power (LOOP), the Unit 1 loss of coolant accident (LOCA) and the loss of an emergency DG all occur simultaneously.

Both units are operating in Mode 1, with the "A" Train shared equipment in service in the normal configuration. The 1A and 2A NSWS Pumps are running and both trains of NSWS are aligned to take suction from the Low Level Intake of Lake Norman and to return flow to Lake Norman.

<u>Case-by-Case Discussion</u>

Case 1: Failure of 1A DG During the Unit 1 LOOP/LOCA and Unit 2 LOOP

It is important to note that on a Blackout or Safety Injection signal on either unit, the NSWS shared suction and return valves align such that the "A" Train on both units receives and returns flow from and to Lake Norman. The "B" Train shared valves position themselves to align suction and return flow paths for the "B" NSWS Pumps to the SNSWP.

In this scenario on Unit 1, the 1A DG is off as this DG is the assumed single failure. The 1B DG is running after it starts on the Blackout/Safety Injection signal. None of the 1A Emergency Core Cooling System (ECCS) equipment is running, including the 1A NSWS Pump.

On Unit 2, both the 2A and 2B DGs are running after they start on the Blackout signal for Unit 2. All of the Unit 2 Blackout loads are running, since they are sequenced on by the Unit 2 Load Sequencers.

The effect on shared equipment for the accident, with a loss of the 1A DG, is as follows:

<u>MNS LCO 3.7.7 (NSWS) Post Event Alignment</u>

The "A" Train shared NSWS valves are without power, and thus remain in their pre-accident positions. The 1A NSWS Pump is off (no power), but is still aligned to the normally open valves, 0RN-12AC and 0RN-13A. The 2A NSWS Pump is running and is receiving flow from the Low Level Intake of Lake Norman through the normally open valves, 0RN-12AC and 0RN-13A. These two valves supply suction to both unit's "A" Train of NSW. Both the "A" and "B" Trains separate. The "B" Train supplies the "B" Essential Header, and the "A" Train on Unit 2 supplies the 2A Essential Header. The 1A Essential Header is not supplied at all. The headers are split because of 1(2)RN-41B closing. The "A" Train on both units remains aligned to return any flow back to Lake Norman.

The "B" Train Blackout/Safety Injection signal initiated by the Unit 1 and Unit 2 LOOP and the Unit 1 LOCA causes the "B" Train to align to the SNSWP. This is accomplished by opening 0RN-9B ("B" Train supply from SNSWP), 0RN-152B ("B" Train return to SNSWP), and by closing 0RN-11B ("B" Train supply from Low Level Intake) and 0RN-284B. All of these valves are receiving power from the 600V Essential MCCs via the 2B DG. The unit specific Blackout signal also causes the 1B and 2B NSWS Pumps to auto start by their respective Load Sequencer and are now aligned to receive flow from the SNSWP. The 1B NSWS Pump receives an additional start signal from the Safety Injection signal. The 1B and 2B NSWS Pumps supply necessary cooling water to their respective essential headers to cool the equipment started by the Load Sequencer. In this alignment, with the NSWS operating with only the "B" train shared equipment, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

MNS LCO 3.7.9 (CRAVS) Post Event Alignment

The CRAVS responds to the accident signal with Outside Air Pressure Filter Fan "2" ("B" related) starting by the "B" Load Sequencer. The Outside Air Pressure Filter Fan "1" is "A" related and does not start because of the loss of power. The Control Room Air Handling Unit "1" is off. The Control Room Air Handling Unit "2" starts or is capable of being started per procedure. Control Room Area Air Handling Unit "1" is off and Control Room Area Air Handling Unit "2" starts or is capable of being started per procedure.

In this alignment, with the CRAVS operating only with "B" Train equipment, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

MNS LCO 3.7.10 (CRACWS) Post Event Alignment

Typically, only one train of CRACWS (i.e., chiller compressors and chilled water pumps) is running at a time. There is a selector switch on the HVAC control board to indicate which train will run. Had the "A" train been selected and running at the onset of the accident, it would not restart due to lack of power to Essential Bus 1ETA. No chillers would be running in this instance. Operators are directed by procedure to check the status of the chillers and make alignments as necessary to get one chiller running. Had the "B" train been selected and running at the onset of the accident, it trips on the Blackout signal for Unit 2, and is then sequenced back on after 15 minutes.

In this alignment, with the CRACWS operating only with "B" Train equipment, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

MNS LCO 3.7.11 (ABFVES) Post Event Alignment

The 1A and 2A Filtered Exhaust Fans have no power for this scenario since MCCs 1EMXH and 1EMXG are aligned to the 1A DG which failed. Thus, these fans are off. The 1B and 2B Filtered Exhaust Fans have power restored to them once the 2B Load Sequencer restores power to Load Centers 2ELXB and 2ELXD from Essential Bus 2ETB. The associated filter is placed in service (the bypass damper closes). As part of the ABFVES design, the Unfiltered Exhaust Fans stop, as do the Auxiliary Building Supply Air Handling Units. This design ensures that the Auxiliary Building remains under a slight negative pressure and all outflow air is through a HEPA filter.

In this alignment, with the ABFVES operating only with "B" Train equipment, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

Case 2: Failure of 1B DG During the Unit 1 LOOP/LOCA and Unit 2 LOOP

Since the "A" Train shared equipment is aligned to receive power from Unit 1 and the "B" Train of shared equipment is aligned to receive power from Unit 2, the failure of the 1B DG has no impact on the shared equipment. The 1B NSWS Pump (not shared at MNS) will not be running due to the loss of power on Essential Bus 1ETB.

The effect on shared equipment for the accident, with a loss of the 1B DG, is as follows:

MNS LCO 3.7.7 (NSWS) Post Event Alignment

The “A” Train shared NSWS valves are aligned to the 1A and 2A RN Pumps such that those pumps are taking suction from the Low Level Intake of Lake Norman. The auto alignment is not prevented because all of the “A” Train shared valves still have power. The 1A and 2A NSWS Pumps start off their respective Load Sequencer once the 1A and 2A DGs restore power to Essential Buses 1ETA and 2ETA, respectively. Both units' NSWS trains separate. The 1B NSWS train does not have any power and is not in service. The 2B NSWS train is supplying the 2B Essential Header. The 1A and 2A NSWS trains supply their respective essential headers. The headers are able to split because of valves 1(2)RN-41B and 1(2)RN-43A closing. The “A” NSWS train on both units is aligned to return any flow back to Lake Norman.

The “B” NSWS train Blackout/Safety Injection signal initiated from the LOOPs and the Unit 1 LOCA sends a signal to align the “B” Train to the SNSWP. This is accomplished by opening 0RN-9B (“B” Train supply from SNSWP), 0RN-152B (“B” Train return to SNSWP), and closing 0RN-11B (“B” Train Supply from Low Level Intake) and 0RN-284B. All of these valves continue to receive power from the 600V Essential MCCs via the 2B DG. When the unit specific Blackout signal was received, the 2B NSWS Pump auto started (by its Load Sequencer) and is now aligned to receive flow from the SNSWP. The 2B NSWS Pump is supplying necessary cooling water to its respective essential headers to cool the equipment started by the Load Sequencer.

MNS LCOs 3.7.9, 3.7.10 and 3.7.11 (CRAVS, CRACWS and ABFVES) Post Event Alignment

The other shared components of the CRAVS, CRACWS and ABFVES are unaffected by the loss of the 1B DG and will respond to the event as designed. All shared components are still receiving power and will align as necessary.

In the alignments described for Case 2, with all of the “A” Train and “B” Train of shared systems operating, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

Case 3: Failure of 2A DG During the Unit 1 LOOP/LOCA and Unit 2 LOOP

Since the “A” Train shared equipment is aligned to receive power from Unit 1 and the “B” Train of shared equipment is aligned to receive power from Unit 2, the failure of the 2A DG has no impact on the shared equipment. The 2A NSWS Pump (not shared at MNS) will not be running due to the loss of power on Essential Bus 2ETA.

The effect on shared equipment for the accident, with a loss of the 2A DG, is as follows:

MNS LCO 3.7.7 (NSWS) Post Event Alignment

The “A” Train shared NSWS valves are aligned to the 1A and 2A RN Pumps such that those pumps are taking suction from the Low Level Intake of Lake Norman. The auto alignment is not prevented because all of the “A” Train shared valves still have power (provided by the 1A DG). The 1A NSWS Pump is started by its Load Sequencer once the 1A DG restores power to Essential Bus 1ETA. The 2A NSWS Pump is without power and is off. The NSWS trains separate. The 2A NSWS train is without power and the 1A NSWS train is supplying the 1A Essential Header. The 1B and 2B NSWS trains are operating and supplying their respective essential headers. Although 2RN-43A did not auto close, the Unit 2 headers were able to split because of 2RN-41B closing. The Unit 1 NSWS headers also split, with 1RN-41B and 1RN-43A closing. The "A" train on both units remains aligned to return any flow back to Lake Norman.

The "B" Train Blackout/Safety Injection signal initiated from the LOOPs and the Unit 1 LOCA sends a signal to align the "B" Train to the SNSWP. The auto alignment is not prevented because all of the "B" Train shared valves still have power (provided by the 2B DG). The auto alignment of the "B" Train to the SNSWP is accomplished by opening 0RN-9B ("B" Train supply from SNSWP), 0RN-152B ("B" Train return to SNSWP), and closing 0RN-11B ("B" Train Supply from Low Level Intake) and 0RN-284B. All of these valves continue to receive power from the 600V Essential MCCs via the 2B DG. When the Unit specific Blackout signal was received, the 1B and 2B RN Pumps auto started (by their respective Load Sequencer) and are now aligned to receive flow from the SNSWP. The 1B and 2B NSWS Pumps supply the necessary cooling water to their respective essential headers to cool the equipment started by the Load Sequencers.

MNS LCOs 3.7.9, 3.7.10 and 3.7.11 (CRAVS, CRACWS and ABFVES) Post Event Alignment

The other shared components of the CRAVS, CRACWS and ABFVES are unaffected by the loss of the 2A DG and will respond to the event as designed. All shared components are still receiving power and will align as necessary.

In the alignments described for Case 3, with all of the "A" Train and "B" Train of shared systems operating, both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures.

Case 4: Failure of 2B DG During the Unit 1 LOOP/LOCA and Unit 2 LOOP

Since the "A" Train of shared components is aligned to receive power from Unit 1 and the "B" Train is aligned to receive power from Unit 2, the failure of the 2B DG will impact the "B" Train of shared equipment. The 2B NSWS Pump is not running and is not available due to the loss of power on Essential Bus 2ETB.

The effect on shared equipment for the accident, with a loss of the 2B DG, is as follows:

MNS LCO 3.7.7 (NSWS) Post Event Alignment

The "A" Train shared NSWS valves align such that the 1A and 2A RN Pumps are capable of taking suction from the Low Level Intake of Lake Norman. The auto alignment is not prevented because all of the "A" Train shared valves still have power (provided from the 1A DG). The 1A and 2A NSWS Pumps start off their respective Load Sequencers once the 1A and 2A DGs restore power to Essential Buses 1(2)ETA.

Both unit's NSWS trains separate. The 2B trains does not have any power and the 1A and 2A NSWS Trains supply their respective "A" essential headers. The 2B NSWS Pump is off. The 1B NSWS Pump is running, but it has no suction source. The following is an explanation as to why the 1B NSWS Pump has no suction source:

When the LOOP event occurs on Unit 2, the “B” Train shared NSWS valves lose power because Essential Bus 2ETB loses power with the failure of the 2B DG. The normally closed NSWS valves that should open on a Blackout or Safety Injection signal did not re-position to align the suction and return flows to the SNSWP. Thus, the “B” Train NSWS pumps remain aligned to the Low Level Intake of Lake Norman. Since there is also a LOCA on Unit 1, the valve 0RN-10AC receives a Safety Injection signal to close in order to separate the “A” and “B” Trains. Valve 0RN-10AC is in the supply line from the Low Level Intake to the “B” NSWS pumps. The “A” Train still has power available (from the 1A DG), and therefore valve 0RN-10AC repositions (i.e., closes). Valve 0RN-9B is the isolation valve that is supposed to open to align the “B” NSWS pumps to the SNSWP. It is a normally closed valve. With 0RN-10AC closed and the failure of 0RN-9B to open, both “B” NSWS pumps are without a suction source. The 2B NSWS Pump is off because of loss of power to Essential Bus 2ETB. The 1B NSWS Pump is still running, but is not supplying any cooling water to the 1B Train ESF equipment, including the 1B DG. Procedures drive operator action to locally stop the 1B DG using the Emergency Stop Push-button. Effectively, in this situation with a loss of power to the “B” Train of shared equipment , both units will be without their “B” DGs (in this case, the 2B DG was the power source to the “B” train of shared equipment, and the result was that Control Room Operators stopped the 1B DG). This operator action does not further impact either unit’s shared components.

The NSWS trains for both units separate. The 1B and 2B trains are off without any power. The 2B Train is lost power because the 2B DG failed, and the 1B Train is lost because of loss of “B” NSWS pump suction supply and operator action to stop the 1B DG. The 1A and 2A NSWS trains are operating and are supplying their respective essential headers. The headers split because of 1(2)RN-43A closing. The “A” train on both units will remain aligned to return any flow back to Lake Norman.

In summary, each unit is now operating with its “A” Train of NSWS (and other “A” train shared components of the CRAVS, CRACWS and ABFVES) running and supplying the respective ESF loads. Both the 1B and 2B DGs are off, and thus Essential Buses 1ETB and 2ETB are both de-energized. Both units are capable of being stabilized and cooled down to Mode 5 by existing plant Abnormal and/or Emergency Procedures with the respective “A” Train of NSWS and other shared components.

f. First, it must be noted that at CNS and MNS it is not possible to simultaneously provide power to a train of shared equipment from both units. CNS and MNS shared equipment consists of an “A” train and a “B” train. The “A” train of shared equipment at CNS is always powered from one 600V motor control center (MCC), MCC 1EMXG and the “A” train of shared equipment at MNS is always powered from two 600V MCCs, 1EMXH and 1EMXG. 1EMXG (CNS) and 1EMXG and 1EMXH (MNS) are powered from one of the two unit’s 4160V Essential Buses, 1ETA or 2ETA. At any given time, only one unit can be aligned to provide power to 1EMXG (CNS) and 1EMXG and 1EMXH (MNS).

   Similarly, the “B” train of shared equipment at CNS is always powered from one 600V MCC, MCC 2EMXH (CNS) and the “B” train of shared equipment at MNS is always powered from two 600V MCCs, 2EMXH and 2EMXG. 2EMXH (CNS) and 2EMXG and 2EMXH (MNS) are powered from one of the two unit’s 4160V Essential Buses, 1ETB or 2ETB. At any given time, only one unit can be aligned to provide power to 2EMXH (CNS) and 2EMXG and 2EMXH (MNS).

CNS and MNS LCO 3.8.1 contain the power supplies and equipment from the Offsite Power System to the 4160V Essential Buses and from the emergency DGs to the 4160V Essential Buses. While the offsite circuits and DGs do ultimately provide power to the downstream 600V MCCs, LCO 3.8.1 is not the LCO that contains those 600V MCCs that power shared equipment. The 600V MCCs for both units at each station that power shared components (except for the CNS NSWS pumps) are required to be operable by the LCO for TS 3.8.9, “Distribution Systems - Operating.” The CNS NSWS pumps are powered by 4160V Essential Buses 1(2)ETA and 1(2)ETB and all four of those Essential Buses are also required to be operable by LCO 3.8.9. CNS LCO 3.8.9 requires 1EMXG, 2EMXH, 1(2)ETA and 1(2)ETB to be operable. MNS LCO 3.8.9 requires 1EMXG, 1EMXH, 2EMXG and 2EMXH to be operable. Operable is defined as “OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages.” And each 600V MCC (or 4160V Essential Bus for the CNS NSWS pumps) that powers shared equipment at CNS (1EMXG, 2EMXH, 1(2)ETA and 1(2)ETB)) and MNS (1EMXG, 1EMXH, 2EMXG and 2EMXH) is “[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” in accordance with 10 CFR 50.36(c)(2)(ii)(C), Criterion 3.

For the proposed change, the TS definition of OPERABLE - OPERABILITY (i.e., normal or emergency power) is used. Thus, as long as an operable normal or emergency power supply exists, and one train of 600V AC power (4160V AC power for the CNS NSWS pumps) is operable, that one train of power can safely shutdown the applicable unit. With the proposed change in effect, CNS and MNS will confirm that at least one train of shared equipment has an operable emergency power supply any time that a DG is inoperable. That is an added measure to ensure operability of shared components. Therefore, Duke Energy concludes that the proposed TS changes in the May 2, 2017 LAR would satisfy 10 CFR 50.36(c)(2)(ii)(C), Criterion 3 for power to shared equipment due to the existing CNS and MNS LCOs.

g. For both CNS and MNS, currently there are no additional sources of AC power that are required to be operable from the opposite units in TS LCO 3.8.1 as a means of emergency power sources for each unit. It is worth noting that the Standby Shutdown Facility (SSF) is an additional source of AC power for each station but the SSF resides in a site-specific Selected Licensee Commitment (SLC) and not in the TSs.

REFERENCES

1. U. S. Nuclear Regulatory Commission's letter dated May 3, 2017 (ADAMS Accession No. ML17079A427), Commission Acceptance on Nuclear Energy Institute Appendix X to Guidance 05-04, 07-12, and 12-13, Close-Out of Facts and Observations (F&Os)

2. U. S. Nuclear Regulatory Commission's Memorandum dated May 1, 2017 (ADAMS Accession No. ML17121A271), Staff Expectations for an Industry Facts and Observations Independent Assessment Process

3. Appendix X to NEI 05-04/07-12/12-13, Close out of Facts and Observations