~~SECURITY-RELATED INFORMATION – WITHHOLD UNDER 10 CFR 2.390~~

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10 CFR 50.90

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

Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69
NRC Docket Nos. 50-317 and 50-318

Subject: Request for Additional Information Regarding the National Fire Protection Association Standard 805 License Amendment Request

References:
1. Letter from G. H. Gellrich (CCNPP) to Document Control Desk (NRC), dated September 24, 2013, License Amendment Request re: Transition to 10 CFR 50.48(c) - NFPA 805 Performance Based Standard for Fire Protection
2. Letter from A. N. Chereskin (NRR) to G. H. Gellrich (Exelon), dated July 15, 2015, Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 - Request for Additional Information Regarding the National Fire Protection Association Standard 805 License Amendment Request (TAC Nos. MF2993 and MF2994)

In Reference 1, Calvert Cliffs Nuclear Power Plant, LLC submitted a license amendment request to transition to 10 CFR 50.48(c) – NFPA 805 Performance Based Standard for Fire Protection. In Reference 2 the Nuclear Regulatory Commission staff requested additional information regarding this amendment request. Attachment (1) and the Enclosure provide the response to the request for additional information. Enclosure 1 contains markups of the original license amendment package pages and supersedes the previously provided pages.

The Attachment S page in Enclosure 1 contains security-related information and is requested to be withheld from public disclosure under 10 CFR 2.390.

This additional information does not change the No Significant Hazards Determination provided in Reference 1. No regulatory commitments are contained in this letter.

Should you have questions regarding this matter, please contact Mr. Larry D. Smith at (410) 495-5219.

A006
NRR

Upon removal of Attachment S pages in Enclosure 1, this submittal is not restricted

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 13, 2015.

Respectfully,

George H. Gellrich
Site Vice President

GHG/PSF/bjm

Attachment: (1) Request for Additional Information Regarding the National Fire Protection Association Standard 8905 License Amendment Request

Enclosure: 1 Contains markups of the original license amendment package pages and supersedes the previously provided pages

cc: NRC Project Manager, Calvert Cliffs
NRC Regional Administrator, Region I
NRC Resident Inspector, Calvert Cliffs
S. Gray, MD-DNR

ATTACHMENT (1)

REQUEST FOR ADDITIONAL INFORMATION REGARDING THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805 LICENSE AMENDMENT REQUEST

Calvert Cliffs Nuclear Power Plant
August 13, 2015

By letter dated September 24, 2013 Calvert Cliffs Nuclear Power Plant, LLC, submitted a license amendment request (LAR) for Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (CCNPP), to transition its fire protection licensing basis from Title 10 of the Code of Federal Regulations (10 CFR) Section 50.48(b) to 10 CFR 50.48(c), National Fire Protection Association Standard (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. The licensee submitted request for additional information (RAI) responses. Based on its review of the RAI responses, the U.S. Nuclear Regulatory Commission (NRC) staff requests the following additional information to complete its safety evaluation of the LAR:

Probabilistic Risk Assessment (PRA) RAI 06.01:

The response to Probabilistic Risk Assessment (PRA) RAI 06 (by letter dated April 13, 2015) appears to indicate that transient combustibles with heat release rates (HRRs) greater than that assumed by the Fire PRA (FPRA) may be present and left unattended in Plant Area Units (PAUs) 311, 317, 407, and 430. The administrative controls currently discussed in the response establish expectations that appear to reduce the frequency that transient combustibles may be present but not necessarily the HRR of the combustibles. For example, if large amounts of transient combustibles are brought into a switchgear room, then it would be subjected to the associated administrative controls that seem to only reduce the frequency of large fires by reducing the time the combustibles will be present (e.g., "remove from the work area at the end of the shift"). Similarly, if "minor amounts" of transient combustibles ("minor amounts" is not defined in the RAI response and is interpreted to be "only the amount needed to support the work," which could still be greater than the 142 kW HRR assumed in the PRA) are brought into a switchgear room, then it would be subjected to a less stringent set of administrative controls that also seem to only reduce the frequency of large fires by reducing the time the combustibles will be present (e.g., "the materials are to be removed from the work location at the completion of the work activity").

Based on the above discussion, clarify how the administrative controls currently in place for PAUs 311, 317, 407, and 430 can be used, in conjunction with specific attributes and considerations applicable to these locations, to support a justification for selection of a screening HRR that is lower than the 317 kW.

CCNPP Response to NRC RAI 06.01:

Exelon will upgrade the existing transient combustible controls in the Switchgear Rooms and PAUs 311, 317, 407, and 430, by designating these rooms as transient combustible exclusion zones. At CCNPP, a transient combustible exclusion zone is an area in the plant in which transient combustible material is prohibited except when constantly attended, contained in metal containers with closed metal lids/openings or has a transient control permit. Minor amounts of transient combustibles are not excluded from this requirement.

Constantly attended transient combustible materials may be present in the room in the event that work activities are required. Plant procedures require that only the amount of combustibles needed to support the work be introduced into the area. Work activities are infrequent in the Switchgear Rooms during power operations and combustible materials associated with these activities are typically limited to test equipment and small tubes of grease. Plant procedures require that transient combustible materials not be staged or stored within 3 feet of heat sources or live electrical components unless unavoidable and, therefore, work activities in the Switchgear Rooms are performed away from the fixed ignition sources. In addition, access to

the Switchgear Rooms is limited; only plant personnel with vital area clearance can access these areas.

The Switchgear Rooms are designated as high risk areas. Plant procedures require consideration of the potential impact of plant activities in these locations to ensure the FPRA assumptions, (e.g., changes to existing fire sources or addition of fire sources) remain valid. Therefore, a transient control permit will not be allowed for the Switchgear Rooms for transient combustible materials that exceed the 142 kW transient fires postulated for the area.

In summary, the combustible controls proposed for these rooms are strict and activities in the Switchgear Rooms are monitored due to the high risk designation. In addition, access to the Switchgear Rooms is limited and work activities are infrequent. Based on these controls, and the history of transient combustible materials in these rooms as described in the response to PRA RAI 06, the selection of a reduced HRR in the Switchgear Rooms is justified.

Implementation Items IMP-22 has been created to ensure applicable site procedures are updated identifying PAUs 311, 317, 407, and 430 as transient combustible exclusion zones.

PRA RAI 13.01:

The response to PRA RAI 13 (by letter dated April 13, 2015) indicates that the main control board (MCB) analysis will be updated as part of the response to PRA RAI 03 to address the NRC staff's observation regarding the presence of both qualified and unqualified wiring in the MCB. However, the response does not state how the MCB analysis will be updated. Describe (or reference a description of) the MCB analysis and clarify how the revised treatment of qualification is consistent with, or bounds, the MCB wiring configuration.

CCNPP Response to NRC PRA RAI 13.01:

The MCB analysis is being revised based on the conservative assumption that all cabling is unqualified cable using the associated NUREG/CR-6850 heat release rate of 1002 kW applicable to open panels with unqualified cables (NUREG/CR-6850, Table E-6). The revised MCB analysis will be included with the revised CCNPP FPRA quantification that will be submitted in response to RAI PRA-03.

PRA RAI 15:

In the response to PRA RAI 15 (by letter dated April 13, 2015), the licensee clarified that Main Control Room (MCR) abandonment for loss of function was included in the PRA following fires in the cable spreading room. The licensee stated that loss of function is defined as the "...immediate or impending loss of vital auxiliaries, degraded steam generator level indication and/or degraded flow control instruments [that] will lead to MCR abandonment." The licensee clarified that loss of the whole Cable Spreading Room (CSR) meets these conditions and, for lesser fires, the appropriate fault tree logic is applied. The response further stated that the "...abandonment cases assume a complete relocation of the primary control station (PCS) to the Auxiliary Safe Shutdown Panel (ASSDP)..." In the response to PRA RAI 18.a (by letter dated February 9, 2015), the licensee stated that Variance from Deterministic Requirements (VFDRs) were removed from the CCNPP FPRA compliant plant model by setting the VFDR related basic events to false "in all areas." However, in the latter response to PRA RAI 18.b (by letter dated April 13, 2015), the licensee clarified that instead of setting the VFDR related basic events to false for scenarios that lead to MCR abandonment, Human Error Probability (HEPs)

associated with actions occurring away from the primary control station (PCS) actions were either adjusted to reflect an equivalent action at the PCS or assumed to be successful in the compliant plant model. Therefore, the effects of individual fires in the CSR are evaluated and, if loss of control occurs, the PRA models the shutdown of the plant from the ASSDP. Furthermore, VFDRs are included as in all areas in the plant.

Confirm that the effects of individual fires in the CSR are evaluated and different scenarios developed based on the population of Structures, Systems, and Components (SSCs) failed for different fires (i.e., not all fires lead to the use of the Auxiliary Safe Shutdown Panel, for both the post-transition and compliant plant models).

CCNPP Response to NRC PRA RAI 15:

Based on impact, CSR fixed initiators are analyzed for fire impact using accepted fire modeling methodologies, often resulting in multiple damage states. If an initiator progresses to whole room damage, the relevant portion of the initiator ignition frequency is added to a single severe fire (whole room burn) scenario.

Consistent with the approach described in PRA RAI 15 (April 13, 2015), CSR scenarios that do not result in a loss of the whole compartment are generally quantified assuming no abandonment. The results are then reviewed to identify scenarios with high CCDPs. Those scenarios are marked for abandonment and requantified.

This process is repeated as modeling refinements are incorporated. At this time only a small percentage of over 200 fixed or transient scenarios that do not result in a loss of the whole compartment are marked for abandonment. Thus, distinct scenarios are developed for each fixed or transient ignition and not all CSR fires lead to use of the Auxiliary Safe Shutdown Panel.

The same variant plant scenarios are used for the compliant plant risk evaluation. A similar process to that described above is applied to determining if abandonment is required in the compliant plant. In general, abandonment is not required in the compliant plant. An exception to this is during a severe fire (whole room burn) scenario which is marked for abandonment.

As elsewhere, all VFDRs are corrected in the compliant plant.

Fire Protection Engineering (FPE) RAI 11:

In its letter dated April 13, 2015, the licensee identified a plant condition that was not in compliance with NFPA 805 Section 3.3.1.2(1). In accordance with 10 CFR 50.48(c)(2)(vii), the licensee submitted new Approval Request 7 as part of the amended pages to the LAR, Attachment L, to request NRC approval of a performance-based method to comply with NFPA 805 Section 3.3.1.2(1). This section requires that wood used within the power block be listed as pressure-impregnated or coated with a listed fire-retardant application.

The licensee requested the ability to store and use wood in designated fenced-in storage areas in Room 1101 (12' North Storage Area) and Room 1109 (Warehouse) in Fire Area TB/NSB/ACA.

Additionally, it states in 10 CFR 50.48(c)(2)(vii), in part, that performance-based methods that are used to evaluate fire protection program (FPP) elements and minimum design requirements of NFPA 805 Chapter 3, must meet certain criteria. It must be determined that the method:

(A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;

(B) Maintains safety margins; and

(C) Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

The NRC staff requests the following information to evaluate the approval request:

a. *The approval request states that the storage areas contain various types and quantities of combustible storage, including but not limited to rack storage, and that limits on the quantities of storage are administratively established by the fire protection engineer through the use of the Combustible Loading Analysis Database.*

   i. *Characterize the type, quantities, and use of wood and other combustible storage in Rooms 1101 and 1109, and include the relative contribution to combustible loading of the non-treated wood compared to other combustible materials in these rooms.*

   ii. *Describe the specific limits and associated administrative controls on the amount of non-treated wood that can be stored in each of the fence-in storage areas in Rooms 1101 and 1109 (in-situ or transient).*

b. *The approval request states that the likelihood of a fire in Rooms 1101 and 1109, is expected to be minimal due to the limited number of fixed ignition sources in the rooms and procedural controls on hot work and transient combustible materials. Describe the types of fixed ignition sources in, or near, the fenced-in storage areas, and the exposure fire hazards that could propagate to the fenced-in storage and potentially ignite the stored materials.*

c. *The approval request states that in the event of a fire in the storage areas, wet pipe automatic suppression is provided in the areas above the storage which has been reviewed for compliance with NFPA 13. Summarize the technical basis for concluding that the sprinkler design is acceptable for the hazard associated with 12-foot rack storage of wood and other combustibles that substantiates the statement that the loading will not challenge that wet pipe sprinkler system, assuming the storage areas contain the maximum allowed quantity of non-treated wood and other combustibles.*

d. *Discuss the bases for not needing the installation of an automatic smoke detection system to provide early warning of a fire in the fenced-in storage areas, assuming the storage areas contain the maximum allowed quantity of non-treated wood and other combustibles. Describe the additional fire protection available in the area of the storage rooms that supports defense-in-depth (e.g., hose stations and extinguishers).*

e. *Element 1 (Echelon 1) of defense-in-depth, as described in NFPA 805, Section 1.2, is associated with fire prevention, which includes controlling the elements of fuels (i.e., combustibles) and ignition that are necessary for fire to occur. In Approval Request 7, the discussion of Element 1 of defense-in-depth only addresses ignition sources. Provide additional discussion of how the storage and use of untreated wood in Rooms 1101 and 1109 meets or has compensated for Element 1 of defense-in-depth relative to control of combustibles.*

CCNPP Response to NRC FPE RAI 11:

a.i. The storage in Rooms 1101 and 1109 consists of solid metal shelving (less than 12 feet high), metal single row open storage single and double row racks with less than 12 feet of storage located on the racks, and materials stored on the floor. The metal open storage racks are separated from each other by a minimum distance of 8 feet. The areas contain ordinary combustibles and can be classified as Ordinary Hazard (Group 2) occupancies with Type II Storage, as defined by NFPA 13, 1971 edition (code of record). The areas are not used as storage areas for wood; instead, wood is incidental to the storage areas. The wood in the areas consists of pallets, cable reels, shipment containers, and small hand tools. The storage in the areas consists of plant supplies including both metal and plastic tools, equipment, and supplies.

The code of record does not contain detailed commodity classifications; therefore, the current (2013) edition of NFPA 13 was used to classify the commodities in the area for the purposes of this approval request. The commodities stored on the single and double row open storage racks and solid metal shelving can be primarily classified as Class I through Class IV commodities. There are minor amounts (10 or fewer distributed, non-adjacent pallets, as allowed by NFPA 13, 2013 edition) of higher hazard commodities (i.e., Group A plastics). Stacks of idle wood pallets are not stored in the area. It is estimated that untreated wood does not exceed 20% of total fire loading of the storage. The total fire load of Room 1101 is approximately 2.2 Billion BTUs, resulting in a fire severity of approximately 2 hours. The total fire load of Room 1109 is approximately 1.3 Billion BTUs, resulting in a fire severity of approximately 2 hours.

a.ii. Administrative controls in these areas include procedural controls on transient combustibles and proceduralized inspections of the area. The Combustible Loading Analysis Database (CLAD) tracks the quantities of combustibles that are present in the areas. The proceduralized inspections of the area will ensure that the storage in the requested areas (including the wood in these areas) does not exceed the design capabilities of the sprinkler system protecting Rooms 1101 and 1109. The technical basis for concluding that storage configurations will not exceed the design capability of the sprinkler system is discussed in subpart (c), below. Implementation Item IMP-21 has been created to ensure that proceduralized inspections of the area will verify that the storage configurations will not exceed the design capability of the sprinkler system protecting Rooms 1101 and 1109 and that non-treated wood will not exceed 20% of the total fire loading of the storage.

b. Fixed ignition sources in, or near, the fenced-in storage areas consist of small wall-mounted transformers, forklift battery chargers, small wall-mounted panels, junction boxes, and electrical cables. The ignition sources are located such that there is no continuous path of fixed intervening combustibles present that could be expected to facilitate fire propagation from a fixed ignition source to potentially ignite the stored materials. Administrative controls ensure that adequate clearance, free of combustible material, is maintained around energized electrical equipment. Additionally, existing processes ensure that administrative controls are being followed in these areas. This provides reasonable assurance that transient combustibles will not provide a pathway for potential fire spread from a fixed ignition source to the stored materials.

c. Section 3.9.1 of NFPA 805 requires that automatic or manual water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall

be installed in accordance with NFPA 13. National Fire Protection Association 13, "Installation of Sprinkler Systems," 1971 edition, is the code of record to which the sprinkler system protecting Room 1101 and Room 1109 was designed. The system was designed as an Ordinary Hazard pipe schedule system with a coverage area of 100 square feet per sprinkler. The water supply is required to provide a flow of 1500 gpm with a minimum residual pressure of 15 psi at the ceiling. The system, including the water supply requirements, were reviewed for compliance with NFPA 13, 1971 edition, as part of the NFPA 805 transition project and determined to comply with all the primary functional requirements of the standard. Per NFPA 13, 1971 edition, this configuration is sufficient to protect miscellaneous storage up to 12 feet, as discussed below. Storage is required to be limited to 12 feet because if storage exceeded this height, additional high-piled storage requirements would be invoked per Section 4045 of NFPA 13, 1971 edition. Details regarding compliance with NFPA 13, 1971 edition are discussed in the following paragraphs:

Section 1321 of NFPA 13, 1971 edition, lists "general warehouses and storage areas" as an example of ordinary hazard occupancies. Section 2126 further classifies the warehouse facility as "Ordinary Hazard (Group 2). This group is defined as the group of the Ordinary Hazard class that has properties "where combustibility of contents and ceiling heights are generally less favorable than those listed in Group No. 1, but there are only minor amounts of flammable liquids and essentially no obstructions." An example given in NFPA 13, 1971 edition, is "storage buildings (having low factors of combustibility and obstruction)." This classification is consistent with the storage configurations in Room 1101 and 1109 at CCNPP.

Section 3 of Appendix A to NFPA 13, 1971 edition, defines ordinary combustibles as "commodities, packaging, or storage aids which have heats of combustion (British thermal units per pound) similar to wood, cloth or paper and which produce fires that may normally be extinguished by the quenching and cooling effect of water." The storage in Rooms 1101 and 1109 is primarily ordinary combustibles.

In order for a system to perform as designed, the maximum allowable system area is limited by NFPA 13. Section 12 of Appendix A to NFPA 13, 1971 edition, defines Type II Storage as storage in which "combustible commodities or noncombustible commodities involving combustible packaging or storage aids stored not over 15 feet high in solid piles or not over 12 feet high in piles that contain horizontal channels." This section further states that, "minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification." Storage in Rooms 1101 and 1109 meets the definition of Type II Storage. Section 3022 of NFPA 13, 1971 edition, limits the maximum system area to 52,000 square feet for Ordinary Hazard and Type II Storage. The system at CCNPP covers a floor area of approximately 28,000 square feet; therefore, it is well within the allowable size limitations.

As the code of record does not contain detailed commodity classification requirements or guidelines and due to the increased prevalence of plastic in modern products compared to 1971, the area/density requirements for the storage configuration were reviewed against the current (2013) edition of NFPA 13. It was determined that the existing storage configuration resembles Class IV commodities and the sprinkler protection requirements are similar to those met by the installed sprinkler system. The current sprinkler system is

adequate for the hazards present as long as the following bases for acceptability are maintained:

i. The height of storage (measured from floor to top of commodity) does not exceed 12 feet.

ii. Commodities stored on racks and shelves can be classified as Class I, Class II, Class III, or Class IV commodities as defined in Section 5.6 of NFPA 13, 2013 edition.
   - Exception: minor quantities of more severe commodities (e.g., Group A plastics) will be allowed as permitted by Section 5.3.1.2.3 of NFPA 13, 2013 edition (limited to 10 distributed and non-adjacent pallets).

iii. Current rack spacing is maintained (i.e., minimum of 8 foot spacing between storage racks).

iv. There are no stacks of idle wood pallets present (Section 12.12.1.2 of NFPA 13, 2013 edition).

Proceduralized inspections of the area will ensure that the aforementioned bases for the acceptability of storage in Rooms 1101 and 1109 are maintained (refer to Implementation Item IMP 21). Should the sprinkler system be upgraded in the future, the bases for acceptability, listed above (storage height, acceptable commodities, rack spacing), may be revised consistent with the hazards/storage configurations allowed by NFPA 13 in the code of record in force at the time the upgraded system is designed/installed.

Additionally, the proceduralized inspections of the area will ensure that the following conditions are maintained:

- Non-treated wood does not exceed 20% of the total fire loading of the areas.
- Adequate clearance, free of combustible material, is maintained around energized electrical equipment.
- There are neither fixed ignition sources in, or near, the fenced-in storage areas, nor exposure fire hazards that could propagate to the fenced-in storage and potentially ignite the stored materials.

Based on the administrative controls and storage practices in the subject storage areas, the sprinkler design is acceptable for the associated hazard and reasonable assurance is provided that a fire in the areas will not challenge the wet pipe sprinkler system. Additionally, the fire brigade will respond to a fire in this area and supplement the system with manual hose streams.

d. An automatic smoke detection system is not necessary in these areas because the automatic wet-pipe suppression system is equipped with a flow switch that alarms in the continually-manned Control Room. Control Room operators will dispatch the onsite fire brigade to commence manual firefighting operations. Additional fire protection in the areas includes fixed hose stations and portable fire extinguishers. These additional fire protection features support defense-in-depth (Echelon 2). Additionally, although a full room burn of either Room 1101 or Room 1109 is not expected, a deterministic analysis for each of these rooms was completed and demonstrated that for a fire in Room 1101 or 1109 damaging all NSCA targets, the plant would be able to achieve a safe and stable condition with a NSCA success path free of fire damage, without recovery actions.

e. The discussion of Echelon 1 of defense-in-depth in Approval Request 7 has been revised to discuss how controls on combustibles in the areas contribute to the overall fire protection defense-in-depth.

FPE RAI 12:

In its letter dated April 13, 2015, the licensee identified a plant condition that was not in compliance with NFPA 805, Section 3.3.5.2. In accordance with 10 CFR 50.48(c)(2)(vii), the licensee submitted new Approval Request 8 as part of the amended pages to LAR Attachment L to request NRC approval of a performance-based method to comply with NFPA 805, Section 3.3.5.2. This section requires that only metal trays and metal conduits be used for electrical raceways, and that thin wall electrical metallic tubing (EMT) not be used for power, instrumentation, or control cables.

The licensee stated that CCNPP currently uses non-metallic raceways (conduit) in concrete-embedded and underground applications; and that EMT is used to route cables in various locations throughout the plant. The licensee also requested permission to use a performance-based approach to evaluate and self-approve the use of non-metallic conduits that are neither concrete-embedded nor underground.

It states in 10 CFR 50.48(c)(2)(vii), in part, that performance-based methods that are used to evaluate FPP elements and minimum design requirements of NFPA 805, Chapter 3, must meet certain criteria. It must be determined that the method:

(A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;

(B) Maintains safety margins; and

(C) Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

The NRC staff requests the following information to evaluate the approval request:

a. For use of non-metallic raceways (conduits):

i. The approval request states that the use of non-metallic conduit is required by CCNPP drawings/specifications for concrete-embedded and underground installations where metal raceways do not meet design requirements. The approval request further states that new applications of non-metallic conduit are approved and evaluated in accordance with design procedures which include a review of fire protection design requirements. Describe the acceptance criteria that is included in the current design procedures that allow the installation of non-metallic conduit at CCNPP, and clarify whether the current design procedure includes (or will include) criteria that involve: satisfying the nuclear safety and radiological release performance goals, performance objectives and performance criteria; maintaining safety margins; and maintaining fire protection defense-in-depth. Also, identify the implementation item to revise the procedure(s), if needed.

ii. The licensee stated during a June 4, 2015, public meeting that Approval Request 8 will be revised and resubmitted to remove the use of non-metallic raceways (conduit) in applications that are neither embedded in concrete nor buried underground. Confirm that this is correct.

b. For use of electrical metallic tubing (EMT):

i. Provide a technical justification which does not rely on an unendorsed edition of NFPA 805 (i.e., the 2015 edition) or any other unendorsed NFPA code (e.g., NFPA 70).

ii. Confirm that the EMT is not installed in any location subject to physical damage, and describe the criteria by which it will be used to ensure that future EMT installations will not be in locations subject to physical damage.

iii. Provide additional detail regarding the extent of installation of EMT at CCNPP (e.g., a few specific fire areas or throughout the plant). Confirm whether EMT is used for any power, control, or instrument cables associated with Nuclear Safety Capability Assessment components.

iv. The licensee stated that EMT is non-combustible and will not contribute to the fire load, and stated that neither non-EMT nor EMT metallic conduits are credited in the NFPA 805 analyses to prevent or delay damage due to the fire. Confirm that fire damage and circuit failure assumptions for circuits in non-EMT metallic conduit and EMT conduit are the same, or describe the differences.

CCNPP Response to NRC FPE RAI 12:

a.i. The following general design criteria are used when installing non-metallic conduits:

1. Conduit runs placed in concrete encasement are Polystyrene Type I conduit.
2. Conduit runs placed in structural concrete slabs are concrete encased are Polystyrene Type II.
3. Conduits are inspected and checked, before concrete pours, to assure continuity and position.
4. Duct banks are encased with a minimum envelope thickness of 4 inches.
5. Duct banks under roadways are reinforced and installed a minimum of 24 inches below finished grade.
6. Underground conduit slope a minimum of 1/16 inch per foot toward cable pits or between cable pits.
7. Conduit elbows projecting above the floor or below the ceiling are standard rigid steel.
8. Dead-ended duct banks (for the purpose of being extended later) have their duct tiers staggers and adjusted so that each tier extends 18 inches farther out than the tier above it. Conduits are plugged with plastic plugs, dux-seal, or equal.
9. Minimum duct bank conduit sizes are 2 inches. Minimum slab or wall embed conduit size are 1 inch in wall or 2 inches in slabs (except as noted by design).

Procedure LS-AA-128-101 provides criteria that include:

1. Satisfying the nuclear safety and radiological release performance goals, performance objectives and performance criteria;
2. Maintaining safety margins; and
3. Maintaining fire protection defense-in-depth.

a.ii. Approval request #8 has been revised to remove the use of non-metallic raceways (conduit) in applications that are neither embedded in concrete nor buried underground.

b.i. Electrical metallic tubing (EMT) is made from steel and is therefore impact resistant (tough) due to high yield and tensile strengths. Electrical metallic tubing provides a method of routing and supporting cables. Electrical metallic tubing completely encases the enclosed cable and therefore provides protection against damage. Electrical metallic tubing is non-combustible.

Electrical metallic tubing in use at CCNPP has the following properties (other larger trade sizes may be used):

Diameter (inches)	Trade Size (inches) Outside	Tolerance	Internal Diameter (inches nominal)	Minimum Weight (lbs/ft)	Wall Thickness (inches nominal)
3/4	0.922	+/-0.005	0.824	0.435	0.049
1	1.163	+/-0.005	1.049	0.64	0.057
1 1/2	1.74	+/-0.005	1.61	1.1	0.065
2	2.197	+/-0.005	2.067	1.4	0.065

b.ii. Electrical metallic tubing is not installed in locations subject to severe physical damage. Routine load handling where forklift operations are in close proximity to NSCA cables is the type of location where severe physical damage could occur. General areas throughout the plant are not subject to severe physical damage since routine load handling with forklifts are not allowed.

b.iii. Electrical metallic tubing (as well as rigid metal conduit) is used in all fire areas of the plant at CCNPP and is used to route NSCA cables for power, control, and instrumentation circuits. Electrical metallic tubing has been a basic conduit type since original construction. Its presence has not adversely affected nuclear safety performance criteria, radiological release performance criteria, safety margin, or defense-in-depth.

b.iv. The fire damage and circuit failure assumptions for non-EMT and EMT conduits are the same as other raceway types. Electrical metallic tubing is metallic and will provide an electrical ground path for circuit failures (e.g., an energized conduit could spuriously energize an NSCA circuit); therefore, no credit is given for EMT to prevent or delay fire damage and circuit failures.

Safe Shutdown Analysis (SSA) RAI 11.01:

Safe Shutdown Analysis (SSA) RAI 11 requested information on how the Marinite boards were credited in NFPA 805, Chapter 4. In its response to SSA RAI 11.a (by letter dated April 13, 2015), the licensee stated that the Marinite boards will no longer be credited to provide 20 foot separation in Unit 1 and Unit 2 containments; and that the Marinite boards are credited in the Fire PRA as a "fire break" to prevent fire spread across the east and west portions of Unit 1 and 2 containments. The licensee stated that a minimum of 25 feet of each cable tray (that traverses between containment east to west) is covered (top and bottom) with 1/2-inch Marinite XL and the Marinite boards are banded to the trays with 3/8-inch stainless steel banding, minimum of 12 gauge steel.

It states in NFPA 805, Section 4.1 that once a determination has been made that a fire protection system or feature is required to achieve the performance criteria of Section 1.5, its design and qualification shall meet the applicable requirement of Chapter 3. Based on discussions with the licensee during a public meeting on June 4, 2015, the NRC staff understands that the Marinite boards have been installed and are being credited in a similar manner to metal cable tray top and bottom covers. Describe the Marinite board performance assumptions, as credited in the performance-based analysis for the Marinite board.

CCNPP Response to NRC SSA RAI 11.01:

The Marinite boards have been installed and are being credited in a similar manner to metal cable tray top and bottom covers. The Marinite boards are not credited to prevent fire damage to the cables routed in the cable trays.

The Marinite boards are credited in the FPRA to prevent fire spread and propagation, and to allow the covered sections of the cable trays to be excluded as a secondary combustible. This credit is consistent with the cable tray barrier test findings reported in NUREG/CR-6850, Appendix Q, and the testing results reported in NUREG-0381.

ENCLOSURE 1

Contains markups of the original license amendment package pages and supersedes the previously provided pages

Approval Request 7

NFPA 805 Section 3.3.1.2(1) states:

"Wood used within the power block shall be listed pressure-impregnated or coated with a listed fire-retardant application.

Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated."

The areas at CCNPP listed below contain some quantity of wood that is not in compliance with NFPA 805, Section 3.3.1.2(1). CCNPP requests NRC approval for the ability to store/use wood in the designated portions of the subject rooms as an acceptable variance from the requirements of NFPA 805 Chapter 3. The request is applicable to the designated fenced-in storage areas described below:

- Fire Area TB/NSB/ACA, Room 1101 (12' North Storage Area)
  - Fenced-in storage area between column DD/102.4 and GG/105.5 (approximately 5,500 ft^2).
- Fire Area TB/NSB/ACA. Room 1109 (Warehouse)
  - Fenced-in storage area between column DD/207.5 and GG/208.5 (approximately 1,900 ft^2).
  - Fenced-in storage area west of the freight elevator to column AA/207.5 (approximately 1,300 ft^2).

Basis for Request:

~~Room 1101 and 1109 are miscellaneous storage areas at CCNPP. These rooms are part of the fire area TB/NSB/ACA which encompasses the 12' and 27/31' elevations of the North Service Building and all elevations of the Turbine Building. . The storage areas contain various types and quantities of combustible storage, including but not limited to rack storage (stored height does not exceed 12'). Limits on quantities of combustibles in these storage areas are administratively established by the fire protection engineer through use of the Combustible Loading Analysis Database.~~

The storage in Rooms 1101 and 1109 consists of solid metal shelving (less than 12 feet high), metal single and double row open storage racks with less than 12 feet of storage located on the racks, and materials stored on the floor. The metal open storage racks are separated from each other by a minimum distance of 8 feet. The areas contain ordinary combustibles and can be classified as Ordinary Hazard (Group 2) occupancies with Type II Storage, as defined by NFPA 13, 1971 edition (code of record). The areas are not used as storage areas for wood; instead, wood is incidental to the storage areas. The wood in the areas consists of pallets, cable reels, shipment containers, and small hand tools. The storage in the areas consists of plant supplies including both metal and plastic tools, equipment, and supplies.

FPE RAI 11

The code of record does not contain detailed commodity classifications; therefore, the current (2013) edition of NFPA 13 was used to classify the commodities in the area for the purposes of this approval request. The commodities stored on the single and double row open storage racks and solid metal shelving can be primarily classified as Class I through Class IV commodities. There are minor amounts (10 or fewer distributed, non-adjacent pallets, as allowed by NFPA 13, 2013 edition) of higher hazard commodities (i.e., Group A plastics). Stacks of idle wood pallets

are not stored in the area. It is estimated that untreated wood does not exceed 20% of total fire loading of the storage. The total fire load of Room 1101 is approximately 2.2 Billion BTUs, resulting in a fire severity of approximately 2 hours. The total fire load of Room 1109 is approximately 1.3 Billion BTUs, resulting in a fire severity of approximately 2 hours.

Administrative controls in these areas include procedural controls on transient combustibles and proceduralized inspections of the area. The Combustible Loading Analysis Database (CLAD) tracks the quantities of combustibles that are present in the areas. The proceduralized inspections of the area will ensure that the storage in the requested areas (including the wood in these areas) do no exceed the design capabilities of the sprinkler system protecting Rooms 1101 and 1109.

Implementation Item IMP-21 has been created to ensure that the proceduralized inspections of the area will verify that the storage configurations will not exceed the design capability of the sprinkler system protecting Rooms 1101 and 1109 and that non-treated wood will not exceed 20% of the total fire loading of the storage. This includes verification of the following:

- The height of storage (measured from floor to top of commodity) does not exceed 12 feet.
- Commodities stored on racks and shelves can be classified as Class I, Class II, Class III, or Class IV commodities as defined in Section 5.6 of NFPA 13, 2013 edition.
    - Exception: minor quantities of more severe commodities (e.g., Group A plastics) will be allowed as permitted by Section 5.3.1.2.3 of NFPA 13, 2013 edition (limited to 10 distributed and non-adjacent pallets).
- Current rack spacing is maintained (i.e., minimum of 8 foot spacing between storage racks).
- There are no stacks of idle wood pallets present (Section 12.12.1.2 of NFPA 13, 2013 edition).
- Non-treated wood does not exceed 20% of the total fire loading of the areas.
- Adequate clearance, free of combustible material, is maintained around energized electrical equipment.
- There are neither fixed ignition sources in, or near, the fenced-in storage areas, nor exposure fire hazards, that could propagate to the fenced-in storage and potentially ignite the stored materials.

FPE RAI 11

The likelihood of a fire in these areas is expected to be minimal due to the limited number of fixed ignition sources in the rooms. Fixed ignition sources in, or near, the fenced-in storage areas consist of small wall-mounted transformers, forklift battery chargers, small wall-mounted panels, junction boxes, and electrical cables. The ignition sources are located such that there is no continuous path of fixed intervening combustibles present that could be expected to facilitate fire propagation from a fixed ignition source to potentially ignite the stored materials. Administrative controls ensure that adequate clearance, free of combustible material, is maintained around energized electrical equipment. Additionally, existing processes ensure that administrative controls are being followed in these areas. This provides reasonable assurance that transient combustibles will not provide a pathway for potential fire spread from a fixed ignition source to the stored materials. ~~and the~~The likelihood of a transient fire is minimized due to procedural controls on hot work and transient combustible material at CCNPP.

FPE RAI 11

In the event of a fire in the storage areas, wet pipe suppression is provided in the areas above the storage which has been reviewed for compliance with NFPA 13, "Standard for the Installation of Sprinkler Systems". The technical justification for compliance with NFPA 13, 1971 edition is as follows:

Section 3.9.1 of NFPA 805 requires that automatic or manual water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be installed in accordance with NFPA 13. NFPA 13, "Installation of Sprinkler Systems," 1971 edition, is the code of record to which the sprinkler system protecting Room 1101 and Room 1109 was designed. The system was designed as an Ordinary Hazard pipe schedule system with a coverage area of 100 square feet per sprinkler. The water supply is required to provide a flow of 1500 gpm with a minimum residual pressure of 15 psi at the ceiling. The system, including the water supply requirements, were reviewed for compliance with NFPA 13, 1971 edition, as part of the NFPA 805 transition project and determined to comply with all the primary functional requirements of the standard. Per NFPA 13, 1971 edition, this configuration is sufficient to protect miscellaneous storage up to 12 feet, as discussed below. Storage is required to be limited to 12 feet because if storage exceeded this height, additional high-piled storage requirements would be invoked per Section 4045 of NFPA 13, 1971 edition. Details regarding compliance with NFPA 13, 1971 edition are discussed in the following paragraphs.

Section 1321 of NFPA 13, 1971 edition, lists "general warehouses and storage areas" as an example of ordinary hazard occupancies. Section 2126 further classifies the warehouse facility as "Ordinary Hazard (Group 2). This group is defined as the group of the Ordinary Hazard class that has properties "where combustibility of contents and ceiling heights are generally less favorable than those listed in Group No. 1, but there are only minor amounts of flammable liquids and essentially no obstructions." An example given in NFPA 13, 1971 edition, is "storage buildings (having low factors of combustibility and obstruction)." This classification is consistent with the storage configurations in Room 1101 and 1109 at CCNPP.

FPE RAI 11

Section 3 of Appendix A to NFPA 13, 1971 edition, defines ordinary combustibles as "commodities, packaging, or storage aids which have heats of combustion (British thermal units per pound) similar to wood, cloth or paper and which produce fires that may normally be extinguished by the quenching and cooling effect of water." The storage in Rooms 1101 and 1109 is primarily ordinary combustibles.

In order for a system to perform as designed, the maximum allowable system area is limited by NFPA 13. Section 12 of Appendix A to NFPA 13, 1971 edition, defines Type II Storage as storage in which "combustible commodities or noncombustible commodities involving combustible packaging or storage aids stored not over 15 feet high in solid piles or not over 12 feet high in piles that contain horizontal channels." This section further states that "minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification." Storage in Rooms 1101 and 1109 meets the definition of Type II Storage. Section 3022 of NFPA 13, 1971 edition, limits the maximum system area to 52,000 square feet for Ordinary Hazard and Type II Storage. The system at CCNPP covers a floor area of approximately 28,000 square feet; therefore, it is well within the allowable size limitations.

As the code of record does not contain detailed commodity classification requirements or guidelines and due to the increased prevalence of plastic in modern products compared to 1971, the area/density requirements for the storage configuration were reviewed against the current (2013) edition of NFPA 13. It was determined that the existing storage configuration resembles Class IV commodities and the sprinkler protection requirements are similar to those met by the installed sprinkler system. The current sprinkler system is adequate for the hazards present as long as the following bases for acceptability are maintained:

- The height of storage (measured from floor to top of commodity) does not exceed 12

feet.

- Commodities stored on racks and shelves can be classified as Class I, Class II, Class III, or Class IV commodities as defined in Section 5.6 of NFPA 13, 2013 edition.
    - Exception: minor quantities of more severe commodities (e.g., Group A plastics) will be allowed as permitted by Section 5.3.1.2.3 of NFPA 13, 2013 edition (limited to 10 distributed and non-adjacent pallets).
- Current rack spacing is maintained (i.e., minimum of 8 foot spacing between storage racks.
- There are no stacks of idle wood pallets present.

Should the sprinkler system be upgraded in the future, the bases for acceptability, listed above above (storage height, acceptable commodities, rack spacing), may be revised consistent with the hazards/storage configurations allowed by NFPA 13 in the code of record in force at the time the upgraded system is designed/installed.

FPE RAI 11

A separate automatic smoke detection system is not necessary in these areas because the automatic wet-pipe suppression system is expected to control the fire and is equipped with ~~Actuation of~~ a water flow switch that results in a fire alarm signal being transmitted to the continually-manned Control Room. Control Room operators will dispatch CCNPP's onsite fire brigade to extinguish the fire. Additional fire protection in the area includes fixed hose stations and portable fire extinguishers. These additional fire protection features support defense-in-depth.

There are cable trays located near the ceiling of each room, approximately 24 feet above the floor and 13 feet above the maximum height of storage. There is also a series of cable risers at column FF/102.4 in Room 1101. Although a full room burn of either Room 1101 or Room 1109 is not expected, a deterministic analysis for each of these rooms was completed. Room 1109 does not contain any Nuclear Safety Capability Assessment (NSCA) targets. The deterministic analysis of Room 1101 concluded the following:

- Backup Control Room/Cable Spreading Room Ventilation and Cooling System is impacted; however, CR/CSR HVAC remains available from redundant systems.
- Offsite power is impacted; however, power remains available to credited 4kV buses from EDGs.
- Non-safety buses are impacted; however, power remains available to credited 4kV buses.
- Steam isolations downstream of the MSIVs are impacted for both units; however, the MSIVs remain available for both units to provide SG isolation.

Based on the above discussion, the deterministic analysis demonstrated that for a fire in Room 1101 or 1109 damaging all NSCA targets, the plant would be able to achieve a safe and stable condition with a NSCA success path free of fire damage. Due to the presence of automatic suppression, manual suppression by ~~and~~ the CCNPP onsite fire brigade, and the large room volume that precludes compartment flashover, the fire is not expected to spread to adjacent rooms. Fire Area TB/NSB/ACA is separated from adjacent fire areas by fire barriers.

FPE RAI 11

Administrative procedures prohibit wood within all other portions of power block structures at CCNPP.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:

Although the storage of wood in the subject fenced-in areas of Room 1101 and 1109 does not comply with section 3.3.1.2(1) of NFPA 805, it will not result in a fire that will compromise the nuclear safety performance criteria of NFPA 805. Deterministic analysis has demonstrated for a fire in Room 1101 or 1109 that the plant would be able to achieve a safe and stable condition with a Nuclear Safety Capability Assessment (NSCA) success path free of fire damage.

The storage of wood in the subject fenced-in portion of Room 1101 and 1109 has no impact on the radiological release performance criteria. The radiological release performance criteria are satisfied based on the determination of limiting radioactive release (Attachment E), which is not affected by the storage of wood within the subject areas.

Safety Margin and Defense-in-Depth:

The storage of wood to a height less than 12 feet in the subject fenced-in portions of Room 1101 and 1109 is within the design capabilities of the NFPA 13 wet pipe sprinkler system and a fire will not impact nuclear safety or radioactive release performance criteria; therefore, the safety margin inherent in the analysis for the fire event has been preserved.

The three echelons of defense-in-depth are:

(1) To prevent fires from starting (combustible/hot work controls)

(2) Rapidly detect, control and extinguish fires that do occur, thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans)

(3) Provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, recovery actions)

Per NFPA 805 Section 1.2, defense-in-depth is achieved when an adequate balance of each of these elements are provided.

Echelon 1 is met by the presence of hot work controls ~~and~~, the limited number of fixed ignition sources in or near the fenced-in areas, and administrative controls that ensure that the types and quantities of storage in the subject areas do not exceed the design capabilities of the installed suppression system. Echelon 2 is met by the installed automatic wet pipe sprinkler system and the CCNPP on-site fire brigade. Echelon 3 is met through the fire barriers separating Fire Area TB/NSB/ACA from adjacent fire areas as well as a success path remaining free of fire damage even if all cables located within each room are failed due to fire. Since a balance of the ~~elements~~ echelons is provided, defense-in-depth is achieved.

FPE RAI 11

Conclusion:

NRC approval is requested for the ability to store/use limited quantities of wood in the designated portions of Room 1101 and 1109, contrary to the requirements of Section 3.3.1.2(1) of NFPA 805, 2001 Edition. Based on the analysis above, the level of risk encountered by maintaining this current practice is acceptable, and the approach is considered acceptable because it:

(A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;

(B) Maintains safety margins; and

(C) Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire nuclear safety capability).

Approval Request 8

NFPA 805 (2001) Section 3.3.5.2 states:

> *"Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components."*

This approval request is applicable to the following elements of Section 3.3.5.2:

1. **Non-metallic Raceways (Conduit):** This section requires that only metal tray and metal conduits shall be used for electrical raceways. CCNPP currently uses non-metallic raceways (conduit) in concrete-embedded and underground applications.
2. **Thin Wall Metallic Tubing (EMT):** This section requires that thin-wall metallic tubing, or electrical metallic tubing (EMT), shall not be used for power, instrumentation, or control cables. CCNPP currently uses exposed EMT to route cables in various locations throughout the plant.

Basis for Request:

Non-metallic Raceways (Conduit):

The use of non-metallic conduit is required by CCNPP drawing/specifications (61406SEC105.3SH0001) for concrete-embedded and underground installations. ~~where metal raceways do not meet design requirements~~. These design applications are required where: FPE RAI 12

- corrosive conditions exist (water, chemicals, etc.) and metal conduits are subject to failure; and
- non-metallic conduit is not relied upon for grounding

Non-metallic conduits are required to be suitable for their intended use. New applications of non-metallic conduit are approved and evaluated in accordance with design procedures which include a review of fire protection program design requirements.

Non-metallic conduit designs rely on the concrete in which they are embedded and/or the ground in which they are buried to prevent:

- the failure of credited internal circuits due to an external fire; or
- the failure of credited external circuits due to an internal fire

Non-metallic conduits are not credited to be fire resistance in the NFPA-805 analysis. Non-metallic conduits are combustible; however, due to the installed locations (underground, concrete-embedded) the combustible material associated with these conduits will not contribute to fire loading. ~~Furthermore, the current edition of NFPA 805 (2015) only prohibits non-metallic conduits in exposed electrical raceways. The use of non-metallic conduit in concrete-embedded or underground configurations is no longer prohibited.~~ FPE RAI 12

~~CCNPP requests permission to use the following performance-based approach to evaluate and self-approve the use of non-metallic conduits that are neither concrete-embedded nor underground.~~

~~The conditions for approval are:~~

1. ~~Environmental conditions preclude the use of metallic conduit (e.g., corrosive environments).~~

2. ~~The use of non-metallic conduit is evaluated by a qualified fire protection engineer, as defined in Generic Letter 82-21, "the fire protection engineers (or engineering consultant) should have the qualifications for membership in the Society of Fire Protection Engineers at the grade of member."~~

3. ~~The evaluation shall conclude that the configuration of non-metallic conduit:~~

   a. ~~Is adequate for the fire hazards in the area based on a review of the hazards, fire protection systems and features, and administrative controls;~~

   b. ~~Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;~~

   c. ~~Maintains safety margin; and~~

   d. ~~Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).~~

FPE RAI 12

Thin Wall Metallic Tubing (EMT)

Article 358.10(A) of NFPA 70, National Electric Code (NEC), 2014 Edition, states, "The use of EMT shall be permitted for both exposed and concealed work." Section 3.3.5.2 of NFPA 805 was revised for consistency with NFPA 70 to remove the sentence regarding thin wall metallic tubing (reference NFPA Report on Proposals for revision to NFPA 805, 2001 Edition). ~~This change has been retained by the current edition of NFPA 805 (2015). The revised section (now Section 5.3.8.2 in the 2015 edition) states:~~

~~*"Only metal tray and metal conduits shall be used for exposed electrical raceways."*~~

~~The change to this code was made by the NFPA Technical Committee on Fire Protection for Nuclear Facilities. This committee is made up of experts representing varied viewpoints and interests concerning nuclear facility fire protection, through a consensus standards development process.~~

FPE RAI 12

The basis for this approval request is:

- ~~The NFPA 805 (2015) edition, Section 5.3.8.2, allows the use of EMT.~~
- EMT is non-combustible.
- ~~The NEC permits the use of EMT in applications where it is not subject to severe physical damage.~~
- EMT has been installed at CCNPP since its original construction, in accordance with plant specifications/drawings, which allow for the use of EMT.
- EMT has been installed at CCNPP under design and fire protection program procedures such that technical requirements are properly met for the intended use.

Acceptance Criteria Evaluation:

Nuclear Safety and Radioactive Release Performance Criteria:

Non-metallic Raceways (Conduit)

The use of non-metallic conduit does not adversely affect nuclear safety since the materials in which the conduits are run (concrete and earth) effectively render the non-metallic conduit non-combustible. New installations of non-metallic conduit are evaluated in accordance with design and fire protection program procedures.

The use of non-metallic conduit in concrete-embedded and underground locations has no impact on the radioactive release performance criteria. The radioactive release review was performed based on the potential location of radiological concerns and is not dependent on the type of conduit material. The use of non-metallic conduit in concrete-embedded and underground locations does not add additional radiological materials or challenge the integrity of plant boundaries.

Thin Wall Metallic Tubing

The use of EMT in the plant does not have an adverse effect on nuclear safety. EMT is noncombustible and will not contribute to fire load. Neither non-EMT nor EMT metallic conduits are credited in NFPA 805 analyses to prevent or delay damage due to fire. Therefore, the use of EMT does not impact the nuclear safety performance criteria.

The use of EMT has no impact on the radioactive release performance criteria. The radioactive release review was performed based on the potential location of radiological concerns and is not dependent on the construction of metallic conduits. The use of EMT does not add additional radiological materials or challenge the integrity of plant boundaries.

Safety Margin and Defense-in-Depth:

Non-Metallic Raceways (Conduits)

The use of non-metallic conduit will not adversely impact the ability to meet the NFPA 805 nuclear safety or radioactive release performance criteria. While non-metallic conduit is combustible, it is embedded or buried in non-combustible materials. The use of these materials has been defined by the limitations of the analytical methods used in the development of the Fire PRA. Therefore, the inherent safety margin and conservatisms in these methods remain unchanged. The three echelons of defense-in-depth are:

1) to prevent fires from starting (combustible/hot work controls),
2) to rapidly detect, control, and extinguish fires that do occur, thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans), and
3) to provide an adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire-rated cable, success path remains free of fire damage, recovery actions).

Per NFPA 805 (2001)Section 1.2, defense-in-depth is achieved when an adequate balance of each of these elements is provided.

Echelon 1: Non-metallic conduit is installed in concrete-embedded and underground locations. A fire occurring in one of the cables will not spread to impact adjacent fire areas due to combustible non-metallic conduit because the conduits are embedded in, or buried under, non-combustible materials.

Echelon 2: Areas adjacent to those containing non-metallic conduit are protected by manual fire suppression functions, such as portable extinguishers and hose reel stations that are available for manual firefighting activities by the site fire brigade, to assure that if a fire was to occur that damage from the fire would be limited.

Echelon 3: The use of non-metallic conduit does not result in compromising automatic fire suppression functions, manual fire suppression functions, or the ability to maintain a success path free of fire damage.

Therefore, the use of non-metallic conduit in concrete-embedded or underground installations does not affect the balance of echelons, 1, 2, or 3 and fire protection defense-in-depth is maintained.

Thin Wall Metallic tubing

The use of EMT will not adversely impact the ability to meet the NFPA 805 nuclear safety or radioactive release performance criteria. EMT is noncombustible due to its metallic construction and its use is allowed by the NEC. Therefore, the safety margin inherent in the analysis for the fire event has been preserved.

The three echelons of defense-in-depth are:

1) to prevent fires from starting (combustible/hot work controls),
2) to rapidly detect, control, and extinguish fires that do occur, thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans), and
3) to provide an adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire-rated cable, success path remains free of fire damage, recovery actions).

Per NFPA 805 (2001) Section 1.2, defense-in-depth is achieved when an adequate balance of each of these elements is provided.

Echelon 1: Administrative hot work controls and transient combustible controls are present in the areas where EMT is routed. The use of EMT is permitted by the NEC when installed in areas not subject to severe physical damage. The use of EMT will not result in additional cables being considered ignition sources.

Echelon 2: Areas where EMT is used are protected by manual fire suppression functions, such as portable extinguishers and hose reel stations that are available for manual firefighting activities by the site fire brigade, to assure that if a fire was to occur that damage from the fire would be limited.

Echelon 3: The use of EMT does not result in compromising automatic fire suppression functions, manual fire suppression function, or the ability to maintain a success path free of fire damage.

Therefore, the use of EMT does not affect the balance of echelons, 1, 2, or 3 and fire protection defense-in-depth is maintained.

Conclusion:

NRC approval is requested for the use of non-metallic conduit in concrete-embedded or underground installations; and for the use of thin-walled metallic conduit (EMT) in existing and future applications. ~~The request also includes the ability to use the performance-based approach described herein to evaluate the use of non-metallic conduits that are neither concrete-embedded nor underground.~~ The ~~performance-based~~ methods used for this analysis provide an equivalent level of fire protection to NFPA 805 (2001) Section 3.3.5.2 and:

FPE RAI 12

- Satisfy the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radioactive release;
- Maintain safety margins; and
- Maintain fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).