Entergy

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PNP 2013-075

September 30, 2013

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

SUBJECT: Response to Request for Additional Information – License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactors

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

References:
1. ENO letter, PNP 2012-106, "License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactors," dated December 12, 2012 (ADAMS Accession Number ML112348A455)
2. ENO letter, PNP 2013-013, "Response to Clarification Request — License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactors," dated February 21, 2013 (ADAMS Accession Number ML13079A090)
3. NRC electronic mail of August 8, 2013, "Palisades - Requests for Additional Information Regarding Transition to the Fire Protection Program to NFPA Standard 805 (TAC No. MF0382)" (ADAMS Accession Number ML13220B131)

Dear Sir or Madam:

In Reference 1, Entergy Nuclear Operations, Inc. (ENO) submitted a license amendment request to adopt the NFPA 805 performance-based standard for fire protection for light water reactors. In Reference 2, ENO responded to a clarification request. In Reference 3, ENO received electronic Request for Additional Information (RAIs).

Attachment 1 provides the ENO responses to the 60-day RAIs, as follows:

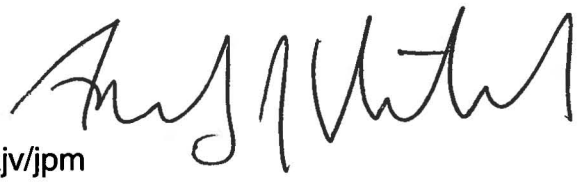
Requests for Additional Information	Response Time	Response Date
FPE RAI 01, 02, 03, 04, 05 ,06, 07 SSA RAI 01, 02, 03, 04, 06, 08, 09, 10 Programmatic RAI 01, 02, 03, 04 RR RAI 01, 02, 03, 04, 05 FM RAI 05 PRA RAI 10, 11	60 Days	October 1, 2013

A copy of this response has been provided to the designated representative of the State of Michigan.

This letter contains no new or revised commitments.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 30, 2013.

Sincerely,



ajv/jpm

Attachments: 1. Response to Request for Additional Information Regarding Licensing Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactors

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC
State of Michigan

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT NFPA 805 PERFORMANCE-BASED STANDARD FOR FIRE PROTECTION FOR LIGHT WATER REACTORS

Electronic RAIs were received from the Nuclear Regulatory Commission (NRC) on August 8, 2013. The Entergy Nuclear Operations, Inc. (ENO) responses to the 60-Day RAIs are provided below.

The ENO documents referenced in the RAI responses below are provided in the Palisades NFPA 805 LAR References Portal under the 60-Day RAI Response Reference Folder.

NRC Request

Fire Protection Engineering (FPE) RAI 01

License Amendment Request (LAR) Attachment A, Table B-1 Section 3.3.1.2(1) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12348A455) states that approval is requested for the use of non-pressure impregnated or fire retardant wood used within the power block. LAR Attachment L, Approval Request #2 states that the administrative procedure used to control combustibles will be revised to place stricter requirements on areas that are deemed risk significant, but does not detail these requirements. In addition, the approval request appears to indicate that permanent untreated wood can be installed as long as it is addressed by the combustible loading calculation. Describe the additional administrative controls and any compensatory measures that are intended to be put in place when using untreated wood in the power block. Include a description of the controls that will prevent the permanent installation of untreated wood.

ENO Response

Fire Protection Engineering (FPE) RAI 01

Currently, there are a few limited cases of permanently installed non-treated wood accounted for in EA-FPP-03-001. The bounding combustible load per Fire Area is calculated in EA-FPP-03-001. Currently and going forward, modifications to the plant that impact fire protection go through the EN-DC-128 procedure process. Changes impacting fire protection, such as changes to combustible loading, require approval by qualified fire protection personnel.

Procedure EN-DC-161, states the administrative requirements for transient combustible controls. Attachment 9.5 outlines the Combustible Control Levels for specific areas at Palisades Nuclear Plant (PNP). In general, Combustible Control Levels are assigned by fire area; however, there are a few cases where large areas were subdivided. The areas of concern, based upon risk and fire protection insights, have more restrictive transient

combustible controls. Four Combustible Control Levels are described in EN-DC-161, Level 1 being the most restrictive. A Level 1 Area is a fire sensitive area where transient combustible loading is prohibited unless evaluated and approved via a Transient Combustible Evaluation (TCE) contained in EN-DC-161. A Level 2 area permits combustibles, but only with strict controls and a Level 3 area permits combustibles; however, a Level 3 area will have fewer restrictions than a Level 2 area. A Level 4 area follows the site ADMIN 1.01 procedure requirements and applicable insurance guidelines. Untreated wood is considered an ordinary combustible and each Combustible Control Level has a threshold for ordinary combustible limits prior to the need of a TCE. Fire retardant wood is also restricted based on the Combustible Control Level. An evaluation is required as part of the approval for a TCE. The evaluation section of the TCE offers some suggested compensatory measures to consider including no hot work/ignition sources within 35', fire watch (hourly or continuous), and metal storage container. PNP Fire Protection Implementing Procedure FPIP-7 outlines the requirements for permanently installed materials. FPIP-7 states that combustible materials should be kept to a minimum by using non-combustibles, whenever practical, at PNP.

To monitor and help ensure procedure requirements are being met, Fire Protection inspections are completed monthly and documented per the EN-AD-103 procedure process.

REFERENCES

- EN-AD-103, "Document Control and Records Management Programs", Revision 14
- EN-DC-128, "Fire Protection Impact Review", Revision 6
- EN-DC-161, "Control of Combustibles", Revision 8
- ADMIN 1.01, "Materiel Condition Standards and Housekeeping Responsibilities", Revision 27
- FPIP-7, "Fire Prevention Activities", Revision 21
- EA-FPP-03-001, "Analysis of Combustible Loading at Palisades Nuclear Plant", Revision 3

NRC Request

FPE RAI 02

The compliance basis for LAR Attachment A, Table B-1, Section 3.3.1.2 (4), states that "ENO procedure EN-DC-161, section 5.6, sets forth limits on the types and quantities of stored combustible materials with the applicable Combustible Control Zones defined in Attachment 9.5." Provide a more detailed description of those limits on type and quantities as applied to Combustible Control Zones.

ENO Response

FPE RAI 02

ENO procedure EN-DC-161 states the administrative requirements for transient combustible controls. Attachment 9.5 outlines the Combustible Control Levels for specific fire areas at PNP. Combustible Control Levels are assigned by fire area or subdivided for larger areas. The four Combustible Control Levels described in EN-DC-161 are:

a. Level 1 Area – a fire sensitive area of a plant where transient combustible loading is prohibited unless evaluated and approved using controls within EN-DC-161.

b. Level 2 Area – a plant area where combustibles are permitted, but only with strict combustible controls.

c. Level 3 Area – a plant area where formal combustible controls are in place, but to a lesser extent than a level 2 area.

d. Level 4 Area – an area where there are no formal combustible controls. Standard industrial housekeeping practices are sufficient to control fire hazards due to combustible materials.

The types of combustible materials are broken down into four categories with general requirements for handling as stated in EN-DC-161, including maximum amounts of combustibles based on a specific combustible control area. The categories are:

a. Class “A” Combustible – any ordinary combustible material such as wood, cloth, paper, rubber, and many plastics.

b. Combustible Liquid – a liquid having a flash point at or above 100 °F. NFPA 704 having a 1 or 2 fire hazard rating.

c. Flammable Liquid – a liquid having a flash point below 100 °F and a vapor pressure not exceeding 40 pounds per square inch atmospheric at 100 °F. NFPA 704 having a 3 or 4 fire hazard rating.

d. Flammable Gas – any gas which will ignite and burn.

Procedure EN-DC-161, Attachment 9.5 details the specific plant areas and their individual Combustible Control Levels

For non-transient combustible of any type, EN-DC-161 states the combustibles are considered permanent and the addition shall require processing under ENO’s modification process as stated in the procedure Purpose section; “Installation of long-term storage of combustible material is controlled through the design change process via EN-DC-115 and is not controlled by this procedure.”

This RAI response supersedes the previously submitted PNP LAR Attachment A, Table B-1, Section 3.3.1.2 (4) response and documents the changed compliance from "Complies with Clarification" to "Complies"

REFERENCES

- EN-DC-115, "Engineering Change Process", Revision 15
- EN-DC-161,"Control of Combustibles", Revision 8

NRC Request

FPE RAI 03

The compliance statement for LAR Attachment A, Table B-1, Section 3.3.6 is "complies with clarification". National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants" (NFPA 805), Section 3.3.6, requires metal roof coverings be Class A as determined by tests described in NFPA Standard 256, "Standard Methods of Fire Tests of Roof Coverings". The compliance basis states that since the testing requirements are more stringent for a Factory Mutual (FM) Class 1 assembly, it can be substituted for a Class A roof assembly. Provide an evaluation justifying the use of the alternate requirement and include a discussion of how all the requirements of Class A are met.

ENO Response

FPE RAI 03

An equivalency evaluation, PLP-RPT-13-00043 was prepared to justify the acceptability of the roofs installed at PNP and their equivalency to NFPA 256 Class A. This RAI response supersedes the previously submitted PNP LAR Attachment A, Table B-1, Section 3.3.6 response and documents the changed compliance statement from "Complies with Clarification" to "Complies with Use of EEEEs."

REFERENCES

- PLP-RPT-13-00043, "NFPA 805 Roofing Equivalency Evaluation", Revision 0

NRC Request

FPE RAI 04

LAR Attachment A, Table B-1, Section 3.3.8, "Bulk Storage of Flammable and Combustible Liquids", identifies controls in place for storage of flammable and combustible liquids inside structures containing systems, equipment or components important to nuclear safety; but does not address the prohibition of bulk storage of these

liquids in accordance with Section 3.3.8 of NFPA 805. Provide additional information of how this requirement is met.

ENO Response

FPE RAI 04

There is no bulk storage of flammable and/or combustible liquids inside structures containing systems, equipment, or components important to nuclear safety. PNP considers bulk storage to be flammable and/or combustible liquid storage in tanks that are at a staged location and not connected to a system. Flammable and/or combustible liquid storage vessels that are installed as part of a designed system (e.g., day tanks for diesel generators or fire pumps, turbine lube oil tanks) do not constitute bulk storage and are not considered to be under the requirements of Section 3.3.8 of NFPA 805. This is consistent with industry interpretations and clarifications with the NRC during the pilot plant process that led to the withdrawal of Frequently Asked Question (FAQ) 06-0023 in 2007.

It should be noted that bulk storage, as discussed, does not include 55 gallons drums. This is based on an interpretation provided by the NFPA 30 Principal Engineer that bulk storage is a fixed above ground or fixed underground (buried) storage tank of greater than 60 gallon capacity.

REFERENCES

- Frequently Asked Question (FAQ) 06-0023 (ML072700552)
- NFPA 805," Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants", 2001 Edition
- NFPA 30, "Flammable and Combustible Liquids Code", 1966 Edition

NRC Request

FPE RAI 05

NFPA 805, Section 3.4.1(c) specifically requires the fire brigade leader and two members to have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria. In Regulatory Guide (RG) 1.189, "Fire Protection for Nuclear Power Plants", Rev. 2, the staff has acknowledged the following example for the fire brigade leader as sufficient : "The brigade leader and at least two brigade members should have sufficient training in or knowledge of plant systems to understand the effects of fire and fire suppressants on safe-shutdown capability. The brigade leader should be competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant systems."

LAR Attachment A, Table B-1, Section 3.4.1(c) indicates compliance with this requirement. The compliance basis does not specify the details of this training and knowledge.

Describe the requirements of NFPA 805 Section 3.4.1(c) are met with regard to training and qualifications for the brigade leader and at least two of the brigade members.

ENO Response

FPE RAI 05

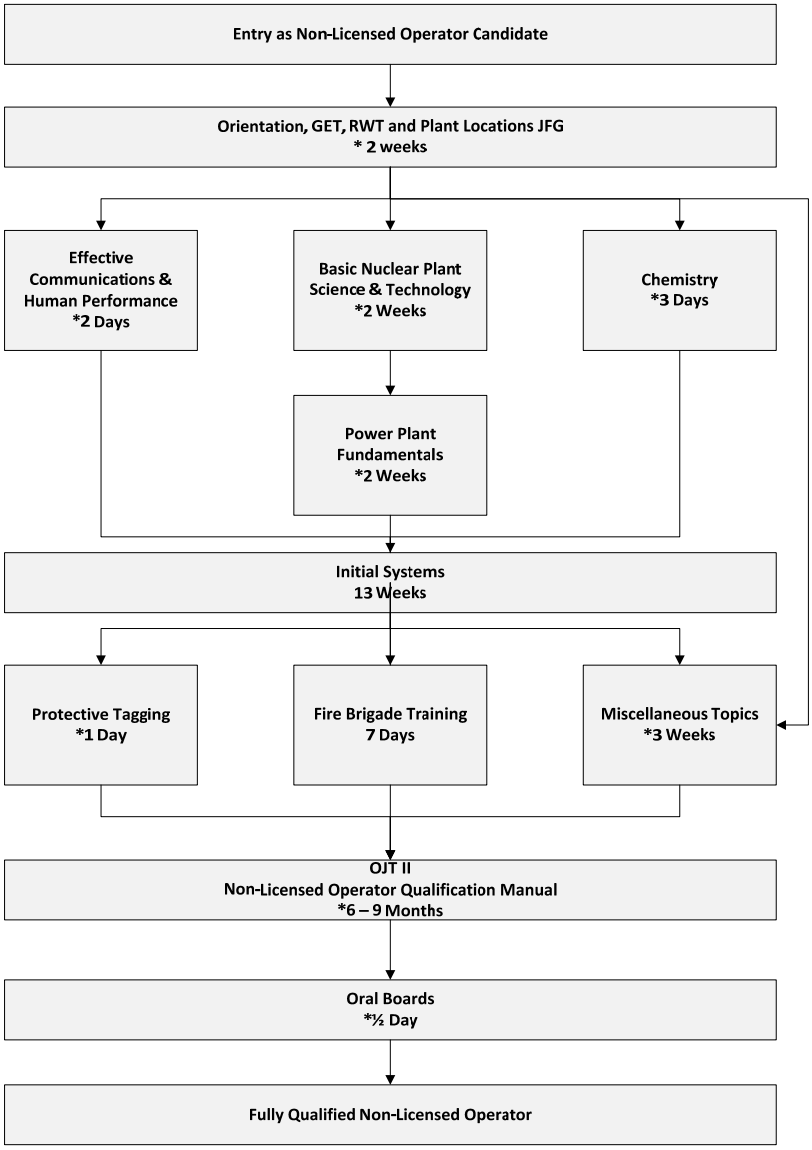
At PNP each fire brigade shift consists of a fire brigade leader and a minimum of four fire brigade members. The fire brigade leader is a qualified Nuclear Plant Operator (NPO) with Plant operating experience/seniority that supports the individual's position as a brigade leader. A minimum of four other fire brigade members are also qualified NPOs. Reference procedure EN-OP-115, Attachment 9.6 for shift staffing requirements. NPOs in training may also be assigned to a shift and function as a brigade member as part of their On the Job Training (OJT) program.

A Nuclear Plant Operator is required to qualify under the Non-Licensed Operator Training program. This training addresses multiple areas of study including; communication, nuclear technology, power plant fundamentals, plant systems, and fire brigade training. In addition to study, the qualification requirements include extensive OJT to reinforce class room skills and establish operating knowledge and skills in such areas as operating equipment, procedure use and control room communications. Details of the NPO training qualification are provided in a site-specific course plan titled "Palisades Non-Licensed Operator Course Plan". This plan is revised as needed to ensure NPO personnel are trained on plant systems and components and are trained to the latest information available to maintain their knowledge and abilities. A flow chart from the course plan of the Non-Licensed Operator Training program is provided in Figure 1.

Once the initial NPO training program has been completed the individual is assigned to an operating shift and enrolled in the Non-Licensed Operator Continuing Training program. Continuing Training is designed to maintain and further improve the knowledge and performance skills of qualified Non-Licensed Operators. This continuing training includes fire protection class room and field exercises designed to broaden the knowledge and skills of a fire brigade member in addition to improving operating skills and knowledge. Continuing training is also addressed in "Palisades Non-Licensed Operator Course Plan". Both the initial and continuing Non-Licensed Operator training programs are accredited by the National Nuclear Accrediting Board .

Figure 1 - PNP Non-Licensed Operator Training Flow Chart

Figure 1 is obtained from “Palisades Non-Licensed Operator Course Plan” which provides the details associated with this flow chart.



PNP has established as part of the fire protection program a Pre-Fire Plans Manual. This manual is used as part of fire brigade training providing important information needed to quickly determine emergency response strategies and to determine important information on hazards and equipment in the area. Each fire area plan addresses a specific fire area and contains two parts. The first part contains a brief synopsis of the key information, radiological concerns, power supplies, ventilation features, strategy, fuel sources and reference drawings for each fire area. The second part contains a drawing showing important equipment locations and hazards that would be important to the fire brigade response. The Pre-Fire Plans Manual is used as a document for brigade training and is immediately available for the brigade leader as a tool to support knowledge of the fire area involved and to establish an effective firefighting strategy for

the fire area of concern. Training on pre fire plans is completed in initial and continuing training as part of the qualification process.

Based on the initial and continuing training and experience provided to Non-Licensed Operators / fire brigade members, PNP complies with the NFPA 805 Section 3.4.1 (c) requirement that the fire brigade leader and at least two brigade members have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria.

REFERENCES

- "Palisades Non-Licensed Operator Course Plan", Revision 7
- "Pre Fire Plans Manual", Revision 3
- EN-OP-115, "Conduct of Operations", Revision 14

NRC Request

FPE RAI 06

LAR Attachment A, Table B-1, Section 3.5.5, contains the requirements for separation of fire pumps. The compliance basis indicates that clarification of previous approval is being requested in LAR Attachment T. The request in Attachment T states that "ENO is requesting that the prior approval of the protection and separation of the service water pumps and diesel fire pump, P-41, be considered acceptable under the new licensing basis." The request further states that the "diesel fire pump P-41 was not sufficiently protected from the service water pumps to provide reasonable assurance that a single fire would not damage both normal and alternate shutdown capability." The separation described in LAR Attachment T, Prior Approval Clarification Request 1, is not the separation requirement described in Chapter 3, Section 3.5.5, of NFPA 805. The prior approval deals with safe shutdown separation to meet service water redundancy and not fire pump separation. Provide a justification for how "previous approval" or the fire pump separation requirements of Section 3.5.5 of NFPA 805, both physically and electrically are met.

ENO Response

FPE RAI 06

Fire pump separation has been previously addressed by PNP and reviewed and approved by the NRC. PNP and NRC reviews resulted in changes that reduced the risk of a fire affecting all fire water pumps and service water pumps. The NRC reviews dealt with both fire pump separation and Appendix R concerns. This clarification was written to communicate the different considerations associated with the issues and identify the present configuration that continues to support the previous NRC approval of fire pump separation.

Fire Pump/Service Water Pump Configuration Background

The equipment configuration of the Intake Structure includes three service water pumps and three fire water pumps, as well as other equipment in a common structure. This configuration has resulted in multiple reviews by the NRC and actions by PNP to ensure the configuration is acceptable. This work considered:

1. Separation of the three fire water pumps.

2. Separation of the service water pumps from fire water pump P-41.

3. Fire water use in supplying the service water system as an alternate shutdown path.

Plant configuration includes three 100% capacity fire pumps located in the Intake Structure. One diesel and one electric pump were part of initial plant construction. A second 100% capacity diesel pump was added in the early 1970's to support cooling tower fire water demands. The second diesel pump, P-41, Diesel Driven Cooling Tower Fire Water Pump would later be credited as providing alternate shutdown capability for service water in the Appendix R safe shutdown analysis. Subsequent evaluations concluded the P-41 alternate shutdown capability was not required to meet safe shutdown conditions.

Past NRC correspondence and supporting PNP modifications and evaluations have addressed the current configuration and function of the equipment involved. Because the topics partially overlap past responses support more than one issue. This response looks at the overall question of fire pump separation as stated in section 3.5.5 of NFPA 805 and the review, justification and NRC approvals of the configuration that is currently in place.

Fire Water Pump Separation

LAR Attachment A, Table B-1, Section 3.5.5, contains the requirements for separation of fire water pumps. This reply summarizes early PNP and NRC correspondence related to the physical lack of separation of the three fire water pumps. The response focused on the lack of separation of the fire water pumps and location of the diesel fire pump fuel oil day tanks inside the Intake Structure. The combustible loading of the fuel oil in the tanks presented a combustible loading challenge to the fire water and service water pumps.

In an NRC SER dated 9/1/78; section 4.3.1.2, Titled; Fire Pumps, the NRC addressed the physical location of the fire pumps in the Intake Structure. The SER stated in part that: "The fire pumps are located in the intake structure in a common room. A fire resulting from an oil spill from the diesel fuel oil day tanks, or from fuel line or transfer pump failures may result in loss of all fire pumps as well as service water pumps. To preclude such an event, the licensee has proposed to relocate the fuel oil day tanks outside of the intake structure in their own enclosure and to provide sprinkler protection in this area." The SER noted that: " upon implementation of the above described

modifications, the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable.“

Section 2.2 states “Guidance on the implementation of General Design Criterion 3 for existing nuclear power plants has been provided by the NRC staff in "Appendix A" of Branch Technical Position 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants."” Section 2.2 goes on to identify the following objectives: 1) Reduce the likelihood of occurrence of fires; 2) Promptly detect and extinguish fires if they occur; 3) Maintain the capability to safely shut down the plant if fires occur; and 4) Prevent the release of a significant amount of radioactive material if fires occur.

In response to the 9/1/78 SER, diesel fire pump fuel oil day tanks were moved to a separate building outside the Intake Structure and a sprinkler system was installed in the Intake Structure providing protection to the area. The diesel fuel oil day tanks are still located outside the Intake Structure and a sprinkler system remains installed in the area, therefore the conditions of the 1978 SER remain in place today.

The issue of fire water pump separation was also documented in the response to Branch Technical Position APCSB 9.5-1 Appendix A "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976”. FPIP-1, Attachment 3 provides the detailed responses to the Branch Technical Position. Attachment 3 states in part: “Separate rooms for the firewater pumps are not provided; however, the pumps are spatially separated from each other by distance and a radiant energy shield is provided between P-41 and the other pumps. At the present time, the only appreciable source of combustible material in this room is the diesel fuel oil supply lines and lube oil. Only a minimal amount of cabling exists in this area. Based on the Fire Hazards Analysis, this is acceptable.” This reply is related to fire pump separation and it takes credit for a radiant heat shield that was installed as part of plant modifications to meet early Appendix R requirements. Radiant heat shield was not part of the original BTP response.

<u>Fire Pump and Service Water Pump Separation</u>

As part of Appendix R, the separation of the fire water pumps from the service water pumps became a safe shutdown concern. Evaluations and modifications performed under Appendix R also benefit the fire pump separation requirement as discussed below.

In the Appendix R analysis credit was taken for P-41, Cooling Tower Diesel Fire Water Pump supplying fire water to the service water header. This alternate path was needed given the Appendix R assumption that off-site power was lost. Actions were taken to provide additional protection between the service water pumps including installation of a radiant heat shield that protected P-41 fire water pump.

As part of the evaluation of fire water use as an alternate shutdown system the NRC established Open Item 255/86022-07. Reference NRC Letter to Consumers Power Company dated November 14, 1986 stating:

“8. Alternative Shutdown Equipment

Section III.G.3 of Appendix R to 10 CFR 50 stipulates that where alternate shutdown is provided, it should be independent of the room, zone or area under consideration. Contrary to the above, the staff observed that in the intake structure, the diesel powered fire pump is not sufficiently protected/separated from the service water pumps and intervening fire hazards to provide reasonable assurance that a single fire would not damage both normal and alternate shutdown capability. The licensee had previously identified this condition and request a staff evaluation of the adequacy of the protection. The staff has identified specific concerns regarding the level of fire Protection in this area. This is considered an Open Item (255/86022-07) pending review of licensee's response".

The NRC staff in closure of the Open Item 255/86022-07, in an inspection report dated August 1988, agreed that the licensee committed modifications to the configuration of the Intake Structure stated in letter dated October 14, 1986, were completed. The committed modifications and evaluations were:

1) Install a fire detection system,
2) Cover the control and annunciator cables for the diesel fire pump with one hour rated fire resistant material,
3) Install a fire suppression system directly over the fuel transfer pumps,
4) Perform an analysis showing that extending the radiant shield to the west was not necessary,
5) Perform an analysis showing an additional drain at the fuel oil transfer pumps was not required.

Item 2 was addressed by the installation of Thermo-Lag wrap; however the Thermo-Lag has since been abandoned in place as documented in a Consumers Power Letter to the NRC Dated January 6, 1997 regarding notification of completed actions related to Thermo-Lag fire barriers. The cables involved in the Thermo-Lag wrapping are associated with remote indication and control of P-41 fire water pump. The P-41 fire water pump cables for remote indication and control have been addressed though fuse protection of the circuits as part of the transition to NFPA 805. Direct fire impact on the cables will fail remote control capability but will not fail fire pump auto start or operating capability. Reference LAR Attachment S completed modification description number S1-3. The LAR Attachment T request is intended to clarify the prior approval of the Thermo-Lag wrap configuration in the Intake Structure, Fire Area (FA) 9.

Additionally, there is a conduit containing the pressure switch cable that connects between diesel fire water pump P-41 and the control panel. This cable controls the auto start function of diesel fire water pump P-41. The control panel is located west of the diesel fire water pump P-41. Due to this location, part of the conduit is shielded by the radiant heat shield and the other part of the conduit extends up to the ceiling and then drops down to the pump. As noted in the January 6, 1997 reply the Thermo-Lag material, while not credited, remains in place will provide some additional protection to the conduit.

Radiant heat transfer to the exposed pressure switch conduit running along the ceiling is not credible due to the spatial separation of the conduit to the possible ignition

sources. The part of the conduit that is not shielded is not subject to a hot gas layer. This is because a hot gas layer is not supported in this location because there are openings at the ceiling level of the Intake Structure that would allow the hot gas layer to be dissipated into the outside air. Reference; EA-FPP-FRE-001, “NFPA 805 Fire Risk Evaluations and EA-PSA-805-FRE-10-03, "Fire PRA Quantification for NFPA 805 Transition Fire Risk Evaluations” for more information related to the lack of a hot gas layer forming in the Intake Structure.

Fire Water Supplying Service Water

The original plant design included two separate fire water connections, one connection to each critical service water system header. The original plant design allowed the fire water system to support service water should all service water be lost. The service water system could also support fire water should all fire water pumping capability be lost.

The Appendix R analysis credited P-41 as an alternate shutdown path where fire water could be used should all service water fail for fires in the Intake Structure. Under this work P-41 remained functional based on distance from the service water pumps and credit for the installation of the radiant heat shield. Fires in the service water pump area would not result in failure of fire pump P-41. Therefore the fire water pump would be available to support service water. For fires affecting P-41 directly, the evaluation considered separation distance and the radiant heat shield as protecting the service water pumps and they would remain available. Installation of detection and suppression also supported this position.

As a result of a PNP corrective action document, the ability of P-41 to support the service water system was challenged. The Appendix R approach was revised to eliminate P-41 as an alternate shutdown path. An engineering evaluation demonstrated that off-site power remained available for a fire in the Intake structure. Off-site power availability was also analyzed as part of NFPA-805 transition as discussed in report PLP-RPT-12-00143, “Nuclear Safety Capability Assessment Fire Area Analysis Results” for all plant fire areas. It also shows off-site power remains available for a fire in the Intake Structure. With off-site power available the plant can maintain hot standby conditions allowing a service water pump motor and cables to be replaced following the fire.

Because of the corrective action document, offsite power studies and the ability to repair a service water pump, P-41 along with the fire water system is no longer credited as an alternate shutdown system in either the current revision of EA-APR-95-007, “10 CFR 50 Appendix R Fire Safe Shutdown Analysis” or PLP-RPT-12-00143, “Nuclear Safety Capability Assessment Fire Area Analysis Results” supporting NFPA 805 transition.

Outside of the fire protection safe shutdown analysis the fire water system connections to the service water system remain an emergency operating procedure option should all other sources of service water cooling fail. Plant operating procedures provide instruction to throttle the valves to maintain fire pump discharge pressure and flow conditions should these connections be used.

NFPA 805 Fire Pump Separation

NFPA 805, Section 3.5.5 states, “Each fire pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.” The specific question of fire pump separation has been reviewed on several occasions and through evaluation and plant modifications the configuration has been found acceptable by the NRC. In addition, the initial use of fire water as an alternate source of water for service water required further protection as an alternate shutdown path. This resulted in additional modifications that benefited the issue of all fire water pumps being in the same fire area. These configuration changes were also reviewed and approved by the NRC and remain even though the alternate shutdown path is no longer credited.

Based on relocation of the fuel day tanks and the installation of a sprinkler system in the Intake Structure, the modifications and configuration supporting acceptance of all three fire water pumps being located in the Intake Structure remain in place as described in the September 1, 1978 NRC SER.

The present configuration includes additional features beyond those discussed in the September 1, 1978 NRC SER. The list below includes the features from the September 1, 1978 NRC SER and additional features that exist which support the installation of all three fire water pumps in the Intake Structure:

- Diesel fuel day tanks relocated outside the Intake Structure
- Installation of a water suppression system in the Intake Structure
- Additional suppression installed over the fuel oil transfer pumps
- Ultraviolet detection installed in the area
- Radiant heat shield protecting fire water pump P-41
- Low levels of combustibles in the area between the fire pumps
- Lack of a hot gas layer in the area as evaluated under the NFPA 805 transition

REFERENCES

- NRC Letter to Consumers Power Company dated November 14, 1986 regarding a special Inspection performed by the NRC.
- NRC Correspondence to Consumers Power Company dated August 8, 1988 Docket No. 50-255 No. EA 88-140. Inspection Report, Open Item (255/86022-07)
- BTP-APSCB 9.5-1, Appendix A, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976" Revision 2 Dated August 24, 1996
- EA-APR-95-007, “10 CFR 50 Appendix R Fire Safe Shutdown Analysis”, Revision 3
- NFPA 805, “Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition”
- Consumers Power Letter to the NRC Dated January 6, 1997, “Notification of Completion of Actions – Generic Letter 92-08 “Thermo-Lag 330-1 Fire Barriers”
- PLP-RPT-12-00143, “Nuclear Safety Capability Assessment Fire Area Analysis Results”. Revision 0
- FPIP-1, “Fire Protection Plan, Organization and Responsibilities”, Revision 22

- EA-PSA-805-FRE-10-03, "Fire PRA Quantification for NFPA 805 Transition Fire Risk Evaluations", Revision 0
- EA-FPP-FRE-001, "NFPA 805 Fire Risk Evaluations", Revision 0

NRC Request

FPE RAI 07

LAR Attachment L, Approval Request 10, indicates approval is requested for the use of the fire water system for non-fire emergency and non-emergency activities. The request indicates examples of non-emergency uses of fire protection water. Provide an estimated, total or bounding, flow and pressure demand for such non-emergency uses, and a discussion of any administrative or work controls that will be used to ensure the fire protection water supply is available when needed for fire protection.

ENO Response

FPE RAI 07

PNP LAR Attachment L, Approval Request 10 contains the definitive list of non-emergency uses of fire protection water. These uses are: traveling screen cleaning, cooling tower screen cleaning, traveling screen basket cleaning, traveling screen trough cleaning, back flushing electro-hydraulic control (EHC) coolers, back flushing condensate pump cooling coils, filling vacuum trucks, cleaning main condenser tubes, supplying condensate pump heat exchangers, cooling the feed water purity air compressors, cleaning seal oil heat exchangers, and spraying down containment and/or courtyard in an extreme emergency situation. PNP plans to implement procedural controls that will require securing the alternate use upon the presence of a fire protection demand. The largest demand at PNP is the Start-up 1-1, 1-2, and 1-3 Transformer deluge system. The alternate uses are bounded by the largest demand at PNP and will be limited to less than 500 gpm which is hose stream flow postulated when determining fire suppression water flow requirements. Currently, PNP procedure FPIP-4 requires that in the event of a non-functional diesel fire pump, the remaining diesel fire pump will be verified functional. PNP has two diesel driven fire pumps and one electric fire pump, each with the capacity to handle the largest demand plus an additional 500 gpm allowance for manual fire suppression demands.

REFERENCES

- PLP-RPT-12-00050, "Combined Fire and Nuclear Safety Flow Demands", Revision 0
- FPIP-4, "Fire Protection Systems and Fire Protection Equipment", Revision 31

NRC Request

Safe Shutdown Analysis (SSA) RAI 01

LAR Attachment C, Table B-3, Fire Area 13 (Aux Building 590 Corridor), VFDR ENP-1467 identifies CV-0910, 911, and other valves as potentially failing closed for a fire, and dispositioned as no modification, recovery action, or defense in depth (DID) is required because risk, safety margin, and DID are met without further action. However, LAR Attachment G, Table G-3 "Operator Actions Required for Additional Risk Reduction" lists for all fire areas (except 1) the need for a Recovery Action (RA) for the primary coolant pump seal cooling from the main control room (MCR). Additionally, LAR Attachment S, Table S-2, Item S2-14, identifies a modification being performed to prevent this spurious closure potential. Provide clarification for this RA and/or modification.

ENO Response

SSA RAI 01

Control valves CV-0910, CV-0911, and CV-0940 are associated with component cooling water to and from containment which supports primary coolant pump seal cooling. PNP LAR Attachment S, Table S-2, Item S2-5 provides a second method to trip primary coolant pumps from the main control room that is physically separated and electrically redundant. Removing the primary coolant pumps from service eliminates the need for seal cooling, hence the disposition provided for Variances from Deterministic Requirements (VFDR) ENP-1467 in PNP LAR Attachment C, Table B-3, Fire Area 13.

PNP LAR Attachment G, Table G-3 "Operator Actions Required for Additional Risk Reduction" lists for all fire areas (except fire area 1) the need for a Recovery Action for the primary coolant pump seal cooling from the main control room. As described, this action is taken in the main control room, which is the primary control station therefore this operator action required for additional risk reduction does not meet the definition of a "recovery action" as defined by NFPA 805 Section 1.6.52. Taking action to maintain or restore primary coolant pump seal cooling from the main control room provides additional time before primary coolant pumps would need to be removed from service and reduces risk should there be a failure to trip primary coolant pumps. PNP LAR Attachment S, Table S-2, Item S2-14 replaces some of the cabling to the control valves which eliminates several failures that would result in the loss of primary coolant pump seal cooling and supports the ability to take the operator action for additional risk reduction from the main control room.

NRC Request

SSA RAI 02

LAR Attachment S, Table S-2, Item S2-1 identifies that a new auxiliary feedwater (AFW) pump will be installed in a dedicated hardened structure within the protected area (PA). The pump will have local control only (with no connection to the control room (CR) or

auxiliary shutdown panel (ASP)) and will be equipped with local flow monitoring instrumentation. Describe how the feasibility of using this external facility/ component factored into the RAs that rely on the new AFW pump. Describe the diagnostic instrumentation that will be available to the operators at this location. Describe any remote controls in the new building. Describe the methods to monitor and control steam generator (SG) Levels. Identify which implementation item in LAR Attachment S, Table S-3, covers procedures and training for the new AFW pump.

ENO Response

SSA RAI 02

The detailed design for the new auxiliary feedwater (AFW) pump modification described in PNP LAR Attachment S, Table S-2, Item S2-1 has not been completed, therefore, all the details about the final installed configuration and procedures for operating the new diesel driven AFW pump are not available. Operation of the new AFW pump is considered an operator action required for additional risk reduction (see PNP LAR Attachment G, Table G-3, Page G-32 and PNP LAR Supplement Attachment 1, Page 72 of 79). The action is a local action (ex-primary control station action), but is not considered to be a recovery action as defined by NFPA 805 Section 1.6.52. This is because the action does not directly resolve a variance from the deterministic requirements of NFPA 805. The lack of detailed design information and lack of approved procedures and training has been factored in to the human error probability of this action by utilizing a screening value.

Since the detailed design has not been completed, all diagnostic instrumentation that may be available at the new AFW pump location has not been identified. As described in PNP LAR Attachment S, Table S-2, Item S2-1, the new AFW pump will be installed in a dedicated hardened structure within the protected area. The pump will have local control only (with no connection to the control room or auxiliary shutdown panel) and will be equipped with local flow monitoring instrumentation. The local flow monitoring instrumentation will be used to align AFW flow to decay heat in accordance with the curves provided in existing Emergency Operating Procedure (EOP) Supplement 19. These curves provide for adequate Steam Generator inventory using only AFW flow and time after shutdown. Development or revision of technical documents and administrative procedures as needed for implementation of NFPA 805 is addressed by PNP LAR Attachment S, Table S-3, Item S3-1. Additionally, the modification process will address procedures and training for modifications designed and installed within the plant.

REFERENCES

- Emergency Operating Procedure (EOP) Supplement 19, “Alternate Auxiliary Feedwater Methods”, Revision 10

NRC Request

SSA RAI 03

LAR Attachment F describes the process for evaluating multiple spurious operations (MSOs). The staff noted that the licensee used the expert panel approach per frequently asked question (FAQ) 07-0038, "Multiple Spurious Operation Resolution", Rev. 3, (ADAMS Accession Number ML103090608). Step 1 of the approach identifies information sources to be considered in the analysis including generic and plant-specific sources. In the "Results of Step 1," the licensee cites draft sources of information for MSOs during both reviews that were performed and does not cite any update based on completed references. Describe the process used to review final documents to ensure no changes had occurred to the draft documents that could affect the results and confirm the completion of that activity, or the identification of future work in the implementation tables of LAR Attachment S.

ENO Response

SSA RAI 03

Draft sources of information were cited in PNP LAR Attachment F for evaluating Multiple Spurious Operations (MSOs) since final sources of information were not available when the process began at PNP. PNP LAR Attachment F also cites NEI 00-01 revision 2 which formally incorporated the Multiple Spurious Operation (MSO) evaluation guidance and PWR Generic MSO list.

A Multiple Spurious Operation (MSO) Expert Panel was conducted in July 2008 for the PNP Nuclear Plant. The Expert Panel process utilized the latest available information at the time the expert panel was convened. MSO Report 0247-07-0005.04 states "The NEI Circuit Failures Task Force and the NRC are working on plans for resolution of the issue and have had a series of meetings on proposed solutions, including proposed guidance on how to determine the risk significance of MSOs, as documented in SECY 08-0093, Resolution of Issues Related to Fire-Induced Circuit Failures. NEI has developed revision 2 of NEI 00-01, Guidance for Post-Fire Safe-Shutdown Circuit Analysis that includes guidance on the MSO Expert Panel process and has submitted it to the NRC for use and endorsement in June 5, 2009 (ADAMS reference pending). At the time of the PNP MSO Expert Panel, NEI-00-01 revision 2 was not yet approved; a draft of the document was used. Task Instruction FPRA-TI-07 was referenced as a draft document since the NEI 00-01 document was not available when the process began. FPRA-TI-07 was intended to follow the guidance being developed by NEI's circuit failure task force and states "The MSO Expert Panel should follow the basic draft process that was being developed by NEI's circuit failure task force as a draft revision to NEI 00-01. The NEI 00-01 draft revision proposed process includes the following three phases:

- Phase 1: Preparation, including an initial list of potential accident sequences;
- Phase 2: Training of the expert panel on Safe Shutdown Analysis and MSOs; and,

- Phase 3: Performance of the Expert Panel review."

As originally envisioned, the generic MSO list was periodically updated as plants performed MSO identification exercises.

Following the initial Expert Panel review and prior to the issuance of the MSO report 0247-07-0005.04, the latest list of generic Pressurized Water Reactor (PWR) MSOs was reviewed by members of the fire PRA team.

Source documents used were:

- WCAP-16933-NP, Revision 1, PWR Generic List of Fire-Induced Multiple Spurious Operation Scenarios PWROG Project, PA-RMSC-0376 Rev. 1, June 2010.

- NEI 00-01, Revision 2, Guidance for Post-Fire Safe Shutdown Circuit Analysis, Nuclear Energy Institute, May 2009.

- Pressurized Water Reactor Owners Group (PWROG) Draft Working MSO list, File "PWR MSO List WCAP Rev 1 (DRAFT for Comment).xlsx" dated 07/12/2010, from package associated with Multiple Spurious Operation Resolution Workshop, Nuclear Energy Institute, July 7-9, 2010.

Members of the fire Probabilistic Risk Assessment (PRA) team reviewed each scenario and the majority of the generic MSO scenarios were substantially unchanged as compared to those reviewed during the Expert Panel. MSO scenarios not addressed during the initial Expert Panel were reviewed and incorporated into the MSO dispositions as necessary.

A final reconvening of the Expert Panel was performed in March 2011 to address all additions, deletions and/or changes to the MSO assessment that have occurred due to post-expert panel reviews and in consideration of the most current information available from the Pressurized Water Reactor Owners Group (PWROG) .

Source documents used were:

- Pressurized Water Reactor Owners Group (PWROG) Draft Working MSO list, File "PWR MSO List WCAP Rev 1 (DRAFT for Comment)-to NEI 12-13.xls".

- NEI 00-01, Revision 3 (Draft), Guidance for Post-Fire Safe Shutdown Circuit Analysis, Nuclear Energy Institute, August 2010, File "NEI+00-01+Rev+3+-+01-18- 11+draft(1).doc" from NEI Multiple Spurious Operations Website, Created Date 03/07/2011.

All scenarios identified as new or changed since draft revision 0 of the generic MSO list were reviewed and dispositioned by the reconvened Expert Panel.

A review of NEI 00-01 revision 2 Appendix G, PWR Generic MSO List, and NEI 00-01 revision 3 Appendix G Table G-2, PWR Generic MSO List, was performed on September 10, 2013 and all scenarios have been evaluated within MSO report 0247-07-0005.04. Therefore no changes to PNP LAR Attachment S are required.

REFERENCES

- 0247-07-0005.04, “Multiple Spurious Operation (MSO) Report”, Revision 1
- PLP-RPT-12-00110, “Multiple Spurious Operation (MSO) Identification and Evaluation”, Revision 0
- NEI 00-01, “Guidance for Post Fire Safe Shutdown Circuit Analysis”, Revision 2 (May 2009)
- NEI 00-01, “Guidance for Post Fire Safe Shutdown Circuit Analysis”, Revision 3 (October 2011)
- FPRA-TI-07, ERIN Draft “Fire PRA Task Instruction, Multiple Spurious Operations”, Draft B

NRC Request

SSA RAI 04

LAR Section 4.5.2.2 and Figure 4-7 summarizes the approach to evaluating DID and safety margin in the resolution of variance from deterministic requirements (VFDRs). Under the heading, "Disposition of VFDR," the LAR indicates the results of the risk evaluation, DID, and safety margin are summarized in LAR Attachment C. LAR Attachment C includes a standardized statement or summary of DID and safety margin for the VFDRs. Provide additional discussion of the methods and criteria for evaluating DID and safety margins and summarize the results, as required by Section 4.2.4.2 of NFPA 805. The description should include what was evaluated, how the evaluations were performed, and what, if any, actions or changes to the plant or procedures were taken to maintain DID or sufficient safety margins.

ENO Response

SSA RAI 04

The wording in LAR Section 4.5.2.2, "Disposition of VFDR," is based on the generic NEI template for NFPA 805 LARs and addresses the methods and criteria used by PNP for evaluating safety margin and defense-in-depth. Details of these evaluations are provided primarily in two documents; EA-FPP-FRE-001, and EA-PSA-805-FRE-10-03. Evaluation information from EA-FPP-FRE-001 for VFDR is summarized in Attachment C of the PNP LAR.

Plant changes that reflect the future plant configuration and that address overall plant risk are contained in the risk bases for each VFDR evaluation. These plant changes are not part of the resolution statement for the VFDR. These changes support overall plant risk reduction and may not be directly related to a specific VFDR resolution. A summary

of these modifications is provided in EA-FPP-FRE-001 Section 5.6 as well as being listed in the PNP LAR Attachment S. In addition, Licensing Correspondence PNP 2013-13, dated February 21, 2013, correlated selected modifications listed in LAR Attachment S to VFDRs that are listed in PNP LAR Attachment C. This correlation provides information on modifications that resolved specific VFDRs.

The fire risk evaluations (FRE) listed in EA-FPP-FRE-001 define in detail what was evaluated, how the evaluations were performed, and what, if any, actions or changes to the plant or plant procedures were taken to maintain sufficient safety margin and defense-in-depth. The overall criterion for an acceptable FRE is based on ensuring:

a. The change in core damage frequency (ΔCDF) is acceptable, and

b. The change in large early release frequency (ΔLERF) is acceptable, and

c. Defense-in-depth and safety margins are maintained.

PNP LAR Attachment G provides details on actions that are required to recover and maintain safe and stable operation. PNP LAR Attachment S provides details on Plant configuration changes that address risk reduction and upgrades to the plant configuration to meet NFPA code requirements. These attachments include all actions and plant configuration changes needed to address conformance and risk reduction issues.

Safety Margin Assessment

The Safety Margin Assessment reviewed the impact of the NFPA 805 transition on safety margins to ensure safety margins are maintained. Safety criteria used in the assessment included:

a. Codes and standards or their alternatives accepted for use by the NRC are met.

   Applicable codes and standards were reviewed against plant configuration and process. Changes for each fire area were identified and actions were established to modify plant configuration to meet code requirements or the condition was evaluated as being acceptable for the configuration. Report PLP-RPT-12-00053, “NFPA Code Conformance Review” and supporting references provide the details supporting the code conformance review. EA-FPP-FRE-001 provides a summary of analyses supporting each fire area configuration and where non-conforming configurations are addressed through detailed evaluations.

b. Safety analysis acceptance criteria in the licensing basis (e.g., Final Safety Analysis Report (FSAR), supporting analyses) are met, or provide sufficient margin to account for analysis and data uncertainty. EA-PSA-805-FRE-10-03 and listed references provide the details supporting review of safety analysis acceptance criteria.

Defense-In-Depth

The Defense-In-Depth (DID) evaluation is documented in EA-FPP-FRE-001. The evaluation started with NFPA 805 Section 1.2 which establishes the basic requirements for defense-in-depth. Defense-in-depth was achieved when a proper balance of each of the following elements occurred. The DID evaluation addressed:

a. Preventing fires from starting (Echelon 1).

   This element considered combustible and hot work control procedures. EN-DC-161, Control of Combustibles and EN-DC-127 address PNP requirements for preventing a fire from starting.

b. Rapidly detect, control and extinguish promptly those fires that do occur thereby limiting fire damage (Echelon 2).

   The assessment of this element involved the evaluation of the adequacy of fire detection systems, automatic fire suppression systems, and manual fire suppression systems, portable fire extinguishers, hose stations and fire hydrants located in or near each fire area. Report PLP-RPT-12-00053 provides details on NFPA code evaluation. Analysis EA-FPP-FRE-001 provides a reference to evaluations used to justify non-conforming configurations and reference to other documents supporting this evaluation.

c. Provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (Echelon 3).

   This element looked at the fire area configuration and its associated structural elements. Specific considerations such as fire barriers, including openings, are properly rated or evaluated, supplemental barriers are identified, and guidance instructions and procedures provided to personnel. Report PLP-RPT-12-00053 provides details on NFPA Code Evaluation. Analysis EA-FPP-FRE-001 provides a reference to evaluations used to justify non-conforming configurations and identified actions that are be required to address defense-in-depth topics.

Evaluation methods considered variations based on the unique characteristics presented by each fire area configuration. Judgment based considerations looked beyond the formal process to determine if any additional steps were appropriate even though basic standards were being met. Final information was reviewed under multiple steps by experienced industry representatives to ensure the final product was accurate and thorough.

Fire PRA Evaluation

The NFPA 805 defense-in-depth balance concept is different from the PRA defense-in-depth concept. EA-PSA-805-FRE-10-03 provides the methodology details used to

assess risk using the PRA model and considers both the probability of occurrence and the consequences of failures. The PRA model assesses what can go wrong, how likely the event may be, and what are the consequences. The process results in a segregation of low probability, high consequence scenarios from high probability, low consequence scenarios and provides a more informed understanding of the actual risks.

EA-PSA-805-FRE-10-03 provides direct input to the fire risk evaluation process, and considered what constituted an adequate balance between the DID echelons. Adequate balance is considered achieved if for each fire scenario where there isn't an over reliance on either preventing fires from starting or from detecting and suppressing fires. If the CDF is not made acceptably small by undue reliance on small values of a combination of fire ignition frequency (FIF), severity factor (SF) and the non-suppression probability (NSP), balance is considered achieved and adequate defense-in-depth provided. To aid in the assessment of NFPA 805 defense-in-depth, the fire PRA quantification considered the following for each fire area:

a. Whether manual or automatic detection or suppression was credited in any fire PRA scenario.

b. Whether any fire PRA scenarios have high CCDP (CCDP > 1E-01);

c. Whether any fire PRA scenarios have high CDF (CDF > 1E-06).

The final results of the PRA evaluation are documented in EA-PSA-805-FRE-10-03 and were used as direct input into the FRE evaluations discussed in EA-FPP-FRE-001.

REFERENCES

- EN-DC-161, "Control of Combustibles", Revision 8
- EN-DC-127, "Control of Hot Work and Ignition", Revision 12
- EA-PSA-805-FRE-10-03, "Fire PRA Quantification for NFPA 805 Transition Fire Risk Evaluations", Revision 0
- EA-FPP-FRE-001, "NFPA 805 Fire Risk Evaluations", Revision 0
- PLP-RPT-12-00053, "NFPA Code Conformance Review", Revision 0
- Licensing Correspondence PNP 2013-13 dated February 21, 2013 Subject: Response to Clarification Request - License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactors (ADAMS Accession Number ML13079A090)
- NFPA 805," Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants", 2001 Edition

NRC Request

SSA RAI 06

The review of the circuit analysis calculation indicated instructions that stated "it is not required to determine all possible combinations of cable/contact faults that may cause a given failure mode. If one combination of failures is identified, tag the necessary cables with the appropriate fault code and proceed to check combinations of other cables not yet labeled with a given fault code." In order to clarify that all failure modes were considered, provide more detail with regard to this assumption including some examples. Explain how this assumption aligns with NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis", Rev. 2.

Additionally, one of the purposes of the analysis was to determine cable locations and to validate routing information was complete and continuous. The conclusion did not address whether this was accomplished. Describe how the calculation met that purpose. If cable routing was not complete and continuous, describe the assumptions that were made with regard to the FPRA.

ENO Response

SSA RAI 06

The circuit analysis guidance statement, "It is not required to determine all possible combinations of cable/contact faults that may cause a given failure mode. If one combination of failures is identified, tag the necessary cables with the appropriate fault code and proceed to check combinations of other cables not yet labeled with a given fault code.", meant that all possible combinations yielding the same fault consequence were not identified during a specific cable evaluation but each type of failure/combination was considered for each cable and other combinations yielding the same specific fault consequence would be identified as the other cables were evaluated using the same process. Each cable/conductor went through the same evaluation to ensure all failure combinations had been considered.

The PNP NFPA 805 Circuit Analysis, documented in EA-FPP-12-009, was performed by first identifying all cables associated with a given component. Each and every cable was then evaluated for the open circuit, short to ground, and hot short failure modes identified in NEI 00-01. The hot short was assumed to exist without any consideration of whether or not a specific conductor capable of providing a hot short was present.

The evaluation of each cable proceeded as follows:

1. If a cable failure mode could impact the function or alignment of the component being analyzed, then the specific fault consequence was tagged to the cable in question. Since the failure mode being evaluated could cause the cable in question to have a specific fault consequence by itself, there was no need to review for additional concurrent cable failure combinations associated with the cable in question that could result in the same specific fault consequence.

2. If a cable failure mode was not sufficient to result in the cable being tagged with a given fault consequence, then the cable failure mode under evaluation was considered with concurrent combinations of other cable failure modes associated with the component being analyzed.

    - If a concurrent combination of cable failure modes, including the failure mode of the cable under evaluation, was identified that could result in a specific fault consequence, then the specific fault consequence was tagged to the identified cables. There was no need to review for additional concurrent cable combinations that would result in the same specific fault consequence for the cable/failure mode under evaluation.

The circuit analysis does not uniquely identify the cable combinations that may result in the fault consequence, but does document the fault consequence against the associated cables. The NFPA 805 analysis would simply assume that wherever the cable is routed that the cable fault consequences exist irrespective of whether the consequences result from a single cable failure or a combination of cable failures. Only in situations where the fault consequence is driving the associated risk to an unacceptable level that a more detailed analysis of cable combinations would be performed to support a disposition of the failure. While the assessment of failure modes was performed at the conductor level, all fault consequences for conductors within a specific cable were documented against the associated cable.

Example of “Cable 1” evaluation:

- Cable 1 and Cable 2 are cables within a circuit associated with a control valve.

- If a hot short to a conductor in Cable 1 results in a control valve opening, then concurrent cable failure modes combined with the Cable 1 hot short were not evaluated since the cable itself results in the specific fault consequence.

- If a hot short to a conductor in Cable 1 does not result in a fault consequence, then cable combinations were evaluated to identify any fault consequences.

- If a hot short to a conductor in Cable 1 combined with a short to ground in Cable 2 could result in a control valve opening, then the specific fault consequence was tagged to Cable 1 and Cable 2. Additional combinations, which include Cable 1 that could provide the same fault consequence, were not evaluated as part of the Cable 1 evaluation. As previously discussed the circuit analysis does not identify cable combinations but does tag the corresponding fault consequences to the associated cables. Additional combinations would be identified when the other individual cables were evaluated.

- The circuit analysis would identify the Cable 1 hot short either by itself or in combination with another cable may result in a specific fault consequence, but the circuit analysis would not identify the cable combinations resulting in

the fault consequence. However, in this example since Cable 2 was a combination that was determined to have the specific fault consequence it would have been tagged as such. Had the Cable 2 fault consequence not been identified during the Cable 1 evaluation, then the failure modes and corresponding fault consequences would have been evaluated and identified during the Cable 2 evaluation.

- The example focused on a hot short to a conductor in Cable 1, but the complete evaluation of Cable 1 would consider the open circuit, short to ground, and hot short failure modes identified in NEI 00-01.

The purpose/scope of the PNP NFPA 805 Circuit Analysis, documented in EA-FPP-12-009, included determination of cable locations and the validation that cable routing information was complete and continuous. This was accomplished by using plant Circuit and Raceway Schedule information, raceway drawing information, and plant walkdowns as necessary. The methodology section of EA-FPP-12-009 describes the approach taken to validate cable routing and the results section of EA-FPP-12-009 describes the cable routing information that was obtained. The EA-FPP-12-009 conclusion identifies that a listing of cable to raceway and raceway to room correlations is included as an attachment.

Some cables in the plant are routed in generic raceways, such as “flex”. These generic raceways were evaluated as part of the validation of complete and continuous cable routing. In the case of “flex”, this is a generic raceway that is typically the last short run of conduit between a junction box and an end component. The failure of a cable in the “flex” raceway would already be captured by the cable being in other raceways and the component itself being in the area of concern. There are also a few cases where assumed routing was used. The high pressure air compressors were installed with field routed cables. The most likely cable routing given the cable end points and plant layout was determined and aligned with available information. The other area where assumed routing was used is in the equipment exclusion analysis used within the Fire PRA. The cable routing considerations for the Fire PRA equipment exclusion analysis was performed using an expert panel of experienced personnel to assess and document the likelihood of equipment and cables being present in the different fire areas. Reference the Fire PRA Model Development Report 0247-007-0005.03 Appendix H, Plant Equipment Credited by Assumed Routing.

Additionally, there were non-safe shutdown cables (N-Cables) that were identified for Appendix R safe shutdown components that had the potential to impact component functions relied upon in the Fire PRA. The routing of the N-Cables did not have the same pedigree as safe shutdown cables under the Appendix R program. To ensure that the N-Cable routing was accurate, validation of complete and continuous cable routing was performed and is documented in report PLP-RPT-12-00134.

REFERENCES

- NEI 00-01, “Guidance for Post Fire Safe Shutdown Circuit Analysis”, Revision 2
- EA-FPP-12-009, “ Palisades NFPA 805 Circuit Analysis”, Revision 0

- PLP-RPT-12-00134, “Validation of Appendix R Non-Safe Shutdown Cable Routing to Support the Fire PRA”, Revision 0
- 0247-07-0005.03, “Palisades Nuclear Plant Fire Probabilistic Risk Assessment Model Development Report”, Revision 1

NRC Request

SSA RAI 08

Provide the following pertaining to non-power operations (NPO) discussions provided in LAR Section 4.3, and LAR Attachment D:

a) *LAR Section 4.3.2 states that incorporation of the recommendations from the 'KSF pinch point' evaluations into appropriate plant procedures prior to implementation will be done to ensure the requirements of NFPA 805 are met. Identify and describe the changes to outage management procedures, risk management tools, and any other document resulting from incorporation of key safety functions (KSF) identified as part of NFPA 805 transition. Include changes to any administrative procedures such as “Control of Combustibles”.*

b) *LAR Section 4.3.2 states that for those components which had not previously been analyzed in support of the at-power analysis or whose functional requirements may have been different for the non-power analysis, cable selection was performed in accordance with approved project procedures. If any new components were added to the analysis, describe the difference between the at-power safe shutdown function and the NPO function. Include a description by system indicating why components would be selected for NPO and not be included in the at-power analysis.*

c) *Provide a list of KSF pinch points by fire area that were identified in the NPO fire area reviews using FAQ 07-0040, “Non-Power Operations Clarifications”, (ADAMS Accession No. ML082200528, closure memo) guidance including a summary level identification of unavailable paths in each fire area. Describe how these locations will be identified to the plant staff for implementation.*

d) *During NPO modes, spurious actuation of valves can have a significant impact on the ability to maintain decay heat removal and inventory control. Provide a description of any operator actions being credited to minimize the impact of fire-induced spurious actuations on power operated valves (e.g., air operated valves (AOVs) and motor operated valves (MOVs)) during NPO (e.g., pre-fire rack-out, actuation of pinning valves, and isolation of air supplies).*

e) *During normal outage evolutions certain NPO credited equipment will have to be removed from service. Describe the types of compensatory actions that will be used during such equipment down-time.*

f) *The description of the NPO review for the LAR does not identify locations where KSFs are achieved via operator actions or for which instrumentation not already included in the at-power analysis is needed to maintain safe and stable*

conditions. Identify those operator actions and instrumentation relied upon in NPO and describe how RA feasibility is evaluated. Include in the description whether these variables have been or will be factored into operator procedures supporting these actions.

ENO Response

SSA RAI 08

a) A new fleet level procedure is under development and is currently titled "NFPA 805 Risk management During Non-Power Operations." The intent of this procedure is to describe the process for risk management during Non–Power Operation (NPO), ensure risk management implementing procedures remain consistent with NPO evaluation and to support the outage planning and shutdown safety management program.

Appropriate plant site procedures will be revised to align with the fleet procedure and will provide additional guidance to be used during High Risk Evolution (HRE) to mitigate the potential for a loss of a Key Safety Function (KSF) based on NPO evaluation information. Changes will provide plant outage management and fire protection with mitigation strategies that can be put in place based on the specific conditions of a planned HRE. The strategies may include:

- Prohibition or limitation of hot work
- Prohibition or limitation of combustible materials
- Establishment of additional fire watches as appropriate
- Verification of operable detection and /or suppression in the vulnerable areas
- Rescheduling of work to a period with lower risk or higher Defense-in-depth (DID)
- Plant configuration changes (including pre-positioning)

No procedure changes are anticipated for the expanded use of recovery actions beyond those in existing procedures. Recovery actions have been credited to recover the loss of HVAC. It has been determined that adequate procedural guidance exists in plant system operating and off-normal operating procedures. These procedures address failed equipment and provide options to either recover the component or operate other equipment to address the lost function. Additionally, HVAC recovery actions are not critically time sensitive as to require action concurrent with firefighting efforts.

b) Report PLP-RPT-12-00056, Attachment 2 provides an overview of the NPO model development. This section addresses such topics as cable identification, equipment selection and plant operating alignments supporting NPO. Where appropriate this attachment also addresses why certain equipment were not evaluated for NPO.

Components credited in the NPO evaluation that have a different function from the function required by the Nuclear Safety Capability Assessment (NSCA) are

addressed in report PLP-RPT-12-00056. In most cases the difference in function did not result in a change to the selected cables, but in all cases the cable selection was reviewed, evaluated and updated as required, for all credited functions. Differences in equipment and functions are typically attributable to the difference in plant operating state.

Systems where a change in state or different equipment selection may occur include:

Low Pressure Safety Injection System

Heat exchangers and suction lines must remain isolated and pumps must remain off for the NSCA. Only components that provide isolation or pumping capability are evaluated. During Non-Power Operations multiple components are aligned to the primary coolant system for decay heat removal and therefore are included in the NPO analysis. In addition, equipment to provide monitoring of shutdown cooling is added to the NPO evaluation.

Shutdown Cooling Isolation from the Primary Coolant System

Two in series motor operated valves allow connection of the primary coolant system to the low pressure safety injection system for decay heat removal. During power operation these motor operated valves have their power removed. During Non-Power Operations power is restored and the valves are opened to provide decay heat removal capability. Power is maintained for control capability until the plant returns to power operation.

Safety Injection Tanks

Motor operated valves isolating the four safety injection tanks from the primary coolant system have power removed with the valves in the open position during plant operation. These valves are not included in the NSCA because postulated fire induced failures will not challenge the Nuclear Safety Performance Criteria. As part of the shutdown and cooldown operation power is restored and the valves are closed to prevent injection into the primary coolant system as primary system pressure decreases. Once the valves are closed power is again removed to prevent low temperature over pressure conditions from occurring.

High Pressure Safety Injection

During a plant shutdown and cooldown sequence the high pressure safety injection pumps are removed from service preventing spurious operation due to primary system over pressure concerns. One pump and associated flow path is returned to service to transfer water from the Safety Injection Refueling Water (SIRW) tank to the refueling cavity once the reactor head is removed and cavity is ready to be filled. Once the transfer is complete the pump is again removed from service.

Containment Spray System

The containment spray system is a concern in the NSCA evaluation primarily due to the potential for transfer of Safety Injection and Refueling Water Tank contents to the containment sump. During transition to NPO conditions the spray headers are isolated through procedural steps requiring isolation as part of the transition from power operations to cold shutdown conditions. Isolation is achieved through closure of each header's manual isolation valve. NPO analysis still evaluates the containment spray pumps and selected system components since the equipment is included in procedures as an optional flow path for shutdown cooling.

Containment Ventilation and Cooling

Containment cooling is not required to support safe and stable conditions and is not included in the NSCA results. During non-power operations containment cooling supports personnel access to the containment. Service water supports cooling and selected isolation valves are included in NPO that are not included in NSCA.

Chemical and Volume Control System

Charging pumps are removed from service during NPO but can be returned to service should boric acid injection be required. Boric acid supplies including SIRW tank and concentrated boric acid supplies remain available. Concentrated boric acid supply paths are not credited in the NSCA. The volume control tank is isolated along with the auxiliary spray line to the pressurizer during NPO conditions.

Auxiliary Feedwater System / Main Steam System

During NFPA 805 safe and stable conditions the auxiliary feedwater system, main steam system and steam generators are required to remove decay heat. These systems and associated components are fully evaluated in the NSCA. These systems and components remain in service as the plant is transitioned to cold shutdown conditions and are then isolated when primary system temperatures no longer support decay heat removal under steaming conditions. Components that are not in the NPO evaluation include main steam isolation valves, blowdown valves and the auxiliary feedwater pumps and valves.

Alternate Hot Shutdown/Monitoring Panels

EC-150/EC-150A are required to support NFPA 805 safe and stable conditions. The panels, and associated controls and instrumentation are included in the NSCA. These panels provide an alternate control and monitoring point in the plant should the control room be evacuated. Selected instrumentation associated with EC-150/EC-150A is included in the NPO analysis but is not relied upon to eliminate a pinch point.

Reactor Vessel Level

Components to monitor reactor vessel level are included in the NPO evaluation. Some reactor vessel level instrumentation is isolated during power operations and therefore not included in the NSCA. These monitoring components are placed in service during NPO and used to monitor the primary system and refueling pool levels.

c) Report PLP-RPT-12-00056, Attachment 4 provides a summary chart organized by fire area where pinch points can occur. This attachment lists the key safety functions that are evaluated. There were twenty-nine (29) fire areas for which the evaluation identified one or more pinch points. There were five (5) fire areas for which the evaluation identified that all KSFs had a pinch point. Use of this attachment as a reference document in support of site procedures discussed in the response to item (a) above will be available to identify pinch points of interest during NPO planning and operation.

d) Currently there are no plans to rely on the pre-positioning of components prior to entry into a HRE to minimize the impact of fire-induced spurious actuations. Credit is taken in the NPO analysis for the positioning of certain components by existing procedures during the normal shutdown sequence to mitigate spurious operation of those components. These components include:

Containment Spray Valves – Both spray header manual header isolation valves are closed per SOP-3. Isolation prevents transfer of SIRW tank contents to the containment sump should spurious operation shutdown cooling components occur.

Dilution Water Supply – Manual valve MV-CVC2162 is closed to prevent inadvertent dilution. Reference procedure GOP-9.

e) Based on the PNP RAI clarification phone call, this response is focused on High Risk Evolution (HREs). Appropriate site procedures will be revised to align with the fleet procedure noted in response (a) and will provide additional guidance to be used specifically for HRE activities. Changes will provide plant outage management and fire protection with mitigation strategies that can be put in place based on the specific conditions of a planned activity. The strategies may include:

- Prohibition or limitation of hot work
- Prohibition or limitation of combustible materials
- Establishment of additional fire watches as appropriate
- Verification of operable detection and /or suppression in the vulnerable areas
- Rescheduling of work to a period with lower risk or higher Defense-in-depth (DID)
- Plant configuration changes (including pre-positioning)

Actions taken may vary based on the plant configuration at the time the credited equipment is removed from service. Action development is based on multiple factors associated with system configuration and status as discussed in GOP-14.

f) Recovery actions have only been credited to recover the loss of Heating, Ventilation, and Air Conditioning (HVAC). It has been determined that adequate procedural guidance exists in off-normal and system operating procedures for the recovery of HVAC. Additionally, these recovery actions are not critically time sensitive as to require action concurrent with firefighting efforts. No instrumentation is required to support these recovery actions. Feasibility is evaluated in a manner consistent with NSCA credited recovery actions. No procedural updates are anticipated for these actions. Reference SOP-24.

REFERENCES

- SOP-1A, “Primary Coolant System”, Revision 22
- GOP-9, “Mode 3 ≥ 525°F TO Mode 4 Or Mode 5”, Revision 35
- GOP-14, “Shutdown Cooling Operations”, Revision 45
- SOP-3, “Safety Injection and Shutdown Cooling System”, Revision 92
- SOP-24, “Ventilation and Air Conditioning System”, Revision 60
- PLP-RPT-12-00056, “Non-Power Operation Modes Transition Review”, Revision 0
- EN-OP-116, "Infrequently Performed Tests or Evolutions", Revision 11
- EN-OU-108, "Shutdown Safety Management Program (SSMP)", Revision 5

NRC Request

SSA RAI 09

LAR Table 4-3 for the 1-C Switchgear Room (fire area 4) identifies the use of “concrete wrap” as a fire protection feature used for NFPA 805 compliance. LAR Attachment A, Table B-1, Section 3.11.5 states that the only raceway wrap credited in the nuclear safety capability assessment (NSCA) is Junction (pull) Box J1198 and the power cable conduits for Service Water (SW) Pump P-7A. Junction (pull) Box (JB J1198) is described as being enclosed in a one-hour-rated concrete enclosure. Describe how this complies with Section 3.11.5 of NFPA 805. Describe the rated compliance configuration, and the technical basis used to obtain the rating.

ENO Response

SSA RAI 09

Junction (pull) Box J1198 and conduit X1885 are encased in the concrete wrap. NUREG 1924, “Electrical Raceway Fire Barrier Systems in U.S. Nuclear Power Plants”, describes the concrete wrap used at PNP. NUREG 1924 states, “Concrete is only used at one plant (Palisades Nuclear Plant) to provide a 1-hour barrier to separate redundant trains within the same fire area. The use of this concrete barrier was a result of

resolving Thermo-Lag deficiencies in the plant." NUREG 1924 also states, "The concrete barrier was constructed by enclosing approximately a 1.22 m (4 ft.) section of a 7.6 cm (3.0 in.) diameter galvanized steel rigid conduit and pull box within concrete." Calculation EA-SC-95-032-02 documents that there is a minimum thickness of greater than 2 inches of concrete which classifies as a 1-hour rating per NFPA 70. Appendix R III.G.2.c states, "Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area." NUREG/CR 6850 Volume 2 Section 1.5.2 states, "Any fire barrier with a minimum fire protection endurance rating of one hour can be credited in partitioning." The 1-C Switchgear Room has a fire detection and fire suppression system installed. Therefore, PNP meets the requirements in Appendix R and guidance in NUREG/CR 6850.

REFERENCES

- NUREG 1924," Electrical Raceway Fire Barrier Systems in U.S. Nuclear Power Plants", May 2010
- NUREG/CR 6850 Volume 2, "Fire PRA Methodology for Nuclear Power Facilities", September 2005
- 10CFR50 Appendix R," Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979"
- EA-SC-95-032-02, "Fire Protection For Conduit X1885 and Box J1198", Revision 1

NRC Request

SSA RAI 10

LAR Attachment S, Table S-2, "Plant Modifications Committed" listed the proposed modifications S2-2; S2-3; S2-6; S2-7; S2-8; S2-9; S2-10; S2-13; S2-15; S2-16; S2-17;S2-18;S2-21; S2-23; S2-24; S2-25; and S2-26. With respect to compensatory measures currently in place, provide a statement regarding whether or not compensatory measures have been implemented in accordance with the plant's fire protection program for the listed modifications.

ENO Response

SSA RAI 10

Applicable compensatory measures have been implemented in accordance with the PNP Fire Protection Program for the listed modifications.

NRC Request

Programmatic RAI 01

Based on the NRC staff's review of the LAR and during the subsequent audit, it was determined that the licensee did not adequately describe the fire protection licensing basis.

Describe the specific documents (e.g., analysis, designs, and engineering reviews) that will comprise the post transition NFPA 805 fire protection program (FPP) licensing basis. In addition, describe whether these documents prepared to support the NFPA 805 FPP will be managed as controlled documents under the document control process.

ENO Response

Programmatic RAI 01

The NFPA 805 Fire Protection Program licensing basis will be described in the following controlled documents:

- PNP Operating License Condition as approved in NRC Safety Evaluation
- PNP Final Safety Analysis Report (FSAR)
- PNP Fire Protection Implementing Procedures (FPIP)
- PNP Fire Hazards / Safety Analysis

Documents, analyses, designs, and engineering reviews prepared to support the NFPA 805 Fire Protection Program are managed as controlled documents in accordance with:

- EN-DC-115, "Engineering Change Process"
- EN-DC-126, "Engineering Calculation Process"
- EN-DC-132, "Control of Engineering Documents" (primary procedure)
- EN-DC-147, "Engineering Reports"
- EN-DC-149, "Acceptance of Vendor Documents"
- EN-DC-151, "PSA Maintenance and Update"
- EN-DC-179, "Preparation of Fire Protection Engineering Evaluations"

REFERENCES

- EN-DC-115, "Engineering Change Process", Revision 15
- EN-DC-126, "Engineering Calculation Process", Revision 4
- EN-DC-132, "Control of Engineering Documents" (primary procedure), Revision 5
- EN-DC-147, "Engineering Reports", Revision 6
- EN-DC-149, "Acceptance of Vendor Documents", Revision 6
- EN-DC-151, "PSA Maintenance and Update", Revision 3
- EN-DC-179, "Preparation of Fire Protection Engineering Evaluations", Revision 3

NRC Request

Programmatic RAI 02

Based on the NRC Staff's review of the LAR and associated documentation, it was determined that the LAR did not provide the information needed for the NRC staff to evaluate what changes will be made to the FPP to incorporate NFPA 805 requirements. Describe the changes that are planned to the FPP as part of the NFPA 805 transition process specifically associated with training and identification of the positions where any such training necessary would be to support the program changes.

ENO Response

Programmatic RAI 02

The systematic approach to training as described in EN-TQ-201 will be utilized to determine which specific tasks and activities under the new FPP required training. Currently the review determined that specific NFPA 805 generic training, which will be a combination of classroom (initial) and computer-based training (periodic requalification training) will be provided to work groups based on their use of the FPP. NFPA 805 position specific qualification cards will be issued to the Fire Protection Group. Individuals, other than Fire Protection, may be assigned qualification cards based on the needs of their position.

REFERENCES

- EN-TQ-201, "Systematic Approach to Training Process", Revision 19

NRC Request

Programmatic RAI 03

NFPA 805, Section 2.7.3.4, "Qualification of Users", states that cognizant personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations.

Describe how the training program will be revised to support the NFPA 805 change evaluation process, including positions that will be trained and how the training will be implemented (e.g., classroom, computer-based, reading program).

ENO Response

Programmatic RAI 03

The NFPA 805 Change Evaluation process will be owned by the Fire Protection Group. The systematic approach to training as described in EN-TQ-201 will be utilized to determine what training will be required and who will be required to receive training on the change evaluation process. Current training plans include a qualification card and associated classroom training for the Fire Protection Group and work group specific training based on their use of the change evaluation process.

REFERENCES

- EN-TQ-201, "Systematic Approach to Training Process", Revision 19

NRC Request

Programmatic RAI 04

LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," does not indicate whether future NFPA 805 analyses will be conducted in accordance with the requirements of NFPA 805, Section 2.7.3. Describe whether future NFPA 805 analysis will be conducted in accordance with NFPA 805, Section 2.7.3.

ENO Response

Programmatic RAI 04

Consistent with the discussion in PNP LAR Section 4.7.3, future NFPA 805 analyses will be conducted in accordance with the requirements of NFPA 805, Section 2.7.3.

NRC Request

Radiological Release (RR) RAI 01

Describe the radiological criteria that were used to screen fire areas out of the review. Describe how Radiation Protection staff participated in the screening process.

ENO Response

RR RAI 01

The steps used to develop the list of areas with radiological hazards are described in the Methodology section of report PLP-RPT-11-00011. The following bullets summarize the process of screening in/out fire areas and the Radiation Protection staff participation in the screening process:

- Comprehensive list of PNP owner-controlled areas containing radiological hazards was developed
- Pre-fire plans and the Fire Hazards Analysis Report were reviewed to determine the presence of radiological hazards
- Discussions and correspondence with PNP Fire Protection and Radiological Protection personnel were held to identify additional areas containing radiological hazards
- Areas containing robust, well-sealed structures containing radiological contamination (such as tanks, casks, and other enclosures) were screened out from further review
- Identification of these structures has been added to the appropriate Pre-Fire Plans for reference purposes
- Pre-fire plan and station fire protection plan drawings were reviewed to determine which areas have the potential for cross-contamination of a radiological boundary due to firefighting activities
- List of areas containing, or potentially containing, contamination were verified by PNP Radiation Protection personnel and several pre-fire plans were updated to identify the radiological concerns for these areas
- List of areas with radiological hazards is presented on a fire area basis in Table E-1 of the PNP NFPA 805 License Amendment Request

REFERENCES

- PLP-RPT-11-00011, “NFPA 805 Radioactive Release Review”, Revision 0

NRC Request

RR RAI 02

For areas where containment/confinement is relied upon:

a) Liquid

1) Describe how the assessment addresses capacities of sumps, tanks, transfer pumps, etc., as appropriate.

2) Describe whether operator actions are specified (e.g., to direct effluent flow/overflow with temporary measures (drain covers, etc.)).

3) Describe whether there are plant features that may divert the effluent flow that were not taken into account (e.g., Aux. Bld. roll-up doors).

4) Section 4.4.2 of the LAR, page 34, states that “radiological release via the equipment hatch during non-power operations is not a credible scenario.” Provide the basis for this statement.

5) Section 4.4.2 of the LAR, page 34, of the submittal indicates that “if the Dirty Radioactive Waste Drain Tank capacity is exceeded, then water will back up on the ground level floor of the Auxiliary Building and remain within the building.” Describe the design features of the building that

prevent leaks from the ground level floor. Describe whether any other sumps being relied upon, have overflow potential. If so describe how the overflow is controlled.

b) Gaseous

1) Describe whether there are any plant features that can bypass the planned filtered/monitored ventilation pathway that have not been accounted for.

ENO Response

RR RAI 02

a) Liquid

1) Capacities of sumps, tanks and pumps were not specifically addressed. For areas where containment is relied upon, calculation EA-C-PAL-95-1526-01, evaluates the flood levels. This evaluation includes postulated ruptures in fire suppression system piping. This calculation identifies that the water drains through floor drains either to sumps that are approximately 20' below ground level or to the Dirty Waste Drain Tank, which is also located in a room that is 20' below ground level. The sumps will overflow into below ground level rooms. If the Dirty Waste Drain Tank overfills, then the water will back-up through the floor drains to the ground level (590') of the Auxiliary Building. For the Auxiliary Building ground level corridors, the bounding flooding source is a 10" Component Cooling Water pipe failure, and the resultant flood level is 3" after 30 minutes. This amount of water is beyond the amount that would reasonably be used for firefighting.

2) Specific pre-fire plans in the Pre Fire Plans Manual cite operator actions as appropriate. Examples include covering storm drains or placement of temporary berms.

3) Plant features, such as exterior doors, which could potentially release contaminated liquid runoff to the environment, are addressed in pre-fire plans. This information, which is captured in report PLP-RPT-11-00011, Attachment III, primarily identifies that opening of doors or hatches could create a path for unmonitored release.

4) The opening sentence of the paragraph identifies that this paragraph is discussing Containment HVAC. Thus this is a gaseous release question rather than a liquid release question. More detail is described in report PLP-RPT-11-00011, which is summarized as follows:

Containment HVAC is connected to the Auxiliary Building HVAC system and thus functionally part of the Auxiliary Building HVAC system. During non-power operations, ventilation in Containment and the Refueling & Spent Fuel Pool Area is procedurally controlled. Also during non-power

operations, control of the Equipment Hatch, which separates Containment from the Refueling and Spent Fuel Pool Area, is procedurally controlled. Opening the Equipment Hatch with loss of negative pressure inside containment could result in the spread of contamination into the Refueling and Spent Fuel Pool Area. However, this area has engineering controls in place to process airborne radioactive effluents. Thus, the potential for an uncontrolled radiological release to the environment via the Equipment Hatch during non-power operations is not a credible scenario.

5) Concrete walls surround the entire Auxiliary Building. Normal access to the Radiologically Controlled Areas of the Auxiliary Building is at the 611' level and not the 590' ground level.

   There are three possible liquid release paths from the Auxiliary Building at the 590' level.

   1. Door-256, Service Building to 590'Corridor, is a locked watertight door that is rarely opened and requires both Radiation Protection and Security present to open.

   2. Door-168, Double Door from 1C SWGR into RCA, is locked and is normally only opened during outages to move tools and equipment into or out of the Auxiliary Building. The flooding calculation, EA-C-PAL-95-1526-01, identifies that water can pass through the gap underneath this door into the Bus 1C Switchgear Room, which is in the non-radiologically controlled portion of the Auxiliary Building. The switchgear room is isolated from the Turbine Building and the environment by Door-169, which is watertight. The switchgear room is isolated from the1-1 Diesel Generator Room by Door-71, which has a 7.25" berm in front of this door that prevents water ingress. The water height from water via this path will be less than the maximum calculated flood level of 3".

      The switchgear room contains three manholes for cables entering/leaving the switchgear. Water passing into the switchgear room can flow into the manholes since the covers are not watertight. The manholes are connected together for water drainage into a low point in one of the manholes. This low point contains a sump pump that automatically pumps to the Turbine Building sump. The Turbine Building sump pump discharges through a monitored release path to the mixing basin, which is also a monitored release path. The discharge path can also be changed to route back to the Dirty Waste Drain Tank in the Auxiliary Building.

   3. In the Component Cooling Water (CCW) Room on the 590' level of the Auxiliary Building, there is an internal flood control feature that allows water flow from the Component Cooling Room to the

Turbine Building if the level reaches 7.5" in the Component Cooling Room. The Component Cooling Room is isolated from the rest of the 590' level of the Auxiliary Building by Door-167, a water tight door. The floor drains in the Component Cooling Room are normally isolated from the rest of the floor drain system. Hence, the Dirty Waste Tank will not backup into this room. The CCW room floor drains can, however, be unisolated during firefighting to drain into the Dirty Waste Drain Tank. This is addressed in the pre-fire plan for the room. The maximum calculated flood height in the room is 20", which is based on a failure of an 18" feedwater pipe. The amount of water used for firefighting will be much less than the amount of water from the flooding.

The following drains are identified in Table E-1 of the PNP LAR as being routed to the Turbine Building sump. The Turbine Building sump is pumped through a radiation monitor and discharges through a monitored release path. The pump's discharge can also be redirected back to the Dirty Waste Drain Tank in the Auxiliary Building.

- North cable way (Fire Area 3)
- Boiler Room sump (Fire Area 25)
- SIRW Tank & CCW Roof Drains (Fire Area 32)

Overflow of the Turbine Building sump is not controlled but is contained within a below-grade concrete structure. These three areas are identified only for completeness, since they are not expected to release any radioactive material.

- North cable way – A very small area of detectable fixed contamination exists in the concrete floor.
- Boiler Rooms – The potential for contamination internal to the boilers exists based on past occurrence of using contaminated water to feed the boilers. There is no external contamination in these rooms.
- SIRW Tank & CCW Roof Area - The source of contamination is the water internal to the SIRW Tank. A fire will not cause tank leakage.

Note that the PNP LAR is incorrect in identifying that the SIRW Tank & CCW Roof (Component Cooling Water Room) drains go to the Turbine Building sump. The roof drains in the SIRW Tank area go to the storm drain section that discharges to the mixing basin, which is a monitored release path. The CCW roof drains go to a section of the storm drain system that is unmonitored. However, there is no source or potential source of radioactivity on the CCW roof. The two roof areas are in the same fire area but are at different elevations. (The PNP LAR error has been entered into the PNP corrective action system as Condition Report CR-PLP-2013-03208.)

b) Gaseous

1) Plant features, such as exterior doors, which could potentially release contaminated gaseous effluent to the environment, are addressed in pre-fire plans. This information, which is captured in report PLP-RPT-11-00011, Attachment III, primarily identifies that opening of doors or hatches could create a path for unmonitored release.

REFERENCES

- PLP-RPT-11-00011, "NFPA 805 Radioactive Release Review", Revision 0
- EA-C-PAL-95-1526-01, "Internal Flooding Evaluation for Plant Areas Outside of Containment", Revision 4
- PFP, "Pre Fire Plans Manual", Revision 3
- CR-PLP-2013-03208, "Error in License Amendment Request for implementing NFPA 805 in Table E-1, Radioactive Release Review".

NRC Request

RR RAI 03

Describe whether all modes of operation (e.g., non-power/outage operations) have been considered. Specifically describe whether there are any increases in outdoor storage of radioactive materials during non-power operations/outages.

ENO Response

RR RAI 03

All modes of operation (including non-power/outage operations) were considered in report PLP-RPT-11-00011. This is specified in the methodology section of the report.

Report PLP-RPT-11-00011, Attachment III for Fire Area 41, Outside Area within Protected Area, states:

> During power and non-power operations, the north area is used for staging materials in metal boxes & Sealand containers with contaminated equipment. In addition during outages, both the east and south faces of the Administrative Building are used for outage-related equipment in metal boxes, Sealand containers, and semi-tractor trailers that hold contaminated equipment.

The use of this area for staging is addressed in the pre-fire plans.

REFERENCES

- PLP-RPT-11-00011, "NFPA 805 Radioactive Release Review", Revision 0

- PFP, “Pre Fire Plans Manual”, Revision 3

NRC Request

RR RAI 04

For areas where containment/confinement is not available:

a) *Provide Calculation TID 2012-007.*

b) *Describe whether TID 2012-007 accounts for all of the areas indicated in Table E-1 as having no engineering controls/containment.*

c) *Describe whether there are any administrative controls in place to limit the amount of combustible material in the area (ISFSI, S/G mausoleum) or the amount of radioactive materials in the area to ensure releases are acceptable.*

d) *Describe whether the assessment credits operator actions. Describe the plans that were developed to minimize the potential for uncontrolled radioactive releases from these areas.*

ENO Response

RR RAI 04

a) Calculation TID 2012-007 and its addendum have been provided on the PNP NFPA 805 Reference Portal in the 60 Day RAI Reference folder.

b) This is described in TID 2012-007, which states:

> After reviewing the areas and discovering that most of the areas contain equipment stored in metal containers it was decided to review the most likely scenario for fire damage and release of activity to the Public and use that scenario as the bounding event for all of the areas where material is stored. The area identified was the East Radwaste Building where storage and processing of radioactive waste is completed.

c) Procedure EN-DC-161 identifies the requirements for storage of combustibles and the need for a Transient Combustible Evaluation. Procedure ADMIN 1.01 identifies the standards for housekeeping that include storage of radioactive or combustible material. Procedure FPIP-7 identifies further details concerning storage of combustible materials. These procedures apply to all areas of the plant.

Procedure EN-DC-161 requirements include:

a. Limiting combustibles
b. Removal of combustibles at completion of work

c. Use of noncombustible material where practical
d. Removal of packing material prior to plant entry
e. Storage of materials that contain radioactivity in closed metal containers and located away from ignition sources and combustibles
f. Use of approved containers for flammable liquids

Procedure ADMIN 1.01 requirements include:

a. Combustibles stored only in designated areas
b. Waste materials placed in proper containers for disposal
c. Work areas maintained clean and orderly
d. Housekeeping tags on unattended items
e. Remove contaminated trash
f. Bag and label items with loose contamination and keep volume reasonable
g. Use of variances for transient combustible materials

Procedure FPIP-7 requirements include:

a. No accumulation of combustibles outside of trash containers
b. Regular removal of combustible trash
c. Meeting requirements of NFPA 30, Flammable and Combustible Liquids Code

Procedure EN-RP-121 establishes requirements for storage of radioactive material. Requirements include:

a. Radiation Protection Manager authorization to store radioactive material (RAM) outside of the Protected Area
b. RAM properly contained and not exposed to elements
c. Area secured from unauthorized access
d. Dose rate does not exceed 0.5 mrem/hr at radioactive material area boundary

The Independent Spent Fuel Storage Installation (ISFSI) is inside a security fence and security must be present to open the gate for access. This area is designated as a critical area, which requires use of fire resistant trash containers, variances for wooden pallets and additional requirements for storage of transient combustibles.

The Steam Generator (S/G) mausoleum door is locked with the key being controlled by Radiation Protection. Entry is very rare since the only purpose of the building is to house the old Steam Generators that were removed from the plant.

The controls identified above ensure that the scenario evaluated in calculation TID 2012-007 remains bounding.

d) No operator actions are credited in the assessment. The addendum to calculation TID 2012-007 recommended changes to pre-fire plans to cover or place berms around storm drains adjacent to burning radioactive material storage areas to minimize uncontrolled runoff. This recommendation has been implemented. However, it is not credited for meeting acceptance criteria.

REFERENCES

- TID 2012-007, "Palisades National Fire Protection Association (NFPA) Standard 805 Effluent Offsite Dose Calculation", Revision 0
- Addendum to TID 2012-007, "Palisades National Fire Protection Association (NFPA) Standard 805 Effluent Offsite Dose Calculation", dated 10/25/12
- PFP, "Pre Fire Plans Manual", Revision 3
- ADMIN 1.01, "Materiel Condition Standards and Housekeeping Responsibilities", Revision 27
- EN-DC-161, "Control of Combustibles", Revision 8
- EN-RP-121, "Radioactive Material Control", Revision 7
- FPIP-7, "Fire Prevention Activities", Revision 21

NRC Request

RR RAI 05

Attachment E, Table E-1, "Radioactive Release Review," indicates that "training materials include strategies to minimize radiological release." Provide examples of these strategies and describe how they will ensure releases do not result in doses that exceed Part 20 (or alternatively Technical Specification) limits.

ENO Response

RR RAI 05

Review of Fire Brigade training material is described in report PLP-RPT-11-00011, Attachment IV. Examples from PLLP-FBT-ORIENTATION and PLLP-FBT-FC1 include:

- Water use and run off is more important in the RCA, so use only what is needed.
- RP Tech will give guidance to Fire Brigade Leader regarding changing conditions related to radiation and contamination.
- Spread of contamination to radiologically clean areas during firefighting is possible. Utilize RP Tech guidance to minimize the spread of contamination.
- For fires outside of the protected area, which are fought by Offsite Fire Departments, ensure Radiation Protection provides guidance of radiological conditions in the buildings. The same strategies for minimizing contamination and radiological release also apply to Off Site Fire Departments.

- During firefighting activities in an area where radioactively contaminated materials are present, restrict extinguishing agent to the quantity needed for extinguishment of the fire to prevent potential spread of contamination.
- Water runoff could contain contamination. Take measures to control this run off if possible. Floor drains in the Auxiliary Building go to tanks designed to accept contaminated water but areas outside the RCA do not. So spill kits and absorbent socks may need to be used to redirect or contain the water.
- Dry chemical extinguishers have a lot of pressure when discharged and could cause cross contamination due to the dry chemical agent spreading throughout the room and through the ventilation system. Use the available reach of the extinguisher and only cover the areas needed to contain the fire.
- The spread of radioactivity is possible when ventilating from a potentially contaminated area. The Fire Brigade Leader is instructed to take advice from Radiation Protection personnel as to how to ventilate to minimize the chance of radioactive release.
- During overhaul, use Radiation Protection personnel to ensure potentially contaminated material is contained and cross contamination is minimized.

Calculation TID 2012-007 and the Addendum to TID 2012-007 analyzed the release to the environment due to gaseous dispersion and liquid runoff and showed that Technical Specification limits were not exceeded for fires in areas that do not have engineering controls. The training strategies apply whether or not engineering controls are present. Although these strategies enhance the ability to minimize radioactive release in both types of areas, they are not credited in the calculations as necessary for the conclusions to remain valid.

REFERENCES

- PLP-RPT-11-00011, “NFPA 805 Radioactive Release Review”, Revision 0
- TID 2012-007, “Palisades National Fire Protection Association (NFPA) Standard 805 Effluent Offsite Dose Calculation”, Revision 0
- Addendum to TID 2012-007, “Palisades National Fire Protection Association (NFPA) Standard 805 Effluent Offsite Dose Calculation”, dated 10/25/12
- PLLP-FBT-ORIENTATION, “Fire Brigade Orientations”, Revision 1
- PLLP-FBT-FC1, “Fire Control 1”, Revision 2

NRC Request

Fire Modeling (FM) RAI 05

NFPA 805, Section 2.7.3.4, "Qualification of Users," states: "Cognizant personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations."

Section 4.5.1.2, "Fire PRA" of the LAR states that fire modeling was performed as part of the FPRA development (NFPA 805 Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together. Furthermore, Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," of the LAR states:

> *Cognizant personnel who use and apply engineering analysis and numerical methods in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by Section 2.7.3.4 of NFPA 805.*
>
> *During the transition to 10 CFR 50.48(c), work was performed in accordance with the quality requirements of Section 2.7.3 of NFPA 805. Personnel who used and applied engineering analysis and numerical methods (e.g., fire modeling) in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by NFPA 805 Section 2.7.3.4.*
>
> *Post-transition, for personnel performing fire modeling or Fire PRA development and evaluation, ENO [Entergy Nuclear Operations, Inc.] will develop and maintain qualification requirements for individuals assigned various tasks. Position Specific Guides will be developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per the requirements of NFPA 805 Section 2.7.3.4 to perform assigned work. (See Attachment S).*

Regarding qualifications of users of engineering analyses and numerical models:

a) *Describe what constitutes the appropriate qualifications for the staff and consulting engineers to use and apply the methods and fire modeling tools included in the engineering analyses and numerical models.*

b) *Describe the process for ensuring the adequacy of the appropriate qualifications of the engineers and personnel performing the fire analyses and modeling activities.*

c) *Describe the communication process between the fire modeling analysts and PRA personnel to exchange the necessary information, and any measures taken to assure fire modeling was performed adequately and will continue to be performed adequately during post-transition.*

d) *Describe the communication process between the consulting engineers and PNP personnel to exchange the necessary information and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition.*

ENO Response

FM RAI 05

a) Individuals that performed fire modeling were qualified based on their education and background. Entergy reviewed the resumes and work history

of the individuals performing the fire modeling tasks and ensured that each task was performed by individuals with appropriate training in the fire modeling area being performed. The qualifications that are required for the staff and consulting engineers that use and apply these technologies depend in part on their specific assigned role on the project. In general, the qualification requirements for those who are technical leads in the preparation of technical tasks are consistent with and often exceed those articulated in NEI 07-12, "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines", for qualification of Peer Reviewers. Given the magnitude of the technical activity being performed, the technical leads are sometimes assisted by support staff. There are no specific qualifications for those in a support role as the assigned technical lead would retain overall technical responsibility for the entire body of work. The overall acceptability of the resulting body of work is established through the review and approval process of the associated analysis documentation.

b) As part of the contract proposal process and prior to assigning the task, Entergy personnel reviewed the qualifications of the engineers and personnel performing the fire analyses and modeling activities as presented in their resumes. Individuals selected to perform tasks were required to have the appropriate background for these activities as described in part a) of this response. For example, proposal evaluation and supplier selection activities are performed in accordance with the process established in procedure EN-MP-105, which includes;

   - technical considerations,
   - research and development effort,
   - qualification of supplier's personnel,
   - supplier's production capability, and
   - supplier's past performance.

c) During the preparation of the PNP LAR, meetings were held between PRA and fire modeling staff to review the necessary fire models and to ensure the results accurately reflected the needs of the PRA model. In addition to the meetings, Fire PRA team members reviewed the documentation prior to its incorporation into the PRA model. The fire modeling results are contained in calculations which are reviewed in accordance with the appropriate quality assurance program. These calculations were reviewed under the contractors Quality Assurance (QA) program with individuals familiar with the technical aspects of the calculation. In addition, the fire modeling calculations were reviewed by individuals at Entergy who were qualified to the Entergy engineering processes. At Entergy, the process contained in procedures EN-DC-126, EN-DC-147 or EN-DC-149 was used to perform the review of the fire modeling. Comments were provided by the appropriate Entergy individuals.

A similar process as described above will be utilized post-transition. Fire

modeling will be performed as needed and reviewed by Entergy using the Entergy engineering processes reflected in procedures EN-DC-126, EN-DC-147, or EN-DC-149.

d) See response to part c) of this RAI.

REFERENCES

- NEI 07-12, “Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines”, Revision 0, Draft H
- EN-DC-126, “Engineering Calculation Process”, Revision 4
- EN-DC-147, “Engineering Reports”, Revision 6
- EN-DC-149, “Acceptance of Vendor Documents”, Revision 6
- EN-MP-105, “Materials, Purchasing and Contracts Process”, Revision 5

NRC Request

PRA RAI 10

The ASME/ANS PRA Standard and RG 1.200, Rev. 2, provide guidance for the technical adequacy, including supporting requirements and peer reviews. Section 2.4.3.3 of NFPA 805 states that the PSA approach, methods, and data shall be acceptable to the AHJ. RG 1.205, provides guidance for use in complying with the requirements promulgated for risk-informed, performance-based fire protection programs that meet the requirements of 10 CFR 50.48(c) and the referenced 2001 Edition of NFPA 805. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Rev. 2, as providing methods acceptable to the NRC for adopting a fire protection program consistent with NFPA-805. The following additional information is requested in order for the staff to complete its review:

Identify if any variance from deterministic requirements (VFDRs) in the LAR involved performance-based evaluations of wrapped or embedded cables. If applicable, describe how wrapped or embedded cables were modeled in the FPRA, including assumptions and insights on how these cables contribute to the VFDR delta-risk evaluations.

ENO Response

PRA RAI 10

No variances from deterministic requirements (VFDRs) in the PNP LAR involved performance-based evaluations of wrapped or embedded cables.

NRC Request

PRA RAI 11

The ASME/ANS PRA Standard and RG 1.200, Rev. 2, provide guidance for the technical adequacy, including supporting requirements and peer reviews. Section 2.4.3.3 of NFPA 805 states that the PSA approach, methods, and data shall be acceptable to the AHJ. RG 1.205, provides guidance for use in complying with the requirements promulgated for risk-informed, performance-based fire protection programs that meet the requirements of 10 CFR 50.48(c) and the referenced 2001 Edition of NFPA 805. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Rev. 2, as providing methods acceptable to the NRC for adopting a fire protection program consistent with NFPA-805. The following additional information is requested in order for the staff to complete its review:

Identify and describe all unanalyzed methods (UAMs) or deviations from NUREG/CR-6850, and clarify whether guidance from the June 21, 2012, letter from NRC to NEI, "Recent Fire PRA Methods Review Panel Decisions and EPRI 1022993, 'Evaluation of Peak Heat Release Rates in Electrical Cabinets Fires'" (ADAMS Accession No. ML12171A583) was used in applying related methods. For identified deviations from NUREG/CR-6850 that fall outside this guidance memo, provide a sensitivity study that estimates the impact of their removal on CDF, LERF, ΔCDF, and ΔLERF.

ENO Response

PRA RAI 11

The PNP fire PRA team and peer reviews concluded no unreviewed analysis methods (UAMs) were utilized for the NFPA 805 fire PRA. However, some deviations from NUREG/CR-6850 were identified and are being addressed in responses to other RAIs.

The methods utilized are consistent with the guidance in Reference 1 for frequencies for cable fires initiated by welding and cutting, transient fires, pump oil fire alignment factors, electrical cabinet fire refinements, and peak heat release rates for electrical cabinet fires. An inconsistency in the application of the new frequencies for cable fires initiated by welding and cutting is being addressed in the response to RAI PRA 13.

Table RAI PRA 11-1 lists UAMs or deviations from accepted methods and approaches discussed during various industry NEI/NRC meetings on fire PRA methodology and the disposition for PNP. Table RAI PRA 11-1 also includes two items identified during the audit (see items 29 and 30).

For items addressed in other RAIs as indicated below, updated values of CDF, LERF, ΔCDF, and ΔLERF will be provided in the response to PRA RAI 23.

Table RAI PRA 11-1: NEI/NRC Identified UAM or Deviation and Palisades Disposition		
Item	**UAM or Deviation**	**Disposition for Palisades**
1	Incipient detection (VEWFDS) Credit: Area-Wide	Palisades fire PRA takes no credit for VEWFDS beyond the NUREG/CR-6850 Appendix P/FAQ 08-0050/Supplement 1 code-compliant detection.
2	Incipient detection (VWEFDS) Credit: Control Room/Complex	PNP fire PRA takes no credit for VEWFDS beyond the NUREG/CR-6850 Appendix P/FAQ 08-0050/Supplement 1 code-compliant detection.
3	Incipient detection (VEWFDS) Credit: Used to Justify Non-Abandonment	PNP fire PRA takes no credit for VEWFDS beyond the NUREG/CR-6850 Appendix P/FAQ 08-0050/Supplement 1 code-compliant detection.
4	Non-abandonment with loss of function	PNP 45 control room fire non-abandonment scenarios explicitly consider loss of function of fire-impacted components. Abandonment due to loss of function addressed in RAI PRA 01, Part k).
5	Control room abandonment (0.1 CCDP screening value)	The three PNP control room abandonment scenarios explicitly calculate CCDP and do not use a screening value.
6	Not using lower failure threshold for sensitive electronics	Addressed in PRA RAI 01, Part o). Sensitive electronics method will be consistent with FAQ 13-0004.
7	Fire propagation from self-ignited cable fires and hot work induced cable fires	Addressed in PRA RAI 01, Part u) and FM RAI 01, Parts g), j) and l). Fire propagation from self-ignited cable fires and hot work method will be consistent with FAQ 13-0005.
8	Modeling junction box scenarios	Addressed in PRA RAI 01, Part u) and FM RAI 01, Parts g), j) and l). Junction box method will be consistent with FAQ 13-0006.
9	Database driven factor for propagation of fire beyond the originating electrical cabinet (not accepted by NRC via ADAMS ML12171A583)	PNP fire PRA did not utilize a database driven factor for fire propagation beyond the electrical cabinet 98th percentile zone of influence.
10	Credit for CPT in probability of spurious operations	Values for circuits with CPTs provided in NUREG CR/6850 Tables 10-1 and 10-3 are considered non-conservative; therefore non-CPT values were used in the PNP fire PRA.

Table RAI PRA 11-1: NEI/NRC Identified UAM or Deviation and Palisades Disposition		
Item	**UAM or Deviation**	**Disposition for Palisades**
11	Hot work factor from administrative control credit	PNP fire PRA did not use an administrative control credit. Adjustments to fire ignition frequencies consistent with Reference 1 were applied. An inconsistency in applying these adjustments addressed in PRA RAI 13.
12	Transient fires (some use 75%ile values)	PNP fire PRA evaluates up to and including the 98th percentile heat release rate from Case 8 in NUREG/CR-6850. Transient fire method is consistent with the June 21, 2012 letter to NEI (ML12171A583).
13	Alignment factor for oil pump fires (similar approach to FAQ 44)	Pump oil fire alignment factor method is consistent with the June 21, 2012 letter to NEI (ML12171A583).
14	Administrative control frequency reduction includes credit for significant administrative control (FAQ 12-0064)	PNP fire PRA did not credit administrative control frequency reduction factors. Frequency reduction method is consistent with FAQ 12-0064. While FAQ 12-0064 allows assignment of “Very Low” and “Extremely Low” influence factor in some circumstances, these were not exercised at PNP for the LAR.
15	Generically use lower HRR for transient combustibles (even though higher HRR is possible) to compensate for perceived lower frequency of occurrence	PNP fire PRA did not credit heat release rate reduction factors based on perceived lower frequency of occurrence. The 98th percentile HRR from NUREG/CR-6850 was assumed as the maximum peak HRR for all PAU transients.
16	Not using 0.001 as lowest value for failure of manual suppression (using values less than 0.001, even 0)	For non-HGL evaluations, PNP fire PRA did not use values lower than 0.001 for manual suppression. For HGL evaluations, PNP fire PRA implicitly credits an NSP of 0 when time to HGL is >60 minutes. Addressed in RAI FM 01, Part e).
17	Not putting transient fires at pinch points (i.e., putting them at non-pinch point locations)	PNP fire PRA placed transient fires both at pinch-points and at non-pinch-point locations. Addressed in PRA RAI 06 and PRA RAI 07.
18	Compliant plant base risk calculation (analysis assumes only 1 train available even if more trains may be available)	PNP fire PRA compliant plant base risk calculation did not artificially increase compliant plant risk by assuming only a single train available.
19	Hot short duration for DC circuits	PNP fire PRA did not credit limited hot short durations for DC circuits.

Table RAI PRA 11-1: NEI/NRC Identified UAM or Deviation and Palisades Disposition		
Item	**UAM or Deviation**	**Disposition for Palisades**
20	Administrative control frequency reduction: Controls for storage/placement (HRA/value for administrative violation)	PNP fire PRA did not credit administrative control frequency reduction factors.
21	Administrative control frequency reduction: Areal factor	PNP fire PRA did not credit administrative control frequency reduction factors.
22	Reducing frequency based on component count (e.g., counting bus ducts differently than FAQ 35)	Plant wide frequencies were not reduced based on component count. The bus duct counting is consistent with FAQ 07-0035.
23	Not modeling loss of instrumentation (assumed available)	Addressed in PRA RAI 01, Parts d), f), l) and cc).
24	Not spreading fires to nearby combustibles (e.g., crediting IEEE-383 "qualification" as basis for not assuming fire spread)	Addressed in FM RAI 01, Part k).
25	Not updating generic data with plant-specific data (ignition frequency or suppression reliability)	PNP fire PRA performed a Bayesian update for fire ignition frequencies consistent with NUREG/CR-6850 methodology. Evaluation of plant specific data for suppression reliability addressed in PRA RAI 01, Part t).
26	Credit for cable coatings	PNP fire PRA did not credit cable coatings.
27	Credit for solid metal bottom cable trays	PNP fire PRA did not credit solid metal bottom cables trays with limiting fire spread.
28	Diesel generator fire reduction factor	PNP fire PRA did not credit diesel generator fire reduction factors.
29	Use of grid method for fixed and transient scenario fire damage in cable spreading room	Addressed in PRA RAI 01, Part m) and PRA RAI 07.
30	Use of Mathcad method to calculate time to damage	Addressed in PRA RAI 01, Parts m) and q); and FM RAI 01, Part p); FM RAI 02, Part b).

REFERENCES

- Letter from NRC to NEI, Recent Fire PRA Methods Review Panel Decisions and EPRI 1022993, 'Evaluation of Peak Heat Release Rates in Electrical Cabinets Fires', ADAMS Accession No. ML12171A583, dated June 21, 2012