UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

September 17, 2018

Mr. Tom Simril
Site Vice President
Duke Energy Corporation
Catawba Nuclear Station
4800 Concord Road
York, SC 29745-9635

SUBJECT: CATAWBA NUCLEAR STATION – NRC DESIGN BASES ASSURANCE INSPECTION (TEAM) REPORT 05000413/2018010 AND 05000414/2018010

Dear Mr. Simril:

On August 2, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Catawba Nuclear Station, Units 1 and 2, and the NRC inspectors discussed the results of this inspection with you and other members of your staff.

NRC inspectors documented two findings of very low safety significance (Green) in this report. These findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement; and the NRC resident inspector at the Catawba Nuclear Station.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Marvin D. Sykes, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-413, 50-414
License Nos. NPF-35, NPF-52

Enclosure:
NRC IR 05000413/2018010 and
05000414/2018010 w/ Attachment
Supplemental Info

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SUBJECT: CATAWBA NUCLEAR STATION – NRC DESIGN BASES ASSURANCE INSPECTION (TEAM) REPORT 05000413/2018010 AND 05000414/2018010 dated September 17, 2018

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Numbers:	50-413, 50-414
License Numbers:	NPF-35, NPF-52
Report Numbers:	05000413/2018010; and 05000414/2018010
Enterprise Identifier:	I-2018-010-0051
Licensee:	Duke Energy Corporation
Facility:	Catawba Nuclear Station, Units 1 and 2
Location:	York, SC 29745
Inspection Dates:	July 16, 2018 to August 2, 2018
Inspectors:	T. Fanelli, Senior Reactor Inspector (Lead) B. Davis, Senior Reactor Inspector R. Patterson, Reactor Inspector M. Schwieg, Reactor Inspector J. Nicely, Contractor R. Waters, Contractor
Approved By:	M. Sykes, Chief Engineering Branch 1 Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring Duke's performance by conducting a Design Bases Assurance Inspection (Team) at Catawba Nuclear Station, Units 1 and 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information. NRC-identified findings, violations, and additional items are summarized in the table below.

List of Findings and Violations

Inadequate Engineering Analyses to Support Design Basis Requirements			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000413,414/2018010-01 Closed	None	71111.21M – Design Bases Assurance Inspection
The team identified four examples of a Green non-cited violation of title 10 Code of Federal Regulations Part 50, Appendix B, Criterion III, "Design Control". Specifically, Catawba failed to verify the electrical design of safety-related switchgear for the emergency core cooling system equipment and distribution systems (4160 volts-alternating-current (VAC), 600 VAC, and 125 volt-direct- current (VDC)): 1) Some circuit breakers had inadequate voltages that did not meet the minimum qualified requirements (90 VDC), 2) The design was not evaluated for the effects of electrical transients on control voltages that could affect the assumptions in the plant safety analyses for sequencing of loads and potentially affect the control fuses, 3) The effects of degraded voltages was not correlated to the component protection devices to prevent damage or unavailability of equipment during an event, and 4) Motor control centers and components located in the diesel control area were not qualified to perform their safety function during expected environmental transients.			

Operability of the VZ and RN Systems were not Assured			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000413,414/2018010-02 Closed	None	71111.21M – Design Bases Assurance Inspection
Introduction: The team identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" for the failure to assure that applicable regulatory requirements for the safety-related service water pump house environmental controls were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the licensee failed to translate the IEEE 279-1971 design basis and requirements for the environmental controls.			

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedure (IP) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, performed walk downs, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.21M - Design Bases Assurance Inspection (Team)

The inspectors evaluated the following components, permanent modifications, and operating experience during the weeks of July 16 to July 20, 2018, and July 30 to August 2, 2018.

Component (5 Samples, one affecting LERF)

1) Service Water (RN) ventilation system (heat loading and operation)
   a) Material condition and configuration (i.e., visual inspection during a walkdown)
   b) Normal, abnormal, and emergency operating procedures
   c) Consistency between station documentation and vendor specifications
   d) Corrective maintenance and corrective action history
   e) Design basis reviews at the system and component levels including RN Pump house heat load calculations
   f) Consistency of component operation and alignments with design and licensing basis assumptions
   g) Review of RN pump house temperature sensitive equipment
   h) Operations monitoring of area temperatures

2) Unit 1 A Train Power System (1ETA, 1ETXA, 1ELXA, 1EMXA Essential 4 Kilo-Volt Alternating-Current (kVAC) switchgear, 480 V load center, associated 4kv/600V transformer, and 600V MCC)
   a) Material condition and configuration performed during a visual non-intrusive inspection to assess material condition, the presence of hazards, and consistency of installed equipment with design documentation and analyses
   b) Normal, abnormal, and emergency operating procedures
   c) Maintenance effectiveness; Procedures for preventive maintenance, inspection, and testing to compare maintenance practices against industry and vendor guidance
   d) Component health reports, corrective maintenance records, and corrective action history
   e) Surveillance testing
   f) Coordination and interface with the transmission system operator for plant voltage requirements and notification set points
   g) Electrical calculations:
      - Load flow, bus loading and voltage drop
      - Motor control center environment temperature effects

- Degraded and loss of voltage protection
- Protective relay and breaker settings and coordination
- Short circuit and breaker duty analysis
- Emergency diesel generator loading

3) Unit 1 and 2 residual heat removal system (ND) Loop Suction Valves, ND37A and ND2A
   a) Normal, abnormal, and emergency operating procedures
   b) Operator actions
   c) Translation of vendor specifications
   d) Maintenance effectiveness
   e) Surveillance Testing
   f) Mechanical design calculations – Generic Letter (GL) 89-10 and GL 95-07
   g) Electrical calculations – adequate voltage to operate valves under all conditions
   h) Component health reports, corrective maintenance records, and corrective action history

4) Air Operated Valves (AOVs) RN351 and RN291 Component Cooling Water heat exchanger outlet throttle valves
   a) Material condition and configuration (i.e., visual inspection during a walkdown)
   b) Normal, abnormal, and emergency operating procedures
   c) Consistency between station documentation and vendor specifications
   d) Corrective maintenance records and corrective action history
   e) Design basis review at the system and component levels including AOV capability calculations
   f) Surveillance testing and recent test results

Component Large Early Release Frequency (LERF) (1 Sample)

5) 600V Bus (SMXG) Safe Shutdown Facility
   a) Material condition and configuration performed during a visual non-intrusive inspection to assess material condition, the presence of hazards, and consistency of installed equipment with design documentation and analyses
   b) Normal, abnormal, and emergency operating procedures
   c) Maintenance effectiveness; Procedures for preventive maintenance, inspection, and testing to compare maintenance practices against industry and vendor guidance
   d) Component health reports, corrective maintenance records, and corrective action history
   e) Surveillance testing
   f) Consistency between station documentation (i.e., procedures) and vendor specifications
   g) Electrical calculations:
      - Load flow, bus loading, and voltage drop
      - Safe Shutdown Facility (SSF) diesel generator loading

Permanent Modification Engineering Changes (ECs) (6 Samples)

(1) EC110958, Resolve Breaker Coordination for Eight Unit 2 600V Essential Motor Control Center (MCC) Circuit Breakers
   a) Material condition and configuration (i.e., visual inspection during a walkdown)
   b) Normal, abnormal, and emergency operating procedures
   c) Consistency between station documentation and vendor specifications
   d) Condition reports and corrective action history
   e) Design basis reviews at the system and component levels

f) Consistency of component operation and alignments with design and licensing basis assumptions
g) Review of operating experience

(2) EC113875, Modify Main Steam Isolation Valves (MSIV) to Un-isolate Air Assist Function on 2SM1 & 2SM7
a) Material condition and configuration (i.e., visual inspection during a walkdown)
b) Normal, abnormal, and emergency operating procedures
c) Consistency between station documentation and vendor specifications
d) Condition reports and corrective action history
e) Design basis reviews at the system and component levels
f) Consistency of component operation and alignments with design and licensing basis assumptions
g) Review of quality assurance records during installation

(3) EC114179, UNIT 2: Removal of SPV at A518 PIN 24 in SSPS Logic Cabinets For Train A & B On Unit
a) Material condition and configuration (i.e., visual inspection during a walkdown)
b) Normal, abnormal, and emergency operating procedures
c) Consistency between station documentation and vendor specifications
d) Condition reports and corrective action history
e) Design basis reviews at the system and component levels
f) Consistency of component operation and alignments with design and licensing basis assumptions
g) Review of operating experience

(4) EC114710, Allow Future Replacement of Emergency Diesel Generator (EDG) Power Driven Potentiometers (PDP)
h) Material condition and configuration (i.e., visual inspection during a walkdown)
i) Normal, abnormal, and emergency operating procedures
j) Consistency between station documentation and vendor specifications
k) Condition reports and corrective action history
l) Design basis reviews at the system and component levels
m) Consistency of component operation and alignments with design and licensing basis assumptions
n) Review of bus voltages following a safety feature actuation periodic test
o) Review of quality assurance records during installation

(5) EC404914, Air Shutoff Cylinder for Diesel Pneumatic Over Speed
a) Material condition and configuration (i.e., visual inspection during a walkdown)
b) Consistency between station documentation and vendor specifications
c) Condition reports and corrective action history
d) Design basis reviews at the system and component levels
e) Consistency of component operation and alignments with design and licensing basis assumptions

(6) EC406259, SSF Indication for Reactor Coolant System (NC) loss of offsite power (LOOP) B & C Wide Range Cold Leg Temperature
a) Material condition and configuration (i.e., visual inspection during a walkdown)
b) Normal, abnormal, and emergency operating procedures
c) Consistency between station documentation and vendor specifications

d) Condition reports and corrective action history
e) Design basis reviews at the system and component levels
f) Consistency of component operation and alignments with design and licensing basis assumptions

Operating Experience (1 Samples)

(1) NRC Regulatory Issue Summary (RIS) 2011-12, Rev. 1, Adequacy of Station Electric Distribution System Voltages

INSPECTION RESULTS

Inadequate Engineering Analyses to support Design Basis Requirements			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000413,414/2018010-01 Closed	None	IP71111.21M

Introduction: The team identified four examples of a Green non-cited violation of title 10 Code of Federal Regulations Part 50, Appendix B, Criterion III, "Design Control". Specifically, Catawba failed to verify the electrical design of safety-related switchgear for the Emergency Core Cooling System (ECCS) equipment and distribution systems (4.16 kilo-volts-alternating-current (kVAC), 600 VAC, and 125 volt-direct- current (VDC)):

1) Some circuit breakers had inadequate voltages that did not meet the minimum qualified requirements (90 VDC),
2) The design was not evaluated for the effects of electrical transients on control voltages that could affect the assumptions in the plant safety analyses for sequencing of loads and potentially affect the control fuses,
3) The effects of degraded voltages was not correlated to the component protection devices to prevent damage or unavailability of equipment during an event, and
4) Motor control centers and components located in the diesel control area were not qualified to perform their safety function during expected environmental transients.

Description: Duke Energy Procedure AD-EG-ALL-1117, Design Analysis and Calculations, Section 5.1.2 specifies that analyses are performed to document the design inputs, computations, data analysis, evaluations, judgements, and including operational experience to demonstrate that a quality level SSC will perform its intended nuclear safety function. The following examples contributed to the identified performance deficiency of not initiating adequate design analyses to ensure the components can perform their safety functions:

1. The team noted that Catawba identified in calculation CNC-1381.05-00-0149 (calculation 0149) that the closing coil for the EDG breaker on 4.16 kVAC Safety-related switchgear 1ETA had an available voltage of 86 VDC when required to operate the breaker following a LOOP/LOCA event. The breakers are ABB 5HK-250, which have a qualified minimum of 90VDC to operate per the published ratings, which is further validated by periodic breaker maintenance IP/0/A/4974/003 which does as As-Found test and As-Left test at 90VDC. However, calculation 0149, which is credited

for accident conditions based qualified minimum voltage on a 1995 time Oconee surveillance style test report (TR)-144 for similar circuit breakers to the ones at Catawba. Even though a surveillance is not a qualification type test, calculation 0149 concluded that 70VDC could be credited as the minimum required voltage in lieu of the published data (qualified 90VDC). Calculation 0149 described the testing in TR-144 as consisting of tests on three Oconee circuit breakers each with the same nominal field test conditions. The team noted that calculation 0149 did not address qualification requirements such as seismic, aging or coil temperature to determine whether the components would remain operable during design basis conditions. The team determined that the variances in the predictability of operation under mild test environments did not provide reasonable assurance of operation at voltages below the 90VDC qualified minimum operating voltage and the more limiting design basis conditions as required by Institute of Electrical and Electronics Engineers (IEEE) 308-1974 Sections 4.2 and 4.7. This finding was entered into the licensee's corrective action program as condition report AR 02222499 and AR 02221302.

2. The team identified that the licensee failed to evaluate if safety-related MOVs, during power system transients (offsite or onsite), would have adequate control voltage to the MOV contactors to operate within the established time designated by the safety analysis. Electrical calculation, CNC-1381.05-00-0162, used steady state post-event MCC voltages to evaluate the most limiting voltage drop on the control circuits. The analysis failed to evaluate the range of voltages expected during transient conditions. As a result, the control circuit contactor might not energize until after the voltage recovered from the perturbations of the upstream 4.16 kV loads. This delay would have the potential to affect the plant safety analysis for valve stroke timing and due to the control circuit being in an inrush condition, the control fuses may operate, disabling the circuit and the capability to actuate the MOV. The standard IEEE 308-1974 Sections 4.2, 4.7 and 5.2.2 (2), required adequate operation of the control circuits. This finding was entered into the licensee's corrective action program as condition report AR 02222033.

3. The team reviewed corrective action request (AR) 01898044, dated June 2012, where the licensee identified that Catawba Nuclear Station (CNS) did not have an appropriate analysis for degraded voltage relay (DGVR) timer settings. The DGVR has a dual-timer setting for degraded voltage transients. The first time setting is to alarm on degraded voltage. The second timer setting, approximately ten minutes, is to start the EDGs. Specifically, the analysis was to address the ability of the safety-related loads to continue to operate for the duration of the second time delay without sustaining damage to components or tripping overloads or circuit breakers during a worst case, non-accident degraded voltage condition. The licensee performed a calculation to determine the load currents for each relevant component during the transient conditions. The evaluation addressed the duration of the second time delay and how the currents affected the protective device settings for that duration. One of the licensee's actions as a result of the evaluation was to ensure that the connected loads would not be damaged or trip while they continued to operate for the duration of the second time delay. The action was closed after an undocumented design review was performed. Protective devices are required to prevent or limit degradation of the class 1E system, but not spuriously trip as required by IEEE 308-1974 section 5.2.1(6). This finding was entered into the licensee's corrective action program as condition report AR 02222346.

4. The team determined that 600V MCC 1EMXE located in the U1 diesel generator room might be subjected to temperatures of up to 50 °C. The MCC and its components were qualified for 40 °C. The licensee performed several replacements of components over the years and ensured that the replacement equipment was qualified to 50 °C. However, the remaining original components (circuit breakers, control relays, MCC buckets, etc.) were still qualified for 40 °C. The licensee could not provide evidence that the remaining original equipment in the MCC could perform their safety function of supplying motive power to EDG support equipment required for the EDG to operate. Qualification of the equipment is required by IEEE 279-1971 sections 3.7, 4.3 and 4.4. This finding was entered into the licensee's corrective action program as condition report AR 02222579.

Corrective Action(s): The licensee performed operability evaluations, which found the electrical SSCs in question operable but degraded non-conforming.

Corrective Action Reference(s): AR 02221302, AR 02222033, AR 02222346, AR 02222499, AR 02222579

Performance Assessment:

Performance Deficiency: The team determined that the failure to verify and assure that safety-related ECCS equipment powered from the 4160VAC, 600VAC, and 125VDC distribution systems during a design basis events would have 1) adequate minimum voltages to operate, 2) adequate protective settings such that the equipment will not be damaged or trip during the event, and 3) be fully qualified to perform their safety functions during all applicable environmental conditions was a performance deficiency.

Screening: This finding was more than minor because it was associated with the design control attribute of the Mitigating Systems Cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

Significance: The finding was evaluated using the significance determination process (SDP) in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings." Because the finding impacted the Mitigating Systems cornerstone, the team screened the finding through IMC 0609 Appendix A, "The Significance Determination Process for Findings At-Power," using Exhibit 2, "Mitigating Systems Screening Questions." The finding screened as of very low safety significance (Green) because it was a deficiency affecting the design or qualification of a mitigating SSC but the SSC maintain its operability or functionality.

Cross-cutting Aspect: None identified.

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires the design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, as of July, 2018, the licensee's design control measures failed to verify the adequacy of design such that safety-related ECCS equipment powered from the 4160VAC, 600VAC, and 125VDC distribution systems during a design basis events would have 1) adequate minimum voltages to operate, 2) adequate protective settings such that the equipment will not be damaged or trip during the event, and 3) be fully qualified to perform their safety functions during all applicable environmental conditions.

Disposition: Because this violation is of very low safety significance and has been entered into the licensee's corrective action program as AR02222499, AR02222033, AR02222346, and AR02222579 this violation is being treated as a non-cited violation consistent with Section 2.3.2 of the NRC Enforcement Policy.

Operability of the service water ventilation system (VZ) and service water system (RN) were not Assured

Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000413,414/2018010-02 Closed	None	IP71111.21M

Introduction: The team identified a Green NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" for the failure to assure that applicable regulatory requirements for the safety-related service water pump house environmental controls were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the licensee failed to translate the IEEE 279-1971 design basis and requirements for the environmental controls.

Description: Calculation CNC-1211.00-00-0142 "Determination of the Outside Air Temperature Limit Associated with VZ System Operability", Revision 0, was performed to determine whether the VZ system ventilation fans are required to maintain the RN pump house ambient temperature below the temperature limit of 115 °F. Catawba determined that if any or all of the VZ system fans and/or dampers are out of service, equipment within the RN pump house that is temperature sensitive does not need to be considered inoperable provided that the outside air temperature is 104 °F (or less) and the maximum lake water temperature is 95.5 °F (or less). However, the calculation omitted the heat load from electrical components that would be in operation. The additional heat loads would cause the RN pump house ambient temperature to exceed 115 °F.

The team reviewed CNC-1211.00-00-0142 and the design and licensing bases related to the VZ and RN systems. The team noted during this review that the VZ system is an engineered safety feature system with two 100 percent capacity fans in each pump compartment that are served from separate trains of the Emergency Power System. This design assures the integrity and availability of the ventilation system in the event of a loss of offsite power or any single active failure. The team also noted that VZ is a support system for the RN system with two RN trains required operable per LCO 3.7.8 in Modes 1 through 4.

During the review of CNC-1211.00-00-0142, the team noted that Catawba incorrectly concluded that if any or all of the VZ system fans and/or dampers are out of service equipment within the RN pump house that is temperature sensitive does not need to be

considered inoperable. The team identified VZ system failure scenarios that were not considered in CNC-1211.00-00-0142 that would increase the ambient temperature in the RN pump house that could render equipment within the RN pump house that is temperature sensitive inoperable. Temperature sensitive equipment in the RN pump house includes equipment required to maintain the RN and ESFAS systems operable. In accordance with the licensing basis, the ESFAS is required to satisfy the requirement of 10 CFR 50.55a(h) with regard to IEEE 279. Section 4.1 of IEEE 279, *"General Functional Requirements"*, states that system operability is required through the full range of transients. Based on this review, the team concluded that calculation CNC-1211.00-00-0142 does not conform to the design and licensing bases of the plant.

Corrective Action(s): Catawba personnel entered the issue into their corrective action program. Catawba evaluations provided reasonable assurance that equipment within the RN pump house that is temperature sensitive does not currently need to be considered inoperable.

Corrective Action Reference(s): AR 02221754

Performance Assessment:

Performance Deficiency: The failure to ensure that the RN pump house equipment met the IEEE 279-1971 requirements of Section 4.1 to automatically initiate appropriate protective action whenever a condition monitored by the system reaches a preset level over the full range of conditions and performance enumerated in Sections 3(7) "operability throughout the full range of environmental transients" was a performance deficiency.

Screening: The team determined the performance deficiency was more than minor because the finding was associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, allowing the RN pump house equipment to exceed the maximum allowed temperature limits adversely affected the reliability and capability of the service water system ability to respond to events requiring cooling water.

Significance: The finding was evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings." Because the finding impacted the Mitigating Systems cornerstone, the team screened the finding through IMC 0609 Appendix A, "The Significance Determination Process for Findings At-Power," using Exhibit 2, "Mitigating Systems Screening Questions." The finding screened as of very low safety significance (Green) because it was a deficiency affecting the design or qualification of a mitigating SSC but the SSC maintain its operability or functionality.

Cross-cutting Aspect: None identified.

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires the design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods.

Contrary to the above, since October 27, 2011, the licensee's design control measures failed

to provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods. Specifically, the licensee's design control measures failed to verify the adequacy of design with of the calculational methods used in calculation CNC-1211.00-00-0142 to determine applicability the RN system components requirements to operate throughout the expected range of environmental transients.

Disposition: Because this violation is of very low safety significance and has been entered into the licensee's corrective action program as AR 02221754, this violation is being treated as a non-cited violation consistent with Section 2.3.2 of the NRC Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

On August 2, 2018, the inspectors presented the design bases assurance (team) inspection results to Mr. T, Simril Site Vice President, and other members of the licensee staff.

LIST OF DOCUMENTS REVIEWED

CALCULATIONS

CNC-1205.19-00-0016, GL 89-10 MOV Calculation NI System, Rev. 17
CNC-1381.05-00-0012, 4160V Essential APS Switchgear Relay Settings, Rev. 16
CNC-1381.05-00-0261, Voltage Study for Loss of Voltage Condition, Rev. 0
CNC-1381.05-00-0162, Voltage Analysis of Motor Starter and Interposing Relay Coils, Rev. 1
CNC-1381.05-00-0162, Diesel Generator Loading Analysis, Rev. 15
CNC-1381.06-00-0060, 600V SSF Diesel Generator and Auxiliary Power System Loading and Voltage Analysis, Rev. 7
CNC-1381.06-00-0036, SSF Load Center Breaker Coordination and Relay Setting Calculation, Rev. 7
CNC-1381.05-00-0198, U1 6.9kV, 4.16kV, and 600V APS Safety-Related Voltage Analysis, Rev. 14
CNC-1381.05-00-0209, U1 6.9kV, 4.16kV, and 600V APS Short Circuit Analysis, Rev. 4
CNC 1205.41-00-0026, 1/2 RN-291, 351 Required Force Evaluation Supporting the Air Operated Valve (AOV) Program, Rev. 3
CDUK 1205.41-0001.001, Unit 1 and Unit 2 AOV Test Setup Sheets, Rev. 5
CNC 1205.41-00-0001, Air Operated Valve (AOV) Program Scope Calculation, Rev. 5
CNC-1211.00-00-0019, Nuclear Service Water Pump Structure Load and Static Pressure Calculations, Rev. 10
CNC-1211.00-00-0142, Determination of the Outside Air Temperature Limit Associated with VZ System Operability, Rev. 0
CNC-1223.24-00-0010, Nuclear Service Water System Non-Safety Instrumentation Ranges and Setpoints, Rev. 12
CNC-1223.24-00-0045, Single Failure Analysis of the Nuclear Service Water System, Rev. 4
DPC 1205.41-00-0001, Evaluation of AOV Issues Needed for Margin Calculations, Rev. 2
CNC-1205.19-00-0039, Generic Letter 89-10 Calculation For ND System: 1(2)ND001B, 1(2)ND002A, 1(2)ND036B, 1(2)ND037A, Rev. 8
CNC-1205.19-00-0176, JOG Classification of Catawba's GL96-05 MOV Population, Rev. 9
CNC-1223.02-00-0016, Evaluation of Containment Isolation Overpressure Protection Features in Response to PIR 0-C90-0273, Rev. 10
CNC-1223.11.00-0007, Design Parameter for Residual Heat Removal Valves 1/2ND1B, 2A, 36B, 37A, Rev. 7
CNC-1223.11-00-0022, GL 95-07 Pressure Locking and Thermal Binding Review of ND System Valves, Rev. 3
CNM-1205.00-2106.001, Motor Operator Sizing Information for BORG Warner Valves, Rev. D1
CNC-1205.19-00-0175, Rotork Over Thrust Testing (11NA, 16NA, 30NA, 40NA, 70NA, 90NA), Rev. 3
CNC-1223.59-04-006, VG Capability, Rev. 8

DRAWINGS

CN-1702-02.01, One Line 4.16kV Switchgear 1ETA, Rev. 18
CN-1702-05.01, One Line Normal Auxiliary Power System 6.9kV/600V, Rev. 13
CNLT-1752-03.17, Electrical One Line and Bill of Materials for 600V MCC SMXG, Rev. 22
CNLD-0115-01.03, 4.16kV IETA Breaker Control Logic Diagram, Rev. 5
CN-1702-05.02, One Line Essential and Blackout APS, Rev. 10
CN-FSAR-FIG.08-001, Figure 8-01 Offsite Power System, Rev. 3
CN-1703-03.24, One Line 600V Non-Essential Load Center SLXG SSF, Rev. 3
CN-1492-RN.00-090, Aux Building Nuclear Service Water Sys (RN), Rev. 34
CN-2492-RN.00-123, Aux Building Nuclear Service Water Sys (RN), Rev. 21

CN-1522-26-26.85-00, HVAC Nuclear Service Water Pump Structure (VZ) Plan at EL 600+0, Rev. 11
CN-1557-2.0, Flow Diagram of Nuclear Service Water Pump Structure Ventilation System (VZ), Rev. 7
CN-1574-2.0.01, Flow Diagram of Nuclear Service Water System (RN), Rev. 58
CN-2574-2.0.01, Flow Diagram of Nuclear Service Water System (RN), Rev. 47
CN-1760-01.12, Connection Diagram NSWS (RN) Solenoid Valves, Rev. 9
CN-2499-RN.11-00, Instrument Detail NSWS (RN) RN Miniflow Control, Rev. 0
CNEE-0131-05.01, Elementary Diagram VZ System (Train A) NSW Pump Structure Fan NSWPSF-1A, Rev. 19
CNEE-0131.05.07, Elementary Diagram NSW Pump Structure Vent – VZ Alarm and Monitoring Devices, Rev. 11
CNM 1205.06-0167.001, O/L, C/S, B/M, OPR Control Valves 1&2/RN/351, Rev. Z
CNM 1205.06-0236.001, O/L, C/S, B/M, OPR Control Valves 1&2/RN/291, Rev. U
CNM 1301.00-0054.004, Schematic Diagram Diesel Generator Local Panel 1DGCPB, Rev. 4
CNM 1399.06-0002.001, Interconnection 4 Loop 65 TC's, Rev. 7
CNM 1301.00-0054.002, Schematic Wiring Diesel Generator Local Panel 1DGCPA, Rev. 17
CNEE-0120-07.01-01, Elementary Diagram Generator Control Panel 1A 1DGCPA (Typical Part 1) Panel Electrical Schematic, Rev. 15
CNM 2399.08-0021.001, SSPS-WIRE List Logic Card Rack Train "A", Rev. 3
CN-1609-04.01, Flow Diagram of Diesel Generator Engine Starting Air System, Rev. 27
CNM-1301.00-0031.001, Diesel Engine Pneumatic Schematic, Rev. D12
CNM-1301.00-0342.001, Air Butterfly Valve Assembly, Rev. 3
CN-1561-01.00, Flow Diagram ND System, Rev. 33
CNM-1205.00-0262.002, Valve Assembly – 12 Inch 1512 LB. Gate Pres. With Motor Operator, Rev. DH

PROCEDURES

IP/0/A/4974/003, Inspection and Maintenance of 5HK Air Circuit Breakers, Rev. 52
IP/0/A/3850/023, Molded Case Circuit Breaker Inspection and Testing, Rev. 127
IP/0/A/4974/005, Inspection and Maintenance of ABB 600V Air Circuit Breakers, Rev. 44
IP/0/A/4972/001, Calibration and Testing for Breaker Power Shield, Rev. 41
OP/0/A/6400/006B Nuclear Service Water Pump Structure Ventilation System Procedure
OP/1/B/6100/010R 1AD-19 E/11 VX RN Pump House A HI/LO TEMP Annunciator Response
OP/1/B/6100/010R 1AD-19 E/12 VX RN Pump House B HI/LO TEMP Annunciator Response
OP/1/B/6100/010R 1AD-19 F/11 RN Pumps 1A, 2A Structure HVAC Trouble Annunciator Response
OP/1/B/6100/010R 1AD-19 F/12 RN Pumps 1B, 2B Structure HVAC Trouble Annunciator Response
OP/2/B/6100/010P 2AD-18 F/11 VX RN PMP HOUSE A HI/LO Temp Annunciator Response
OP/2/B/6100/010P 2AD-18 F/12 VX RN PMP HOUSE B HI/LO Temp Annunciator Response
OP/1/A/6200/004, Residual Heat Removal System, Rev. 146
PD-EG-ALL-1430, Air Operated Valve Program, Revision 1
AD-EG-ALL-1432, Air Operated Valve Design Basis Review, Revision 0
AD-EG-ALL-1433, Air Operated Valve Testing Requirements, Revision 1
AD-EG-ALL-1117, Design Analyses and Calculations, Revision 5
PT/1/A/4200/009, Engineered Safety Features Actuation Periodic Test, Rev. 189
PT/X/A/4200/013 C, Stroke Time Test for RN 291/351
PT/0/A/4400/008 A, RN Flow Balance Train A, Rev. 65
PT/0/A/4400/008 B, RN Flow Balance Train B, Rev. 59
PT/0/A/4400/022 A, Nuclear Service Water Pump Train A Performance Test, Rev. 93

PT/0/A/4400/022 A, 1A Pump, 5/17/18
PT/0/A/4400/022 A, 2B Pump, 5/20/18
PT/0/A/4400/022 B, Nuclear Service Water Pump Train B Performance Test, Rev. 85
PT/0/A/4400/022 B, 1B and 2B Pumps, 4/25/18
PT/1/A/4200/013 F, ND Valve Inservice Test (CS), Rev. 34
PT/1/A/4200/001 N, Reactor Coolant System Pressure Boundary Valve Leak Rate Test, Rev. 59
CNS-1560.SS-00-0001, Design Basis Specification for the Standby Shutdown Facility (SSF), Rev. 41
AD-EG-ALL-1133, Preparation and Controls of Design Equivalent Change Engineering Changes, Rev. 8
AD-EG-ALL-1137, Engineering Change Product Selection, Rev. 4
PT/2/A/4200/009, Engineered Safety Features Actuation Periodic Test, Rev. 166
IP/0/A/3680/007, Calibration Procedure for the D/G Power Driven Potentiometer and Static Voltage Regulator, Rev. 16
PT/0/A/4700/061, Time Critical Operator Action Review, Rev. 7
CNM 1301.00-0237.005, Diesel Generator Instruction Manual Vol. 5, Rev. 18
OP/0/B/6100/013, Standby Shutdown Facility Operations, Rev. 55
AD-EG-ALL-1631, Evaluation and Selection of Materials, Rev. 1
MP/0/A/7400/032, Diesel Engine Periodic Test of Overspeed Shutdown System, Rev. 7
AD-LS-ALL-0015. License Amendment Request and Changes to SLC, TRM, and TS Bases, Rev. 5
CP0094OF, Chemistry Management Procedure 3.4.17.1 Primary Chemistry, Rev. 78

DESIGN BASIS DOCUMENTS
CNS-115.01-EPC-0001, 4.16kV Essential Power System Design Basis Specification, Rev. 15
CNS-112.01-EPE-0001, Design Basis Specification for the EPE System, Rev. 8
CNS-1560.SS-00-0001, Design Basis Specification for the Standby Shutdown Facility, Rev. 41
RE-3.02, Relaying 600/480VAC – Equipment Protection Settings, Rev. 5
CNS-1557.VZ-00-0001, Design Basis Specification for the VZ System, Rev. 4
CNS-1573.KC-00-0001, Component Cooling System (KC) Design Basis Specification, Rev. 45
CNS-1574.RN-00-0001, Nuclear Service Water System (RN) Design Basis Specification, Rev. 64
Technical Specification 3.7.8, Nuclear Service Water System (NSWS), Amendment Nos. 271/267
CNS-1609.VG-04-0001, Diesel Generator Engine Starting Air System (VG) Design Basis Specification, Rev. 17

PLANT MODIFICATIONS
EC110958, EPE Breaker Replacements with Bus Bars, Rev. 0
EC406259, SSF Indication for NC LOOP B & C Wide Range Cold Leg Temperature, Rev. 0
EC114710, Allow Future Replacement of EDG Power Driven Potentiometers (PDP), Rev. 0
EC114179, UNIT 2: Removal of SPV at A518 PIN 24 in SSPS Logic Cabinets For Train A & B On Unit, Rev. 0
EC110972, Modify Unit 1 Emergency D/G Pre-position Circuit, Rev. 1
EC408319, 2A D/G Power-Driven Potentiometer (PDP) Pre-Position Circuit, Rev. 0
EC 404914, Evaluate Alternate Air Shutoff Cylinder, Rev. 0

MISCELLANEOUS DOCUMENTS
DPS-1205.19-00-0002, Guideline for Performing MOV Reviews and Calculations, Rev. 5

EPC. System Health Report – 4.16kV Essential Auxiliary Power System, Q2-1018
EPE, System Health Report – 600VAC Essential Auxiliary Power System, Q2-2018
EPA, System Health Report – Health Main Power System, Q4-2017
SWTCHYRD-PS, System Health Report – Switchyard Power Systems, Q2-2018
CNM-1356.01-0031-001, Seismic Test Program – GNB Batteries, 07/18/1991
CNM-1356.01-0014, Seismic Qualification Report 44681-2, 1981
CNM 1205.06-0268.001, I/M & Parts List for Control Valves & Regulators, Rev. 40
CNM 1211.00-0362.001, Catawba System VZ Controls, Rev. D16
CNM 1211.00-1065.001, Operator's Handbook for Fans: ARF AVF, DSF, BR-XF, NSWPSF & HSF, Rev. 10
CNM-1211.00-0217.001, VZ Fan Motor Data Sheet
CNM-1211.00-1008.001, NSR Motor Operated Damper NSWPS-D-A3, 6/27/18
Westinghouse Technical Bulletin TB-13-7, “Solid State Protection System New Design Universal Logic Board and Safeguards Driver Board 48VDC Input”, dated December 16, 2013
ESI Supplier Deviation Report Motor Operated Potentiometer, dated 2/12/15
CNM 1301.00-0285.002, Seismic Qualification Report for the Diesel Generator Units, Rev. 4
CNM 1301.00-0237.005, Diesel Generator Instruction Manual Vol. 5, Rev. 18
ESI Seismic Qualification of Motor Operated Potentiometer PIN: 2-04E-184-103-ESI, dated 2/12/12
Basler Instruction Manual for Motor Operated Potentiometer MOC21XX through MOC24XX and MOC29XX, Rev. K
NUREG-0954 Supplement No. 4, Safety Evaluation Report related to the operation of Catawba Nuclear Station, Units 1 and 2 dated December 1984
Purchase Order 00195576
PART 21 REPORT – Defective Motor Operated Potentiometer, dated 06/09/2017
2B ESF Blackout/LOCA voltage plot, dated March 19, 2018
2B ESF LOCA only voltage plot, dated March 19, 2018
CNM-1201.00-0237.002, Diesel Generator Instruction Manual Vol. II, Rev. 9002195797
Maintenance Rule Scoping Functions for ND Loop Suction Valves, dated May 27, 2015

CONDITION REPORTS

00404196	02180950	02116525	01897756
01431120	02206617	02079232	01899455
01513518	02207335	02116554	02106220
01897235	02221754	01897592	02052597
02132222	02219182	01897699	02207982
01976019	02195797	02191418	

WORK ORDERS

02101232	20262289		
02203299	20267959		
20176107	20262289		
20257479	20213086		

CONDITION REPORTS WRITTEN DUE TO THE INSPECTION

AR 02221297, Limitorque Undervoltage Exponent
AR 02221302, Trip Coil Voltage
AR 02221754, Heat Calculation for VZ System Operability
AR 02222033, Transient Voltage on Motor Starters
AR 02222108, QC Inspection While Performing IP/0/A/3890/011

AR 02222133, VZ Damper Model Work Orders Changed to As Required
AR 02222332, VQ Valve Cycle Count Discrepancy
AR 02222333, VQ Valve Actuator EQ Replacements
AR 02222346, Motor Protection Evaluation 1A NV Pump Setpoint Calculation
AR 02222499, Breaker Close Coil Voltage on 1ETA 18
AR 02222542, Vital Batteries Spacer Material Qualification
AR 02222579, Lack of EQ Evaluation for 1EMXE
AR 02219501, OOS Sticker in Place on 2NCRD5910 After Completion
AR 02219857, DVR Harmonic Resolution Consolidation
AR 02219899, UFSAR/Design Basis Temperature Discrepancy