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SOUTHERN COMPANY
Energy to Serve Your World℠

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

Joseph M. Farley Nuclear Plant Units 1 and 2
Request to Revise Service Water Intake Structure
Exemption from Fire Protection Requirements at Farley Nuclear Plant

Ladies and Gentlemen:

In accordance with the requirements of 10 CFR 50.12, Southern Nuclear Operating Company (SNC) requests the Nuclear Regulatory Commission (NRC) approve a revision to the existing exemption for the Joseph M. Farley Nuclear Plant (FNP) Service Water Intake Structure (SWIS). The NRC granted the current SWIS exemption on December 29, 1986, which exempted FNP from certain requirements in 10 CFR 50, Appendix R, Section III.G.2, as applied to specific cables and equipment in the SWIS, FNP Fire Area 72.[1] This exemption revision is part of SNC's comprehensive plan to respond to the NRC's concerns about Kaowool fire barrier material. NRC approval of this revision to the current exemption will satisfy the NRC's exemption requirements in 10 CFR 50.12 for the reasons discussed in this correspondence.

SNC has made and will make additional modifications, which eliminate the need to rely on Kaowool for much of the plant where this material has been used to demonstrate compliance with 10 CFR 50, Appendix R or as part of the bases for an exemption. Approximately six million dollars is expected to be spent for design, material, and implementation of these modifications. However, in the SWIS, SNC has determined that rerouting of cables is not feasible and that replacing the Kaowool with an alternative

[1] An overview of the exemption is provided in Attachment A. SNC recognizes that because Farley 1 was licensed to operate prior to January 1, 1979, it is subject to Appendix R to 10 CFR 50 and requires an exemption for any noncompliance with that rule, but that Farley 2 was licensed after that date and, therefore, requires a deviation from any commitment to comply with the substance of that rule. Nevertheless, because the subject matter of these requests is located in an area servicing both units, the technical analysis of the justification for the exemption request and the deviation request are the same, and the prior exemption for this area did not separately provide for a deviation for Farley 2, SNC has followed that precedent by not distinguishing between an exemption request and deviation request for the two units.

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material will not result in a significant improvement in safety. Other cost-effective modifications, however, have been identified that could improve safety and reduce regulatory burden. These cost-effective modifications, in conjunction with analyses and administrative controls, do not result in the SWIS being in full compliance with 10 CFR 50, Appendix R. Accordingly, SNC proposes to implement an alternative compliance strategy based on a combination of changes to the current fire protection program, consistent with the plant's current licensing basis, and an application of the risk-informed, performance-based methods in the National Fire Protection Association's standard "NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition" (NFPA 805), to eliminate reliance on Kaowool.

The proposed changes to the current licensing basis rely on traditional deterministic analyses, which demonstrate compliance with the standard fire protection license condition. These changes include: (1) removal of some conditions for circuits, which have been found not to require protection; (2) elimination of some manual actions to reposition valves, which have been shown not to change position as the result of a fire; (3) creation of new fire areas by upgrading the passive fire resistance features of certain fire zone barriers; (4) modification of the success criterion for the ability to remove decay heat and safely shutdown in the event of a fire in the SWIS; and (5) modifications to remove reliance on lube and cooling water pumps. Attachment B, in the section titled "Deterministic Re-analysis of the SWIS Licensing Basis," describes the justification to modify the current licensing basis.

The proposed elimination of reliance on Kaowool, using processes described in NFPA 805, is based on the NRC's proposal to adopt that standard as an alternative comprehensive fire protection regulation [Reference: "Voluntary Fire Protection Requirements for Light Water Reactors; Adoption of NFPA 805 as Risk-Informed, Performance-Based Alternative," 67 Fed. Reg. 66578 (November 1, 2002)]. Section 2.2.9 of NFPA 805 provides for a risk-informed evaluation and acceptance of proposed changes to a plant's fire protection program. SNC has applied these NFPA 805 provisions by using a draft version of Section 8.3 of the NFPA 805 Implementing Guidance, which is being developed by the Nuclear Energy Institute (NEI), to evaluate proposed changes to the plant's fire protection program in the SWIS. An overview of SNC's application of the plant change evaluation process is provided in Attachment B.[2]

NFPA 805 Section 2.4.4.1 refers to the risk acceptance criteria adopted by the authority having jurisdiction (AHJ) as an element of the basis for determining the acceptability of proposed changes. The NRC is the AHJ in this case. Therefore, acceptance criteria for risk-informed change to a plant is established by Regulatory Guide 1.174, "An Approach

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[2] This first-of-a-kind application of the NFPA's risk-informed, performance-based methods was undertaken not only to support proposed changes to FNP's fire protection program but also as a pilot demonstration of the usability of the Implementing Guidance, which is being developed in concert with the NRC, to support licensees' adoption of NFPA 805 and application of its methods. Industry and NRC experts participated in a discussion of this pilot application of the plant change process and their valuable insights have been incorporated in this request. Those insights have also been incorporated into the Implementing Guidance as part of the iterative process for its development.

for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, Revision 1." Accordingly, SNC applied these acceptance criteria to evaluate the acceptability of the change in risk that would result by eliminating reliance on Kaowool and found the change in risk acceptable. Attachment C demonstrates why compliance with NFPA 805 provides reasonable assurance of adequate protection of public health and safety.

SNC has demonstrated that the proposed fire protection program changes to the current licensing basis, combined with a risk-informed, performance-based determination that reliance on Kaowool can be eliminated, satisfy all of the NRC criteria for an exemption under 10 CFR 50.12. The NRC, in accordance with 10 CFR 50.12, may grant an exemption if it is authorized by law, will not adversely affect public health and safety, is consistent with the common defense and security, and is supported by a showing of special circumstances. In this case, the NRC is authorized by law to grant revisions to exemptions from 10 CFR 50, Appendix R because that requirement was promulgated solely under the NRC's authority in the Atomic Energy Act of 1954, as amended, and so may be modified under that same statutory authority. Approval of the exemption will not adversely affect public health and safety because the proposed changes to the fire protection program have been shown to maintain or enhance fire safety. The changes SNC proposes to make to the current licensing basis satisfy the acceptance criteria in the standard fire protection license conditions. In addition, the proposed elimination of credit for Kaowool in the analysis satisfies the criteria in NFPA 805. Approval of the exemption revision will have no effect on common defense and security because plant security plans and programs are not affected by the proposed exemption. Special circumstances support granting of the exemption revision because strict application of the requirements in this case is not necessary to achieve the underlying fire protection purposes of the rule [Reference: 10 CFR 50.12(a)(2)(ii)]. Plant modifications and the integrated risk assessment demonstrate that with the exemption revision, the fire protection program in the SWIS will continue to maintain or enhance plant safety while avoiding the unnecessary regulatory burden that would result from strict compliance with 10 CFR 50, Appendix R.

Based on the above, SNC requests that the NRC approve this revised comprehensive exemption by August 25, 2004. This revised exemption will clarify SNC's fire protection licensing basis, delete the unnecessary attributes of the exemption, and revise the remaining exemption attributes to remove references to Kaowool consistent with the findings conclusions in Attachment C. Due to this first-of-a-kind application of NFPA 805, SNC requests a meeting with the NRC prior to the issuance of any requests for information.

Mr. J. B. Beasley, Jr. states he is a Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

This letter contains no NRC commitments. If you have any questions, please advise.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

J. B. Beasley, Jr.

Sworn to and subscribed before me this 28th *day of* August, *2003.*

Glenda C. Spirks
Notary Public

My commission expires: 11/10/06

JBB/JLS/sdl

Attachments: A – Overview of Current SWIS Exemption
B – Detailed Description of Exemption Revision Request
C – Adequacy of Safety Finding Under NFPA 805

cc: Southern Nuclear Operating Company
Mr. J. D. Woodard, Executive Vice President
Mr. D. E. Grissette, General Manager – Plant Farley
Document Services RTYPE: CFA04.054; LC# 13828

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. F. Rinaldi, NRR Project Manager – Farley
Mr. T. P. Johnson, Senior Resident Inspector – Farley

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Attachment A
Overview of Current SWIS Exemption

An exemption from Section III.G.2.c of 10 CFR 50, Appendix R was granted for Fire Area 72 on December 29, 1986 to the extent that it requires enclosure of one train of redundant cables and equipment by a 1-hour rated fire barrier and requires an automatic fire suppression system. The Safety Evaluation Report (SER) was based upon submittals dated March 13, 1985, July 19, 1985, and October 18, 1985.

The exemption request described individual conditions, which were evaluated in the SER. The conditions and a summary of the acceptance, is provided in Table A-1.

Table A-1 Current Approved SWIS Exemption

Item	Condition	Summary of Acceptance
1	Unit 2 side of the pump deck contains redundant Service Water pump lube and cooling water pumps. Local control stations also located in close proximity.	Pre-action sprinkler system for pump deck, local pre-action spray system, pre-action coverage for local control station, Train A raceways protected by Kaowool blanket, area-wide detection.
2	Unit 2 side of the strainer pit contains redundant Unit 2 Service Water header strainer motor operated inlet valves and swing pump motor operated discharge valves.	Pre-action sprinkler system coverage for redundant valves, Train A valves cables protected by Kaowool blanket, physical separation of valves, minimal intervening combustibles.
3	Unit 1 side of the strainer pit contains redundant Unit 1 Service Water header strainer motor operated inlet valves and swing pump motor operated discharge valves.	Pre-action sprinkler system coverage for redundant valves, Train A valves cables protected by Kaowool blanket, physical separation of valves, minimal intervening combustibles.
4	Fire Zone 72A contains redundant safe shutdown Service Water Train A and Train B cables (associated with Service Water discharge to the wet pit and storage pond flume) shared by Unit 1 and Unit 2.	Long term manual operator actions (not required for 24 hours), Plant procedures written to perform action.
5	Fire zones 72A and 72E contain cables for the motor operated valve that aligns the swing service water pump discharge to Train A service water system. When the swing service water pump is aligned to Train B, a fire induced spurious opening of this valve could result in cross connection of Train A and B service water systems.	Service water alignment procedures revised to remove power to subject valves after swing pump alignment. This action removes potential for valve repositioning due to fire.
6	Fire zones 72A and 72B contain cables for the motor operated valve that aligns the swing service water pump discharge to Train B service water system. When the swing service water pump is aligned to Train A, a fire induced spurious opening of this valve could result in cross connection of Train A and B service water systems.	Service water alignment procedures revised to remove power to subject valves after swing pump alignment. This action removes potential for valve repositioning due to fire.
7	Fire Zones 72D and 72E contain redundant Unit 1 and Unit 2 swing Service Water pump cables.	Design and interlocks of disconnect switches, bottom entry design of disconnect switch, disconnect switch and switchgear detection and CO2 suppression system, Fire Zone 72A sprinkler system, passive fire barriers.

Attachment A
Overview of Current SWIS Exemption

Table A-1 Current Approved SWIS Exemption

Item	Condition	Summary of Acceptance
8	Fire Zones 72B and 72C contain redundant Unit 1 and Unit 2 swing Service Water pump cables.	Design and interlocks of disconnect switches, bottom entry design of disconnect switch, disconnect switch and switchgear detection and CO2 suppression system, Fire Zone 72A sprinkler system, passive fire barriers.
9	Fire Zone 72A contains redundant Service Water pumps (Train A and Train B) for Unit 1 and Unit 2.	Pump deck pre-action system, local pre-action spray system, curbs and partial height barriers on either side of swing pumps, Kaowool blanket protection for Train A raceways, area wide detection. The exemption request and SER provide statements that prevent a fire on the pump deck "from spreading to the redundant train or opposite unit Service Water pumps."
Addendum to Request	Adequate coordination was not provided between safe shutdown and non-safe shutdown circuits powered from 125v dc distribution panels 1N, 2N, 1M, and 2M.	Manual operation of affected breakers credited, if necessary. Loss of dc would not affect power to required safe shutdown loads. Design change was initiated to improve breaker coordination, which would eliminate the concern (stated as not part of the exemption request). *Note: This addendum is listed for completeness only. The condition was corrected by design change and is unrelated to the changes associated with Kaowool resolution and the use of risk-informed, performance-based approaches.*
Other	Train A and Train B raceways containing redundant Service Water and related power distribution cables for both units enter the SWIS near the ceiling in the northeast corner.	Note that this scenario is not explicitly discussed in the nine scenarios in Revision 1 of the Fire Area 72 exemption request. However, the "Fire Protection" discussion on page 1-3-10 and 1-3-11 of the exemption request discusses the northeast corner raceway fire barrier and pre-action system protection.

Attachment B
Detailed Description of Exemption Revision Request

This discussion provides a detailed description of the exemption request, an overview of deterministic changes that have been made to the Service Water Intake Structure (SWIS), and an overview of the risk-informed, performance-based plant change evaluation that was conducted.

Background

Joseph M. Farley Nuclear Plant (FNP) Unit 1 was licensed to operate before the Nuclear Regulatory Commission (NRC) adopted Appendix R. FNP Unit 2 was well into construction at that time. As with many other plants of that vintage, the FNP units were granted exemptions from certain requirements in Section III.G.2 of Appendix R to 10 CFR 50. Some of those exemptions were based in part on the installation of a rated fire barrier material called Kaowool. Kaowool was relied on in part for several conditions in the current exemption for the SWIS.

SWIS

The SWIS is a structure which is about half a mile from the nuclear main power block and its support buildings. It is common to FNP Units 1 and 2 and contains cables, pumps, valves, and other equipment necessary for the Service Water system. The SWIS supplies cooling water from the Service Water pond to the various essential components in both the nuclear main power block and balance of plant systems which require heat removal for proper operation during normal and accident conditions. Details about the cables, pumps, valves and other equipment in the SWIS are provided below, as appropriate.

Current Exemption

An exemption was granted for the SWIS for certain redundant valves, pumps, and cables, which did not satisfy the separation criteria in Section III.G.2 of Appendix R to 10 CFR 50. The NRC documented their review of the exemption in a Safety Evaluation Report (SER) dated December 29, 1986. Some of the conditions in the exemption were granted, in part, on the basis that Kaowool had been used to protect certain cables. In particular, Kaowool had been used to protect redundant cables in the vicinity of their points of entry into the SWIS at the northeast corner of the building, where they provide power to the Service Water pumps near the wall which separates the pumps from the switchgear rooms, and on raceways running in the east-west direction of the pump deck and the strainer pit.

SNC Response to NRC Concerns about Kaowool

Several years after the 1986 exemption had been granted, the NRC concluded that the information relied on by Southern Nuclear Operating Company (SNC) and the other licensees which had installed Kaowool was not sufficient to demonstrate the fire barrier rating claimed for that material. After extensive interactions between these licensees and the NRC, the licensees initiated programs to eliminate reliance on Kaowool as a means of demonstrating compliance with Appendix R. SNC conducted an extensive re-analysis of its post-fire safe shutdown program to identify alternative compliance strategies that would eliminate reliance on Kaowool. Based on this re-analysis, SNC determined that a combination of plant modifications and program changes for some fire areas could result in the elimination of reliance on substantial quantities of Kaowool. SNC plans to spend approximately six million dollars in re-analyses and modifications to eliminate reliance on Kaowool for nearly 6000 linear feet of electrical raceways.

Revised Compliance Strategy

During this same period, NRC initiated rulemaking to adopt National Fire Protection Association 805 (NFPA 805), with a few minor exceptions, as a risk-informed, performance-based comprehensive alternative to previous NRC fire protection requirements, including 10 CFR 50, Appendix R. This NRC action was part of the NRC's evolving regulatory strategy based on the replacement of unduly burdensome prescriptive regulations with risk-informed, performance-based alternatives. The NRC had initiated this strategy in general by issuing Regulatory Guide 1.174 and viewed the adoption of NFPA 805 as a specific application of this strategy as applied to fire protection.

SNC had been following the NRC's evolving regulatory strategy and conducted a study of the feasibility of applying risk-informed, performance-based methods to address some of the remaining issues associated with Kaowool. The study indicated that proposed fire protection program modifications under FNP's current license conditions in combination with an application of the risk-informed, performance-based methods in NFPA 805 to revise the existing exemption in the SWIS would likely show that SNC could: (1) maintain or enhance safety consistent with the acceptance criteria in NFPA 805, which includes the acceptance criteria in Regulatory Guide 1.174; and (2) avoid unnecessary regulatory burden. Accordingly, SNC decided to conduct a risk-informed, performance-based evaluation of the SWIS to support its implementation of this strategy.

SNC conducted a detailed review of the SWIS, which included an integrated safety analysis using the risk-informed, performance-based methods in NFPA 805. The detailed review and integrated safety analysis showed that some of the conditions in the exemption were unnecessary, that some conditions in the exemption could be removed cost-effectively by upgrading a dividing wall and creating new fire areas, that some conditions could be removed by modifying lubrication and cooling support for Service Water pumps, and other program changes, and that modification of the conditions in the exemption to remove reliance on Kaowool would cost-effectively maintain or enhance safety while reducing unnecessary regulatory burdens. SNC is in the process of modifying its current licensing basis fire protection program in accordance with its fire protection license conditions to support removal of the unnecessary conditions in the exemption. To complete this response to NRC concerns about Kaowool, SNC is requesting that exemption items 1 through 8 and the "Addendum to Request" described in Attachment A be removed. It is also requested that the remaining two conditions in the exemption granted in the SER of 1986 (Item 9 and the item described as "Other" in Attachment A) be amended to eliminate references to reliance on Kaowool, because Kaowool is no longer needed to demonstrate compliance with Appendix R such that FNP can be shut down safely in the event of a fire in the SWIS.

Current Fire Protection Licensing Basis in the SWIS

To understand why revisions to certain of the existing exemption conditions are appropriate, it is necessary to examine the fire protection situation in the SWIS in some detail.

Attachment B
Detailed Description of Exemption Revision Request

Overview of the SWIS

The SWIS is a building that is located about half a mile from the nuclear main power block. It principally contains Service Water pumps and their supporting equipment that, among other uses, are necessary to cool certain plant equipment needed to achieve and maintain safe shutdown in the event of a fire. These pumps are spaced between five and six feet apart, on centers, and are protected by fire suppression and detection systems. Each reactor unit has five pumps, two in Train A, two in redundant Train B, and a swing pump that can be aligned to either train. Redundant Train A and Train B cables supply power and controls to the pumps and support equipment. These cables are in close proximity where they enter the SWIS in the northeast corner of the building. Motor operated valves located in the strainer pit direct the pump flow for Trains A and B. These valves have very little separation.

As shown in Figure B-1, most of the SWIS is designated as Fire Area 72. Fire Area 72 is comprised of five fire zones:

Zone 72A – Service Water Pump Deck and Strainer Pit
Zone 72B – Switchgear Room Train B
Zone 72C – 5kV Disconnect Switch – Train B
Zone 72D – 5kV Disconnect Switch – Train A
Zone 72E – Switchgear Room Train A

Smoke detection is provided in all fire zones. Automatic suppression is provided for the pumps, strainer pit, northeast corner, and switchgear/disconnect switches. The principal combustible materials in the SWIS are lubricating oil in the Service Water pumps, cable jacketing and insulation, and transient combustibles.

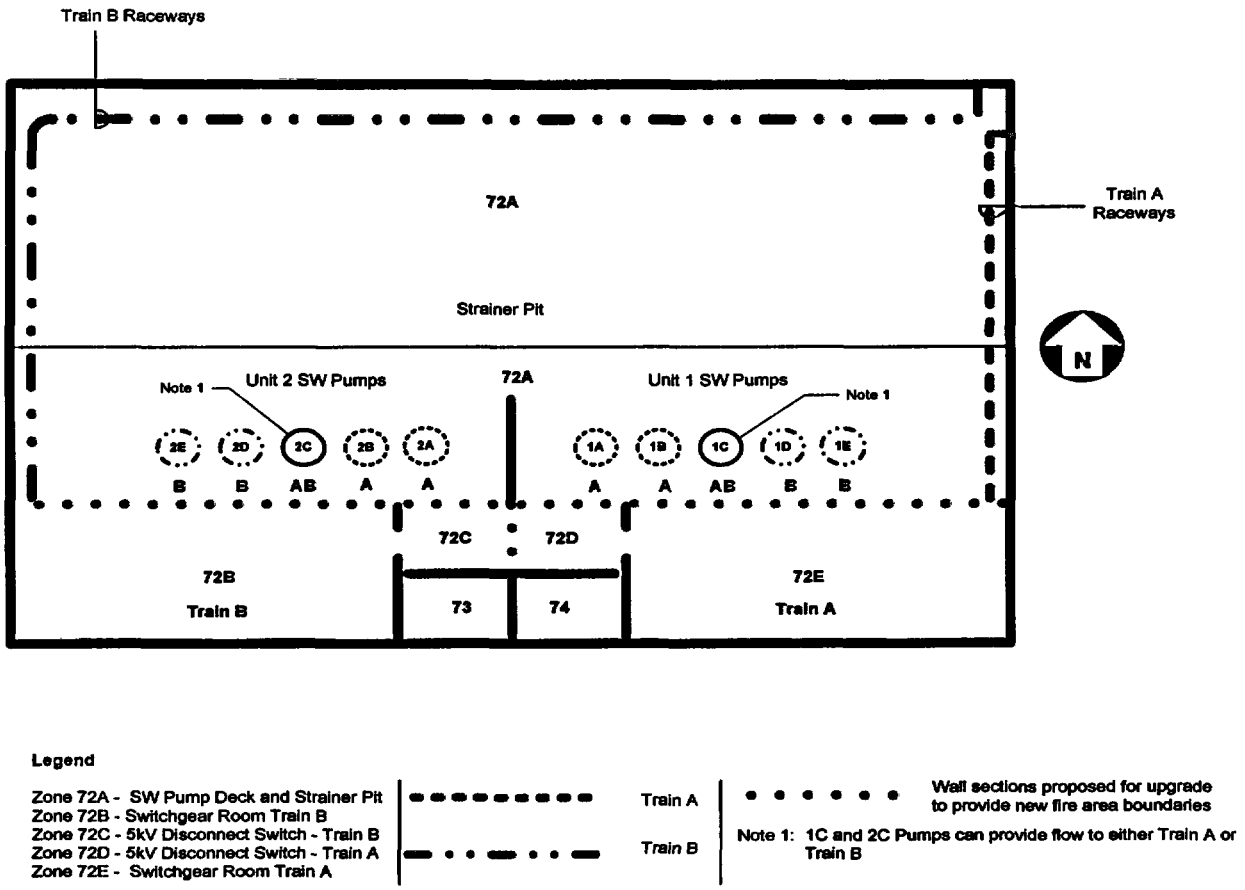

Figure B-1 – Farley SWIS Fire Area 72 – Simplified Layout

Existing SWIS Exemption Conditions

Appendix R nonconforming conditions were explicitly identified in the SWIS exemption. They are:

1. Redundant Unit 2 Service Water pump lubrication and cooling water pumps and their associated valves and local control stations did not satisfy Appendix R separation or fire barrier requirements (Attachment A, Item 1).

2. Redundant Unit 2 Service Water header strainer motor operated inlet valves and swing pump motor operated discharge valves do not satisfy either Appendix R suppression, separation or fire barrier requirements (Attachment A, Item 2).

3. Redundant Unit 1 Service Water header strainer motor operated inlet valves and swing pump motor operated discharge valves do not satisfy either Appendix R suppression, separation or fire barrier requirements (Attachment A, Item 3).

4. Fire damage to redundant safe-shutdown Service Water Train A and Train B cables in Fire Zone 72A and shared by both units could cause certain valves to change positions (Attachment A, Item 4).

5. Fire damage to redundant Unit 1 and Unit 2 Service Water cables in Fire Zones 72A and E could cause certain Train A valves to change position under certain conditions (Attachment A, Item 5).

6. Fire damage to redundant Unit 1 and Unit 2 Service Water cables in Fire Zones 72A and B could cause certain Train B valves to change position under certain conditions (Attachment A, Item 6).

7. Redundant Unit 1 and Unit 2 Service Water swing pump cables in Fire Zones 72D and E do not meet separation or fire barrier requirements (Attachment A, Item 7).

8. Redundant Unit 1 and Unit 2 Service Water swing pump cables in Fire Zones 72B and C do not meet separation or fire barrier requirements (Attachment A, Item 8).

9. Redundant safe-shutdown Service Water pumps and related cable raceways do not meet separation or fire barrier requirements (Attachment A, Item 9).

In addition to these nine situations addressed by the existing exemption, SNC also considered the redundant Train A and Train B raceways, which contain Service Water and related power distribution cables for both units, which enter the SWIS near the ceiling in the northeast corner. Train B raceways that are required for post-fire safe shutdown are wrapped with Kaowool in the northeast corner. The Addendum to Request described in Attachment A was resolved with a plant modification.

The 1986 SER granted the SWIS exemption based on the presence of combinations of some or all of the following fire protection features in the SWIS:

- Pre-action sprinklers
- Pre-action water spray system
- Detection
- Partial height radiant barriers between the pumps and concrete walls and curbs
- Long-term manual operator actions
- Kaowool as electrical raceway fire barriers (Fire Zone 72A only)

Now that the NRC has called into question reliance on Kaowool, SNC has reviewed the fire protection licensing basis and determined that it could be revised without the need to take credit for Kaowool, as discussed below.

Deterministic Re-analysis of the SWIS Licensing Basis

SNC reviewed the SWIS's fire protection licensing basis and its underlying assumptions in the context of the currently applicable deterministic, prescriptive requirements. SNC found that some of the assumptions could be modified and that changes could be made to the licensing basis consistent with the conditions established in the current fire protection license condition. As discussed below, these changes would not adversely affect FNP's ability to achieve and maintain

safe shutdown or decrease the effectiveness of the fire protection program. In some cases the changes reduce fire risk in the SWIS.

Modifications that Improve Fire Protection and Enhance Safety

Currently, the Unit 2 Service water pumps are supported by lube and cooling pumps. These lube and cooling pumps are also considered ignition sources and contribute oil and cable insulation to the total combustible loading in the area. SNC intends to modify the Unit 2 Service Water pumps to eliminate their reliance on lube and cooling support pumps. This will not only eliminate the need to consider fire-induced impacts on these pumps, but also the need to consider these pumps as ignition sources, including the combustible loadings associated with them, and will eliminate reliance on Kaowool utilized for protection of their circuits. The modification will eliminate a specific interaction in the vicinity of the lube and cooling pumps discussed in the exemption request.

SNC also intends to upgrade the nominal 18-inch concrete wall between Fire Zone 72A and Fire Zones 72B, C, D and E to meet the requirements of FNP's Fire Protection Program for a minimum 3-hour fire area boundary. Penetrations will be sealed, un-rated doors will be replaced by 3-hour rated fire doors, and three new fire areas will be created, 72A, 72B/72C and 72D/72E. These changes will provide cost-effective improvements in fire safety and will eliminate potential fire propagation paths between the pump deck and switchgear rooms, as well as between redundant switchgear rooms. These changes will provide additional defense-in-depth, supporting the elimination of the need for Kaowool barriers in fire area 72A because cables in that fire area will be protected from fires in fire areas 72B/72C and 72D/72E by the passive features of the upgraded wall.

In addition, a new curb on the Unit 1 pump deck will be installed to prevent liquid spill fires associated with the Unit 1 pumps from pooling beneath the Train A cable tray located near the east wall.

It should be noted that none of these upgrades to SNC's fire protection program in the SWIS were required and likely would not have been identified had SNC determined instead to re-establish compliance with its current licensing basis by replacing the Kaowool with an alternative, approved fire barrier material. SNC identified these opportunities to improve fire protection in the SWIS because it conducted a comprehensive deterministic and risk-informed, performance-based review of the current configuration. SNC planned implementation of these improvements in the SWIS consistent with the NRC's views that risk-informed, performance-based evaluations may reveal previously unappreciated risks as well as provide support for eliminating unnecessary actions where risks have been overestimated.

Safe Shutdown Success Criterion

Prior to the detailed review of the SWIS, two Service Water pumps per unit were considered the minimum necessary to provide decay heat removal in the event of a shutdown. This conclusion does not appear to be based on an analysis of post-fire shutdown cooling needs but appears to have been adopted from the safe shutdown analysis for design basis accidents. A traditional thermal-hydraulic analysis was conducted using the methods that had been used to determine the minimum number of Service Water pumps that would be necessary for cooling in the event of a

design basis accident. That analysis showed that the equipment that would be required to be cooled to achieve and maintain safe shutdown after a fire was not as extensive as the equipment that would be required to be cooled to achieve and maintain safe shutdown after a design basis event. Calculations showed that one Service Water pump per unit in the SWIS will provide adequate flow to cool the equipment necessary for achieving and maintaining safe shutdown of a unit in the event of a fire. In the unlikely situation that only one Service Water pump per unit is operable due to a fire in the SWIS, new manual actions may be required to ensure inventory replenishment to the Condensate Storage Tank. These actions involve the manipulation of valves that are located within the main power block, approximately one-half mile from the SWIS, and would not be necessary within the first 24 hours following initiation of plant shutdown.

Re-determination of the Equipment Requiring Fire Protection to Ensure Safe Shutdown

Using traditional deterministic analysis, SNC reviewed the equipment in the SWIS that would be relied upon for safe shutdown in the event of a fire. SNC determined that certain power and control circuits for the motor operated valves (MOVs) provided with Kaowool raceway fire protection in the strainer pit did not require fire protection because fire-induced failures would not lead to repositioning of the valves so as to interfere with plant shutdown. Therefore, credit for Kaowool used to protect raceways containing these cables could be eliminated. Additional reviews of the failure modes of valves aligning Service Water from the circulating water canal to the Service Water pond would not result in a need to perform long-term manual operator actions previously relied upon in the original exemption.

In addition, SNC determined that certain cables for MOVs that align the swing Service Water pump discharge valves no longer require reliance on Kaowool. Service Water alignment procedures remove power from these valves, thus precluding spurious valve operation.

Change Evaluation Process Supporting Grant of the Revised Exemption

Consistent with its intent to use this request for an exemption revision as a pilot test of the plant change process in NFPA 805, SNC applied the plant change evaluation process described in draft Section 8.3 of the NFPA 805 Implementing Guidance, which is being developed by the Nuclear Energy Institute, which provides a detailed methodology for complying with the plant change evaluation process in NFPA 805. It is comprised of the following steps:

Plant Change Evaluation Process Steps

- Identify/define the change from the current licensing basis.
- Determine whether the deterministic criteria in Section 4.2.3 of NFPA 805 are met. If they are met, no further analysis is required to accept the change.[1]

[1] A plant subject to the current, deterministic fire protection requirements can first change aspects of its fire protection program by using deterministic methods, as long as the fire protection license condition is satisfied. Any remaining changes by exemption can then be supported by a risk-informed, performance-based evaluation in accordance with either the proposed requirements in NFPA 805 or the process in Regulatory Guide 1.174. Although this two-step process was applied to support this exemption request,

- Conduct an initial assessment to determine whether an engineering analysis will suffice, or whether to use fire modeling, or risk assessment, or a combination of the two.
- Conduct a combined fire modeling and risk assessment analysis if neither method individually demonstrates acceptability of the proposed change.
- For fire modeling, determine the response of the target to postulated fire conditions given the feature(s) proposed to be changed.
- If the Maximum Expected Fire Scenario (MEFS) results in target damage, fire modeling alone will not suffice to support the proposed change.
- Address uncertainty by calculating the Limiting Fire Scenario (LFS). If there is sufficient margin between the MEFS and the LFS, then fire modeling will suffice.
- Conduct a risk assessment using existing plant fire risk analyses. Determine the change in Core Damage Frequency (CDF) due to fire-induced failure due to the proposed change in the fire protection program.
- Apply the acceptance criteria to determine acceptability of the change in CDF.
- Ensure defense-in-depth and safety margins are maintained.

Identification of the Change

To identify the proposed change, it is necessary to compare the proposed future SWIS configuration to the Current Licensing Basis (CLB). The fire protection CLB for the SWIS is that one train of service water will remain free of fire damage in the event of a fire in the SWIS. Also included in the CLB are the exemption conditions described in the SER. SNC re-analyzed the SWIS using deterministic methods and found that several proposed changes satisfied the deterministic acceptance criteria. The remaining proposed changes that were subjected to the NFPA 805 plant evaluation process involved elimination of credit for Kaowool where it had been used as a raceway fire barrier.[2]

Initial Assessment

The initial assessment was an integrated review of the likelihood and consequences of a fire in the SWIS. The assessment was performed by a qualified fire protection engineer as defined by Section C.1 of CMEB 9.5-1 NUREG 0800, "Fire Protection Program," and an experienced fire probabilistic risk assessment (PRA) analyst. The purpose was to focus the engineering evaluations on the areas that were likely to be the most risk significant. The assessment considered fire hazards associated with ignition sources and fixed and transient combustible fuel

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the deterministic changes were also considered utilizing the Implementing Guidance to demonstrate its application in all cases.

[2] The revised licensing basis included modified deterministic demonstrations of compliance. In particular, only one Service Water pump is required to be available per unit, Lube and Cooling support pumps will be removed, certain cables no longer require protection, and certain manual actions are no longer needed. Under Section 2.2.6 of NFPA 805, these deterministic demonstrations of compliance are considered to satisfy the performance criteria in Section 1.5 of NFPA 805. Therefore, whether all of the proposed changes are considered utilizing NFPA 805 or the change process is divided into two steps, in which the first step is a traditional modification of the existing CLB, using deterministic criteria and the second step is a risk-informed, performance-based evaluation of the need to continue to rely on a fire barrier, only the proposed elimination of the credit for Kaowool is evaluated using the risk-informed, performance-based tools in NFPA 805.

loads. The effort was not limited to the licensing basis information. This approach enabled the potential for fire to be integrated with the critical targets for which the consequences of a fire would be most severe. Target locations in the SWIS were selected on the basis of a fire's ability to disable both the A and B Train Service Water pumps for either unit. The critical failure mode was found to be damage to the power and control cables, either in the cable trays or in the motor terminal boxes. Several targets were identified.

Three fire scenarios required a more detailed evaluation in order to make an adequate preliminary assessment of fire risk in the SWIS. Other fire scenarios were determined to not contribute to the change in risk being assessed. In identifying these scenarios, the following considerations were applied:

- Only scenarios in Fire Zone 72A were considered because it is the only fire zone in which reliance on Kaowool is proposed to be eliminated.
- Impacts of Service Water pump lubricant fires on redundant raceways and pump operability were included.
- Transient combustible fire scenarios in the vicinities of the pumps and motor winding fires were not included because a pump lubricant fire bounds their impacts.
- Transient combustible controls in the vicinities of the Service Water pumps and the northeast corner are expected to be adopted.
- Self-igniting cable fires were not assumed because power cables in the SWIS are contained in conduit, other cables carry only signal and control loads, which have a low likelihood of igniting a fire, and all cables in the SWIS are IEEE 383.

The three scenarios are:

Scenario 1 is a fire in the northeast corner of the SWIS. This is a "pinch-point" where Train A and Train B cables approach each other as they run along perpendicular walls from the corner. The cables are 20 feet above the strainer pit floor. A transient fire was considered to be the bounding fire in this area because of a lack of *in-situ* ignition sources and combustible material.

Scenario 2 involves the Unit 1 Service Water pumps and the Train A raceways for both the Units 1 and 2 Service Water systems and supporting power distribution. The most damaging fire was determined to be a fire on the SWIS pump deck, originating at the Unit 1 Train B Service Water pump 1D or 1E, which could damage the adjacent Unit 1 Train B Service Water pumps as well as the Units 1 and 2 Train A raceways that run along the adjacent east wall.

Scenario 3 involves the same kind of fire configuration for the Unit 2 Service Water pumps as for the Unit 1 Service Water pumps.

Fire Modeling/MEFS/LFS

The three scenarios identified above were subject to an initial fire modeling analysis, utilizing Regulatory Guide 1.174, to determine whether the removal of credit for Kaowool from the exemption for cables in the northeast corner of the SWIS and near the Service Water pumps

would result in an unacceptable risk. Although removal of credit for Kaowool was the issue of concern, SNC recognized that a comprehensive application of risk-informed, performance-based methods should include an evaluation of the effects of pump fires on adjacent pumps. It was determined that damage to multiple Service Water pumps could not be excluded without more detailed fire modeling. Also, it was not evident that there would be sufficient margin between the MEFS and LFS. Accordingly, it was determined that fire modeling alone could not justify these proposed changes. Additional discussion of MEFS and LFS is provided later in Attachment B in the Fire Modeling Results section.

Initial Risk Assessment

An initial risk assessment was not performed because it would require consideration of a loss of all Service Water. A review of the FNP PRA showed that the change in CDF could not meet the NRC's acceptance criteria. Accordingly, it was determined that an integrated risk assessment was necessary.

Combined Fire Modeling and Risk Assessment Analysis

Because these scenarios clearly involved damage to multiple Service Water pumps, such that the possible loss of all pumps could not be excluded without a more detailed evaluation, no formal risk conclusions were reached. It was clear that an integrated, detailed analysis of the SWIS was necessary. Fire models were constructed for specific examples of the three scenarios and an integrated risk assessment was conducted for them. The scenarios were:

- Scenario 1 - Transient fires in the northeast corner of the SWIS.
- Scenario 2 - Pool fires on the SWIS pump deck involving confined and unconfined lubricant spills assessed Unit 1 Service Water pump-pump interactions and interactions between Unit 1 Service Water pumps and redundant raceways.
- Scenario 3 - Same scenarios as above for the Unit 2 Service Water pumps.

Detailed fire modeling and fire risk analyses were conducted for each of the scenarios. In each case, the MEFS and the LFS were calculated. All combinations of Service Water pump alignments were considered. Suppression was not credited.

Fire Modeling

Overview

The detailed fire modeling was performed by a fire protection engineer meeting the qualifications defined by Section C.1 of CMEB 9.5-1 NUREG 0800, "Fire Protection Program." The purpose of the fire modeling was to provide insight into the potential for a particular fire scenario to damage a target. Critical target locations were identified during the preliminary assessment and consisted of cables, cable trays, and/or motor terminal boxes.

Fire modeling took into account the configuration, contents, and locations of equipment in the SWIS. Consideration was given to the need for administrative controls to limit the amount of lubrication oil in the SWIS when pump oil is changed.

Five targets were identified for their ability to result in the critical failure mode for the Service Water pumps, which is failure of the power and control cables either in the raceways or in motor terminal boxes. Five target locations were considered: (1) Train A cables in the northeast corner of the Strainer Pit; (2) Train B cables in the northeast corner of the Strainer Pit; (3) Train A cable trays near the east wall of the Pump Deck; (4) Pump motor junction boxes associated with the Unit 1 Service Water pumps; and (5) Pump motor junction boxes associated with the Unit 2 Service Water pumps. Other locations involving the effects of a fire on Train A or B cable trays, conduit, or motor terminal boxes were also considered.

Target damage was assumed to occur if the target surface temperature reached 700°F. Factors considered when assessing the potential for target damage include flashover conditions (smoke temperature greater than 932°F), direct flame impingement, and an incident radiant heat flux at the surface of a target exceeding 1.0 Btu/s-ft^2. Damage to Service Water pumps is assumed to occur if the temperature at the pump motor terminal boxes exceeds the target temperature criteria.

Detailed Fire Modeling Background

Three types of models were used:

- Empirical plume and flame height models.
- A compartment fire zone computer model (CFAST).
- A thermal computer model (HEATING).

The plume and flame height models were used to assess the potential for a fire located near a target to directly impact the target. The correlations were used within the specified bounds and in a manner that provided a conservative estimate of the fire impact on the particular target. CFAST was used to estimate the smoke temperature and smoke layer elevation for a given fire scenario. HEATING was used to predict the temperature response of a specific target given the proximity to the flame (thermal radiation), immersion in the thermal plume, and/or immersion in the smoke layer. The computer models were used within prescribed bounds and in a manner that provided conservative results.

Fire Modeling Input Assumptions

Conditions were modeled as found (i.e., materials, physical dimensions, physical locations) except as noted. Key input assumptions for the fire modeling were as follows:

- The threshold damage condition for a target was a surface temperature of 700°F.
- The critical exposure location on a Service Water pump was the pump motor junction box.
- Fire suppression systems and mechanical ventilation systems were inoperable.
- Wall plume and flame height correlations were assumed for fires near walls.
- Corner plume and flame height correlations were assumed for fires near corners.
- The single largest oil reservoir in a Service Water pump was assumed to fail and all contents were involved in a fire when assessing the Service Water pump fire scenarios.

- A Service Water oil reservoir would pool either behind or in front of the Service Water pumps.
- Doors and other openings were assumed shut.
- Transient combustibles consisted of an equal mix of cellulose based and plastic based material.

Fire Modeling Results

Both the MEFS and LFS were calculated for each fire scenario. The MEFS is identified by considering the fire types that have a reasonable likelihood of occurring. Multiple, but not concurrent, MEFS events are possible in the SWIS because it contains several target locations. The LFS is obtained by varying parameters in the MEFS until the threshold is exceeded for the critical temperature for, or flux impinging on, a target. The parameters varied were the peak heat release rate of the source fire, the unit heat release rate and the duration of the source fire, and the total mass of fuel available. It is conceivable that an LFS is incredible, for example, if there is not physically enough volume available for the assumed mass of fuel.

Only targets in Fire Zone 72A were evaluated because it is the only area in which reliance on Kaowool is proposed to be eliminated. Fire scenarios were characterized by heat release rate, duration, fire area or equivalent diameter, and flame height. These factors were determined for each fire scenario.

1. Transient fire in northeast corner

   A transient fire in the northeast corner of the SWIS on the strainer pit level would expose the nearest overhead target to a maximum temperature of 268°F, which is significantly lower than the damage threshold temperature. The peak heat release rate would be 332 Btu/s and the fire duration is 600 seconds. This fire is the MEFS for this location. The target exposure temperature was determined by calculating the smoke layer environment with CFAST then estimating the temperature of a corner thermal plume at the target elevation assuming the smoke layer environment is the ambient temperature. There was no significant thermal radiation contribution predicted from a transient fire on the Strainer Pit level. The LFS for this location would require a transient fuel package that produces a heat release rate more than four times greater than the MEFS and a mass that is nearly ten times greater.

2. Unit 1 Service Water pump fire scenario

   A Unit 1 Service Water pump fire scenario was assumed to involve 22.5 gallons of Texaco Regal 68 lubricant, a Class IIIB combustible liquid. There are curbs between the B- and C-Pumps and the C- and D-Pumps. There will also be a curb located between the E-Pump and the east wall. Based on the location of the curbs, two sub-scenarios were postulated: one that would involve an oil spill from the C-pump and is contained in the area behind the C-Pump and one that would involve an oil spill from any one of the remaining four Service Water pumps and is contained in the area behind two Service Water pumps. The latter condition arises because the liquid was assumed to spread in the area behind the pump to the C-Pump curbing.

The fire size for these scenarios would range between 2,600 Btu/s and 5,140 Btu/s. CFAST was used to determine the smoke temperature in the SWIS and HEATING was used to calculate the surface temperature of the Service Water pump motor junction box targets and the east wall cable tray target. Three exposure mechanisms were assessed: radiant exposure from the fire, immersion in the smoke layer, and a combination of smoke layer immersion and radiant heat flux from the fire. It was determined that a pump lubricant fire could damage any pump in which there was flame impingement as well as an adjacent pump via thermal radiation. The maximum number of pumps that could thus be damaged by a single fire is three (two by flame impingement and one by thermal radiation or one by flame impingement and two by thermal radiation). The temperature of any pump target or cable tray target located beyond this range would be less than 610 °F.

The LFS for a Unit 1 Service Water pump fire scenario would require a seventy-five percent volume increase for a C-Pump fire and a four-fold increase for an A-, B-, D-, or E-Pump fire scenario.

3. Unit 2 Service Water pump fire scenario

A Unit 2 Service Water pump fire scenario was assumed to involve 8 gallons of Texaco Regal 68 lubricant, a Class IIIB combustible liquid. There are curbs between the B- and C-Pumps and the C- and D-Pumps. Based on the location of the curbs, two sub-scenarios were postulated: one that would involve an oil spill from the C-pump and is contained in the area behind the C-Pump and one that would involve an oil spill from any one of the remaining four Service Water pumps and is contained in the area behind two Service Water pumps. The latter condition arises because the liquid is assumed to spread in the area behind the pump to the C-Pump curbing.

The fire size ranges between 2,200 Btu/s and 4,400 Btu/s. CFAST was used to determine the smoke temperature in the SWIS and HEATING was used to calculate the surface temperature of the Service Water pump motor junction boxes. Three exposure mechanisms were assessed: radiant exposure from the fire, immersion in the smoke layer, and a combination of smoke layer immersion and radiant heat flux from the fire. It was determined that a pump lubricant fire could damage any pump in which there was flame impingement as well as an adjacent pump via thermal radiation. The maximum number of pumps that could thus be damaged by a single fire is three (two by flame impingement and one by thermal radiation or one by flame impingement and two by thermal radiation). The temperature of any pump target located beyond this range would be less than 350 °F.

The LFS for a Unit 2 Service Water pump fire scenario would require a five-fold volume increase for a C-Pump fire and an eleven-fold increase for an A-, B-, D-, or E-Pump fire scenario.

Fire Modeling Conclusions

- The LFS for the northeast corner requires a fuel package that produces a heat release rate more than four times greater than the MEFS and a mass that is nearly ten times greater.
- A Unit 1 pump lubricant fire can disable three Unit 1 Service Water pumps. If there is one that is out of service, then one pump will remain functional.
- A Unit 1 pump lubricant fire would not impact the Train A cable tray near the east wall of the SWIS.
- A Unit 2 pump lubricant fire can disable three Unit 2 Service Water pumps. If there is one pump that is out of service, then one pump will remain functional.
- The LFS for the three pump lubricant fire scenarios is a minimum seventy-five percent greater than the MEFS in terms of burn duration and/or the heat release rate.
- The crediting of fire suppression system actuation in this analysis would further increase the margin between the MEFS and the LFS.

Fire Risk Analysis

Overview

Regulatory Guide 1.174 and NFPA 805 specify that the risk associated with a plant change be determined by considering the change in CDF and Large Early Release Frequency (LERF) that result from the plant change. These changes in CDF and LERF are calculated by comparing the CDF and LERF values for the entire fire area before and after the change to ensure that all contributors to risk are included. The fire risk analysis focused only on elements of the SWIS that had been or were proposed to be changed from the current licensing basis. These elements were associated with pump/motor lubricant fires (one for each pump or ten cases in all). The risk analysis determined that a conservative estimate of the CDF associated with the ten cases would be approximately 6.5E-07/yr. per unit.

The Plant Farley-specific Level 1 and Level 2 Probabilistic Risk Assessment (PRA) Model was used, with modifications, to evaluate the impacts on plant risk of postulated fires originating in the SWIS. The modifications involved two changes that are summarized below. The analysis did not add any fire specific operator actions or recoveries to the base plant PRA Model.

The scope of analyses that were performed for this analysis included a re-analysis of the Service Water system performance. This re-analysis concluded that a single Service Water pump per unit was sufficient to satisfy the system performance requirements. The re-analysis results were integrated into the PRA Model by altering the number of Service Water pumps per train that was required for system success from two to one.

The plant PRA model was modified to take advantage of recent vendor data related to RCP seal performance. The specific data is related to seal performance given loss of motor bearing cooling.

The performance of the PRA quantifications with the changes described above applied the same techniques and processes as used for the Fire IPEEE. This basically involved the setting of certain model basic events to 'TRUE' by translating the fire modeling results for the MEFS into plant equipment damage states. Because the SWIS is a relatively simple location with respect to plant system interactions, all of the fire-induced failures were adequately characterized and treated by the existing suite of model basic events. A fire ignition frequency was developed for each fire scenario by partitioning the generic fire frequencies from the EPRI Fire Events Database. The resulting CDF for each of the fire scenarios were aggregated to obtain the cumulative risk for the proposed change. A separate calculation for the "baseline" CDF was not developed. Instead, the CDF for the changed configuration was taken as a conservative surrogate for the increase in risk.

Acceptance Criteria

The results of the risk assessment show a conservatively estimated risk increase to be approximately 6.5E-07/yr. per unit. This places the proposed change in Region III of the Regulatory Guide 1.174 acceptance criteria for CDF. Region III allows the cumulative total plant risk to be greater than 1.0E-04/yr. The total plant CDF from internal events for Unit 1 and 2 is 3.86E-05/yr. and 5.81E-05/yr., respectively. The Farley Nuclear Plant does not have an updated fire risk assessment. The available analysis is the Fire IPEEE. A comparison of the Fire IPEEE results with the internal events PRA results that were applicable at that time shows that the Unit 1 Fire CDF was approximately 20% higher than the corresponding Unit 1 internal events CDF. This would result in an estimated total plant risk of less than 8.5E-05/yr.

The Unit 2 Fire CDF was approximately 10% less than the corresponding Unit 2 internal events CDF. This would result in an estimated total plant risk for Unit 2 of 1.1E-04/yr. Given these factors, it can be concluded that the cumulative plant risk for Unit 1 and 2 would meet the Regulatory Guide 1.174 criteria.

In order to gain further insights, the fire areas that were the dominant contributors to risk from the Fire IPEEE were requantified using the current plant PRA model. This re-quantification of dominant fire areas provided a cumulative CDF of 4.98E-05/yr. and 5.87E-05/yr. for Unit 1 and 2, respectively. Using these updated values, the estimated total plant risk for Unit 1 and 2 is 8.84E-05/yr. and 1.17E-04/yr., respectively. Although a comprehensive update and upgrade of the plant PRA has not been performed, these estimates are sufficient to conclude that the proposed change is within the Region III limits.

The LERF associated with the proposed change is negligible given the acceptance criteria of Regulatory Guide 1.174. Based on this negligible contribution due to fire, the Regulatory Guide 1.174 LERF acceptance criteria is considered to be satisfied.

Defense-in-Depth/Safety Margins

Regulatory Guide 1.174 identifies several factors to be considered when evaluating defense-in-depth in general. Consistency with the defense-in-depth philosophy is maintained if:

- A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.
- Over-reliance on programmatic activities to compensate for weaknesses in plant design is avoided.
- System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the system, and uncertainties (e.g., no risk outliers).
- Defenses against potential common cause failures are preserved, and the potential for the introduction of new common cause failure mechanisms is assessed.
- Independence of barriers is not degraded.
- Defenses against human errors are preserved.
- The intent of the General Design Criteria in Appendix A to 10 CFR 50 is maintained.

These factors are consistent with Sections 1.2, 2.4.4.2, and A.2.4.4.2 of NFPA 805, which define and discuss defense-in-depth. NFPA 805 requires an adequate balance of the following three elements:

1) Preventing fires from starting.
2) Rapidly detecting fires and controlling and extinguishing promptly those fires that do occur, thereby limiting fire damage.
3) Providing an adequate level of fire protection for structures, systems, and component important to safety, so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

Removal of the credit for Kaowool satisfies these criteria.[3] A reasonable balance among the elements is preserved, there is no over-reliance on programmatic compensating activities, system redundancy is preserved commensurate with the frequency and consequences of challenging fires, impacts of common cause failures are unchanged, the overall independence of barriers is not degraded because the wall creating new fire areas is added, defenses against human errors are unchanged, and the intent of General Design Criterion 3 is met.

Additional defense-in-depth is indirectly provided via the conservatisms in the analysis and the existing active and passive fire protection features that are not credited. Of particular note is the installed automatic fire suppression system in the Service Water pump deck area whose response to the postulated fire event is not credited.

[3] Kaowool is not considered to provide additional safety margin. Although the fire barrier rating of Kaowool is uncertain, it clearly is more than zero. However, because the Kaowool barriers are unnecessary they will not be maintained. Accordingly, no credit has been taken for them as contributors to safety margin.

Sufficient safety margins are maintained in accordance with the guidance in Regulatory Guide 1.174.

- NFPA 805, the standard proposed to be approved for use by the NRC, is met.
- Comparisons between the MEFS and LFS and the values for the changes to the CDF and LERF show sufficient margin to account for analysis and data uncertainty.

In summary, the results of a combined analysis based on fire modeling and risk assessment meets the acceptance criteria in NFPA 805, and defense-in-depth and safety margin are maintained for a change to the SWIS licensing basis that removes reliance on Kaowool. Accordingly, the integrated risk assessment shows that the proposed change maintains safety.

Administrative Program Elements

The following administrative program elements required per NFPA 805 will be implemented to further ensure safety.

- Program documentation, configuration control, and quality assurance will be provided.
- Existing Technical Specifications will ensure that appropriate monitoring of the Service Water system and support equipment will be performed.
- Additional controls will be placed on transient combustibles in the northeast corner of the SWIS and near the Service Water pumps.
- Curbs to contain oil spills will be monitored for integrity.
- Key passive boundaries in the SWIS will be maintained as fire area boundaries.

PRA Quality

As an integral part of the development of the PRA model pursuant to NRC Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," an Independent Review Group that included experts in plant design, plant operation, and probabilistic risk assessment repeatedly reviewed the PRA model. Further, each subsequent revision to the model has been internally reviewed and approved in accordance with applicable SNC procedures. In addition, an evaluation based upon Appendix B of the Electric Power Research Institute (EPRI) Probabilistic Safety Assessment (PSA) Applications Guide was performed to confirm that the PRA conforms to the industry state-of-the-art practices with respect to the scope of potential plant scenarios.

In August 2001, the Revision 4 Farley PRA was extensively reviewed by an experienced five-man Peer Review Team coordinated by the Westinghouse Owners Group in a manner described in the Nuclear Energy Institute's document NEI 00-02, "Industry Peer Review Process." The peer review evaluated the eleven elements of the PRA and concluded that all elements were either a "Grade 3" or a "Contingency Grade 3." A "Grade 3" is defined in the Peer Review Process as:

> "This grade extends the requirements [of previously defined Grades 1 and 2] to assure that the risk significance determinations made by the PRA are adequate to support regulatory applications, when combined with deterministic insights. Therefore, a PRA with elements determined to be at Grade 3 can support physical plant changes when it is used in

conjunction with other deterministic approaches that ensure that defense-in-depth is preserved. Grade 3 is acceptable for Grade 1 and 2 applications, and also for assessing safety significance of equipment and operator actions. This assessment can be used in licensing submittals to the NRC to support positions regarding absolute levels of safety significance if supported by deterministic evaluations."

Nine PRA elements were judged by the peer review to have findings that resulted in their being considered "Contingency Grade 3." A "Contingency Grade 3" reverts to a "Grade 3" when items noted in the evaluation of the element are resolved. Such pending items are classified as one of four degrees of significance. None of the pending items noted in the Plant Farley PRA evaluation were judged to be of a level of significance to require prompt resolution to ensure the technical adequacy of the PRA for this specific application.

Conclusion

As shown above, a review of the current fire protection licensing basis in the SWIS demonstrated that several changes could be made consistent with the current, deterministic fire protection license condition. In addition, a risk-informed, performance-based integrated analysis of a proposal to eliminate reliance on Kaowool in the SWIS meets the acceptance criteria in both NFPA 805 and Regulatory Guide 1.174. Therefore, independent of whether the proposed changes to the fire protection program in the SWIS are viewed as a combination of changes using deterministic methods and Regulatory Guide 1.174, or an integrated plant change evaluation under NFPA 805 and draft Section 8.3 of the NFPA 805 Implementing Guidance, the conclusion is that the following proposed changes satisfy the NRC's exemption criteria, so that certain conditions in the exemption and supporting SER should be revised as indicated below:

1. Plant modifications will result in removing the need for lubricating oil and coolant pumps, valves and their control stations in Unit 2. Accordingly, the condition in the exemption for this situation will no longer be needed and should be removed.

2. A deterministic re-analysis, consistent with the current licensing basis, shows that fire damage to cables on the Unit 2 side of the strainer pit cannot result in spurious operation of the valves. Accordingly, the bases for the condition in the exemption for this situation should be modified to remove reliance on Kaowool.

3. A deterministic re-analysis, consistent with the current licensing basis, shows that fire damage to cables on the Unit 1 side of the strainer pit cannot result in spurious operation of the valves. Accordingly, the bases for the condition in the exemption for this situation should be modified to remove reliance on Kaowool.

4. A deterministic re-analysis, consistent with the current licensing basis, shows that existing long-term manual actions regarding safe shutdown Service Water Train A and B cables are no longer required.

5. Service Water alignment procedures remove power from the subject swing pump discharge valves, thus precluding spurious valve operation and adverse impact on the

Service Water system. The compliance strategy under the revised approach is unchanged.

6. Service Water alignment procedures remove power from the subject swing pump discharge valves, thus precluding spurious valve operation and adverse impact on the Service Water system. The compliance strategy under the revised approach is unchanged.

7. The current exemption and bases for redundant swing Service Water pump cables in Fire Zones 72D and 72E remain unchanged because they do not involve Kaowool. Although the walls are unrated as clearly stated in the licensing basis, the unlikely potential exists for fire propagation between redundant trains in the event of a severe, uncontrolled fire. Nevertheless, an upgrade to the barriers was determined to be a cost-effective modification that could enhance fire safety and help compensate for other elements of defense-in-depth that have been modified as part of the risk-informed, performance-based approach. Following the modifications, the new fire area (72D/72E) will comply with the separation criteria of 10 CFR 50, Appendix R, Section III.G.2 required by the FNP Fire Protection Program. Therefore, a condition in the exemption will not be required for these new fire areas.

8. The current exemption bases for redundant swing Service Water pump cables in Fire Zones 72B and 72C remain unchanged because they do not involve Kaowool. Although the walls are unrated as clearly stated in the licensing basis, the unlikely potential exists for fire propagation between redundant trains in the event of a severe, uncontrolled fire. Nevertheless, an upgrade to the barriers was determined to be a cost-effective modification that could enhance fire safety and help compensate for other elements of defense-in-depth that have been modified as part of the risk-informed, performance-based approach. Following the modifications, the new fire area (72B/72C) will comply with the separation criteria of 10 CFR 50, Appendix R, Section III.G.2 required by the FNP Fire Protection Program. Therefore, a condition in the exemption will not be required for these new fire areas.

9. An integrated risk assessment shows that safe shutdown can be achieved even if no credit is taken for the Kaowool raceway enclosures. This finding is also based, in part, on a re-determination of the safe shutdown success criterion, using traditional thermal-hydraulic techniques. The exemption should be revised not only to eliminate reliance on Kaowool but also to recognize the new success criterion.

In addition to these nine situations addressed in the existing exemption, SNC also considered the redundant Train A and Train B raceways, which contain Service Water and related power distribution cables for both units, entering the SWIS near the ceiling in the northeast corner. Train B raceways required for safe shutdown are wrapped with Kaowool. An integrated risk assessment shows that fire damage would not occur to these cables or the redundant Train A cables even if no credit were taken for Kaowool. Accordingly, the condition in the exemption for this configuration can be revised to eliminate reliance on Kaowool. Additionally, the issue

covered in the "Addendum to Exemption Request 1-3, Fire Area 72" was resolved with a plant modification, therefore the addendum can be deleted.

Attachment C
Adequacy of Safety Finding Under NFPA 805

Approval of the exemption revision will not adversely affect public health and safety for the reasons described in the detailed discussion of the risk-informed, performance-based evaluation conducted in accordance with NFPA 805. In making this safety finding, Southern Nuclear Operating Company (SNC) could have relied on the Nuclear Regulatory Commission's (NRC's) acceptance criteria in Regulatory Guide 1.174 for making risk-informed, performance-based changes to a plant. However, because this exemption request also is based on NFPA 805, SNC also determined that the plant change meets the acceptance criteria in that standard.

Compliance with NFPA 805 has been determined by the NRC to be an acceptable alternative to compliance with the current, prescriptive fire protection requirements. In proposing to adopt NFPA 805, the NRC stated that NFPA 805, "when taken as a whole, provides an acceptable alternative for satisfying General Design Criterion 3 (GDC) of Appendix A to 10 CFR Part 50" and "as excepted, when taken as an integrated whole, meets the NRC's existing fire protection regulations and guidance" [Reference: 67 Fed. Reg. at 66580]. NFPA 805 permits compliance to be determined on a fire area basis [Reference: Section 2.2.3 of NFPA 805]. Thus, a demonstration that the proposed changes to the Service Water Intake Structure (SWIS) satisfy the acceptance criteria in NFPA 805 also provide the basis for finding that the changes are acceptable as an alternative to the current, prescriptive requirements.

Sections 2.2.9 and 2.4.4. of NFPA 805 establish the acceptance criteria for a plant change evaluation. Section 2.2.9 requires that the "public risk associated with fire-induced nuclear fuel damage accidents is low and that adequate defense-in-depth and safety margins are maintained." Section 2.4.4. requires an "integrated assessment of the acceptability of risk, defense-in-depth, and safety margins," and that the impact of the proposed change shall be monitored in accordance with Section 2.6 of NFPA 805. The "change in public health risk from any plant change shall be acceptable to the [NRC]" and the "CDF and LERF shall be used to determine acceptability of the change" [Reference: Section 2.4.4.1 of NFPA 805]. The NRC, in Regulatory Guide 1.174, has established change acceptability criteria based on changes to the Core Damage Frequency and the Large Early Release Frequency associated with changes to the plant. Therefore, compliance with the Regulatory Guide 1.174 criteria demonstrates that the risk resulting from any change to the plant is acceptable.

Section 2.4.4.2 of NFPA 805 requires maintenance of the defense-in-depth philosophy, relative to fire protection, as established in Section 1.2 of NFPA 805. Section 2.4.4.3 of NFPA 805 requires assurance that sufficient safety margins are maintained. Considerations of defense-in-depth and safety margin also are required by Regulatory Guide 1.174. Therefore, the conduct of an integrated risk assessment under Regulatory Guide 1.174 satisfies the requirement for such an assessment in Section 2.4.4 of NFPA 805.

Finally, any demonstration of compliance with NFPA 805 must also include a showing that the generally applicable performance criteria in Section 1.5 of NFPA 805 are met. In the SWIS, except for the exemption, which has separately been found acceptable using the plant change evaluation criteria, compliance with 10 CFR 50, Appendix R demonstrates compliance with the nuclear safety performance criteria during operation [Reference: Section 1.5.1 of NFPA 805].

Attachment C
Adequacy of Safety Finding Under NFPA 805

Based on the above, SNC has demonstrated that an integrated risk assessment in accordance with Regulatory Guide 1.174 meets the NRC's acceptance criteria for a risk-informed, performance-based plant change. Thus, this integrated risk assessment provides an adequate safety basis for granting the requested exemption revision. Nevertheless, SNC has also demonstrated that its proposed plant changes meet the relevant criteria in NFPA 805. This demonstration further supports approval of the exemption because the NRC has determined that compliance with NFPA 805 provides reasonable assurance of adequate protection of public health and safety.