

NON-CONCURRENCE PROCESS COVER PAGE

The U.S. Nuclear Regulatory Commission (NRC) strives to establish and maintain an environment that encourages all employees to promptly raise concerns and differing views without fear of reprisal and to promote methods for raising concerns that will enhance a strong safety culture and support the agency's mission.

Employees are expected to discuss their views and concerns with their immediate supervisors on a regular, ongoing basis. If informal discussions do not resolve concerns, employees have various mechanisms for expressing and having their concerns and differing views heard and considered by management.

Management Directive, MD 10.158, "NRC Non-Concurrence Process," describes the Non-Concurrence Process (NCP), <http://nrcweb.nrc.gov:8600/policy/directives/catalog/md10.158.pdf>.

The NCP allows employees to document their differing views and concerns early in the decision-making process, have them responded to (if requested), and attach them to proposed documents moving through the management approval chain to support the decision-making process.

NRC Form 757, "Non-Concurrence Process" is used to document the process.

Section A of the form includes the personal opinions, views, and concerns of a non-concurring NRC employee.

Section B of the form includes the personal opinions and views of the non-concurring employee's immediate supervisor.

Section C of the form includes the agency's evaluation of the concerns and the agency's final position and outcome.

NOTE: Content in Sections A and B reflects personal opinions and views and does not represent official factual representation of the issues, nor official rationale for the agency decision. Section C includes the agency's official position on the facts, issues, and rationale for the final decision.

At the end of the process, the non-concurring employee(s):

- ☐ Concurred
- ☒ Continued to non-concur
- ☐ Agreed with some of the changes to the subject document, but continued to non-concur
- ☐ Requested that the process be discontinued
- ☐ The non-concurring employee(s) requested that the record be non-public.
- ☒ The non-concurring employee(s) requested that the record be public.
- ☐ This record is non-public and for official use only.
- ☒ This record has been reviewed and approved for public dissemination.



NON-CONCURRENCE PROCESS

NCP-2018-001

NCP PM 02/27/18

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT ONS Units 1, 2, and 3 Alternative to codes and Standards	ADAMS ACCESSION NO. ML18051B257
DOCUMENT SIGNER Michael Markley	SIGNER TELEPHONE NO. 415-5723

TITLE Branch Chief	ORGANIZATION NRR/DORL
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NAME OF NON-CONCURRING EMPLOYEE(S) Roy K. Mathew	TELEPHONE NUMBER 8324
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TITLE Senior Electrical Engineer	ORGANIZATION NRR/DE/EEOB
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☐ DOCUMENT AUTHOR
 ☐ DOCUMENT CONTRIBUTOR
 ☒ DOCUMENT REVIEWER
 ☐ ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR
Jessie Quichocho

TITLE Branch Chief	ORGANIZATION NRR/DE/EEOB
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☒ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.
☐ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM: ☒ PUBLIC ☐ NON-PUBLIC

REASONS FOR THE NON-CONCURRENCE, POTENTIAL IMPACT ON MISSION, AND THE PROPOSED ALTERNATIVES
(use continuation pages or attach Word document)

Reason:

The proposed alternative approval (ADAMS Accession No. ML18051B257) does not demonstrate an acceptable level of quality and safety is maintained in lieu of complying with the single failure criteria specified in IEEE 279-1971. Therefore, the licensee did not adequately address the regulatory requirements in 10 CFR 50.55a(z)(1)

Basis: See attached

Potential Impact on Mission:

The approval of the Oconee Alternative to codes and Standards is inconsistent with the NRC Mission, NRC Vision, NRC Safety Objectives, NRC Regulatory Effectiveness Strategies, NRC Openness Strategies, and the Principles of Good Regulation. The NRC staff's authorization for permanent use of the alternative put the plant in a less safe condition and not meet the regulation specified in 10 CFR 50.55a(h)(2). Thus, affecting health and safety of the public.

Proposed Alternative:

Deny the permanent use of the alternative (IEEE 384-1992, Section 6.1.4 requirements instead of IEEE 279 requirements specified in 10 CFR 50.55a(h)(2) or issue an NRC approval of temporary use of the alternative until the licensee complies with the requirements of 10 CFR 50.55a(h)(2) within 1 year.

SIGNATURE 	DATE 2/27/18
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Attachment

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 SAFETY EVALUATION FOR
ALTERNATIVE TO CODES AND STANDARDS REQUIREMENTS ASSOCIATED WITH
BRONZE TAPE WRAPPED EMERGENCY POWER CABLES (CAC NOS. MF7365, MF7366,
AND MF7367; EPID L-2016-LLR-0001)

Scope: I reviewed safety evaluation (ADAMS Accession No. ML18051B257) and associated supporting licensee documents which approves licensee's (Duke) request for NRC review and approval of the use of alternatives at the Oconee Nuclear Station, Units 1, 2, and 3 (ONS) and provide review comments to Branch Chiefs of DE/EEOB and DORL/LPL2.

Specifically, the licensee requested the NRC to authorize alternatives to the single failure criteria requirements of Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Paragraph 50.55a(h) for certain cable configurations. Pursuant to 10 CFR 55a(z)(1), the licensee proposed that the NRC authorize permanent acceptance of current cable configurations in certain locations and application of Paragraph 6.1.4, "Limited Hazard Areas," of Institute of Electrical and Electronic Engineers (IEEE) Standard (Std.) 384-1992, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," as a means of providing acceptable cable separation in certain areas for complying with single failure criteria of IEEE 279-1971.

The safety evaluation stated that "NRC staff reviewed the subject request and, as set forth in the enclosed safety evaluation, concludes that the licensee adequately addressed the regulatory requirements in 10 CFR 50.55a(z)(1). The NRC staff concludes the proposed alternatives provide an acceptable level of quality and safety for the cable configurations and locations discussed in the enclosed safety evaluation. Therefore, the NRC staff authorizes the permanent use of the alternative."

Background:

By memorandum dated October 16, 2014 (ADAMS Accession No. ML14290A136), NRC Region II requested assistance from the Office of Nuclear Reactor Regulation (NRR) to provide answers to several questions related to the compliance of cable configuration in certain recently installed underground raceways at Oconee Nuclear Station, Units 1, 2, and 3 (ONS), with the ONS licensing basis, design basis, and NRC regulations and requirements. These questions were specifically related to trench 3 and associated manholes and Protected Service Water Modifications discussed in Inspection Report Unresolved Item 05000269/2014007-05, 05000270/2014007-05, 05000287/2014007-05, Potential Unanalyzed Condition Associated with Emergency Power System.

The TIA response states that the ONS as-modified design does not comply with the licensing bases as it pertains to placing safety related cables in close proximity to high energy non-safety related energy sources in trench 3 and Protected Service Water Modifications discussed in Unresolved Item 05000269/2014007-05, 05000270/2014007-05, 05000287/2014007-05, Potential Unanalyzed Condition Associated with Emergency Power System. Furthermore, the staff is concerned that these modifications may have introduced potential failure modes that were not adequately analyzed.

The TIA response states the following:

The medium-voltage power cables that are intended to provide emergency power to the ONS, Units 1, 2, and 3 safety systems are within the scope of IEEE Std. 279-1968 and the single failure requirements of IEEE Std. 279-1971.

Section 4.2, "Single Failure Criterion," of IEEE Std. 279-1971 states that "Single failure" includes such events as the shorting or open-circuiting of interconnecting signal or power cables." 'Shorting' between independent interconnecting power cables is an exact parallel condition to multi-phase shorts.

The NRC staff has performed an evaluation of the physical installation of the cable and compared it to the ONS licensing basis. The staff determined that the cables in Trench #3 are intertwined and relatively close together in most of the raceway. The failure mode could be initiated due to arcing from one cable to an adjacent cable rather than the ground. This would be the more limiting fault. Duke Energy has not provided an adequate basis to conclude that multi-phase faults are non-credible in all sections of the cable runs, other than at the terminal connections. Since short circuits may occur between two-phase conductors, between all phases of a polyphase system, or between one or more phase conductors and ground, the short circuit may be solid (or bolted) or welded, in which case the short circuit is permanent and has relatively low impedance.

ONS's licensing and design bases includes conformance to the single failure requirements of IEEE Std. 279-1971. The conformance to IEEE 279-1971 includes the requirements to consider the full effects and consequences from electrical single failures in the onsite power system.

Staff concludes that the licensee has not demonstrated that existing routing of power and control cables, including the ESPS protection circuits to the KHU units, from each ONS unit have adequate separation, independence, and redundancy, as specified by the ONS licensing basis. Additionally, the licensee failed to demonstrate that no potential exists to disable functional requirements of redundant Class 1E systems

Issues Identified during the review of safety evaluation (ADAMS Accession No. ML18051B257):

The staff's technical evaluation states the proposed alternative demonstrates an acceptable level of quality and safety. I disagree with this conclusion.

The specific areas associated with this request are the PSW System Ductbank Manholes 1 through 6, the KHS Mechanical Equipment Gallery, and the PSW Building Cable Spreading Area. My review indicates the following problems:

1. As stated in response to the TIA, the licensee's testing described in licensee's submittal dated February 12, 2018, is inadequate and does not resolve any of the licensing basis questions posed by the Region II staff in the TIA. This is because the licensee's test did not prove that cable design with bronze shield can withstand a worst-case credible three-phase fault or prevent consequential damages to the nearby cables as discussed in the TIA response. The licensee' cable test and analysis calculated the fault current to be 16kA. However, the NRR EEEB and RII staff calculated the maximum fault current to be on the order of more than 130kA. In addition, the licensee's cable crush test did not prove that the cable can withstand or prevent a worst-case credible three-phase fault. It only proved the mechanical capability of the cable. The staff determined that the electromagnetic forces produced during short circuits would likely cause failure of the

cable restraint system and could challenge the integrity of the cables along the raceway system to transformer CT4 and the manholes associated with the raceway system to the protected service water (PSW) system. Since the licensee has not fully evaluated the worst-case credible cable faults and single failures to determine the integrity of the emergency power system and other safety-related systems, the staff determined that the cited testing is insufficient to support the licensee's current position described in its response.

2. The adequacy of one-inch separation between medium voltage cables and safety related power and control cables with respect to potential damage from heat generated due to worst case fault conditions (arc flash, voltage flashover, etc.) which may result in cable insulation fire is not determined. In addition, the adequacy of one-inch separation between medium voltage cables and safety related power and control cables with respect to potential damage from cable whiplash observed at the onset of three phase fault conditions is not evaluated. These are required to verify that whether NRC can authorize permanent acceptance of current cable configurations in three specified locations and application of Paragraph 6.1.4, "Limited Hazard Areas," of Institute of Electrical and Electronic Engineers (IEEE) Standard (Std.) 384-1992, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," as a means of providing acceptable cable separation in certain areas for complying with single failure criteria of IEEE 279-1971.
3. The licensee's use of IEEE 384-1992, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," as a means of providing acceptable cable separation in certain areas for complying with single failure criteria of IEEE 279-1971 is not acceptable because of the following reasons:

The IEEE 384-1992 Annex cautions users of this standard that the testing program did not utilize medium voltage cables, and thus, the separation distances for these circuits were not revised. The staff notes that medium voltage power cables are typically separated from lower voltage circuits and run in totally enclosed trays or conduits, which is not the configuration at ONS

The staff also reviewed a technical paper that was written and presented at the 1989 Winter Power Engineering Society Meeting. This technical paper ("Cable Separation - What Do Industry Testing Programs Show? IEEE Reference Number 90 WM 254 - 3EC") was published detailing the committee's data analysis and recommended separation distances. The technical paper notes that the scope of test results and conclusions is limited to only low-voltage power system applications and below (control and instrumentation).

4. The licensee grossly underestimates the level of induced voltages (0.2 Volts) possible between the DC and AC cabling. The testing conducted in Philadelphia, PA, witnessed by the NRC staff showed much higher induced voltages on the order of 5-7 Volts in a ten-foot section when the control cable was more than five inches from the power cables. Also, the cable fault simulated was only phase to ground and did not consider the worst-case cable fault (phase to phase or three phase bolted fault along the cable run in trench 3, PSW duct bank, and manholes 1-6).
5. The licensee credits high impedance grounding system limits fault current (KHS-to-PSW feeder) and minimizes the effect of any cable interaction should a fault occur. This is true only for phase to ground fault conditions. It should be noted that the most consequential three-phase faults still need to be considered by the licensee to evaluate the adequacy

of independence of power and control circuits to withstand a consequential three phase fault.

6. The licensee committed to all single failure requirements not limited to those in Section 4.2. Additional single failure requirements are contained in other sections of IEEE Std. 279-1971 including but not limited to Sections 4.2, 4.7, 4.11 and 4.17. Although ONS's original licensing basis included IEEE Std. 279-1968, for single failure requirements, ONS later adopted IEEE Std. 279-1971. The proposed technical evaluation must clarify that staff is not approving this alternative requirement for other Sections of IEEE 279-1971.
7. Cascading failures (i.e. circuit breaker failures that may result from the short circuit conditions) were not considered concurrent with the line to ground fault or phase to phase or three phase faults. Section 8.3.1.2 of the Updated Final Safety Analysis Report (UFSAR) which states the following, "The basic design criterion for the electrical portion of the emergency electric power system of a nuclear unit, including the generating sources, distribution system, and controls is that a single failure of any component, passive or active, will not preclude the system from supplying emergency power when required."
8. The licensee's submittal dated February 15, 2016, and responses to RAIs are not risk-informed submittals meeting the criteria in RG 1.774, 1.777, and 1.200. Therefore, unsupported risk insights such as frequency of cable faults, probability that a fault is a multi-phase or high energy arc fault, probability of a large imposed voltage on one or both vital 125-volt direct current (VDC) trains, probability of a failure of one or both vital 125-VDC trains given an imposed voltage, and probability of a failure of mitigation strategies, probability of damaging multi-phase faults, and adverse impacts of electromagnetic and radio frequency must not be used for evaluation of this submittal. This is because as evidenced by the responses to the Generic Letter 2007-01, staff learned that the nuclear industry has not maintained a good record of cable failures and cable condition assessment methods.
9. The Safety Evaluation does not discuss all the cables of concern. As an example, there is a 4,000-foot-long raceway, identified as trench 3, between the Keowee Hydro Station (KHS) and transformer CT-4 at ONS, and a new PSW raceway that extends another 2,000 feet past CT-4 and around the ONS site to the new PSW building, thus connecting each system through underground interconnected raceways. Majority of this raceway contains non-safety related 13.8kV PSW cables in close proximity to safety related power and control cables without any separation barriers. The relief request and the SE discusses limited areas where cables are in ductwork. The original request did not include approval for major portions of these cables. Although, RAI 6 requested additional information about the cables in Trench 3, the response does not discuss the consequences of a multi-phase fault condition on the 13.8 kV non-safety related power cables (in open air configuration) and adverse impact on associated safety related cables.
10. In general, the SE reiterates licensee's positions developed during the CDBI and subsequent correspondence with Staff. The Staff has previously reviewed licensee's supporting information and did not agree with the technical justification. The SE does not

provide a technical basis for accepting the licensee positions but concludes that the cable configurations, as proposed, are acceptable. This is a major shortcoming in the SE.

Based on my review of the safety evaluation (ADAMS Accession No. ML18051B257) and the basis provided above, my review concludes that the proposed alternative does not demonstrate an acceptable level of quality and safety is maintained in lieu of complying with the single failure criteria specified in IEEE 279-1971. Therefore, the licensee's request must be denied.

NON-CONCURRENCE PROCESS

NCP-2018-001
NCP PM 02/27/18

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT

ONS Units 1,2, and 3 Alternative to codes and Standards

ADAMS ACCESSION NO.

ML18051B257

NAME

Jessie Quichocho

TITLE

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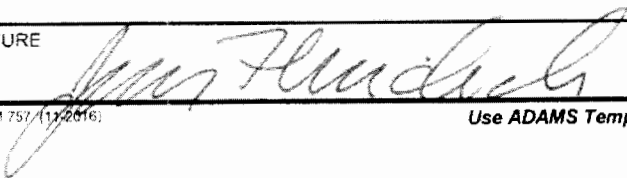
ORGANIZATION

NRR/DE/EOB

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

See the 3-page attachment. "Section B to NCP-2018-001 NCP PM 02/27/18"

SIGNATURE



DATE

2/28/18

“Section B to
NCP-2018-001
NCP PM 02/27/18

The NCP submitter has disagreed that the proposed alternative demonstrates an “acceptable level of quality and safety,” which is the regulatory standard to be applied in granting an alternative under 10 CFR 50.55a(z)(1). I note that, by definition, such a request indicates a situation that is not compliant with a standard, in this case IEEE Std. 279-1971. I also note that the licensee has made several modifications to the system since the time that Region II submitted a related Task Interface Agreement (TIA) to NRR to bring aspects of the design back into compliance with the current licensing basis. The licensee’s request for an alternative only addressed those aspects where the licensee felt that it had achieved an acceptable level of quality and safety even without restoring compliance with the current licensing basis including IEEE Std. 279-1971. In my review, I have carefully evaluated the issues discussed by the NCP submitter in section A to determine whether these issues impact the NRC determination of acceptability of the alternative request. The NCP submitter identified what he believes are ten issues with the NRC safety evaluation (SE) of the alternative request. In my evaluation of the information provided in section A, I have grouped the issues raised by the NCP submitter into several general concerns, which I discuss in my evaluation of below.

Concern 1 (NCP submitter items 1, 2, 4, 5, 7, and 9):

The request for alternative did not resolve the licensing basis questions posed to NRR staff by Region II staff in a related TIA. Specifically, the licensee’s request: 1) did not adequately address a worst-case credible three-phase fault or prevent consequential damages to the nearby cables, either through testing or analysis, 2) did not justify the adequacy of the one-inch separation between medium voltage cables and safety-related power and control cables with respect to potential damage from worst-case and 3-phase fault conditions, 3) did not discuss the consequences of a multi-phase fault in the non-safety related 13.8 kV power cables on associated safety related cables, and 4) did not consider cascading failures when determining if they meet their UFSAR.

Response to Concern 1:

The information provided in the NCP in Items 1, 2, 4, 5, 7, and 9 was used by the EEOB staff to determine whether the licensee was in compliance with its licensing basis at the time of the CDBI inspection in 2014, as part of the TIA response. I do not see a need to change the discussion in the safety evaluation of the alternative request, since the licensee is requesting to change its licensing basis by submitting a request for alternative from the codes under 10 CFR 50.55a(z) to meet the requirements of 50.55a(h)(2) and (3). The staff’s review of the justifications and supplemental information provided by the licensee in their request was considered collectively, to determine if it provided an acceptable level of quality and safety. The review to determine if an acceptable level of quality and safety included a review of the level of protection provided by all of the steps taken by the licensee to reduce the hazard, including additional enclosures, limitations on the exposure distance and time, and the risk associated with the potential hazards, in addition to the cable crush and fault test results. Even though these factors taken together will not demonstrate compliance with single failure requirements of IEEE Std. 279-1971, they do provide reasonable assurances that the alternative will provide an acceptable level of quality and safety.

Concern 2 (NCP submitter item 3):

The proposal to use IEEE Std. 384-1992 is not acceptable because of the standard's testing program and that the separation distances used is limited to low voltage power and I&C systems.

Response to Concern 2:

The licensee described in its application, as supplemented, that they request an alternative to adopt IEEE Std. 384-1992, to the single failure requirements of Section 4.2 IEEE Std. 279-1971 by using installed protected covered trays for control and power cables. The licensee is also proposing the "as-is" configuration as an alternative for other areas not able to meet the separation requirements of IEEE Std. 384-1992. I do not see a need to change the information in the safety evaluation since the staff's review of the justifications and supplemental information collectively, as described in the response to Concern 1, provides an acceptable level of quality and safety.

Specifically, the staff confirmed that the installed enclosures may be used as an alternative and cable separation meets the separation requirements of IEEE Std 384-1992, Table-2 for control and power cables as an alternative to the single failure requirements in Section 4.2 of IEEE Std. 279-1971.

Concern 3 (NCP submitter item 8):

The licensee's submittal was not a risk-informed submittal meeting RG 1.174, 1.177, or 1.200, therefore the staff cannot use risk insights (e.g., frequency of faults) in its evaluation.

Response to Concern 3:

The Commission policy on Risk-informed approach to licensing reviews indicates that the use of PRA information should be increased in all regulatory matters to the extent supported by the state-of-the-art PRA methods and data, and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy. NRR Division Management from DORL, DE and DRA met with the staff several times to provide direction that it was acceptable for the staff to use the risk insights provided by the licensee in the review of the request for an alternative. Although the request for alternative was not risk-informed, risk insights are incorporated into numerous regulatory activities and have proven to be a valuable complement to traditional deterministic approaches. Although there is uncertainty associated with some of the assumption used in the risk analysis, as pointed out in the NCP submitter's section A, this was known by and discussed with the staff that completed the evaluation of the licensee's risk information. I find that the licensee's and the staff's risk insight have been effectively evaluated and support the conclusions of the SE.

Concern 4 (Also part of NCP submitter item 9):

The licensee should also discuss cables in Trench 3 or in a new PSW raceway, nor does the licensee discuss the consequences of a multi-phase fault in the non-safety related 13.8 kV power cables on the associated safety related cables.

Response to Concern 4:

The scope of the licensee's request for alternative does not include the cables referenced by the NCP submitter and is not a subject of the alternative. I do not see a need to change the information in the safety evaluation since the safety evaluation adequately addresses the items identified in the request for alternative.

Concern 5 (NCP submitter item 10)

The licensee used justifications (i.e., testing data) in the request for alternative that the HQ staff has previously not agreed with, during its review of the TIA. The SE does not provide a technical basis for accepting the licensee positions.

Response to Concern 5:

When reviewed as part of the TIA response, the testing mentioned in Item 10 was evaluated by the EEOB staff to determine whether the licensee was in compliance with its licensing basis at the time of the CDBI inspection in 2014. I do not see a need to change the information in the safety evaluation since the staff's review of the justifications and supplemental information collectively as part of the evaluation of the alternative, was an independent analysis of all of the information, not just the information associate with the prior TIA review, to determine if the alternative provides an acceptable level of quality and safety.

Specifically, and as identified in the response to Concern 2, the cable tests provided by the licensee in the request for alternative provide some evidence that cable faults are likely (versus definitively) limited to single-phase faults and are unlikely (versus definitively) to result in multi-phase faults. These tests also provide evidence that single-phase faults are unlikely (versus definitively) to directly affect the control cables. Additionally, the control cables use armor that help minimize impacts of EMF from power cables. There is limited direct exposure between power and control cables (180 ft. from a total of ~4,500 ft.). Calculations and analysis show minimal impact on control cables considering that control cables are provided with armor (GSIA - Galvanized Steel Interlocked Armor). This coupled with the fact that there is a low probability of a fault; therefore, very low risk, provide sufficient reason to find that the requested alternative is acceptable.

Concern 6 (NCP submitter item 6):

SE should be clarified to not approve single failure requirements from other Sections of IEEE 279-1971.

Response to Concern 6:

I agree with this comment. This concern was previously identified during the review and I believe is reflected in the final safety evaluation.

NON-CONCURRENCE PROCESS

NCP-2018-001

SECTION C - TO BE COMPLETED BY NCP COORDINATOR

TITLE OF SUBJECT DOCUMENT

ONS Unit 1, 2, and 3 Alternative to Codes and Standards

ADAMS ACCESSION NO.

ML17096A129

NAME

Gregory F. Suber

TITLE

Deputy Director, Division of Operating Reactor Licensing

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ORGANIZATION

NRR/DORL

AGREED UPON SUMMARY OF ISSUES (use continuation pages or attach Word document)

Please see attached documents

EVALUATION OF NON-CONCURRENCE AND RATIONALE FOR DECISION (use continuation pages or attach Word document)

Please see attached documents

TYPED NAME OF NCP COORDINATOR

Gregory F. Suber

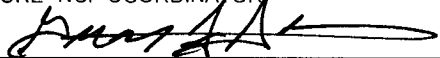
TITLE

Deputy Director, Division of Operating Reactor Licensing

ORGANIZATION

NRR/DORL

SIGNATURE--NCP COORDINATOR



DATE

2/28/2018

TYPED NAME OF NCP APPROVER

Gregory F. Suber

TITLE

Deputy Director, Division of Operating Reactor Licensing

ORGANIZATION

NRR/DORL

SIGNATURE--NCP APPROVER



DATE

2/28/2018

NCP-2018-001 Section C

As the NCP Approver, I have read and considered the submission of the non-concurrence. Prior to discussion of the issues, I would like to acknowledge the work of the submitter and the commitment to the NRC mission. It is commendable to all involved that an environment has been created where employees are free to exercise their ability to register their concerns through the NRC's non-concurrence process.

Statement of Issues for NCP-2018-001

1. The licensee's Alternative request is based on assuming a single phase to ground fault. This is inconsistent with the staff's responses to Region II's questions raised in TIA 2014-05 and does not meet the NRC requirements specified in 10 CFR 50.55a (h)(2) and 10 CFR 50.55a(z)(1). The licensee's cited cable testing assuming an impedance grounded system which results in a fault current of approximately 17 amps as sufficient to support the licensee's request. However, the NRR and R2 staff calculated the maximum fault current (approximately 130kA, based on three phase fault) to be significantly higher than that from the licensee's cable test and analyses. The cable crush tests and cable fault test results did not prove that the cable can withstand or prevent a worst-case credible 3-phase fault to satisfy separation criteria required to preclude damage to safety related cables.

2. The licensee did not justify the adequacy of the *one-inch separation between medium voltage cables and safety-related power and control cables as well as non-safety cables with respect to analyzing potential damage from a worst-case 3-phase fault condition (i.e., analyzing consequential damage from electrical failures that can affect adjacent Class 1E safety systems in applicable trenches and manholes to ensure that redundant safety trains are not adversely affected by any new failure modes, so that the consequential damage does not result in a common cause failure of a system).

* Based on IEEE 384-1992, Table 2 (Minimum Separation Distances for Limited hazard areas) for enclosed to open configurations are 6" horizontal and 12" vertical for low power circuits with cable size $\leq 2/0$ AWG and 3ft by 5ft for medium voltage cables and low voltage power circuits $>2/0$ AWG.

3. The licensee's proposal to use IEEE 384-1992 for separation distances is not acceptable because this standard's testing program did not use medium voltage cables (cables above 600 volts) and IEEE 384-1992 cautions the users of this Standard. Annex A of this Standard discusses industry tests performed to verify the separation distances and references IEEE technical paper from 1989 (IEEE 90 WM 254-3EC) for separation distances that was limited to low voltage power and I&C systems. The high energy dissipated from a system operating at 13.8 kV fault condition is of a magnitude several times higher than the fault energy available in a system operating at 600 V or less. Hence the separation distance proposed by the licensee has to be appropriately justified.

Attachment for Section C

4. The licensee underestimated induced voltages between DC and AC cables because testing witnessed by NRC staff showed higher induced voltages and the simulated cable fault did not consider the worst-case cable fault including the Oconee plant cable routing configurations such as cable support, cable restraints, cable fills, etc.,.
5. The licensee's high impedance grounding system applications only limit the fault current for phase to ground faults and does not affect limiting worst-case 3-phase and phase to phase faults.
6. In addition to Section 4.2, the licensee has committed to other sections of IEEE 279-1971 (including but not limited to Sections 4.7, 4.11, and 4.17) which would affect the staff's determination of 10 CFR 50.55a(z)(1) requirements. The SE must clarify that the staff is not approving the proposed alternative for any other Sections of IEEE 279-1971 or IEEE 279-1968.
7. The SE must consider cascading failures concurrent with phase -to-ground, phase-to-phase, and 3-phase faults in order to meet Section 8.3.1.2 of the UFSAR.
8. Because the licensee's submittal was not a risk-informed submittal (meeting RG 1.174, 1.177, or 1.200), the staff should not use risk insights (e.g., frequency of faults) in its evaluation (inconsistent with Office Instructions). Also, the failure probability of cable failures and consequences were underestimated and does not reflect the data collected by the staff via GL 2007-001 review.
9. The SE does not discuss cables in Trench 3 or in a new PSW raceway nor does it discuss the consequences of a multi-phase fault in the non-safety related 13.8 kV power cables on associated safety related cables are required to operate during a design basis event.
10. The SE used licensee justifications that the staff did not agree with for the purposes of completing the TIA and dispositioning inspection issues. The SE does not provide a technical basis for accepting the licensee justifications.

Evaluation of Non-Concurrence

NCP Issue 1

The request for relief is, by definition, an acknowledgement that the as-is configuration does not fully meet applicable standards. The test results do not demonstrate compliance but provide some useful supporting information associated with cable performance. The staff's review encompassed numerous considerations including additional enclosures, limitations on the exposure distance and time, and the risk associated with the potential hazards, and a review of cable test results. Together, these evaluations form the basis of the staff's finding of reasonable assurance that the alternative will provide an acceptable level of quality and safety. I find the resolution of this issue valid.

NCP Issue 2

The Safety Evaluation concludes that the use of the alternative standards will meet all but the most limiting cases. The cable tests provided by the licensee in the request provided some evidence that cable faults are likely limited to single-phase faults and are unlikely to result in multi-phase faults. These tests also provided evidence that single-phase faults are unlikely to directly affect the control cables. Additionally, the control cables use armor that help minimize impacts from power cables.

NCP Issue 3

The request for relief is, by definition, an acknowledgement that the as-is configuration does not meet applicable standards. However, the staff's review encompassed numerous considerations including additional enclosures, limitations on the exposure distance and time, the risk associated with the potential hazards, and a review of cable test results. Together, these evaluations form the basis of the staff's finding of reasonable assurance that the alternative will provide an acceptable level of quality and safety. I find the resolution of this issue valid.

NCP Issue 4

The staff acknowledges that the test results alone did not fully address the concerns. However, the staff's review of the justifications and supplemental information provided by the licensee in their license amendment request was considered collectively, to determine if it provided an acceptable level of quality and safety. The information provided in the license amendment request, taken in conjunction with risk insights, provides reasonable assurance that the alternative will provide an acceptable level of quality and safety. I find the resolution of this issue valid.

NCP Issue 5

The staff concluded that the impedance grounding system limits fault current which minimizes the likelihood of cable interactions. Therefore, the SE has provided a sound justification that cable faults are likely limited to single-phase faults and are unlikely to result in multi-phase faults.

NCP Issue 6

This comment is consistent with comments received during the final review of the document. A footnote has been added to address this comment in the safety evaluation.

NCP Issue 7

The staff's safety evaluation focuses on the relief request from IEEE 279-1917, which includes cascading failures. The request for relief is, by definition, an acknowledgement that the as-is configuration does not fully meet applicable standards. However, the staff's review encompassed numerous considerations including additional enclosures, limitations on the exposure distance and time, and the risk associated with the potential hazards, and a review of cable test results. Together, these evaluations form the basis of the staff's finding of reasonable assurance that the alternative will provide an acceptable level of quality and safety. I find the resolution of this issue valid.

NCP Issue 8

The staff acknowledges that the licensee's submittal was not risk-informed. However, consistent with Commission policy, risk insights are incorporated into numerous regulatory activities and have proven to be a valuable complement to traditional deterministic approaches. I agree that the staff's use of risk insights is appropriate and support the conclusions of the safety evaluation. The use of risk insights is an acceptable method to review alternative approaches. Therefore, the staff has reasonable assurance that the alternative will provide an acceptable level of quality and safety.

NCP Issue 9

The scope of the licensee's request for alternative does not include the cables referenced by the NCP submitter and is not a subject of the alternative. Since the subject cables are out of scope for this safety evaluation, I find the staff's review appropriate and valid.

NCP Issue 10

The safety evaluation considered all of the information submitted, not just the information associated with the prior TIA review. The staff performed an independent analysis which formed the basis of the conclusions in the safety evaluation and determined that the alternative provides an acceptable level of quality and safety. I find the staff's review appropriate and valid.