FPL.

February 24, 2014

L-2014-056
10 CFR 50.90

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

Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) - NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition)

References:

1. FPL Letter L-2013-099 dated March 22, 2013, Transition to 10 CFR 50.48(c) –NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition).

2. Email from Siva Lingam, NRC, to Ken Frehafer, FPL, dated June 7, 2013, St. Lucie NFPA-805 LAR Acceptance Review Clarification Questions.

3. FPL Letter L-2013-193 dated June 14, 2013 Transition to 10 CFR 50.48(c) – NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Editions) Acceptance Review Clarification Response.

4. St. Lucie Plant Units 1 and 2 Request for Additional Information on License Amendment Request to Adopt National Fire Protection Association Standard 805 Performance-Based Standard for Fire Protection (TAC Nos. MF 1373 and MF 1374) dated December 26, 2013.

Per Reference 1 above, Florida Power and Light Company (FPL) requested an amendment to the Renewed Facility Operating License (RFOL) for St. Lucie Units 1 and 2. The License Amendment Request (LAR) will enable FPL to adopt a new fire protection licensing basis which complies with the requirements in 10 CFR 50.48(a) and (c) and the guidance in Revision 1 of Regulatory Guide (RG) 1.205.

Per Reference 3 FPL responded to NRC LIC-109 acceptance review questions received by FPL via Reference 2 to clarify aspects of the LAR submittal.

Security-Related Information - Withhold From Public Disclosure Under 10 CFR 2.390. Enclosure 2 to this letter contains security-related information. Upon removal of Enclosure 2, this letter is uncontrolled.

A006
NRR

By letter dated December 26, 2013 (Reference 4) NRC Staff requested additional information regarding the LAR. Based on discussions with the NRC Staff, the additional information requested was prioritized and the response to the request for additional information will be provided in three separate submittals. The attachments to this letter provide the 60-day response to the request for additional information.

The information provided in this submittal does not impact the 10 CFR 50.92 evaluation of "No Significant Hazards Consideration" previously provided in FPL letter L-2013-099.

FPL requests that Enclosure 2 to this letter, which contains sensitive security-related information, be withheld from public disclosure in accordance with 10 CFR 2.390.

This letter makes new commitments and changes existing commitments. The commitment revisions are included in Enclosure 2 as mark-ups to Attachment S, Table S-2, Implementation Items.

Should you have any questions regarding this application, please contact Mr. Eric Katzman, Licensing Manager, at 772-467-7734.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 24, 2014.

Respectfully submitted,

Joseph Jensen
Vice President
St. Lucie Plant

JJ/rcs

Enclosures: 1. FPL's St Lucie Units 1 and 2 NFPA 805 LAR 60-Day RAI Response
2. FPL's St Lucie Units 1 and 2 NFPA 805 LAR 60-Day RAI Response - Withheld from Public Disclosure

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant
USNRC Project Manager for St. Lucie Plant
Ms. Cindy Becker, Florida Department of Health

Enclosure 1

FPL's St Lucie Units 1 and 2 NFPA 805 LAR 60-Day RAI Response

PSL FM RAI 02a	PSL FPE RAI 02	PSL PRA RAI 04b	PSL PROG RAI 01	PSL SSA RAI 01
PSL FM RAI 02b	PSL FPE RAI 03	PSL PRA RAI 04c	PSL PROG RAI 02	PSL SSA RAI 02
PSL FM RAI 02c	PSL FPE RAI 04	PSL PRA RAI 07		PSL SSA RAI 03
PSL FM RAI 02d	PSL FPE RAI 05	PSL PRA RAI 10a		PSL SSA RAI 05
PSL FM RAI 02e	PSL FPE RAI 06	PSL PRA RAI 10b		PSL SSA RAI 06
PSL FM RAI 05a	PSL FPE RAI 07	PSL PRA RAI 10d		PSL SSA RAI 07
PSL FM RAI 05b	PSL FPE RAI 08	PSL PRA RAI 10e		PSL SSA RAI 08
PSL FM RAI 05c	PSL FPE RAI 09	PSL PRA RAI 10f		PSL SSA RAI 09
	PSL FPE RAI 10	PSL PRA RAI 12		PSL SSA RAI 10
	PSL FPE RAI 11	PSL PRA RAI 13		PSL SSA RAI 11
		PSL PRA RAI 15a		PSL SSA RAI 12
		PSL PRA RAI 15b		PSL SSA RAI 13
		PSL PRA RAI 15c		PSL SSA RAI 14

PSL FM RAI 02a

American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Standard RA-S-2008, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications.", Part 4, requires damage thresholds be established to support the FPRA. Thermal impact(s) must be considered in determining the potential for thermal damage of Structure, Systems, and Components (SSCs). Appropriate temperature and critical heat flux criteria must be used in the analysis.

Provide the following information:

a. Describe how the installed cabling in the Units 1 and 2 power block was characterized, specifically with regard to the critical damage threshold temperatures and critical heat flux for thermoset and thermoplastic cables as described in NUREG/CR-6850.

RESPONSE:

The cabling in both Unit 1 and Unit 2 is characterized as thermoplastic as described in Section 6.1 of Report 0493060006.104 ("St. Lucie Units 1 and 2 Fire Probabilistic Risk Assessment Fire Scenario Report NUREG/CR-6850 Tasks 8 and 11"). The generic damage thresholds for thermoplastic cable as described in NUREG/CR-6850, Appendix H, Table H-1 are used in the Fire PRA to determine cable damage. Specifically, the temperature damage threshold that is applied to cable targets is 400°F for hot gas layer and thermal plume exposures. The heat flux damage threshold that is applied to cable targets is 0.5 Btu/s-ft^2. The damage threshold for exposure conditions involving an elevated temperature and an incident heat flux consider the combined effects of both the temperature and heat flux components.

PSL FM RAI 02b

American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Standard RA-S-2008, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications.", Part 4, requires damage thresholds be established to support the FPRA. Thermal impact(s) must be considered in determining the potential for thermal damage of Structure, Systems, and Components (SSCs). Appropriate temperature and critical heat flux criteria must be used in the analysis.

Provide the following information:

b. The technical documentation supporting the LAR that describes the fire modeling that was performed seems to imply that IEEE [Institute of Electrical and Electronics Engineers]-383 qualified cables are assumed to be equivalent in terms of damage thresholds to "thermoset" cables as defined in Table 8-2 of NUREG/CR-6850. In addition, non-IEEE-383 qualified cables are assumed to be equivalent to "thermoplastic" cables as defined in Table 8-2 of NUREG/CR-6850. These assumptions may or may not be correct. An IEEE-383 qualified cable may or may not meet the criteria for a "thermoset cable" as defined in NUREG/CR-6850. It is also possible that a non-IEEE-383 qualified cable actually meets the NUREG/CR-6850 criteria for a "thermoset" cable. Provide clarification on the assumptions that were made in terms of damage thresholds of cables.

RESPONSE:

The generic damage thresholds for thermoplastic cable as described in NUREG/CR-6850, Appendix H, Table H-1were used to characterize cable targets in the fire modeling analyses supporting the Fire PRA for both Unit 1 and Unit 2 (see Section 6.1 of Report 0493060006.104). These damage thresholds are lower than the damage thresholds for thermoset cables and do not factor in the IEEE-383 qualification status. Refer to the response to PSL RAI FM 02a, "Cable Characterization" for additional details on the cable damage thresholds that are used in the Fire PRA.

PSL FM RAI 02c

c. Describe how cable tray covers and conduits affect the damage thresholds that were used in the fire modeling analyses.

RESPONSE:

Neither cable tray covers nor conduits were used as a reason to preclude damage and were subjected to the same zone of influence (ZOI) as all other targets in a given scenario. The same damage threshold was applied for cables routed in covered trays or in conduits as was applied for cables in trays which were not covered. The damage criteria for non-IEEE thermoplastic cables was applied for all cables. For PSL Unit 2 the majority of the cables used were Thermoset Kerite cables. Due to concerns regarding lower damage temperatures for Kerite cables, the thermoplastic damage temperature criteria was used for these cables also. The only credit for covered trays and conduits is in terms of secondary combustibles. Neither fire propagation nor additional HRR for the HGL calculations was postulated for covered trays or conduit.

PSL FM RAI 02d

American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Standard RA-S-2008, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications.", Part 4, requires damage thresholds be established to support the FPRA. Thermal impact(s) must be considered in determining the potential for thermal damage of Structure, Systems, and Components (SSCs). Appropriate temperature and critical heat flux criteria must be used in the analysis.

Provide the following information:

d. Explain what damage thresholds were used in the fire modeling analyses for cables coated with Flamemastic 77.

RESPONSE:

Flamemastic was not credited to limit damage or fire propagation for secondary combustibles in the PSL FPRA. The damage criteria for thermoplastic non-IEEE 383 cable was applied to all cables, whether coated or not coated with Flamemastic. PSL Unit 2 uses thermoset, Kerite cables, for which the thermoplastic non-IEEE 383 cable damage temperature criteria was also applied due to concerns regarding Kerite cables qualification.

PSL FM RAI 02e

American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Standard RA-S-2008, "Standard for level1/large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications," Part 4, requires damage thresholds be established to support the FPRA. Thermal impact(s) must be considered in determining the potential for thermal damage of structures, systems, and components (SSCs). Appropriate temperature and critical heat flux criteria must be used in the analysis. Provide the following information:

e. Describe the methodology that was used to convert damage times for thermoplastic cables in Appendix H of NUREG/CR-6850 to percent damage as a function of heat flux, and discuss the assumptions and technical basis for this methodology. In addition, explain how this methodology was applied to determine damage to targets within the horizontal ZOI.

RESPONSE:

The NUREG/CR-6850 Appendix H Table H-8 data provides times to target damage for thermoplastic cables for a set of constant incident heat flux values. This provides a time delay for target damage beyond the damage heat flux of 5.7 kW/m^2. For instance, Table H-8 provides a 19 minute time to damage delay for a thermoplastic cable with a constant incident heat flux of 6 kW/m^2.

In order to apply the NUREG/CR-6850 Appendix H data to a fire with a t^2 growth rate, a methodology of damage accrual is applied. The methodology used to evaluate thermoplastic cable percent damage is based on the use of the time to damage data provided in Appendix H of NUREG/CR-6850 and applying an Arrhenius methodology, which is used extensively for environmental qualification (EQ) of components such as cables in a containment accident environment, to determine the time to damage of equipment and cables. A discussion of an NRC internal evaluation of the Arrhenius methodology for environmental qualification is provided in a February 24, 2000 NRR Memo from Samuel J. Collins to Ashok Thadani (ML003701987).

The times to damage provided in NUREG/CR-6850 Appendix H were converted to damage rates by taking the reciprocal of the time to damage. For instance, the 19 minute time to damage for a 6 kW/m^2 incident heat flux in Table H-8 is converted to a $\frac{1}{19}$ min^{-1} damage rate. This provides a discrete set of damage rates for the heat flux values provided in Appendix H. An exponential regression is applied to these data points to generate a damage rate – heat flux profile. This regression analysis provides the Arrhenius curve for these cables based on the NUREG/CR-6850 Appendix H data.

The methodology used in the LAR submitted FPRA model used a damage rate profile that assumed no damage before a critical incident heat flux was reached, directly applying the Appendix H data which states that no damage occurs prior to critical heat flux. The updated methodology that will be used to update the model will assume a damage rate equal to the critical heat flux damage rate for incident heat flux values up to and including the critical heat flux. This approach bounds any degradation of the cable target prior to the critical heat flux. Beyond the critical heat flux, the Arrhenius curve damage rates are applied with no maximum damage rate applied. This ensures the use of a bounding damage rate curve without extrapolating data to lower heat flux values, using the critical heat flux damage rate as a minimum damage rate, providing a conservative, bounding analysis. Figure 1 below shows a plot of the damage rate – heat flux profile that models this approach.

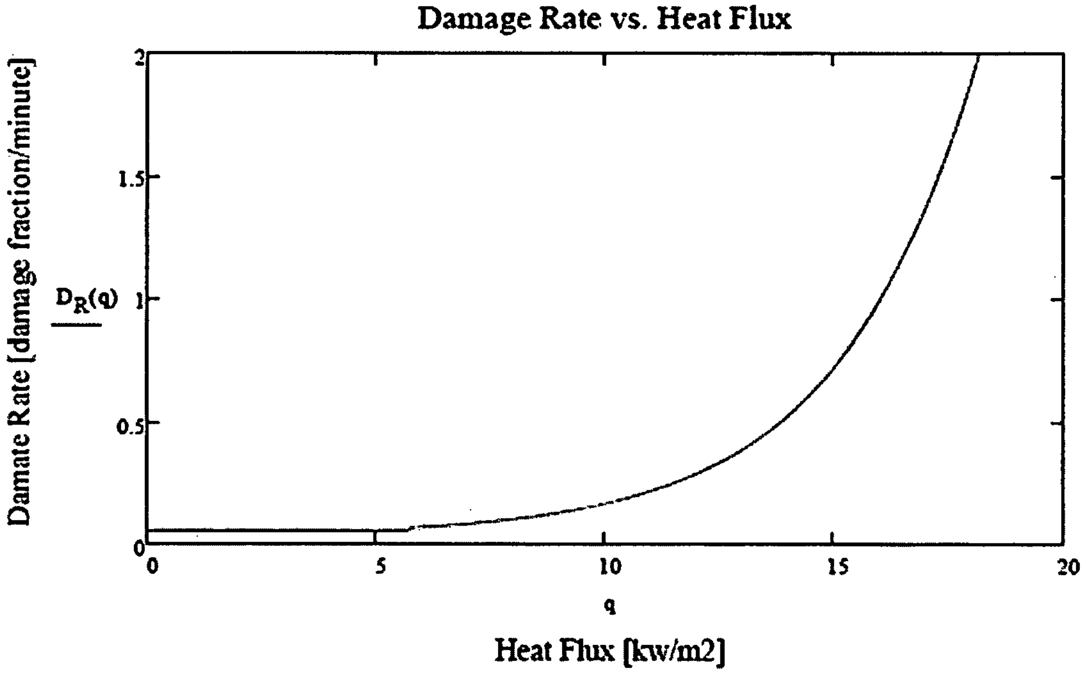


Figure 1. Damage rate – heat flux profile.

Note: The above curve uses a profile more conservative than that specified in NUREG/CR-6850, Appendix H. Appendix H assumes no damage below the critical heat flux (the above curve assumes the rate of damage below critical heat flux is the same as at the critical heat flux). Appendix H also assumes a damage rate of 1/minute at a heat flux greater than 16 kW/m^2 (the above curve allows for application of higher damage rates above 16 kW/m^2) as defined by the curve derived from the Appendix H, Table H-8 data.

In order to calculate a time to damage, the t^2 heat flux – time profile is then correlated to the damage rate – heat flux profile to produce a damage rate – time function. The damage rate – time function is calculated by performing point by point multiplication over the heat flux – time and the damage rate – heat flux profiles. Figure 2 provides the plots of the damage rate – time function for several example HRR bins.

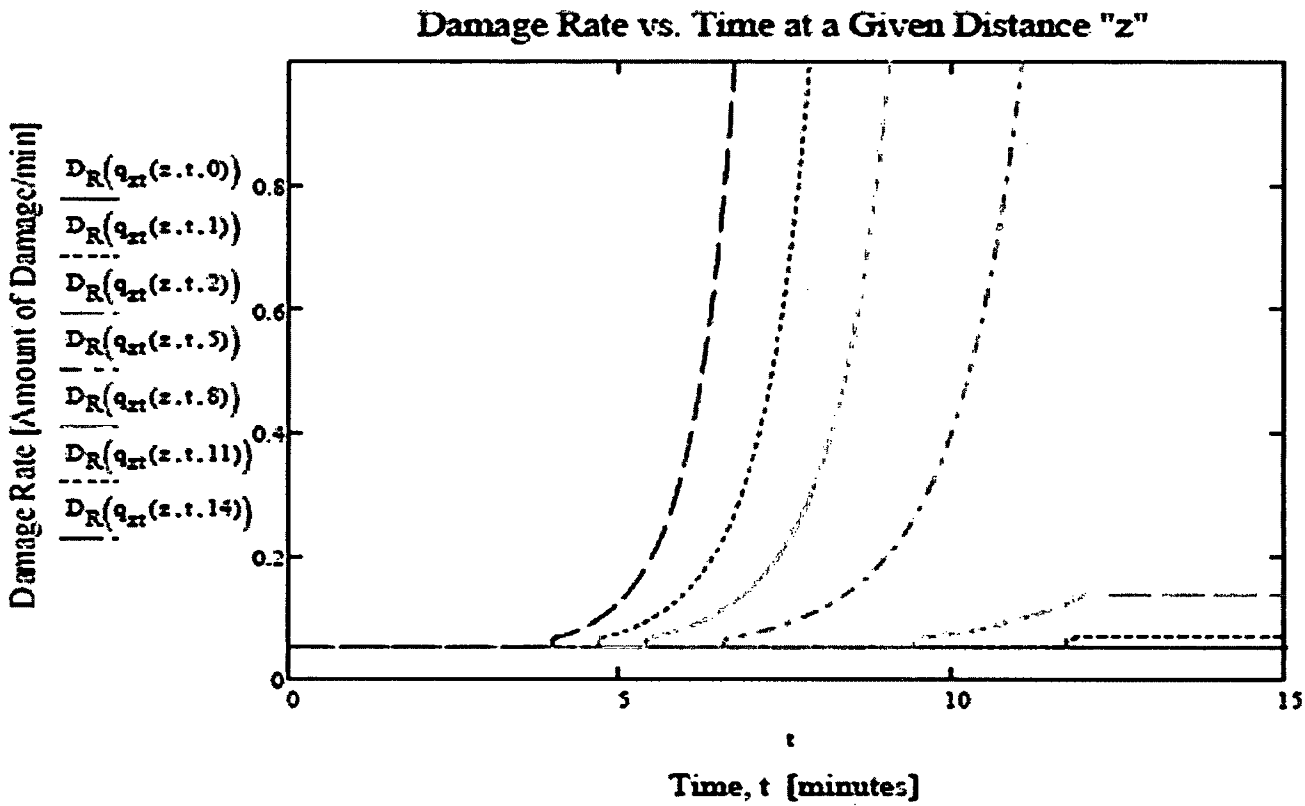


Figure 2. Damage rate – time function for several bins.

In order to calculate the time to target damage, the damage rate – time function is integrated, resulting in target accrued damage over time. The time at which the cumulative accrued damage for each bin equals 1.0 is the resulting time to target damage. Attachment 1 provides a simplified example calculation evaluating the time to target damage for a thermoplastic target located 3 vertical feet from a NUREG/CR-6850 Appendix E Case 3 Bin 3 fire.

The approach described above is focused on evaluating the time to damage using a vertical ZOI distance. This approach is conservative because vertical targets see both direct fire heat flux and plume temperature, where plume temperature is frequently driving the damage times. In situations where the most critical target is in the horizontal direction, the horizontal ZOI distance must be transformed to an equivalent vertical ZOI distance. This correlation between vertical and horizontal distance is performed using the vertical and horizontal ZOI distances provided in the Generic Fire Modeling Treatments (GFMTs). For instance, for a Case 1 medium sized electrical cabinet, the GFMTs provide horizontal and vertical distances in Table 5-10 and Table 5-11, respectively, for the 15 NUREG/CR-6850 Appendix E bins. A linear regression was performed on this data to generate a function that correlates horizontal distance to vertical distance. Applying this approach to horizontal targets is conservative because horizontal targets will not be subject to plume temperature effects.

PSL RAI FM 02e: Example Case 3 Bin 3 calculation

This calculation performs a simplified evaluation for the time to damage of a target using the damage accrual methodology. This example will evaluate a NUREG/CR 6850 Appendix E Case 3, single cable bundle thermoplastic, bin 3 ignition source fire impacting a target at a vertical distance of 3 feet. The calculation is organized into 4 sections: input data, heat flux profile damage rate profile, and correlation of the heat flux and damage rate profiles.

Input Parameters

This section provides a tabulation of the input data to be used.

- **HRR** - the HRR distribution row for a Case 3 bin 3 fire from NUREG/CR 6850 Appendix E
- **HF_distance** - The Generic Fire Modeling Treatments Table 5-11 provides vertical damage distances for an Appendix E Case 3 bin 3 fire impacting thermoplastic (5.7 kW/m^2), class A combustible (9 kW/m^2), and thermoset (11 kW/m^2) targets. These three heat flux - distance points are used for the first three columns. The Generic Fire modeling Treatments Table 5-4 provides the flame height distance for the an Appendix E Case 3 bin 3 fire. The half flame height is assumed to be the point at which the maximum heat flux of 120 kW/m^2 is incident. The max heat flux - distance point for a medium sized cabinet is used as the fourth column in the matrix.
- **distance** - the vertical distance from the fire to the target
- **q_data** - tabulates the four heat flux points 5.7, 9, 11, and 120 kW/m^2
- **damage_data** - tabulates the damage time from NUREG/CR 6850 Appendix H Table H-8

$$\text{HRR} := \begin{pmatrix} \text{"Lower Bound"} & \text{"Upper Bound"} & \text{"Point Value"} & \text{"SF"} \\ 53 & 79 & 65 & 0.192 \end{pmatrix}$$

$$\text{HF\_distance} := \begin{pmatrix} \text{"5.7 kW/m^2"} & \text{"9 kW/m^2"} & \text{"11 kW/m^2"} & \text{"120 kW/m^2"} \\ 6.4 & 5.4 & 4.9 & 1.15 \end{pmatrix}$$

$$\text{distance} := 3 \qquad \text{q\_data} := \begin{pmatrix} 5.7 \\ 9 \\ 11.4 \\ 120 \end{pmatrix} \qquad \text{damage\_data} := \begin{pmatrix} 6 & 19 \\ 8 & 10 \\ 10 & 6 \\ 11 & 4 \\ 14 & 2 \\ 16 & 1 \end{pmatrix}$$

Heat Flux Profile

This section produces the heat flux - time profile by evaluating the peak incident heat flux at a distance of 3 feet and then using a t^2 growth from NUREG/CR 6850 Appendix G, replacing peak HRR with peak heat flux.

$$\left(HF\_distance^{T}\right)^{\langle 1\rangle} = \begin{pmatrix} 6.4 \\ 5.4 \\ 4.9 \\ 1.15 \end{pmatrix}$$

Extract from input data the relevant distance data.

$$q_{fit} := \text{pwrfit}\left[\left(HF\_distance^{T}\right)^{\langle 1\rangle}, q\_data, \begin{pmatrix} 50 \\ -1 \\ -3 \end{pmatrix}\right] = \begin{pmatrix} 153.551 \\ -1.304 \\ -7.969 \end{pmatrix}$$

Perform a power regression of the heat flux and distance data to generate a heat flux - distance function coefficients A, B and C, for the Case 3 bin 3.

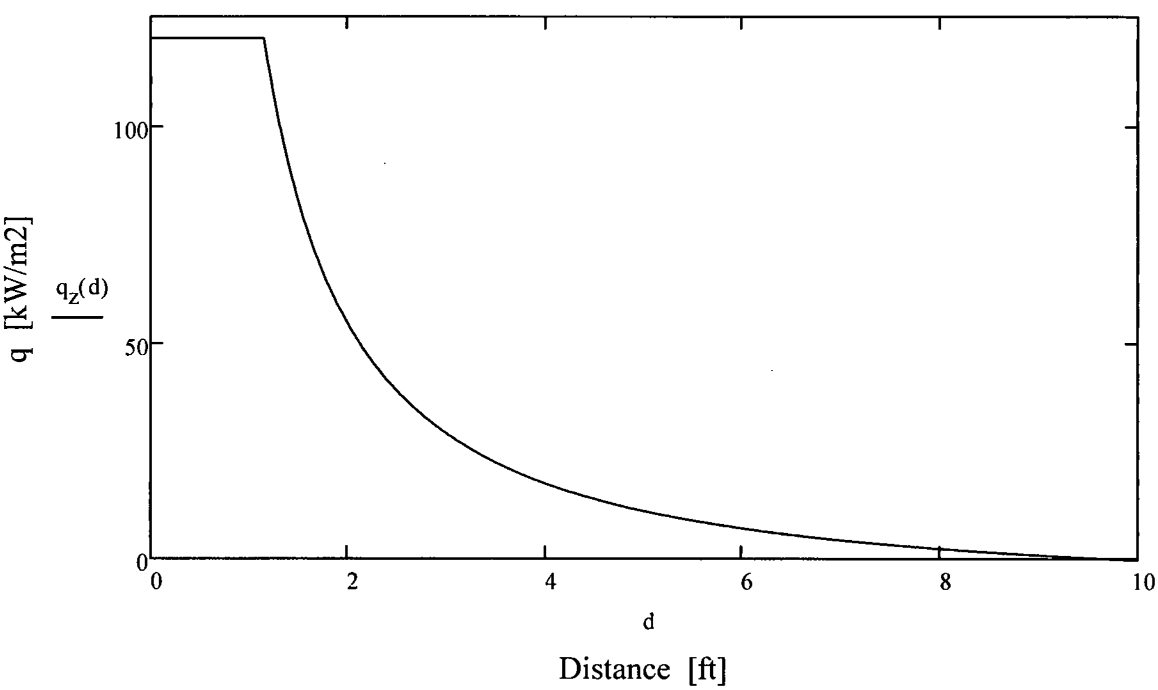
$$F_{flux}(d, A, B, C) := A \cdot d^{B} + C$$

Generate generic power function that accepts A, B, and C coefficients.

$$q_z(d) := \begin{cases} 120 & \text{if } F_{flux}\left(d, q_{fit_0}, q_{fit_1}, q_{fit_2}\right) > 120 \\ F_{flux}\left(d, q_{fit_0}, q_{fit_1}, q_{fit_2}\right) & \text{otherwise} \end{cases}$$

Apply the power regression coefficients to the generic power function, using a maximum heat flux of 120 kW/m^2.

Heat Flux vs. Vertical Distance for Select HRR Bins

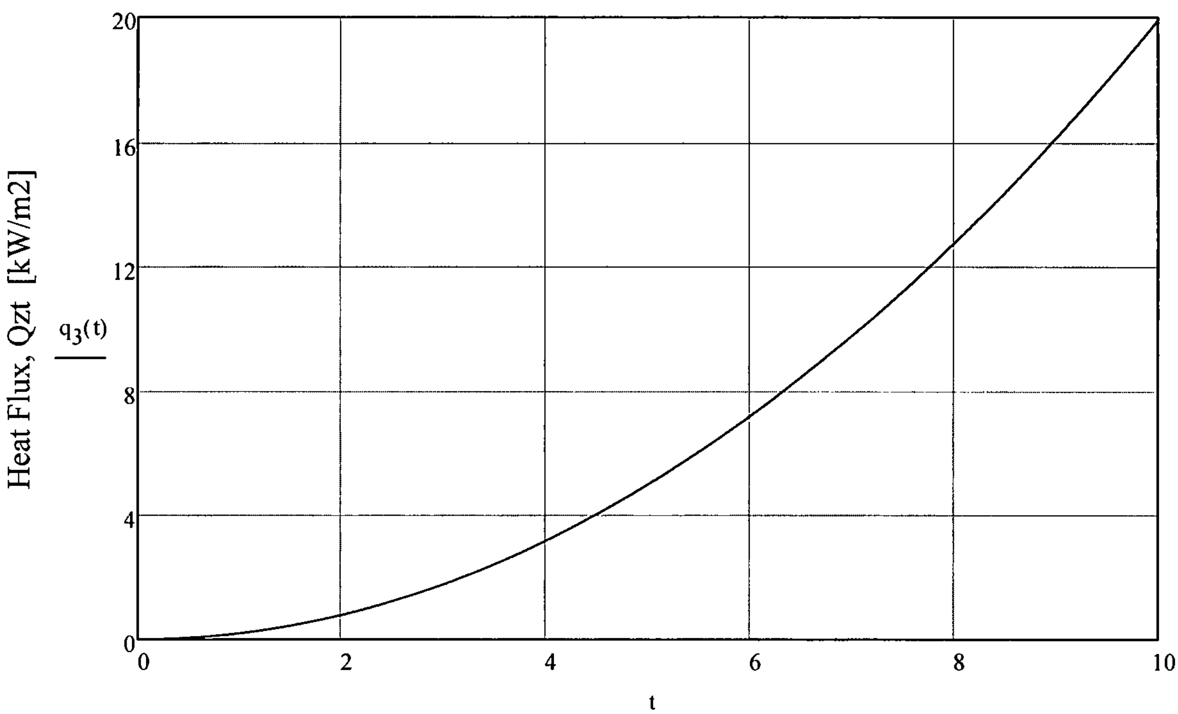


$q\_max_3 := q_z(3) = 28.682$ Maximum incident heat flux to a target at 3 feet by a Case 3 bin 3 fire.

To determine the heat flux as a function of time it was assumed that the heat flux will increase proportionally to the HRR increase of the ignition source. Therefore, to determine the heat flux as a function of time, the equation from NUREG/CR-6850 Appendix G was used. The peak HRR was replaced with the peak heat flux, q_3, as determined by the function $q_z(d)$.

$$q_3(t) := \begin{cases} \max\left[1\cdot 10^{-4}, \min\left[120, q\_max_3\cdot\left(\frac{t}{12}\right)^2\right]\right] & \text{if } t < 12 \\ \max\left(1\cdot 10^{-4}, \min\left(120, q\_max_3\right)\right) & \text{otherwise} \end{cases}$$

Incident Heat Flux vs. Time at a Distance of 3 feet



Damage Rate Profile

$$damage\_q := damage\_data^{\langle 0 \rangle} = \begin{pmatrix} 6 \\ 8 \\ 10 \\ 11 \\ 14 \\ 16 \end{pmatrix} \qquad damage\_time := damage\_data^{\langle 1 \rangle} = \begin{pmatrix} 19 \\ 10 \\ 6 \\ 4 \\ 2 \\ 1 \end{pmatrix}$$

$$damage\_rate := \frac{1}{damage\_time} = \begin{pmatrix} 0.053 \\ 0.1 \\ 0.167 \\ 0.25 \\ 0.5 \\ 1 \end{pmatrix}$$

$$C := \text{expfit}\left[damage\_q, damage\_rate, \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}\right] = \begin{pmatrix} 4.702 \times 10^{-3} \\ 0.332 \\ 0.034 \end{pmatrix}$$

Perform an exponential regression of the heat flux and distance data to generate a heat flux - damage rate function coefficients A, B and C, for the Case 3 bin 3.

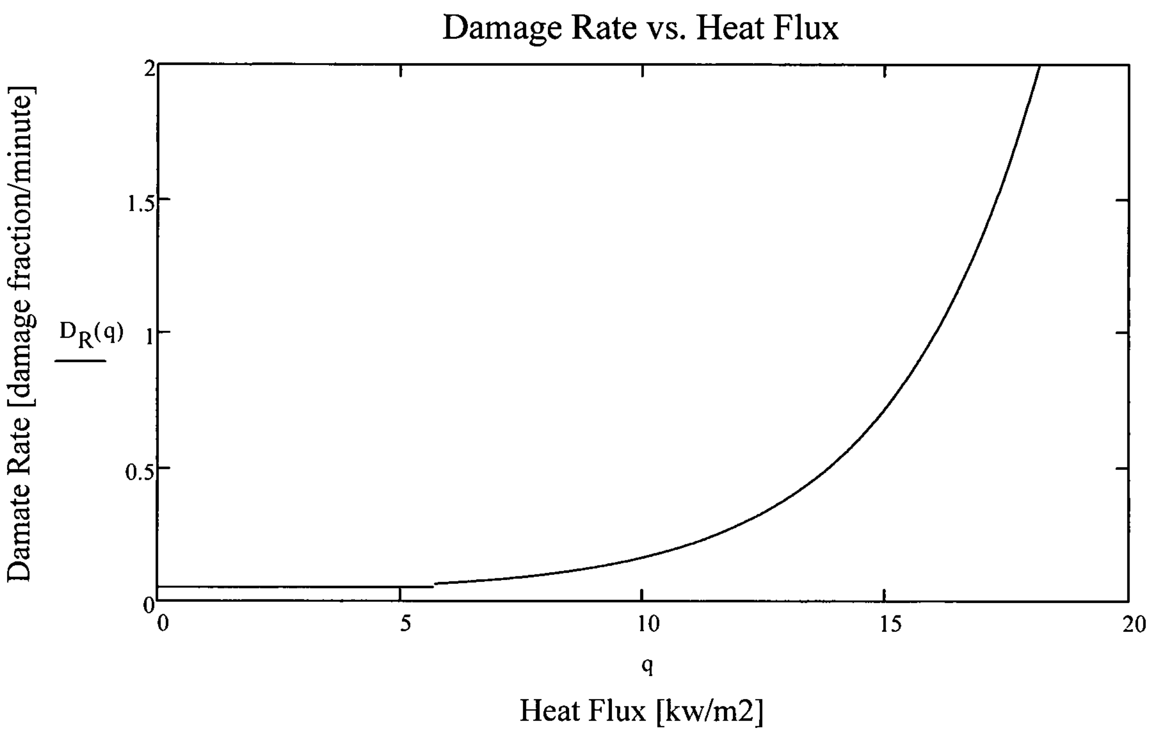
$$D_{R\_curve}(q) := C_0 \cdot \exp(q \cdot C_1) + C_2$$

Generate an exponential function that uses the A, B, and C coefficients.

$$D_R(q) := \left(\begin{array}{|l} \frac{1}{19} \text{ if } q < 5.7 \\ \frac{1}{19} \text{ if } q > 5.7 \wedge D_{R\_curve}(q) < \frac{1}{19} \\ D_{R\_curve}(q) \text{ if } q > 5.7 \wedge D_{R\_curve}(q) > \frac{1}{19} \end{array} \right)$$

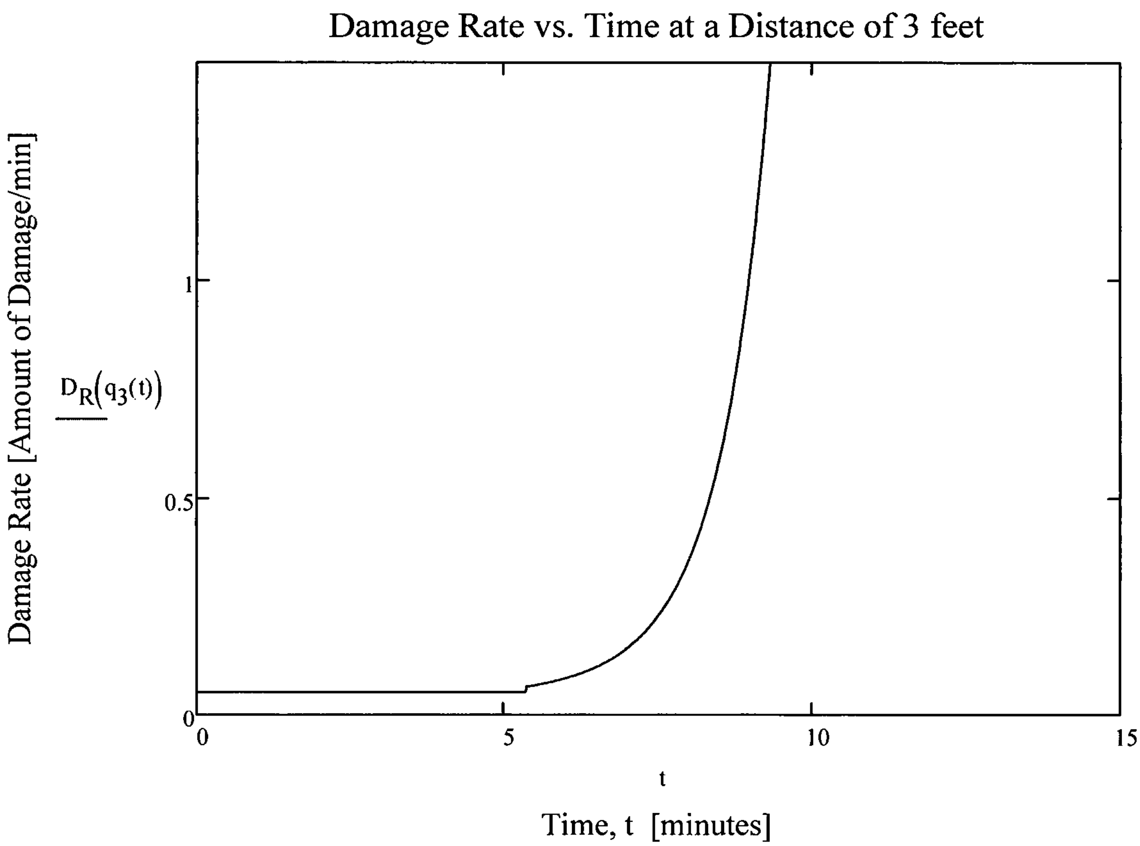
Ensure a minimum value of 1/19 damage rate is applied

The plot below shows the damage rate vs. heat flux function produced from the exponential regression. As the plot shows, a damage rate equal to the critical damage heat flux damage rate of 1/19 per minute is applied to heat fluxes up to and including the critical heat fluz of 5.7 kW/m^2. No maximum damage rate boundary is applied.


Damage Rate vs. Heat Flux
Damate Rate [damage fraction/minute]
$D_R(q)$
2
1.5
1
0.5
0
0
5
10
15
20
q
Heat Flux [kw/m2]

Correlation of Heat Flux and Damage Rate Profiles

The plot below shows the damage rate curve over time applicable to a Case 3 bin 3 fire impacting a thermoplastic target at 3 feet vertical distance. In order to capture the cumulative damage over time, this function needs to be integrated.



The function below integrates the damamge rate vs. time function using a time step of 0.1. The integration terminates when the accrued damage equals 1.0. The time step at which this occurs is the time to target damage.

$$
\begin{aligned}
t_{dam} := \; & t_{step} \leftarrow 0.1 \\
& Dmg \leftarrow 0 \\
& t_{dmg} \leftarrow 0 \\
& \text{while } Dmg < 1 \\
& \quad t_{dmg} \leftarrow t_{dmg} + t_{step} \\
& \quad Dmg \leftarrow Dmg + D_R(q_3(t_{dmg}))\cdot t_{step} \\
& t_{dam} \leftarrow t_{dmg}
\end{aligned}
$$

$t_{dam} = 8.6$

PSL FM RAI 05a

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.

LAR Section 4.5.1.2, "Fire PRA" states that fire modeling was performed as part of the fire PRA development (NFPA 805 Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together. Furthermore, LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," 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, Florida Power & Light Company 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 Implementation Item 15 in Table S-2 of Attachment S (see LAR Attachment S)."

Regarding qualifications of users of engineering analyses and numerical models (i.e., fire modeling techniques):

a. Describe the requirements to qualify personnel for performing fire modeling calculations in the NFPA 805 transition.

RESPONSE:

The governing requirement for qualifying personnel performing fire modeling calculations during the NFPA 805 transition was NFPA 805, Section 2.7.3.4. The qualifications for fire modeling personnel were based on the education and background for those individuals performing the fire modeling tasks. Specific fire modeling tasks (development of the "Generic Fire Modeling Treatments" report and its associated supplements and the preparation of the Main Control Room abandonment calculation) was carried out by fire protection engineers that meet the qualification standards described in R.G. 1.189, Section 1.6.1.a.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 for qualification of Peer Reviewers and thus meet the qualification requirements of NFPA 805, Section 2.7.3.4. Section 2.2 of NEI 07-12 describes the desired experience requirements for Peer Reviewers. Similar qualification was expected of technical leads involved in the performance of the PSL fire PRA. Given the magnitude of the technical activity that was performed, the technical leads were 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.

PSL FM RAI 05b

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.

LAR Section 4.5.1.2, "Fire PRA" states that fire modeling was performed as part of the fire PRA development (NFPA 805 Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together. Furthermore, LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," 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, Florida Power & Light Company 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 Implementation Item 15 in Table S-2 of Attachment S (see LAR Attachment S)."

Regarding qualifications of users of engineering analyses and numerical models (i.e., fire modeling techniques):

b. Describe the process for ensuring that the fire modeling personnel meet those qualifications, not only before the transition but also during and following the transition.

RESPONSE:

The fire modeling calculations performed during the transition were conducted by fire protection contractors having the appropriate qualifications as described in the response to PSL RAI FM 05a "Fire Modeling Qualifications." As stated in the response to PSL RAI FM-05a personnel performing fire modeling activities during the time supporting the LAR and during transition met the requirements in RG 1.189, Section 1.6.1.a. The qualification of these personnel often exceed the minimum requirements in the RG and have significant experience in fire modeling specifically supporting NFPA 805 transitions.

Personnel who will perform fire modeling calculations following transition will be qualified to a specific qualification mentoring guide for fire modeling. Based on the usage of the generic fire modeling treatments at St. Lucie it is expected that little detail fire modeling will be required.

However, the understanding of the generic fire modeling treatments and their limitations is part of the qualification to perform fire PRA analysis. Refer to the response to PSL RAI PROG 02 "Qualification of Users," regarding training of engineering personnel to qualify them to perform fire modeling post transition.

PSL FM RAI 05c

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.

LAR Section 4.5.1.2, "Fire PRA" states that fire modeling was performed as part of the fire PRA development (NFPA 805 Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together. Furthermore, LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," 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, Florida Power & Light Company 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 Implementation Item 15 in Table S-2 of Attachment S (see LAR Attachment S)."

Regarding qualifications of users of engineering analyses and numerical models (i.e., fire modeling techniques):

c. When fire modeling is performed in support of FPRA, describe how proper communication between the fire modeling and FPRA personnel is ensured.

RESPONSE:

Throughout the Fire Probabilistic Risk Assessment (FPRA) process, the Fire Protection Engineers (FPE) who conducted the fire modeling and the Fire PRA personnel maintained frequent communications. Fire modeling calculations were initiated with a description of the fire modeling objective, a visual inspection of the area by the FPE engineers, and a design input document transfer. FPRA team members reviewed the documentation prior to its incorporation into the FPRA model. The fire modeling results that are used by the FPRA are contained in calculations which are reviewed in accordance with the appropriate Quality Assurance (QA) program. These calculations were reviewed under the contractors' QA program with individuals familiar with the technical aspects of the calculation. Direct communication was also provided through the calculation review process. The fire modeling calculations were reviewed by FPRA and FPE contractors and FPL personnel, and comments were provided and addressed by the FPE staff. During the preparation of the LAR, meetings were held between the FPRA and FPE staff to review the necessary fire models and to ensure the results accurately reflected the needs of the FPRA model.

The post transition process (currently being implemented to support Duane Arnold) implements the process described in FAQ 07-0061. This process will have a screening done by the responsible engineer. If that screening indicates that there is any potential to impact the fire protection program the screening will have to be reviewed by a qualified fire protection engineer. Any actual impacts to the fire protection program will be reviewed by both a qualified fire protection engineer and a qualified FPRA engineer working together. This ensures proper communication between fire protection and FPRA.

PSL FPE RAI 02

National Fire Protection Association Standard 805, (NFPA 805) "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," Section 3.3.1.2(6) requires the storage and use of flammable gases to be "in accordance with applicable NFPA standards". However, LAR Attachment A, Section 3.3.1.2(6) indicates compliance with something other than NFPA standards. Describe the requirements used and provide justification for their use in lieu of NFPA standards.

RESPONSE:

The PSL Response to Section 3.3.1.2(6) states:

> 3.3.1.2 (6) * Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.
>
> Compliance Statement:
>
> *Complies with Clarification*
>
> Compliance Basis:
>
> *PSL is not committed to any flammable gas standards, with the exception of NFPA 50A for bulk hydrogen, and as such are not part of the current license basis. Per FAQ 06-0020, the following guidance applies as to which NFPA standards referenced in Chapter 3 are applicable:*
>
> *"Where used in NFPA 805, Chapter 3, the term, "applicable NFPA Standards" is considered to be equivalent to those NFPA standards identified in the current license basis (CLB) for procedures and systems in the Fire Protection Program that are transitioning to NFPA 805."*
>
> *Flammable gases are controlled per AP-0010434.*

PSL does not have any NFPA standards explicitly in its current license basis identified for use and storage of flammable gas other than NFPA 50A for bulk hydrogen storage. PSL controls flammable gases per a plant administrative procedure, AP-0010434.

AP-0010434, Sections 8.2.12 and 8.8 contain direction on the use of flammable gases (note that the LAR did not cite section 8.2.12).

Section 8.2.12 discusses control of combustibles, specifically bulk compressed or cryogenic flammable gas storage. Specific controls include:

- Storage is not permitted inside structures house systems, equipment, or components important to nuclear safety
- Storage of flammable gas shall be located outdoors, or in separate detached buildings
- NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be used for hydrogen storage
- Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings
- Flammable gas storage cylinders not required for normal operation shall be isolated from the system

Section 8.8 discusses requirements for handling flammable gases. Specific controls include:

- When handling flammable gases, release to the air should be avoided in that it may provide a means for a combustion explosion, fire hazard or both
- In areas where flammable gases are handled, adequate fire extinguishing capability shall be provided
- When handling flammable gases, some form of ventilation shall be provided. In a closed storage area, exhaust ventilation shall be provided
- When transferring flammable gases, a ground strap will be connected between the containers involved whenever the possibility of electrical sparking exists

These controls have been developed over years of operating experience with industry guidance. No specific NFPA standards other than NFPA 50A are cited in the administrative procedure. This is acceptable as defined in FAQ 06-0020.

PSL FPE RAI 03

LAR Attachment A, Section 3.3.1.3.1 Control of Ignition Sources, identifies both “complies via Engineering Evaluation”, and “Complies” as the compliance statement. Provide a description to clarify the difference, and describe how each compliance strategy is applied.

RESPONSE:

There is no difference in the compliance strategies utilized for LAR Attachment A, Section 3.3.1.3.1. This NFPA 805 Chapter 3 element requires a hot work safety program. The PSL hot work program is implemented in AP-0010434 hence the "Complies" Compliance Statement. Section 3.3.1.3.1 also states the program shall be developed in accordance with NFPA 51B. PSL performed a code compliance evaluation for NFPA 51B as documented in PSL-FPER-09-052 which demonstrates compliance of the PSL hot work program. Because the compliance was documented in an engineering evaluation the "Complies via Engineering Evaluation" Compliance Statement was also used. PSL will revise the compliance statements in the NFPA 805 LAR as shown on the attached LAR mark-up page for clarity. The "Complies via Engineering Evaluation" Compliance Statement will be struck and the "Complies" Compliance Basis enhanced to clarify that "Compliance with NFPA 51B is documented in PSL-FPER-09-052 and confirms AP-0010434 implements a compliant hot work program."

Attachment A

NEI 04-02 Table B-1 Transition of Fundamental FP Program & Design Elements

NFPA 805 Ch. 3 Reference	Requirements / Guidance	Compliance Statement	Compliance Basis
3.3.1.2 Control of Combustible Materials (5)	3.3.1.2 (5) * Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards.	Complies via Engineering Evaluation	See the NFPA 30 Code Compliance Evaluation for evaluation of use and storage of flammable and combustible liquids. No other NFPA standards were determined to be applicable based on FAQ 06-0020.
References	**Document ID**		
	PSL-FPER-11-005 Rev. 0 - NFPA Code Compliance Evaluation for NFPA 30, 1973 Edition, Flammable and Combustible Liquids Code		
		Complies	Additional requirements for handling flammable liquids are provided in AP-0010434.
References	**Document ID**		
	AP-0010434 Rev. 44 [Section 8.2.12, 8.7] - Fire Protection Guidelines		
3.3.1.2 Control of Combustible Materials (6)	3.3.1.2 (6) * Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.	Complies with Clarification	PSL is not committed to any flammable gas standards, with the exception of NFPA 50A for bulk hydrogen, and as such are not part of the current license basis. Per FAQ 06-0020, the following guidance applies as to which NFPA standards referenced in Chapter 3 are applicable: "Where used in NFPA 805, Chapter 3, the term, "applicable NFPA Standards" is considered to be equivalent to those NFPA standards identified in the current license basis (CLB) for procedures and systems in the Fire Protection Program that are transitioning to NFPA 805." Flammable gases ar
References	**Document ID**		
	AP-0010434 Rev. 44 [Section 8.8] - Fire Protection Guidelines		
3.3.1.3 Control of Ignition Sources	3.3.1.3 Control of Ignition Sources	N/A	Section Title
3.3.1.3.1 [Control of Ignition Sources Code Requirements]	3.3.1.3.1* A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.	~~Complies via Engineering Evaluation~~	~~See the NFPA 51B Code Compliance Evaluation.~~
~~**References**~~	~~**Document ID**~~		
	~~PSL-FPER-09-052 Rev. 0 - NFPA Code Compliance Evaluation for NFPA 51B, 1976 Edition, Cutting and Welding Processes~~		
		Complies	Hot work is controlled by AP-0010434.
	Document ID		
	AP-0010434 Rev. 44 [Section 8.3, 8.4] - Fire Protection Guidelines		

Enhance Compliance Basis as follows:
"Hot work is controlled by AP-0010434. Compliance with NFPA 51B is documented in PSL-FPER-09-052 and confirms that AP-0010434 implements a compliant hot work program."

Add Reference -
PSL-FPER-09-052 Rev. 0 - NFPA Code Compliance Evaluation for NFPA 51B, 1976 Edition, Cutting and Welding Processes

PSL FPE RAI 04

The compliance basis for LAR Attachment A, Section 3.3.3 Interior Finishes states that "walls, floors and ceilings are of reinforced concrete or concrete block construction and use of interior finish materials is limited to non-combustible material or those with a flame spread, smoke and fuel contribution of 50 or less (ASTM E-84) whenever practicable." However, NFPA 805 Section 3.3.3 requires interior wall or ceiling finish classification to be in accordance with NFPA 101, Life Safety Code requirements for Class A materials. NFPA 101 Section 10.2.3.4 defines Class A as "Flame spread index, 0–25". Provide a justification for the apparent finish classification discrepancy.

RESPONSE:

PSL complies with NFPA 805 Section 3.3.3 in the following manner:

1) The control rooms, which contain the majority of interior finish materials at PSL, are evaluated for compliance via engineering evaluations. Engineering evaluations PSL-FPER-05-047, PSL-FPER-05-048, and PSL-FPER-10-029 determined that the interior finishes of the control rooms comply with the requirements of NFPA 805. PSL-FPER-10-029 also determined that Unit 2 overall is compliant with the requirements of NFPA 101, 1973 edition. The control rooms and Unit 2 overall meet the requirements of NFPA 805 Section 3.3.3 as documented in engineering evaluations.

2) PSL does utilize epoxy floor finishes. The request for NRC approval of epoxy floor finishes is documented in LAR Attachment L, Approval Request 2. Epoxy floor coatings will be acceptable upon approval documentation in the NFPA 805 Safety Evaluation.

3) The balance of the buildings and rooms within the PSL Power Block are constructed primarily of steel and concrete, which may or may not be painted. Floors are either unfinished concrete, painted concrete, or vinyl floor tiles over concrete. The PSL UFSAR Appendix 9.5A, Table 2.4, Section D.1(d) states that walls and structural materials are noncombustible. This statement is in response to Appendix A of BTP 9.5-1 guidelines that requires interior finishes to have a flame spread rating of 25 or less. In addition, Regulatory Guide (RG) 1.189, Fire Protection for Nuclear Plants, Section 4.1.1.1 states that interior finishes should be noncombustible and further lists materials acceptable for use as interior finish without evidence of test and listing by a recognized testing laboratory. These materials include (in part):

- plaster, acoustic plaster, and gypsum plasterboard (gypsum wallboard), either plain, wallpapered, or painted with oil- or water-base paint,
- brick, stone, and concrete blocks, plain or painted,
- steel and aluminum panels, plain, painted, or enameled, and
- vinyl tile, vinyl-asbestos tile, linoleum, or asphalt tile on concrete floors

PSL interior finish materials are noncombustible and consistent with the guidance in Appendix A to BTP 9.5-1 Guidelines Section D,1(d) and Regulatory Guide 1.189, Section 4.1.1.1 and subsequently the requirements of NFPA 805 Section 3.3.3.

The current UFSAR Appendix 9.5A wording, which is inconsistent between Section 2.1 and Table 2.4, Section D.1(d), will be revised as part of implementation. UFSAR Section 9.5A is currently the Fire Protection Program Report. This information will be revised during the creation of the Fire Protection DBD. Implementation Item #15 creates a fire protection design basis document, Implementation Item #3 updates station documentation to include the applicable interior finish requirements from NFPA 101, and Implementation Item #9 will ensure the details supporting compliance bases in Table B-1 (Attachment A) that originate from the UFSAR are carried forward as a nuclear record. These implementation items will resolve the discrepancy between current program documentation and the requirements of NFPA 805.

PSL will revise the compliance statements in the NFPA 805 LAR Attachment A, Section 3.3.3 as shown on the attached LAR markup page for clarity.

Attachment A

NEI 04-02 Table B-1 Transition of Fundamental FP Program & Design Elements

NFPA 805 Ch. 3 Reference	Requirements / Guidance	Compliance Statement	Compliance Basis
	Unit 2 UFSAR, Appendix 9.5A Rev. 20 [Section 2.1] - Fire Protection Program Report		
3.3.3 Interior Finishes	3.3.3 Interior Finishes. Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes.	Complies via Engineering Evaluation	For Unit 1 Control Room compliance is documented in PSL-FPER-05-047. For Unit 2 Control Room compliance is documented in PSL-FPER-05-048 and PSL-FPER-10-029.
References	**Document ID**		
	PSL-FPER-05-047 Rev. 3 - Fire Protection Evaluation for PSL Unit 1 Control Room Modification (PCM 04115)		
	PSL-FPER-05-048 Rev. 4 - Fire Protection Evaluation for PSL Unit 2 Control Room Modification (PCM 04115)		
	PSL-FPER-10-029 Rev. 0 - NFPA Code Compliance Evaluation for NFPA 101 (Interior Finishes), 1973 Edition, Life Safety Code		
		Submit for NRC Approval	Epoxy floor coatings were reviewed under CR 2007-25587 and determined to meet the requirements contained in GL 86-10 (no more than 1/8" thick with flame spread of 50 or less). This is not the same as the requirements from NFPA 805. See Attachment L of the License Amendment Request for further details on the request for NRC approval for evaluation of epoxy floor coatings interior finish requirements.
References	**Document ID**		
	CR 2007-25587 Rev. 0 - OE Review of IN 07-26 Combustibility of Epoxy Floor Coatings at Commercial Nuclear Power Plants		
	Insert: The balance of the buildings and rooms within the PSL Power Block are constructed primarily of steel and concrete, which may or may not be painted. Floors are either unfinished concrete, painted concrete, or vinyl floor tiles over concrete. These materials are noncombustible and consistent with guidance in Appendix A to BTP 9.5-1 Guidelines Section D.1(d) and Regulatory Guide 1.189, Section 4.1.1.1.	Complies	~~The Unit 1 and Unit 2 Fire Protection Program Reports Section 2.1 state:~~ ~~Non-combustible and fire resistant materials are used throughout the St. Lucie plant; walls, floors and ceilings are of reinforced concrete or concrete block construction and use of interior finish materials is limited to non-combustible material or those with a flame spread, smoke and fuel contribution of 50 or less (ASTM E-84) whenever practicable.~~ Implementation Item: The applicable station documentation will be updated as required to include the interior finish requirements per NFPA 805. See Implementation Item 3 in Table S-2 of Attachment S.
References	**Document ID**		
	Unit 1 UFSAR, Appendix 9.5A Rev. 25 [~~Section 2.1~~] - Fire Protection Program Report		
	Unit 2 UFSAR, Appendix 9.5A Rev. 20 [~~Section 2.1~~] - Fire Protection Program Report		

Insert:
Table 2.4, Section D.1(d)

Insert:
Table 2.4, Section D.1(d)

Insert new Reference:
Regulatory Guide 1.189, Fire Protection for Nuclear Power Plants, Revision 2, Section 4.1.1.1

PSL FPE RAI 05

LAR Attachment A lists the requirement for NFPA 805 Section 3.4.4, "Firefighting Equipment." However, radiation monitoring, personal dosimeters, and fire extinguishers are not discussed in the LAR. Provide additional details for these elements, listed in the NFPA 805 Section 3.4.4 requirement.

RESPONSE:

The NFPA 805 Chapter 3 requirement for Section 3.4.4 states firefighting equipment shall be provided for the fire brigade which includes protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment. The Compliance Basis provided in the LAR only specifically identified fire brigade turnout gear and breathing apparatus. The NFPA 805 Section 3.4.4 response will be enhanced to address the other elements listed in the section requirement.

- A Radiation Team is responsible to verify proper levels and precautions for radiation and contamination concerns as identified in the Fire Fighting Strategies (1(2)-1800023). The fire brigade does not respond with radiation monitoring equipment. This equipment is brought, as needed, by the Radiation Team.
- Operations personnel that also serve on the fire brigade are trained for access to radiological areas (Radiological Worker Training). In order to access radiological areas, personal dosimetry (TLD) and other dosimetry are issued to each individual.
- Fire extinguishers and hose stations are installed throughout the plant for fire brigade use as documented in the NFPA 10 (fire extinguishers) code compliance evaluation (PSL-FPER-10-001), in the NFPA 14 (hose stations) code compliance evaluation (PSL-FPER-10-007), and in the Fire Fighting Strategies (1(2)-1800023), and drawings 8770-G-060 through -077 and 2998-G-060 through -077.
- Additional fire suppression equipment provided for the fire brigade includes hydrants, hose houses (hose, nozzles, wrenches, gate valves, spanners), and dedicated equipment storage cages/locations (foam, fans, SCBA). Hydrant locations are documented in the NFPA 24 code conformance evaluation (PSL-FPER-08-070) and drawings 8770-G-170 & -174 and 2998-G-170 & -174. Contents of hose houses and fire cages are documented in surveillance procedures.

PSL FPE RAI 06

LAR Attachment A, Section 3.3.5.1 identifies the need for 10 CFR 50.48(c)(2)(vii) approval for use of non-plenum rated cables above the suspended ceiling of the control room (CR). LAR Attachment L, Approval Request #3 indicates that "the wiring/cable may be small amounts of video /communications cable that is not listed for plenum use as required by this section of the code." Provide a more definitive description of the "limited amount" of unqualified cabling materials and quantities (either inside or outside the raceways). Include a more detailed justification for the conclusion that it "does not present a significant fire hazard." Describe whether the areas above the suspended ceilings are provided with credited fire detection and how it is identified in LAR Attachment C, Table C-2.

RESPONSE:

LAR Attachment L, Approval Request #3 was for the use of non-plenum cables above suspended ceilings in multiple areas. The specific request is for control cable trays above the Unit 1 Control Room Complex and limited amount of video/communication cable above the suspended ceilings. LAR Attachment L states: "This approval request is specifically for the cable trays above the ceiling in the Unit 1 Control Room Complex and limited amounts of video/communication cable above all suspended ceilings." This response will address the cable trays above the Unit 1 Control Room Complex separately from the more generic 'limited amounts of video/communication cable"

Limited Amount Outside Raceways

A more definitive description of the "limited amount" of unqualified cabling materials and quantities (either inside or outside the raceways) has been requested.

As identified in PSL-FPER-12-001 the cables that are not tracked within the existing cable and raceway system and may not be routed in conduit are those cables associated with communications. Communications can be more clearly broken down into the categories of standard telephone, PAX, Public Address (PA), Sound Powered Phones and other computer cables required for interface with equipment in the Control Room. Controlled drawings identify that the cable associated with PAX, PA, and Sound Powered Phones are routed in conduit. (8770-G-333 Sh 1 and Sh 2) The potential for concern regarding computer cable and standard telephone cables is what remains.

PSL-FPER-12-001 did not identify any obvious areas where there might be unscheduled/unrated cable e.g. no cables were identified as hanging down from the overhead or penetrating the suspended ceiling. However, the walkdowns and reviews done for PSL-FPER-12-001 cannot preclude that unscheduled/unrated cable exist because the suspended ceilings were not removed and the entire area above the ceiling was not visually observed.

Computer Cables : Modifications made to the Control Room (EC 235249 and EC 235438) related to the installation of raised floor, and workstations (digital controls and digital displays) identified that communications cable is considered "L" (instrumentation). The modifications identified that cables associated with equipment relocated or installed by the modification would be routed in the raised floor area of the Control Room. In general, it would not have been considered efficient to have routed computer cables in a manner that would have included a routing through the overhead. In a similar manner, it is unlikely that computer cable in other areas with suspended ceilings would have been run overhead. While visual examination of these areas shows that little, if any, cable was run up into the ceiling, the presence of such cables above the ceiling cannot be excluded.

Telephone Cable: Telephone cable is not tracked or controlled by St. Lucie. Similar to computer cable described above, the locations of telephones currently present in the Control Room Complex of Unit 1 and Unit 2 do not afford themselves to having been routed within the overhead of the Control Room, predominantly due to their location within the rooms involved as well as the modifications performed to implement the Control Room Digital Upgrades. As described with computer cables above, a visual examination of these areas shows little potential for these types of cables to above suspended ceilings but this cannot be excluded.

Conclusion: While it is unlikely that any unscheduled/unrated cable exists above the suspended ceilings in the St. Lucie Power Block, it cannot be explicitly excluded. With respect to 'limited amount' as stated in the Attachment L approval request a limited amount means that there may be a single cable or a small group of cables above the suspended ceilings that are unscheduled (e.g. not tracked in the cable and raceway system) and potentially not plenum rated. There was no plan to route such cables above the suspended ceilings and that type of cable routing is not used. However, there may have been some cables routed above the suspended ceilings to support things such as additional telephone or communication equipment to support outage work or test/computer cables to support special testing that may still remain (likely no longer connected) as a single cable or isolated sections of a small group of cables. While it has not been the practice to route cables above the suspended ceilings at St. Lucie (except for cable trays in the control rooms [see below]) the approval request for 'limited amounts' is meant to cover the fact that these cables may exist.

Non-Plenum Cables in Raceways (applies to Unit 1 Control Room Only)

As stated in the LAR Attachment L Approval Request 3 there are cables routed above the suspended ceilings in the Unit 1 Control Room Complex that may not be plenum rated and in ventilated trays. This does not meet the requirements of NFPA 805 Section 3.3.5.1 which would require these trays to be solid bottom with solid covers. The cable trays in question are 'C' type trays. There are only three such cable trays located above the suspended ceiling. The cables in these trays are either IEEE-383 qualified or covered with Flamemastic 77. While this is not equivalent to being plenum rated it does provide some assurance that these cables are difficult to ignite and limit the spread of combustion along the cable length. Two of these trays (C5 and C38) are at the bottom of the tray stack of 3 trays, where the other trays are "L" type with solid bottoms and covers. But one tray (C63) is located on the top of a stack with only one "L" tray beneath which is solid bottom and cover. There are no ignition sources in the vicinity of the three 'C' trays (C5, C38 and C63) and even if the cables in these trays were ignited the fire would be limited to these "C" trays and the 'L' trays above (C5 and C38) might be damaged they would not contribute any combustibles to the fire because the cables are completely enclosed.

Include a more detailed justification for the conclusion that it "does not present a significant fire hazard."

As stated above unscheduled/unrated cables are not expected to be present but cannot be excluded. There are no ignition sources above the suspended ceilings and it is expected that the majority of these cables may not be energized. Even if energized, these cables would be low voltage communication/computer cables with little energy present that could cause these cables to fail and ignite. In addition, any cables if present would be scattered in location and would not provide any continuity of combustibles allowing any fire to spread.

Specifically for the Unit 1 the cables of concern are in a limited number of cable trays that are not in the vicinity of any ignition sources and even if they were to ignite there are no additional combustibles near these trays that would allow the fire to grow beyond the combustibles that are contained within the tray.

Tray Locations: The cable trays that are located above the Unit 1 Control Room suspended ceiling are routed in a manner such that they are closer to the perimeter of the Control Room and <u>not</u> densely packed in the overheads of the Unit 1 Control Room (8770-G-410 Sh 6 and 7).

Unit 1 tray details: The "L" designated (instrumentation) cable trays in the Unit 1 Control Room are identified to be solid bottom with covers (8770-B-328 Sh. 5 and 9A). There are a total of ten (10) cable trays over the Control Room at various lengths. Seven (7) of these trays are designated as "L" trays and are therefore solid bottom with tray covers in place. Three of the trays are "C" trays and do not have covers and are ventilated trays. The actual percent cable fill in all the trays in the overhead is less than 20% at a majority (>85%) of all plant points associated with the Control Room (8770-B-328).

Conclusion: Based on the following points described in more detail above

- location of trays (limited in number and not densely packed over the entire Unit 1 Control Room),
- tray style (solid bottom with tray covers where identified – meets the NFPA 805 requirements),
- the quantity of trays not meeting the NFPA 805 requirements (3 for Unit 1),
- the actual percent fill (<20% for the majority of locations for all trays)
- Documented cables in Unit 1 is either IEEE 383 rated or non-rated and coated with Flamemastic (both difficult to ignite and difficult to have sustained combustion along their length)

Describe whether the areas above the suspended ceilings are provided with credited fire detection and how it is identified in LAR Attachment C, Table C-2.

Ionization smoke detection is provided over the cable trays in both Units Control Room Complexes as documented on plant drawings 8770-G-413, Sh. 11, 2998-G-413, Sh. 7. The smoke detection installed over the cable trays is identified in Table C-2 of the St. Lucie NFPA 805 LAR in Fire Area 1F for zones 1-70 and 1-73 as Detection System, Unit 1 Zone 8B and for Fire Area 2F for zones 2-42I as Detection System, Unit 2 Zone 8A and Detection System, Unit 2 Zone 8B.

PSL FPE RAI 07

LAR Attachment C, Tables C-1 and C-2 identify "enhanced transient controls" for certain areas (for example electrical penetration rooms, cable spread room, cable loft, and reactor auxiliary building corridor). Describe what those controls are, where in the plant these controls are established, and how this is managed by plant procedures. Describe how this is different than "Transient Exclusion Zones" listed in LAR Section 4.6.2.

RESPONSE:

"Enhanced transient controls" are those controls that are beyond the current plant guidelines. These enhanced transient controls may include:

- Additional / tighter limits on the amount and type of transient combustible materials in an area.
- Identification of transient exclusion or zero transient zones. This will result in no transient combustibles or ignition sources in specific locations. Currently these enhanced transient controls are in the following fire areas/zones where credit is taken in the Fire PRA. A fire watch is not required for this enhanced transient control.

AreaZone

1B1_57

2A2_51X

2B2_52

2H2_51E

2I2_51W

The "transient exclusion zones" are not different than "enhanced transient controls" but a subset of the "enhanced transient controls". Note that at this time, under the current licensing basis, there are no transient exclusion zones at PSL.

For areas in the LAR where "enhanced transient controls" are identified (see list above which correlates to those areas listed in RAI PRA 4.a), storage of transient combustibles will not require a fire watch. This is documented in Section 1.2.8.1 of the Fire Risk Evaluation report (PSL-FPER-11-001) for the identified areas.

The enhanced transient controls will be further defined and refined during the implementation period concurrent with implementation of the Monitoring Program and will include development of a procedure which will manage the transient controls.

PSL FPE RAI 08

LAR Attachment K, identifies previously approved exemptions and deviations from 10 CFR 50, Appendix R that require transition to the NFPA 805 program. Provide clarification to the following:

a. LAR Attachment K, identifies radiant energy shields and 18 accessible fire extinguishers credited in Fire Area 1K as an element of the exemption 1-LA-03-19850221 for Unit 1 reactor coolant pump (RCP) oil collection system. LAR Attachment C, Table C-2 identifies radiant energy shields required for risk reduction only. Justify why the radiant energy shields and fire extinguishers shouldn't also be required for "E- EEEE/LA Criteria" as indicated in LAR Section 4.8.1.

b. LAR Attachment K, identifies fire extinguishers and hose stations for Fire Areas A, J, and L as one element of the basis for the exemption 1-LA-08-19850221 for the lack of fire rated dampers. However, LAR Attachment C, Table C-2 does not identify either extinguishers or hose stations as fire protection features for the exemptions being transitioned. Justify why the fire extinguishers and hose stations shouldn't also be required for "E- EEEE/LA Criteria" as indicated in LAR Section 4.8.1.

c. LAR Attachment K, identifies fire extinguishers and standpipe system as part of the evaluation for exemption 1-LA-13-19870305, the lack of 3-hour rated penetration seals. However, these features are not identified in Attachment C, Table C-2. Justify why these features shouldn't also be required for "E- EEEE/LA Criteria" as indicated in LAR Section 4.8.1.

d. LAR Attachment K, identifies fire extinguishers and hose stations as elements of the basis for exemption 1-LA-14-19870305 for lack of fire rated dampers. Justify why the fire extinguishers and hose stations shouldn't also be required for "E- EEEE/LA Criteria" as indicated in LAR Section 4.8.1.

e. Provide a review of the fire protection features being relied upon for any of the transitioned exemptions and deviations of LAR Attachment K. Provide justifications for any fire protection features not identified in LAR Attachment C, Table C-2.

RESPONSE:

a) Licensing Action 1-LA-03-19850221 is the exemption for the U1 RCP oil collection system. The basis for the exemption does not include radiant energy shields or fire extinguishers as credited fire protection features. The radiant energy shields and fire extinguishers discussed in the summary of letter dated September 16, 1983 which was a Supplement to the Fire Hazards Analysis for St. Lucie Unit 1. The discussion on radiant energy shields and fire extinguishers were not associated with any discussion of the K.2 Exemption and are incorrectly included in the K.2 Exemption review within Attachment K of the LAR. The September 16, 1983 letter is cited as a reference to the licensing action because the Fire Hazard Analysis for Fire Area K Section 6a and a brief statement in Section 6b of the letter addresses the details of the oil collection system (Section 6a) and a summary statement which identified that the RCP Oil Collection System design was amended by exemption request K.2 (Section 6b). The radiant energy shields discussed in Section 6b and the fire extinguishers mentioned in Section 6c of the letter are related to the overall Fire Hazard Analysis discussion for Fire Area K and were not identified with any of the discussion associated with the RCP Oil Collection System Exemption K.2. The NRC approval of the RCP oil collection system in the SER dated February 21, 1985 (also summarized in Attachment K) does not cite fire extinguishers or radiant energy shields as the basis for approval. Because the basis for the approval request, per the NRC SER, does not cite fire extinguishers or radiant energy shields, the features are not required for "E- EEEE/LA Criteria" as indicated in LAR Section 4.8.1

A markup of LAR Attachment K is attached to this response.

b) The installation of portable extinguishers and/or hose stations are required by NFPA 805, Chapter 3, Sections 3.4.4 (firefighting equipment including hoses, nozzles, extinguishers), 3.6.1 (hose stations and standpipes) and 3.7 (fire extinguishers). Therefore, although licensing actions may credit fire extinguishers or hose stations as the basis for approval/acceptability, the features are not explicitly called out in Attachment C, Table C-2 as fire extinguishers and hose stations are already required by NFPA 805 Chapter 3.

c) The installation of portable extinguishers and/or hose stations are required by NFPA 805, Chapter 3, Sections 3.4.4 (firefighting equipment including hoses, nozzles, extinguishers), 3.6.1 (hose stations and standpipes) and 3.7 (fire extinguishers). Therefore, although licensing actions may credit fire extinguishers or hose stations as the basis for approval/acceptability, the features are not explicitly called out in Attachment C, Table C-2 as fire extinguishers and hose stations are already required by NFPA 805 Chapter 3.

d) The installation of portable extinguishers and/or hose stations are required by NFPA 805, Chapter 3, Sections 3.4.4 (firefighting equipment including hoses, nozzles, extinguishers), 3.6.1 (hose stations and standpipes) and 3.7 (fire extinguishers). Therefore, although licensing actions may credit fire extinguishers or hose stations as the basis for approval/acceptability, the features are not explicitly called out in Attachment C, Table C-2 as fire extinguishers and hose stations are already required by NFPA 805 Chapter 3.

e) Fire Protection systems and features required by licensing actions are included in Attachment C, Table C-2. Table C-2 of the LAR is a summary table of the overall system and feature review. The NFPA 805 Required Fire Protection Systems and Features are detailed in a separate evaluation (PSL-FPER-13-004). PSL-FPER-13-004 documents the required systems and features that are presented in LAR Attachment C, Table C-2 that are required to support various source documents. Source documents include the licensing action review (PSL-FPER-11-006), the existing engineering evaluation review (PSL-FPER-11-007), the fire risk evaluations (PSL-FPER-11-001), and other transition documents. The evaluation PSL-FPER-13-004 includes a detailed table in Attachment A which identifies the required systems and features.

The detailed table identifies the specific reference from which each feature is credited. Therefore, when reading PSL-FPER-13-004 Attachment A, each feature associated with PSL-FPER-11-006 is a system or feature required by a licensing action. In addition, the basis for each licensing action is validated in Attachment 2 of the Transition Review of Existing Licensing Actions (PSL-FPER-11-006). Attachment 2 is the field validation and controlled documents which confirm the bases for acceptability. The attachment identifies each licensing basis and provides the reference that validates the basis. All Fire Protection systems and features identified as bases for acceptance of the licensing actions are captured in LAR Attachment C, Table C-2.

Attachment K
Existing Licensing Action Transition

Licensing Action 1-LA-03-19850221, Unit 1 Appendix R Exemption K.2 Because the Reactor Coolant Pump Oil Collection System is Not Capable of Collecting Lube Oil From All Four of the Reactor Coolant Pump Lube Oil Systems (III.O Criteria)

Evaluation

oil from an entire Reactor Coolant Pump Lube Oil System (190 gallons) and a generous allowance for reasonable leakage from the remaining systems. This is the basis of Exemption Request K2 from Section III.O of Appendix R to 10CFR50.

Shutdown equipment in Fire Area K required in the event of a fire consists of Safety A and B train instrumentation for the following functions: Pressurizer pressure and level, Steam Generator pressure and level and Reactor Coolant System temperature; Safety A and B train system valve; related cables and controls.

Delete

6b. Fire Protection System Not Operating:

Fire Area K contains, in total, approximately 70,200 Btu/Sq ft, which is considered a low combustible load. The majority of this combustible load is attributable to cable insulation which is generally distributed over large sections of the fire area with a major concentration occurring at the Penetration Area, elevation 23.00' between Column Lines 6 and 8. A radiant energy shield provides separation of redundant cables required for safe shutdown from a fire in the Penetration Area. The cables are then routed separately to several items of equipment. In addition, all cables in Fire Area K are IEEE-383 (1974) qualified or are provided with a fire retardant protective coating system to retard flame spread and all instrument trays are covered. The balance of the combustible load in the fire area is due to the twenty-six individual items as shown in Table I. Fourteen of these involve a combustible load equivalent to less than one gallon of oil. Each is an isolated point source combustible which, when assumed to ignite and burn until completely consumed, has no adverse effect on redundant cable or equipment required for safe shutdown in the event of a fire. The other concentrated combustibles are evaluated individually:

<u>Items 1-4 (Reactor Coolant Pump Lube Oil Systems)</u>

Delete

An oil collection system has been provided in accordance with Appendix R to 10CFR50, Section III-O, as amended by exemption request K-2 submitted April 25, 1983 (L-83-261) and August 24, 1983 (L-83-453)."

"6c. Fire Protection System Operating:

Fire Area K has ionization smoke detectors and thermal detectors which provide annunciation locally and in the Control Room. There are 18 accessible fire extinguishers in the fire area. An effective response by the trained fire brigade, utilizing the portable fire extinguishers will assist in limiting the consequences of any fire effects. Safe reactor shutdown capabilities will not be adversely affected in the event of a fire."

Document ID

1985-02-21-1b [SER Sections 15.0 thru 15.4] - NRC- FPL, Exemption Requests for St Lucie Plant, Unit No. 1, 10 CFR Part 50, Appendix R Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979, dated February 21, 1985

Evaluation

This NRC SER granted the exemption for the oil collection system. It stated:

"15.0 Oil Collection System for Reactor Coolant Pumps

15.1 Exemption Requested

An exemption is requested from Section III.O to the extent it requires an oil collection tank sized to hold the lube oil inventory of all three Reactor Coolant Pump (RCP) motors.

15.2 Discussion

The unit has four reactor coolant pumps with an oil collection system that drains to a vented closed collection tank. The quantity of lubricating oil in each pump is 190 gallons. The capacity of the oil collection tank is 225 gallons. The components have been designed so that they are capable of withstanding a safe shutdown earthquake (SSE).

PSL FPE RAI 09

The compliance statement for LAR Attachment A, Table B-1, Section 3.4.1(c) is "complies". NFPA 805, Section 3.4.1(c) specifically requires the fire brigade leader and two brigade 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. The compliance basis for this element states that the 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; but does not specify the details of the training and knowledge of these members. Describe how the requirements of NFPA 805 Section 3.4.1(c) are met with regard to training and knowledge of the leader and at least two members of each fire brigade.

An approach acceptable to the staff for meeting this training and knowledge requirement is provided in Regulatory Guide (RG) 1.189, "Fire Protection for Nuclear Power Plants," Rev. 2, Section 1.6.4.1, Qualifications:

"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."

RESPONSE:

PSL requires the brigade leader and at least two brigade members have sufficient training in or knowledge of plant safety related systems to understand the effects of fire and fire suppressants on safe shutdown capability. This is documented in 1800022, Section 8.7.6.B:

"Composition and Responsibility - A Shift Fire Brigade of at least five members shall be maintained on site at PSL at all times. The brigade leader and at least two brigade members shall have sufficient training in or knowledge of plant safety related systems to understand the effects of fire and fire suppressants on safe shutdown capability."

"The fire brigade shift shall not include the Shift Manager, nor the three other members of the minimum shift crew necessary for safety shutdown of the unit and any personnel required for essential functions during a fire emergency. Each shift will have a Fire Brigade Leader assigned. A list of all qualified Fire Brigade members is maintained in a current, up-to-date condition in LMS." LMS is St. Lucie's Learning Management System.

1800022, Section 8.7.5.C.1.c states:

> "The Fire Brigade Leader course, as outlined in the Fire Protection Training Guide, is required for all Fire Brigade Leaders. The Fire Brigade Leader is required to have sufficient training or knowledge of plant safety related systems. This knowledge may be demonstrated by having an operator license or having completed Senior Nuclear Plant Operator Training. The Brigade Leader is trained and qualified in fire fighting practice to understand the effects of fire and fire suppressants on safe shutdown capability and is competent to assess the potential safety consequences of a fire, so as to advise Control Room personnel. Fire Brigade Leader training shall be completed prior to assignment as Fire Brigade Leader."

In addition, 1-OSP-100.27, Attachments 1 and 2, document the Operations Surveillances performed for the midnight and day shift. These surveillances include a specific note that the Fire Brigade Leader and at least two Fire Brigade Members have sufficient training in or knowledge of plant safety related systems to understand the effects of fire and fire suppressants on safe shutdown capability.

All Fire Brigade Members are Nuclear System Operators and receive full Systems (TR-AA-104 and TPD-PSL-E01) and Fire Protection (0005729) training. They are required to attend requalification classes throughout the year on operation of the systems (TR-AA-104, TPD-PSL-E01, and 0005729) and fire event impacts to plant operations. Fire Brigade Members participate, as a minimum, quarterly in fire drill exercises (1800022 and 00005729). Fire Brigade Leader and two other members have knowledge of the effects of suppressants on safe shutdown equipment. This is achieved by being, at a minimum, qualified Senior Nuclear Plant Operators (SNPOs) that have received training on plant safe shutdown equipment as a part of accredited non-licensed training. The other brigade members are non-licensed operators but are not required to be qualified as a SNPO.

PSL FPE RAI 10

LAR Attachment S, Table S-1 and LAR Attachment C, Table C-1 state that incipient detection is to be installed in the cable spreading room (CSR). Provide more details regarding system design features: NFPA code(s) of record, installation, acceptance testing, set-point control, alarm response procedures and training, and routine inspection, testing, and maintenance that will be implemented to credit this new incipient detection system. Describe whether the installation and credit that will be taken will be in accordance with the method elements, limitations, and criteria of NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements," Chapter 13 and provide justification for any deviations.

RESPONSE:

The PSL description in LAR Attachment S, Table S-1 and Attachment C, Table C-1 identifies that a modification to install incipient detection to detect a fire well in advance of significant damage. The VEWFD system is to be installed in the Annunciator Logic Cabinet in the Unit 2 Cable Spread Room.

- Provide more details regarding system design features:

  The design for the Incipient Detection VEWFD system to be installed in the Unit 2 Cable Spread Room is in the conceptual phase at this time. The current NFPA codes that are applicable to the design of the system(s) are NFPA 76, 2012 ed., *Standard for the Fire Protection of Telecommunications Facilities,* and NFPA 72, 2013 ed., *National Fire Alarm and Signaling Code.*

  The system design will be to install incipient detection inside the cabinet to detect fire well before significant damage occurs and prior to the occurrence of visible fire outside the cabinet. In this way damage to the cables located above (not related to the function of the cabinet) can be minimized. The design of the system and credit for the system is not to prevent fire in the cabinet or prevent fire damage to the contents of the cabinet.

  Specifications to be issued for the system equipment and design procurement will identify the design features required, as well a need for the manufacturer's recommended acceptance testing requirements as well as routine inspection, testing and maintenance requirements. The system design, procurement, installation, acceptance test performance, and turnover to Operations will also include the development of procedures for inspection, testing, maintenance, alarm response, and control of set point controls. The development of procedures will include a review for identification of required training for Operations and Maintenance personnel.

The design will meet the guidance of FAQ 08-0046 as well as the NFPA Codes of Record and will be developed following the St. Lucie Engineering controls for modification development, implementation and turnover to the plant.

Where conflicts between the documents arise the more restrictive requirement will apply.

- Installation methods will be aligned with the NFPA Code of Record, and Manufacturer's Recommended Practices, which will include any parameters that may be associated with the specific requirements associated with the Underwriter's Laboratories Listing of Factory Mutual Approval, as applicable.
- Acceptance testing for the system will be developed as part of the modification package and will incorporate those requirements documented in NFPA 72 Code of Record and the Manufacturer's Recommended Practices.
- Set-point control will be administratively controlled by procedures to be written as a result of the Engineering process for development of modification packages.
- Alarm response procedures for Operations Personnel will be developed as part of the modification package process and a review for training needs will be performed as part of the normal process for development of procedures and modifications.
- Routine inspection, testing, and maintenance will be controlled and performed by procedures that will be implemented to credit the new incipient detection system. The procedures will utilize the manufacturer's criteria and NFPA 72, which will be developed as a result of the modification package.

The installation and credit that will be taken will be in accordance with the method elements, limitations, and criteria of NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements," Chapter 13. No deviations from this guidance were taken. The system design will be to install incipient detection inside the cabinet to detect fire before visible fire occurs such that the potential for damage to cables located above and not related to the function of the cabinet can be minimized.

PSL FPE RAI 11

LAR Attachment S, Table S-1 identifies several proposed modifications to "protect" cables or signals (i.e., 1A-MR-1, 1B-MR-01, 1C-MR-01 through 05, 2A-VM-01, and 21-MV-02). Provide a more definitive description of this protection. If barriers or rated cabling is to be used, describe the type of rated configurations that will be installed. If cable reroutes will be used, describe what type of new cable will be used and how that will be incorporated in the design.

RESPONSE:

The above modifications all protect specific cables or eliminate them as secondary combustibles in specific fire zones. Modification 1C-MR-01 involves a modification to a ventilation fan motor to facilitate venting a fire zone to the outside atmosphere to reduce risk by mitigating the formation of a hot gas layer.

Cables routed in conduit, before or after the modification, will be protected as necessary with a Thermo-Lag fire barrier system of the appropriate rating commensurate with the suppression and detection present in the affected fire zone. The conduit will receive the Thermo-Lag wrap in accordance with applicable requirements utilizing the standard design in use at St. Lucie for protected cables. Cables routed in cable trays will be spliced outside the zone and routed into a conduit in the affected zone and splice at the other end outside the zone. The existing cable that was in the cable tray will be abandoned in place. The routing for the spliced cable will be similar to the cable tray route and not a reroute to eliminate fire scenarios. There are no proposed modifications which involve the application of a rated fire barrier system to cable trays or fire rated cable. The new portion of the spliced cable route will utilize IEEE-383 rated cable.

LAR Attachment S Table S-2 Item 18 requires that after all modifications have been implemented and as-built, that the fire risk will be evaluated and compared to the baseline risk. Action will be taken if the results exceed the limits stated in the implementation item.

PSL PRA RAI 04b

LAR Attachment V, Section V.3 indicates that a reduction in 98th-percentile HRR of NUREG/CR-6850 for transient fires is credited (i.e., from 317 kilowatts (kW) to 69 kW) for certain fire zones; however, no basis is provided to support this reduction. Address the following:

b. For these PAUs, address the location-specific attributes and considerations, plant administrative controls, the results of a review of records related to violations of the transient combustible and hot work controls, and any other key factors used to demonstrate the adequacy of a reduced HRR per the guidance endorsed by the NRC Letter from Joseph Giitter to Biff Bradley, Nuclear Energy Institute, "Recent Fire PRA Methods Review Panel Decisions And EPRI 1022993, Evaluation Of Peak Heat Release Rates In Electrical Cabinet Fires," June 21, 2012 (ADAMS Accession No. ML12171A583). In the response, address the full range of types and quantities of combustibles that are expected to be in each location and how administrative controls will enforce this range to preclude a peak HRR greater than 69 kW.

RESPONSE:

The 69 kW HRR is based on an evaluation of a potential violation of the administrative controls to be implemented in these zones where administrative procedures will implement a zero transient combustible control criteria. The expectation is that the implementation of a zero transient combustible limit will significantly reduce the size of potential transients which could be placed in the zone in violation of the applied limits. This type of transient control is a newly imposed criterion that will require a monitoring program to address future adherence to the requirements. A review of existing transient control experience is provided in the response to RAI PRA 4c. The results of post transition monitoring with respect to these controls will be the basis for implementation of appropriate corrective actions should violations occur. This review will also assess the configuration and potential size of any such violations and determine if the use of the 69 kW HRR criteria remains appropriate.

Additional bases for the use of the 69 kW HRR are provided below:

- PSL is implementing additional administrative controls such as a fire watch (or other compensatory measures) for conditions in which transients are stored in these areas. These fire zones will be subject to strict combustible controls (designated as "No Storage") and so paper, cardboard, scrap wood, rags and other trash will not be allowed to accumulate in the area. An implementation item specifying these additional controls will be added to LAR Attachment S.

- Areas that have transient administrative controls will not have stock piles of paper, cardboard, scrap wood or trash stored in these areas.
- Large combustible liquid fires are not expected in these fire zones because activities in these areas do not include maintenance of equipment containing large quantities of oil.
- The transient fire heat release rate distribution specified in NUREG/CR-6850 as a 317 kW (300 Btu/s) 98th percentile peak heat release rate fire is considered to be generically applicable to nuclear power plants. The PSL plant does not differ in any significant manner with respect to its transient combustible controls to warrant a significant increase or decrease in the applicable heat release rate profile. However, for areas that have been designated as "no transient combustible areas", to address the potential for violation of these controls, a 69 kW (65 Btu/s) 98th percentile peak heat release rate fire was applied. This HRR is considered appropriate given the unlikely event that transients are stored in these areas contrary to the controls imposed. Any such violations are expected to be of a smaller size than the typical transient HRR configuration.

The 69 kW (65 Btu/s) heat release rate was defined based on the heat release rate specified in NUREG/CR-6850 for a motor fire given that the most likely transient fire in a zone with limited transients would be associated with temporary cabling because this configuration would provide both the ignition source (energized temporary cabling) and combustible (cable insulation). The motor configuration would resemble such a transient fire. A transient fire in an area of strict combustible controls, where only small amounts of contained trash are considered possible, is judged to be no larger than the 69 kW fire. Because only small quantities of trash in temporary containers can be expected, a 69k W peak heat release rate was determined to be appropriate to represent this quantity of combustibles. The 69kW heat release rate bounds the small trash can fires reported in NUREG/CR-6850 Appendix G.

Monitoring of the controls and evaluation of their effectiveness will provide a basis for assessing the appropriateness of this HRR as will the monitoring of other transient fires at PSL and industry wide with respect to the use of the nominal 317 kW (300 Btu/s) peak heat release rate transient fire.

A letter dated September 27, 2011, from NEI to NRC, B. Bradley to D. Harrison, Recent Fire PRA Methods Review Panel Decisions: Clarifications for Transient Fires and Alignment for Pump Oil Fires, Attachment 1, Description of Treatment for Transient Fires, and Attachment 3, Panel Decision, allows a lower heat release rate to be chosen for transient fires based on "the specific attributes and considerations applicable to that location." The letter suggests that "plant administrative controls should be considered in the appropriate HRR for a postulated transient fire" and that "a lower screening HRR can be used for individual plant specific locations if the 317 kW value is judged to be unrealistic given the specific attributes and considerations applicable to that location.". The use of this method was endorsed by the June 21, 2012 letter from the NRC to NEI (ML12171A583), with minor exceptions unrelated to the PSL treatment. This endorsement came in response to EPRI 1011989 which states that from a practical standpoint that a plant can have a "range of HRR values being applied in a nuclear power plant fire PRA. Locations within the plant that are under more rigorous controls or that have greater restrictions with respect to the introduction, handling, and placement of combustibles and/or the performance of hot work would be expected to have a lower HRR applied as compared to locations that have less rigorous controls and/or restrictions." The use of the lower HRR in the areas with significantly increased transient controls is considered to be consistent with this guidance.

PSL PRA RAI 04c

c. Perform and document a review of past transient fire experience as well as a review of records related to any violations of the transient combustible controls that may include both internal plant records (e.g., condition reports) and NRC inspection records (e.g., by residents or during triennials), and discuss how this review informs the development of administrative controls credited, in part, to justify a HRR lower than 317 kW.

RESPONSE:

A review of plant records over the past five years has been performed to identify violations of existing transient controls. The review was based on plant records/databases which would include tracking items associated with NRC inspections. This review has identified no instances of transient related fires or fires involving transient combustibles. Only two instances were identified of issues related to control of transient combustibles which potentially violated the transient combustible control limits in place. Based on this review, the St. Lucie plants have a good track record with respect to compliance with existing transient controls. The limited review findings, and the increased level of controls to be implemented, support the proposed use of a lower transient combustible HRR.

Zones crediting the reduced heat release rate, 69kW, transient fire are being subjected to a new and stricter set of transient controls than those previously in place at PSL. These zones are subjected to transient free controls. Fire zones crediting these administrative controls will be monitored going forward to ensure there are no violations. If any such violation is recorded corrective actions will be put in place to ensure that the transient free administrative controls are appropriately maintained. The use of such controls to credit a reduced transient HRR is in accordance with the Joseph Giitter letter to Biff Bradley (see response to RAI PRA 4b).

The review of plant records indicates a good compliance record with regards to existing transient controls. The imposition of these new controls is expected to see a similar level of compliance.

PSL PRA RAI 07

The ASME/ANS RA-Sa-2009 standard states that an ignition frequency greater than zero is to be assigned to every plant physical analysis unit (e.g., manholes). Considering guidance for the exclusion of transients provided in FAQ 12-0064 (e.g., manholes are welded shut, space too small to allow personnel access under any conditions, etc.), identify locations where transient fire scenarios are not postulated, and provide justification for their exclusion.

RESPONSE:

Transient fires are postulated to occur in all fire zones containing Fire PRA equipment except manholes. Manhole covers are of substantial build that require special equipment to open. The manholes are considered to be a confined space that requires special procedures for entry, and are not subject to entry without a work order. Space within the manholes is also very limited. Additionally, adding transient fires to the manhole zones would serve only to dilute the frequency from other fire zones. The co-location of a transient combustible and an ignition source within these manholes is not considered credible.

PSL PRA RAI 10a

Attachment V indicates that "bounding" abandonment conditional core damage probabilities (CCDPs) of 0.1, 0.2 and 1.0 were utilized rather than detailed human error analyses and that abandonment conditional large early release probabilities (CLERPs) were obtained by multiplying a scenario's corresponding abandonment CCDP by the ratio of the FRANC-calculated CLERP to CCDP; however, there appears to be no justifiable basis to assume that these values are bounding. Provide the following:

1. An identification of the fire areas/compartments that credit MCR abandonment due to loss of habitability and/or loss of control or function.

RESPONSE:

The following Fire Areas credit MCR abandonment:

1B (Fire Zone 1_57, CSR) – Unit 1 cable spreading room for HGL scenarios

(Due to loss of control or function only, CCDP of 1.0 is assumed)

1F (Fire Zone 1_70, MCR) – Unit 1 control room for a percentage of all fires in zone

(Due to loss of habitability only, for the portion of fires that are not suppressed prior to loss of habitability)

2B (Fire Zone 2_52, CSR) – Unit 2 cable spreading room for HGL scenarios

(Due to loss of control or function only, CCDP of 1.0 is assumed)

2F (Fire Zone 2_42I, MCR) – Unit 2 control room for a percentage of all fires in zone

(Due to loss of habitability only, for the portion of fires that are not suppressed prior to loss of habitability)

PSL PRA RAI 10b

Attachment V indicates that "bounding" abandonment conditional core damage probabilities (CCDPs) of 0.1, 0.2 and 1.0 were utilized rather than detailed human error analyses and that abandonment conditional large early release probabilities (CLERPs) were obtained by multiplying a scenario's corresponding abandonment CCDP by the ratio of the FRANC-calculated CLERP to CCDP; however, there appears to be no justifiable basis to assume that these values are bounding. Provide the following:

b. For those areas in which abandonment is credited on loss of control or function, a description of the criteria used for making the determination to abandon, and clarify how these criteria will be addressed by the going-forward fire procedures. In particular, justify the assumption that MCR abandonment due to fires in the cable spreading room is only assumed to occur for HGL scenarios

RESPONSE:

The St. Lucie Fire PRA does not credit/require control room abandonment due to loss of control or function. MCR abandonment is assumed/required only for fires in the MCR for both Unit 1 and Unit 2 which cause habitability criteria to be exceeded. For all fires that do not impact habitability the limited fire damage and the ability to maintain command and control from the main control room will result in a lower risk than would MCR abandonment, therefore, no MCR abandonment is required for loss of control or function. The quantification of the cable spreading room fire scenarios is based on no credit for control from the hot shutdown control panel. The cable spreading room (CSR) HGL scenario, which impacts all cables in the CSR and thereby the majority of MCR functions is assumed to have a CCDP of 1.0. Although an attempt will likely be made to shut down from the hot shutdown control panel for such a fire, the Fire PRA conservatively assumes such a fire will result in core damage. The only reason to abandon the MCR for fires outside of the MCR would be a loss of functionality. There are no individual scenarios that would lead to a plant state that would make it more advantageous to attempt shutdown from the hot shutdown control panel than at the MCR. As such the operators are not expected to leave the MCR, where they have the greatest capability to reach safe shutdown.

It should be noted that the analysis for the CSR was done by systematically creating scenarios throughout the CSR. For each of these scenarios the percentage of fires that create a HGL is calculated and the sum of the HGL contribution for all scenarios is the factor that is applied to the HGL scenario. Using this methodology inherently means that every scenario contributes to MCR abandonment, however for the percentage of each individual scenario that does not lead to a HGL, enough functionality would remain from the MCR that it would not warrant abandonment. The remaining functionality is defined by the CCDP of the fire scenario which is based on the extent of damage of the fire scenarios that do not result in a HGL.

PSL PRA RAI 10d

Attachment V indicates that "bounding" abandonment conditional core damage probabilities (CCDPs) of 0.1, 0.2 and 1.0 were utilized rather than detailed human error analyses and that abandonment conditional large early release probabilities (CLERPs) were obtained by multiplying a scenario's corresponding abandonment CCDP by the ratio of the FRANC-calculated CLERP to CCDP; however, there appears to be no justifiable basis to assume that these values are bounding. Provide the following:

d. Explanation of the timing considerations (i.e., total time available, time until cues are reached, manipulation time, and time for decision-making) made to characterize scenarios in Part (c). Include in the explanation the basis for any assumptions made about timing.

RESPONSE:

MCR actions are assumed to fail at time zero such that no credit is given for these actions regardless of how much time is available prior to abandonment. This is a very conservative approach as the operators would not exit the control room at the start of a fire. No special timing considerations were made for actions external to the MCR which would be taken regardless of whether or not the operators exited the MCR. These actions are subject to the timing as outlined by the HRA analysis or the safe shutdown analysis manual action feasibility evaluation. All screening actions that are currently used as surrogates in the Fire PRA will either be removed or replaced with a detailed HFE in accordance with NUREG-1921. Timing considerations due to MCR abandonment will be taken into account as appropriate. See responses to PRA RAIs 01.d, 01.l and 01.o (to be submitted with the 120 day RAIs).

PSL PRA RAI 10e

Attachment V indicates that "bounding" abandonment conditional core damage probabilities (CCDPs) of 0.1, 0.2 and 1.0 were utilized rather than detailed human error analyses and that abandonment conditional large early release probabilities (CLERPs) were obtained by multiplying a scenario's corresponding abandonment CCDP by the ratio of the FRANC-calculated CLERP to CCDP; however, there appears to be no justifiable basis to assume that these values are bounding. Provide the following:

e. Discussion of how the probability associated with failure to transfer control to the alternate shutdown panel is taken into account in Part (c).

RESPONSE:

The St Lucie Fire PRA analysis calculates a CCDP and CLERP for MCR abandonment based on components affected by a particular MCR fire and assumed failure of all in control room actions. The analysis then conservatively increases these values to account for additional risk associated with the transfer of control to the hot shutdown control panel. This risk is appropriately distributed to scenarios based on how severe those scenarios are (as measured by their quantified CCDP). The minimum risk has been set to a CCDP of 0.1, for scenarios with a calculated CCDP of < 1E-03. For potentially challenging fires a 0.2 has been used, and for the most severe fires core damage is assumed (CCDP = 1.0). Additional detail is provided in the response to part c of this question.

PSL PRA RAI 10f

f. Description of how the feasibility of the operator actions supporting the alternate shutdown pathway was considered by the scenario characterization performed in Part (c).

RESPONSE:

For MCR abandonment, ex-control room actions are credited the same as if control was maintained at the MCR. Actions taken at the hot shutdown control panel (HSCP) are subject to the time limitations of their associated components/in-control room HEPs. All screening HFEs will be either removed from the analysis or replaced with a detailed HFE in accordance with NUREG-1921, to be addressed in response to RAIs PRA 01.d, 01.l and 01.o. Feasibility of actions at the ASP is consistent with the feasibility of the associated in-control room operator actions because the timing associated with control room abandonment is not expected to have a significant impact on the operator response once control is transferred to the ASP. As such, the additional risk associated with the transfer of control is bound by the increase in the CCDPs and CLERPs from their nominal in-control room value to a higher control room abandonment value as specified in Attachment V, page V-5, of the PSL NFPA 805 LAR submittal. Scenarios with a very low calculated CCDP (< 1E-03) have a very high probability of success in transferring control to the ASP. The CCDP for these scenarios has been increased to 0.1. Actions with a medium level of risk (< 0.1 and > 1E-03) have been assigned a value twice as great, 0.2, as those with a low risk. The most risk significant scenarios (calculated CCDP > 0.1) are conservatively assumed to have a CCDP of 1.0. Thus for the most complicated abandonment scenarios no credit is given for actions taken at the ASP.

In the process of responding to other RAIs, PRA 01.d, 01.l and 01.o (to be submitted with the 120 day RAIs)., related to issues associated with Fire HRA, it is anticipated that the approach described above may be altered with respect to the level of credit taken for actions at the ASP and the need to develop specific HEPs for such actions.

PSL PRA RAI 12

A review of LAR Attachment W, Table W-7 indicates that for Fire Areas 2J and 2M, a value of "0.00E+00" is reported for both ΔCDF and ΔLERF. The risk summaries provided for Fire Areas 2J and 2M in LAR Attachment C, Table C-1 state that "[a] negative delta risk results from the summation of cutsets for the system/components made available in the compliant case [that] exceed the risk associated with the failure of the system," further noting that "this is typically due to conservative estimates of risk associated with operator action dependencies". It is further stated that delta risk values for Fire Areas 2J and 2M are set to zero to preclude the resulting negative delta risk from offsetting the risk associated with other fire areas or scenarios. The risk summary provided for Fire Area 1C contains a similar discussion; however, non-zero values are reported to give credit to an identified risk-reduction modification. It is unclear how negative delta risk values could be obtained, particularly noting that Fire Areas 2J and 2M do not appear to credit risk-reduction modifications, and to what extent the ΔCDF and ΔLERF values for other fire areas reported in Tables W-6 and W-7 are systematically underestimated. Explain this modeling anomaly, and evaluate its impact on risk results.

RESPONSE:

This is not a modeling anomaly. A negative delta risk can be obtained when risk associated with a Compliant case exceeds the risk of the respective Variant case due to conservative estimates of associated human failure events (HFEs) and associated joint human error probabilities (HEPs) that could differ due to availability of equipment in the Compliant case (and associated HFEs) that is not available in the Variant case with a high level of dependency between the associated HEPs. In order to preclude such a negative delta risk from offsetting positive delta risk in other fire areas, the negative delta risk is set to zero.

Typically the conservative estimates of the risk associated with operator action dependencies could result in the failure to credit the Compliant system due to being totally dependent on another HEP related to a system which is failed. This dependency alone results in equal Compliant and Variant risk with the additional risk associated with non-operator action failures of the Compliant system further increasing the risk of the Compliant case and resulting in a negative delta. HRA dependency analysis relies on generic treatment of human failures in terms of the order of events and the level of dependencies between them that are considered conservative at best, and could lead to numerical results such as that described above.

The following simplified example illustrates this condition. Assume a condition whose cutsets include the following operator actions; A (1E-02), B (2E-03) and C (3E-02).

Compliant Cutset:	INIT	COMP	A	B	C	Z1
Variant Cutset:		INIT	COMP	A	C	Z2

Assuming B and C have a high dependency on A in the Compliant case, the respective joint human failure (combination event) of A,B,C is Z1 which is equal to (1E-02 x high dependency probably for B given A is successful of 0.5 x high dependency probability of C given A and B are successful of 1.0 = 5E-03). For the same condition (Variant case) in which hardware failure negates the need to have operator action B, then the associated cutsets will include only operator actions A and C, i.e., dependency on other operator actions in the scenario is either reduced or eliminated, thus the joint human failure (Z2) in this case is equal to (1E-02 x medium dependency of C given A is successful of 1.5E-02 = 1.5E-04). Because the only difference in the cutsets is the difference in joint human failures (Z1 of 5E-03 in compliant case vs. Z2 of 1.5E-03 in Variant case), a comparison of cutsets would indicate that the Compliant case would have higher risk than Variant case, which would produce a negative delta. In these instances, the difference was set to zero.

An example of a scenario in Fire Area 2M with a negative delta, 2_16I – F03 PTB "Variant" vs. FRE "Compliant" is given below. For this example the first 50 cutsets for the Variant and Compliant cases were compared. These cutsets accounted for 75% of the total scenario risk. The increase in risk for the Compliant case is driven by the HFE JHFPSDCS – which is a failure to implement shutdown cooling (S LOCA). This is not available in the Variant case due to fire failures in this area but is in the Compliant case. This in itself does not increase the risk but it causes a more conservative HEP combination value to be injected into the cutset which leads to an overall higher risk. Of the 50 cutsets compared, a total of three differed between the Variant and Compliant case. These are as shown below:

CUT SET #	CASE	CCDP	INITIATOR	TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7
1	Variant	1.76E-07	%ZZFIREU2	CHFPRCP TRP	CTM2CCW HXB	NHFPMAN UALR	NLCD2AM 525	COMBINA TION_1437		
	Compliant	3.96E-07	%ZZFIREU2	CHFPRCP TRP	CTM2CCW HXB	JHFPSDC S	NHFPMAN UALR	NLCD2AM 525	COMBINA TION_1418	
2	Variant	1.55E-07	%ZZFIREU2	CHFPRCP TRP	NHFPMAN UALR	NLCD2AM 525	QHFPICW CCW	QTM2BHD R	COMBINA TION_1439	
	Compliant	1.55E-07	%ZZFIREU2	CHFPRCP TRP	JHFPSDC S	NHFPMAN UALR	NLCD2AM 525	QHFPICW CCW	QTM2BHD R	COMBINA TION_1420
3	Variant	9.11E-08	%ZZFIREU2	CHFPRCP TRP	CTM2CCW HXB	GMPF2PA REC				
	Compliant	9.10E-08	%ZZFIREU2	CHFPRCP TRP	CTM2CCW HXB	GMPF2PA REC	JHFPSDC S	COMBINA TION_1411		

As seen above cutset 1 sees an increase to the CCDP of 2.2E-07, cutset 2 remains unchanged and in cutset 3 there is a slight reduction to risk. The conservatism in the HRA combinations can lead to both an increase or decrease in risk which will likely offset each other in most cases. Regardless, the overall delta CCDP for the example scenario is -2.20E-07, however, once this number is multiplied by the ignition frequency the scenario delta CDF is -3E-11 (based on a Variant case CDF of 3.26E-09 and an Compliant case CDF of 3.29E-09). The table below gives each of the basic events from the above cutsets, a brief description and there probabilities.

BE	DESCRIPTION	PROBABILITY
%ZZFIREU2	FIRE RELATED INITIATING EVENT	1.00E+00
CHFPRCPTRP	OPERATOR FAILS TO TRIP RCPS LOSS OF CCW	1.42E-02
COMBINATION_1411	HEP dependency factor for CHFPRCPTRP,JHFPSDCS	2.38E+05
COMBINATION_1418	HEP dependency factor for CHFPRCPTRP,JHFPSDCS,NHFPMANUALR	6.80E+05
COMBINATION_1420	HEP dependency factor for CHFPRCPTRP,QHFPICWCCW,JHFPSDCS,NHFPMANUALR	1.26E+10
COMBINATION_1437	HEP dependency factor for CHFPRCPTRP,NHFPMANUALR	1.27E+00
COMBINATION_1439	HEP dependency factor for CHFPRCPTRP,QHFPICWCCW,NHFPMANUALR	5.29E+04
CTM2CCWHXB	CCW HX 2B IN TEST OR MAINTENANCE	5.58E-03
GMPF2PAREC	HPSI PUMP 2A FAILS TO RUN DURING RECIRCULATION	1.17E-03
JHFPSDCS	OPERATOR FAILS TO ESTABLISH SDC FOLLOWING SML LOCA	4.20E-06
NHFPMANUALR	OPERATOR FAILS TO INITIATE SUMP RECIRC AFTER LOCA & AUTO SWITCHOVER FAILS	3.50E-01
NLCD2AM525	LOGIC CIRCUIT AM525 FAILS TO GENERATE SIGNAL	5.07E-03
QHFPICWCCW	OPERATOR FAILS TO RESTORE ICW TO CCW HX WHEN LOST	5.40E-05
QTM2BHDR	2B ICW HDR IN TEST OR MAINTENANCE	2.18E-03

No credit was taken for the negative delta risk in Fire Areas 2J or 2M to offset a positive delta risk in another area. While it is possible that this is an issue that shows up in other fire areas and is being masked by a positive delta, no impact on the total delta would be expected due to the exceedingly small values involved. Negative deltas calculated are less than one percent of the total risk for the fire areas where they have been identified and typically are 3 to 4 orders of magnitude less on a scenario level. As such, no impact to the total plant delta CDF or delta

PSL PRA RAI 13

The seismic CDF (9.19E-8/yr) reported in LAR Attachment W Table W-1 and used to estimate the total plant CDF appears to be low compared to the seismic CDF estimate (4.6E-5/yr) presented for in a memorandum from NRC staff dated September 2010 providing updated results for Generic Issue 199 (memo titled: "Safety/Risk Assessment Results for Generic Issue 199, Implication for Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United states on Existing Plants"). The total CDF, if higher CDF values for seismic events were used, exceeds RG 1.174 risk acceptance guidelines. As a result, provide the basis and corresponding technical justification for the seismic events CDF and LERF presented in the LAR. Additionally, considering deficiencies identified by F&O SF-A1-01, provide further justification that seismic/fire interactions are adequately evaluated in light of the new seismic hazard data from the United States Geological Survey 2008.

RESPONSE:

The seismic CDF (9.19E-8/yr) reported in LAR Attachment W Table W-1 and used to estimate the total plant CDF is consistent with the same value that was presented in an earlier submittal associated with Extended Power Uprate (EPU) LAR (Letter L-2010-078 dated April 16, 2010 for Unit 1, Section 2.13, Table 2.13-14). Due to the low seismicity location of St. Lucie plant, the seismic hazard was analyzed as part of the Individual Plant Examination for External Events (IPEEE) using the "scaled-back" option that was offered by the NRC to FPL which included Structure, Systems, and Components (SSCs) screening based on seismic plant walkdown. The Unit 1 CDF estimated value reported in the IPEEE was lower than the value presented in EPU LAR. Further estimates of seismic CDF based on the EPU plant configuration indicated a slightly higher value that was reported as presented above. The following table summarizes the seismic risk impact as presented in EPU LARs (Letter L-2010-078 dated April 16, 2010, and Letter L-2011-021, dated February 25, 2011, for Unit 1 and Unit 2, respectively).

	EPU Seismic Risk	
	CDF, per year	LERF, per year
Unit 1	9.19E-08	1.33E-08
Unit 2	4.50E-09	6.50E-10

Regarding the CDF reference related to Generic Issue 199 (GI-199), FPL believes that the NRC referenced value is considered a conservative bounding value, based on the simplifying assumption used in the GI-199 calculations that the plant-level High Confidence of a Low Probability of Failure (HCLPF) value was equal to the Safe Shutdown Earthquake (SSE) (0.1g). That is in contrast to the best-estimate plant-specific value expected to be evaluated for the site, given the Florida region low seismicity. Per the Near Term Task Force (NTTF) Initiative 2.1, FPL plans to follow its recommendations which includes reevaluation of seismic hazard and comparison of plant-specific Ground Motion Response Spectra (GMRS), being developed by EPRI for St. Lucie (currently in progress and not issued yet), against the site's design basis SSE spectra, then revise the seismic hazard analysis if warranted when the plant-specific GMRS is greater than SSE.

The current seismic-induced fire impact, as presented in the LAR, is valid and requires no change. Should an update to seismic-induced fire impact be warranted in response to NTFF Initiative 3.0, such update will be developed in accordance with the respective ruling.

PSL PRA RAI 15a

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting an FPP consistent with NFPA-805. In letter dated July 12, 2006, to NEI (ADAMS Accession No. ML061660105), the NRC established the ongoing FAQ process where official agency positions regarding acceptable methods can be documented until they can be included in revisions to RG 1.205 or NEI 04-02. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

Identify any changes made to the IEPRA or FPRA since the last full-scope peer review of each of these PRA models that are consistent with the definition of a "PRA upgrade" in ASME/ANS-RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency for Nuclear Power Plant Applications," as endorsed by RG 1.200. Also, address the following:

a. Clarify why the SRs in LAR Attachment V Table V-1 were found to be not applicable (N/A) by the peer review team. Identify what the supporting requirements are not applicable to, for example, the type of reactor. If there are specific and multiple reasons that the supporting requirements are determined to be N/A, identify the reason for each SR, grouping them as appropriate. In general, SRs that are not deemed applicable to an application require application specific justification; so, all reasons provided should include a discussion of the NFPA 805 application characteristics.

RESPONSE:

A review of Table V-1 in the PSL LAR, as modified by the PSL LAR Supplement dated June 14, 2013, for all SRs listed as N/A by the peer review has been completed. The majority of all SRs will remain N/A. The SRs that are still N/A are listed below with a reason for their disposition as such:

SR	Disposition in Table V-1	Basis for N/A Disposition
ES-B3	N/A	No additional equipment credited that is not in the Fire Safe Shutdown analysis or in the Full Power Internal Events PRA
ES-B5	N/A	No exclusions of fire-induced spurious operations of components were applied based on the conditional probability of occurrence of the spurious operation condition subsequent to a fire
CS-A7	N/A	PSL does not use ungrounded three phase circuits. Therefore, this SR is not applicable
QLS-A1	N/A	PSL did not use qualitative screening
QLS-A2	N/A	PSL did not use qualitative screening
QLS-A3	N/A	PSL did not use qualitative screening
QLS-A4	N/A	PSL did not use qualitative screening
QLS-B1	N/A	PSL did not use qualitative screening
QLS-B2	N/A	PSL did not use qualitative screening
QLS-B3	N/A	PSL did not use qualitative screening
PRM-B4	N/A	No new initiating events were identified in PRM-B3 (referenced SR in PRM-B4 is erroneously identified as PRM-B2 in the ASME/ANS Standard RA-Sa-2009).
PRM-B6	N/A	No new accident sequences were identified in PRM-B3 or B5
PRM-B8	N/A	No new success criteria were identified in PRM B-7
PRM-B13	N/A	No Fire specific PRM probability values were identified in PRM-B12 which require re-analysis
PRM-B15	N/A	No new LERF accident progressions were identified in PRM-B14
FSS-C3	N/A	No specific consideration of burnout (due to depletion of available fuel) was applied in the analysis

SR	Disposition in Table V-1	Basis for N/A Disposition
FSS-C7	N/A	The disposition of FSS-C7 is extensive and is being provided separately with the response to RAI PRA 1n (120 day RAI response)
FSS-C8	N/A	Raceway fire wrap is not credited in the PSL Fire PRA
FSS-E2	N/A	PSL used generic fire modeling parameters for all scenarios
FSS-F2	N/A	No Fire PRA scenarios involving exposed structural steel required modeling per FSS-F1 requirements.
FSS-F3	N/A	This SR is not applicable since no high hazard areas containing structural steel fire proofing (see SR FSS-F1) were identified. No Fire PRA scenarios involving exposed structural steel required modeling.
FSS-G5	N/A	Active fire barriers were not credited in the multi-compartment analysis.
IGN-A2	N/A	No non-nuclear power industry data utilized in the FPRA.
IGN-A3	N/A	No engineering judgment based data was utilized in the FPRA.
QNS-A1	N/A	Quantitative screening not used at PSL
QNS-B1	N/A	Quantitative screening not used at PSL
QNS-B2	N/A	Quantitative screening not used at PSL
QNS-C1	N/A	Quantitative screening not used at PSL
QNS-D1	N/A	Quantitative screening not used at PSL
QNS-D2	N/A	Quantitative screening not used at PSL
FQ-F2	N/A	No “claim of nonapplicability of any of the referenced requirements in Part 2 beyond that already covered by the clarifications in this Part” were applied, so there was no need to provide documentation.

PSL PRA RAI 15b

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting an FPP consistent with NFPA-805. In letter dated July 12, 2006, to NEI (ADAMS Accession No. ML061660105), the NRC established the ongoing FAQ process where official agency positions regarding acceptable methods can be documented until they can be included in revisions to RG 1.205 or NEI 04-02. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

Identify any changes made to the IEPRA or FPRA since the last full-scope peer review of each of these PRA models that are consistent with the definition of a "PRA upgrade" in ASME/ANS-RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency for Nuclear Power Plant Applications," as endorsed by RG 1.200. Also, address the following:

b. If any changes are characterized as a PRA upgrade, indicate if a focused-scope peer review was performed for these changes consistent with the guidance in ASME/ANS-RA-Sa-2009, as endorsed by Regulatory Guide 1.200, and describe any findings from that focused-scope peer review and the resolution of these findings. If a focused-scope peer review has not been performed for changes characterized as a PRA upgrade, describe what actions will be implemented to address this review deficiency.

RESPONSE:

ASME/ANS-RA-Sa-2009 defines an upgrade to an existing PRA that would require a focused scope peer review as follows: "the incorporation into a PRA model of a new methodology or significant changes in scope or capability that impact the significant accident sequences or the significant accident progression sequences. This could include items such as new human error analysis methodology, new data update methods, new approaches to quantification or truncation, or new treatment of common cause failure." While there have been several updates to the St Lucie Fire PRA model, these updates are not considered to fall within the definition of an upgrade. All Fire PRA updates since the peer review have been built off of peer reviewed models (whether IEPRA or Fire PRA models). As such, they do not require a focused scope peer review per the definition given in ASME/ANS-RA-Sa-2009. For further details on specific updates see PSL RAI PRA 15c.

PSL PRA RAI 15c

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting an FPP consistent with NFPA-805. In letter dated July 12, 2006, to NEI (ADAMS Accession No. ML061660105), the NRC established the ongoing FAQ process where official agency positions regarding acceptable methods can be documented until they can be included in revisions to RG 1.205 or NEI 04-02. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

Identify any changes made to the IEPRA or FPRA since the last full-scope peer review of each of these PRA models that are consistent with the definition of a "PRA upgrade" in ASME/ANS-RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency for Nuclear Power Plant Applications," as endorsed by RG 1.200. Also, address the following:

c. The NRC staff notes that, several "updates" made to the fire scenario selection and analysis after the peer review appear to qualify as PRA "upgrades", including , but not necessarily limited to:

- Replacement of a unreviewed analysis method (UAM), i.e., panel factors, with a target-distance-based and time-dependent methodology,
- Significant enhancements made to the HGL analysis (e.g., new fire modeling to address secondary combustibles),
- Incorporation of new cable spread methodology (i.e., FLASH-CAT),
- Significant enhancements made to the MCA, including transition from a two-tiered quantitative screening approach that screened all such scenarios as a very small fraction of the fire CDF at the time of the peer review to one that fully quantifies scenarios and identifies them as significant fire initiating event contributors to both CDF and LERF in LAR Attachment W, and

- Credit for automatic suppression systems when the original peer-reviewed analysis only credited manual suppression.

Provide justification for why each of these model updates are not considered PRA upgrades in accordance with the PRA Standard ASME/ANS-RA-Sa-2009, as endorsed by Regulatory Guide 1.200 (Rev. 2). If considered a PRA upgrade, provide the information requested by Part (b).

RESPONSE:

The methodology utilized for the target-distance-based time to damage for severe and non-severe fires is simply an application of the generic treatments which has previously been peer reviewed. The data was further utilized by breaking down the heat release rate probability distribution (HRR) to each constituent bin, however, this data is taken directly from the generic treatments using the NUREG/CR-6850 HRR and bin definitions. The use of the time dependent damage accrual methodology is an extrapolation of the data provided in Appendix H of NUREG/CR-6850 using a formulation used for evaluation of cable degradation for Equipment Qualification analysis. As such this is not an upgrade to the PRA, but an update to a peer reviewed methodology already being applied at PSL and does not require a focused scope peer review.

The methodology for calculating HGL has not changed due to the addition of secondary combustibles. Additional heat sources have been added to scenarios where applicable resulting in a change in the total HRR for individual scenarios but not altering the methodology which is defined in the generic fire modeling treatments. The same CFAST methodology used to calculate time to HGL is utilized and the source data has remained unchanged. As such the addition of secondary combustibles is an update to the existing Fire PRA model and does not require a focused scope peer review.

The cable spread rate used at PSL comes directly from Appendix R in NUREG/CR-6850. The spread rate and PSL specific configurations were used as inputs into a FLASH-CAT model to determine the HRR for individual configurations. FLASH-CAT is an NRC validated model addressed in NUREG/CR-7010 which applies the NUREG/CR-6850 methodology along with insights from cable testing to define the means for which to combine HRRs from an ignition source with those from cable tray combustibles. The HRRs calculated in FLASH-CAT are fed into CFAST to calculate scenario specific times to HGL. The use of FLASH-CAT to get PSL specific data is an update to the existing methodologies used and applying an NRC validated data methodology using NUREG/CR-6850 criteria. As such a focused scope peer review is not necessary for this item.

MCA calculations are based on the HGL calculation for the initiating zone. As noted the HGL calculation comes from the generic treatments which is a peer reviewed methodology. The same methodology is still applied with the screening step excluded and all scenarios retained. As such this is an update to the PSL Fire PRA which addresses peer review F&Os and does not require a focused scope peer review.

Credits for both automatic suppression as well as manual suppression are used in accordance with NUREG/CR-6850 specified methodology. The method used was part of the peer reviewed Fire PRA methodology. F&Os relative to this issue were addressed in the methodology update. Further discussion of the dependency of the automatic and manual suppression/detection systems will be provided in response to RAI PRA 01m.

There are no other known updates to the PSL Fire PRA that would be a new methodology warranting a focused scope peer review.

PSL PROG RAI 01

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 the requirements of NFPA 805, Sections 2.7.3.4 and 3.3.1.1.

Describe the changes that are planned to the FPP as part of the NFPA 805 transition process that are specifically associated with training. In addition, describe the positions where such training would be necessary.

RESPONSE:

All current fire protection program documents such as AP-1800022, Fire Protection Plan, will be updated and a new fire protection program design basis document will be issued that contains all the aspects of the fire protection program. This will result in multiple changes in implementing documents for the fire protection program. The documents to be revised will be determined by the process that revises the primary fire protection program documents and issues the design basis document. All new procedures or procedure revisions require an assessment of training impact and completion of training prior to issuance per procedure AD-AA-100-1004, Preparation Revision, Review and Approval of Site-Specific Procedures. The type of training and the recipients of such training are identified as part of that process. In addition to this, due to the complex nature of this fire protection licensing basis change, a change management plan has been developed to support the transition to NFPA 805. That change management plan consists of two parts, the first is a fleet level plan (AR 1623193) and the second is a site level plan (AR 1667266). These plans also require review of training requirements. Positions where such training is necessary are identified in the change management plans. Positions include Operations Personnel, Engineers (Fire Protection, Safe Shutdown, and PRA), Schedulers and Planners, and Fire Brigade Members.

Based on the current development of the transition process the following training is anticipated. This process is currently being implemented at Duane Arnold through mostly fleet level procedures. The procedures, qualification cards, and training developed for Duane Arnold will be utilized to the extent possible at St. Lucie.

Training Task	Module
1	NFPA 805 Overview Awareness for All Licensee Personnel CBT
2	NSCA/NPO Analyses Qualification Card
3	Fire PRA Qualification Card
4	NFPA 805 Process Changes for Site Personnel
5	Applicability Screening of Changes for OPS/MTC/WC etc.
6	Applicability Screening of Changes for ENG
7	Fire Protection Modification Review Engineering Qualification Card
8	Monitoring Program Data Input for Ops/WC/MTC/CAP
9	Monitoring Program Engineering Data Review Qualification Card
10	Change Evaluation Qualification Card Development

PSL PROG RAI 02

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

RESPONSE:

The response to PSL RAI Programmatic 01 outlined changes to the fire protection program and provided identification of how training is to be handled under the transition. The change evaluation process will incorporate the guidance in FAQ 12-0061 when it is approved. This guidance will be used to revise existing procedures and/or create new procedures for the change evaluation process.

As stated in the response to PSL RAI Programmatic 01, all new procedures or procedure revisions require an assessment of training impact and completion of training prior to issuance per procedure AD-AA-100-1004, Preparation Revision, Review and Approval of Site-Specific Procedures. The type of training and the recipients of such training are identified as part of that process. In addition to this, due to the complex nature of this fire protection licensing basis change, a change management plan has been developed to support the transition to NFPA 805. That change management plan consists of two parts, the first is a fleet level plan (AR 1623193) and the second is a site level plan (AR 1667266). These plans also require review of training requirements.

Based on the current development of the transition process, the following training is anticipated for the change evaluation process (screening is included because that is the start of the process). Positions requiring training primarily include Engineering personnel (Fire Protection, Safe Shutdown, and PRA). The change management plan states that the Training Department will define a graded approach to be used and a resource plan will be written to identify who, how, and when training supporting procedure changes will be implemented. This process is currently being implemented at Duane Arnold through mostly fleet level procedures. The procedures, qualification cards, and training developed for Duane Arnold will be utilized to the extent possible at St. Lucie.

Module
Applicability Screening of Changes for Operations/Maintenance/Work Control etc.
Applicability Screening of Changes for Engineering
Fire Protection Modification Review Engineering Qualification Card
Change Evaluation Qualification Card Development

PSL SSA RAI 01

LAR Attachment G, Table G-1, "Recovery Actions and Activities Occurring at the Primary Control Station(s)," provides a list of primary control stations (PCSs) for Units 1 and 2. There are approximately 25 PCSs locations identified for Unit 1 and 32 for Unit 2. The LAR defines PCS actions that contain activities such as placing specified transfer switches in their "isolate" position, selected tripping of breakers, selected removal of power to provide independence, and electrical separation from potentially damaged circuits. Many of these appear to be operator actions in locations separate from the remote shutdown panels, which may not meet the definition of PCS in RG 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing light-Water Nuclear Power Plants," Revision 2. Justify each of these locations as having met the definition of PCS as defined in RG 1.205, Revision 2.

RESPONSE:

PSL-FPER-11-013 Revision 0, *Definition of Primary Control Station for use with Transition to NFPA 805* provided the basis for defining the Primary Control Stations at St. Lucie in accordance with Regulatory Guide 1.205 Revision 1 December 2009 and FAQ 07-0030, Revision 5, Establishing Recovery Actions (ML103090602). It states in part that, in addition to the definition presented in the regulatory guide, actions taken in the process of abandoning a control room and transferring to a primary control station may meet the definition of a recovery action, but the additional risk of their use does not need to be evaluated to demonstrate compliance with NFPA 805 Section 4.2.4. In accordance with the information contained in FAQ-07-0030 and accepted by the NRC, actions taken to enable the PCS are considered equivalent to being performed at the PCS and are not considered recovery actions requiring the evaluation of additional risk. To meet this definition, the action must meet the following as stated in FAQ-07-0030:

Actions that are necessary to activate or switch over to a primary control station(s) may be considered as taking place at primary control station(s) under the following conditions:

- The actions are limited to those necessary to activate, turn on, power up, transfer control or indication, or otherwise enable the primary control station(s) and make it capable of fulfilling its intended function following a fire. These actions must be related to the alternative/dedicated shutdown function and should take place in locations common to panels that perform the transfer of control. For example, switches that disable equipment in order to allow the alternative/dedicated shutdown location to function would be included as part of the primary control station. However, these actions must be in the same location(s) (panel or the local vicinity surrounding the panel) as the normal/isolation switches and may include de-energization of selected equipment and/or circuits (if such actions are similar to the use of isolation switches). This does not include additional actions in the plant that, while necessary to achieve the NSPC, are not part of enabling the primary control station(s) (e.g., controlling inventory by locally controlling valve(s)).

- The actions are feasible and take place in sufficient time to allow the primary control station(s) to be used to perform the intended functions. The intended functions are defined as the original design criteria for the alternative/dedicated shutdown location(s) as provided in Generic Letter 86-10, Enclosure 2, Question 5.3.10 and Section 5.4.1 of RG 1.189, Revision 2.
- The switches or other equipment being operated to transfer control to the primary control station(s) are free from fire damage and the operators are able to travel from the main control room to the transfer location(s) and on to the primary control station(s) without being impeded by the fire.

To determine which actions (and locations) meet this definition, a review of the Safe Shutdown Analysis (SSA) and Control Room Inaccessibility Procedure for each unit was performed to make a determination if the action was a transfer action to enable the Hot Shutdown Control Panel (HSCP), or a one-time simple action that disables equipment to allow the success of the HSCP by either a transfer switch or simple removal of power.

The following provides the justification that the PCS actions listed in LAR Attachment G under the definition of the primary control station aligns with the guidance in RG 1.205 Revision 1 and FAQ 07-0030. There is a separate table for Unit 1 and Unit 2 and the table is grouped by transfer panel location. However, each location may not represent a single panel. For example, the A Switchgear Transfer Panels consist of a transfer panel (instrumentation), switches located at the breaker (4 kV breakers), or switches located in a separate compartment (480V Load Center and MCC). This is consistent with RG 1.205 guidance, which refers to "panel(s)" which indicates that transfer switches in more than one panel is acceptable. The RAI discusses approximately 25 locations on Unit 1 and 32 locations on Unit 2. However, the data presented in LAR Attachment G Table G-1 was listed by action and not location. St. Lucie uses a distributed transfer scheme with instrumentation in transfer panels and switchgear/load centers/MCCs with transfer switches at the switchgear/load center/MCC. This equipment is in close proximity to the instrument transfer panels. Each transfer scheme is train related with all the A train transfers in the A switchgear room and all the B transfers in the B switchgear room, etc. While there are 25 actions on Unit 1 and 32 actions on Unit 2, these actions are performed in only 7 locations on Unit 1 and 8 locations on Unit 2. The majority of the locations are in close proximity to each other. For example, for a control room fire the majority of the transfer action take place in the A switchgear room, B switchgear room, and the cable spread room. Each of these rooms is adjacent to one another.

Unit 1:

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (all locations are on Unit 1)	Remarks
Sound Powered Phone Isolation Box RAB 1-2 located in the A switchgear room. Normal/Isolate switches	Transfer of Control	A Switchgear room transfer panels	Transfer Switch
1A Isolation Panel located in the A switchgear room. Normal/Isolate switches	Transfer of Control	A Switchgear room transfer panels	Transfer Switch
480V MCC 1A6 Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear room transfer panels	Transfer Switch
480V MCC 1A6 located in the A switchgear room breakers 1-41311, 1-41316, and 1-41321 to the off position	De-energization to allow HSCP to function	A Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1A2 480V Load Center Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear room transfer panels	Transfer Switch
1A2 480V Load Center located in the A switchgear room breakers 1-40207 and 1-40210 to the open position	De-energization to allow HSCP to function	A Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
480V MCC 1A5 Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear room transfer panels	Transfer Switch
480V MCC 1A5 located in the A switchgear room breakers 1-41202, 1-41272, 1-41254, 1-41260 to the off position	De-energization to allow HSCP to function	A Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1A3 4160V Switchgear Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear room transfer panels	Transfer Switch
1A3 4160V Switchgear trip of breakers 1-20204 and 1-20212 located in the A switchgear room	De-energization to allow HSCP to function	A Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1B Isolation Panel located in the B switchgear room. Normal/Isolate switches	Transfer of Control	B Switchgear room transfer panels	Transfer Switch
480V MCC 1B6 Normal/Isolate Switches located in the B switchgear room	Transfer of Control	B Switchgear room transfer panels	Transfer Switch
Communications Isolation Panel B-1609 located in the B switchgear room. Normal/Isolate switches	Transfer of Control	B Switchgear room transfer panels	Transfer Switch
1B3 4160V Switchgear Normal/Isolate switches located in the B switchgear room	Transfer of Control	B Switchgear room transfer panels	Transfer Switch

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (all locations are on Unit 1)	Remarks
1B3 4160V Switchgear located in the B switchgear room, close breakers 1-20404 and 1-20410, and close breaker 1-20403 (control room fire) or trip 1-20403 (cable spread room fire)	Energize equipment to allow for HSCP control (de-energize for a cable spread room fire)	B Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1B2 480V Load Center Normal Isolate switches located in the B switchgear	Transfer of Control	B Switchgear room transfer panels	Transfer Switch
1B2 480V Load Center located in the B switchgear room breakers 1-40503, 1-40505, and 1-40506 to the closed position with breaker 1-40507 to the open position	Energize and de-energize equipment to allow for HSCP control	B Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1B5 480V MCC Norma/Isolate switches located in the B switchgear room	Transfer of Control	B Switchgear room transfer panels	Transfer Switch
1B5 480V MCC located in the B switchgear room breakers 1-42016, 1-42017, 1-42018, 1-42068, 1-42035, and 1-42040 to the off position	De-energize equipment to allow for HSCP control	B Switchgear room transfer panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1A1 6.9KV Switchgear located in the Turbine Building Switchgear Room. Local switch for breaker 1-30102	Transfer of Control	Turbine Building Transfer Switches/Panel	Transfer Switch
1A1 6.9KV Switchgear located in the Turbine Building Switchgear Room. Breaker trip for breakers 1-30103, 1-30104, and 1-30105 (including pulling fuse blocks)	De-energization to allow HSCP to function	Turbine Building Transfer Switches/Panel	Simple breaker action in the vicinity of the transfer panel (fuse blocks designed to be pulled without tools). Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1A2 4 KV Switchgear located in the Turbine Building Switchgear Room Normal/Isolate switches	Transfer of Control	Turbine Building Transfer Switches/Panel	Transfer Switch
1B2 4 KV Switchgear located in the Turbine Building Switchgear Room. Normal/Isolate switches	Transfer of Control	Turbine Building Transfer Switches/Panel	Transfer Switch
1B1 6.9 KV Switchgear located in the Turbine Building Switchgear Room. Local switch for breaker 1-30202	Transfer of Control	Turbine Building Transfer Switches/Panel	Transfer Switch
1B1 6.9 KV Switchgear located in the Turbine Building Switchgear Room. Breaker trip for breakers 1-30203, 1-30204, and 1-30205 (including pulling fuse blocks)	De-energization to allow HSCP to function	Turbine Building Transfer Switches/Panel	Simple breaker action in the vicinity of the transfer panel (fuse blocks designed to be pulled without tools). Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1AB Isolation Panel (control room fires only) located in the cable spread room. Normal/Isolate switches	Transfer of Control	Cable Spread room transfer panels	Transfer Switch

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (all locations are on Unit 1)	Remarks
1AB 480V MCC Normal/Isolate switches (for control room fires only) located in the cable spread room	Transfer of Control	Cable Spread room transfer panels	Transfer Switch
1B3 Pressurizer heater 1B3 480V load center Normal/Isolate switches (control room fire only) located in the cable spread room	Transfer of Control	Cable Spread room transfer panels	Transfer Switch
1A3 Pressurizer heater 1A3 480V load center Normal/Isolate switches (control room fire only) located in the cable spread room	Transfer of Control	Cable Spread room transfer panels	Transfer Switch
B PORV and RCS Gas Vent Isolation switches in the 1 B electrical penetration room	Transfer of Control	B Penetration room transfer panel	Transfer Switch
A PORV and RCS Gas Vent Isolation switches in the 1 A electrical penetration room	Transfer of Control	A Penetration room transfer panel	Transfer Switch
4160V Switchgear 1AB Normal/Isolate switches located in the AB Switchgear room	Transfer of Control	AB Switchgear Room Transfer Panels	Transfer Switch
4160V Switchgear 1AB located in the AB Switchgear room trip breakers 1-20502 and 1-20503	De-energize equipment to allow for HSCP control	AB Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
1AB 480V Load Center Normal/Isolate switches located in the AB switchgear room	Transfer of Control	AB Switchgear Room Transfer Panels	Transfer Switch
1B Diesel Generator Isolate switches located in the 1B Diesel Generator room	Transfer of Control	B EDG Transfer panel (part of the B EDG Control Panel)	Transfer Switch

Unit 2:

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (All locations are on Unit 2)	Remarks
MCC 2A6 Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear Room Transfer Panels	Transfer Switch
MCC 2A6 position breakers 2-41310 and 2-41319 to off located in the A switchgear room	De-energize equipment to allow for HSCP control	A Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A2 480V Load Center Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear Room Transfer Panels	Transfer Switch
2A2 480V Load Center position breaker 2-40212 to open located in the A switchgear room	De-energize equipment to allow for HSCP control	A Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
MCC 2A5 Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear Room Transfer Panels	Transfer Switch
MCC 2A5 position breaker 2-41202 to off located in the A switchgear room	De-energize equipment to allow for HSCP control	A Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A3 4160V Switchgear Normal/Isolate switches located in the A switchgear room	Transfer of Control	A Switchgear Room Transfer Panels	Transfer Switch
2A3 4160V Switchgear position breakers 2-20201, 2-20203, and 2-20205 to trip including pulling fuse blocks, and position breakers 2-20204, 2-20210, 2-20213, 2-20206, and 2-20207 to close located in the A switchgear room	De-energize and energize equipment to allow for HSCP control	A Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel (fuse blocks designed to be pulled without tools). Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A Transfer Panel Normal/isolate switches located in the A switchgear room	Transfer of Control	A Switchgear Room Transfer Panels	Transfer Switch
LT-9012 transfer switch located in the A switchgear room	Transfer of Control	A Switchgear Room Transfer Panels	Transfer Switch
2B3 4160V Switchgear Normal/Isolate switches located in the B switchgear	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
2B3 4160V Switchgear located in the B switchgear room trip breakers 2-20405, 2-20407, and 2-20408 including pulling fuse blocks	De-energize equipment to allow for HSCP control	B Switchgear Room Transfer Panels	Transfer Switch
2B transfer panel Normal/Isolate switches located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
2B2 480V Load Center Normal/Isolate switches located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
2B5 480V Load Center Normal/Isolate switch located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (All locations are on Unit 2)	Remarks
2B5 480V Load Center located in the B switchgear room breaker 2-40511 to open	De-energize equipment to allow for HSCP control	B Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2B9 MCC fan cooler switches to fast located in the B switchgear room	See Remarks	B Switchgear Room Transfer Panels	Simple switch operation similar to transfer switch. No dependence on communication or other actions. Equivalent to simple breaker operation to energize equipment to allow HSCP function. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A 125 VDC buss breakers to on position for breakers 2-60166, 2-60123, and 2-60139 located in the 2A battery charger room	Energize HSCP control	In the vicinity of the B Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2AB transfer panel Normal/Isolate switches located in the 2AB battery charger room	Transfer of Control	In the vicinity of the B Switchgear Room Transfer Panels	Transfer Switch
MCC 2A9 MCC containment fan cooler switches to fast located in the B switchgear room	See Remarks	B Switchgear Room Transfer Panels	Simple switch operation similar to transfer switch. No dependence on communication or other actions. Equivalent to simple breaker operation to energize equipment to allow HSCP function. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A5 480V Load Center Normal/Isolate switch located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
Communication isolation switches located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
MCC 2B6 Normal/Isolate switches located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
MCC 2B6 position breaker 2-42118 to off located in the B switchgear room	De-energize equipment to allow for HSCP control	B Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
MCC 2B5 Normal/Isolate switches located in the B switchgear room	Transfer of Control	B Switchgear Room Transfer Panels	Transfer Switch
MCC 2B5 position breakers -42004, 2-42012, 2-42033, 2-42036, 2-42037, and 2-42052 to off located in the B switchgear room	De-energize equipment to allow for HSCP control	B Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (All locations are on Unit 2)	Remarks
2C AFW pump room Normal/Isolate switches located in the 2C AFW pump room	Transfer of Control	AFW Pump Area Transfer Panels	Transfer Switch
2A and 2B AFW pump room Normal/Isolate switches located in the 2A and 2B AFW pump room	Transfer of Control	AFW Pump Area Transfer Panels	Transfer Switch
2A1 6.9 KV Switchgear breakers to trip position located in the Turbine Building switchgear room for breakers 2-30105, 30104, and 30103 including pulling fuse blocks	De-energize equipment to allow for HSCP control	Turbine Building Switchgear Transfer Panels	Simple breaker action in the vicinity of the transfer panel (fuse blocks designed to be pulled without tools). Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A2 4160V Switchgear Normal/Isolate switches located in the Turbine Building switchgear room	Transfer of Control	Turbine Building Switchgear Transfer Panels	Transfer Switch
2B2 4160V Switchgear Normal/Isolate switches located in the Turbine Building switchgear room	Transfer of Control	Turbine Building Switchgear Transfer Panels	Transfer Switch
2B1 6.9 KV Switchgear position breakers to trip position located in the Turbine Building switchgear room for breakers 2-30203, 2-30204, and 2- 30205 including pulling fuse blocks	De-energize equipment to allow for HSCP control	Turbine Building Switchgear Transfer Panels	Simple breaker action in the vicinity of the transfer panel (fuse blocks designed to be pulled without tools). Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
MCC 2AB Normal/Isolate switches located in the cable spreading room (control room fire only)	Transfer of Control	Cable Spread Room Transfer Panels	Transfer Switch
MCC 2AB position breaker 2-42406 to off located in the cable spreading room (control room fire only)	De-energize equipment to allow for HSCP control	Cable Spread Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A3 480V Load Center Normal/Isolate switches located in the cable spread room (control room fires only)	Transfer of Control	Cable Spread Room Transfer Panels	Transfer Switch
2A3 480V Load Center position breaker 2-40305 to off located in the cable spread room (control room fires only)	De-energize equipment to allow for HSCP control	Cable Spread Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2B3 480V Load Center Normal/Isolate switches located in the cable spread room (control room fires only)	Transfer of Control	Cable Spread Room Transfer Panels	Transfer Switch
2B3 480V Load Center position breaker 2-40602 to off located in the cable spread room (control room fires only)	De-energize equipment to allow for HSCP control	Cable Spread Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030

PCS Description from LAR Attachment G	Transfer of Control or Power (energize/ de-energize)	Location (All locations are on Unit 2)	Remarks
B PORV and RCS gas vent isolation located in the 2B electrical penetration room	Transfer of Control	B Penetration Room Transfer Panels	Transfer Switch
A PORV and RCS gas vent isolation located in the 2A electrical penetration room	Transfer of Control	A Penetration Room Transfer Panels	Transfer Switch
2AB 4160 Switchgear Normal/Isolate switches located in the AB switchgear room	Transfer of Control	AB Switchgear Room Transfer Panels	Transfer Switch
2AB 4160 Switchgear located in the AB switchgear room close breakers 2-20502 and 20503	Energize equipment to allow for HSCP control	AB Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2AB 480V Load Center Normal/Isolate switches located in the AB switchgear room	Transfer of Control	AB Switchgear Room Transfer Panels	Transfer Switch
2AB 480V Load Center located in the AB switchgear room position breakers 2-40702, 2-40706, and 2-40707 to open	De-energize equipment to allow for HSCP control	AB Switchgear Room Transfer Panels	Simple breaker action in the vicinity of the transfer panel. Therefore, meets the definition in RG 1.205 Revision 1 and FAQ 07-0030
2A diesel generator Normal/Isolate switches located in the 2A diesel generator room	Transfer of Control	A EDG Transfer Panel (part of A EDG control panel)	Transfer Switch

PSL SSA RAI 02

LAR Attachment B, Table B-2 Section 3.2.1.2 "Fire Damage to Mechanical Components" identifies that mechanical components subjected to a fire are not considered credible. However, the guidance also states that instrument tubing with brazed, soldered joints, or other heat sensitive materials should not be included in this non-failure assumption. Describe how the failure of brazed or soldered joints in a fire was considered in the NFPA 805 nuclear safety capability analysis.

RESPONSE:

The systems relied upon to satisfy the post-fire NFPA 805 nuclear safety performance criteria do not contain brazed or soldered joints. The integrity of the instrument air system may have some vulnerability due to the presence of heat sensitive components associated with the end devices, but this system is not credited in the nuclear safety capability assessment (NSCA). This system is assumed to fail in the NSCA resulting in all instrument air powered valves failing to the loss of air position unless a fire induced cable failure could a cause a valve to fail in an adverse position. The NSCA then assumes the valve will move to the adverse position even if that would require instrument air to be available. Therefore, the failure of brazed or soldered joints does not impact the NSCA.

PSL SSA RAI 03

LAR Attachment B, Table B-2 Section 3.2.1.2 "Fire Damage to Mechanical Components" states: "...the SSA includes required actions to manually operate valves that are in the affected fire area." This appears to be in conflict with the statement made in LAR Section 4.2.1.1, Subheading "Comparison to NEI 00-01, Revision 2" that states "There are no recovery actions on valves in the same area as the fire."

Discuss which statement is correct. If the safe shutdown analysis (SSA) includes required actions to manually operate valves that are in the affected fire area, provide an analysis that demonstrates the operability of the valves given potential fire damage.

RESPONSE:

The statement made in LAR Section 4.2.1.1, Subheading "Comparison to NEI 00-01, Revision 2" that states "There are no recovery actions on valves in the same area as the fire" is correct. This statement specifically addresses rising stem manual valves as discussed in NEI 00-01 Revision 2 (coefficients of friction, handwheel sizes, rim pulls, etc.). PSL-FPER-11-002, NFPA 805 Recovery Action Feasibility Evaluation, concluded that all actions relied upon for risk, or defense-in-depth, are feasible. Some of the action statements include entry into the affected area, but these are all contingency actions and none of these actions involved the use of rising stem valves.

The statement in the B-2 Table was made during its initial development before the evaluation of recovery actions and defense in depth had taken place. At that time actions were included that are now not required based on a fire risk evaluation that evaluated VFDRs that resulted from these actions as being acceptable for risk, defense in depth, and safety margin with the action not being performed. Additionally, the actions taking place in an affected fire area are contingent upon accessibility while the credited actions are those that do not require access to the affected area. This portion of the B-2 Table should have been revisited for update. The LAR Table B-2 will be revised. A markup is attached to this RAI response.

PSL SSA RAI 03 - Mark-up

Attachment B

NEI 04-02 Table B-2, Nuclear Safety Capability Assessment - Methodology Review

2.4.2.1 Nuclear Safety Capability System and Equipment Selection

NEI 00-01 Ref.
3.2.1.2 [Fire Damage to Mechanical Components (not electrically supervised)]

NEI 00-01 Guidance
3.2.1.2 Assume that exposure fire damage to manual valves and piping does not adversely impact their ability to perform their pressure boundary or safe shutdown function (heat sensitive piping materials, including tubing with brazed or soldered joints, are not included in this assumption). Fire damage should be evaluated with respect to the ability to manually open or close the valve should this be necessary as a part of the post-fire safe shutdown scenario.

Applicability
Applicable

Alignment Statement
ALIGNS WITH INTENT

Replace existing alignment basis statement with A

Alignment Basis
Although the methodology documentation does not consider mechanical damage to components as a result of fire, the SSA includes required actions to manually operate valves that are in the affected fire area. Evaluations were performed to determine the effect of maloperation of equipment, and time limits were established as the bounds for mitigation, including manual actions. A manual action feasibility study was conducted to ensure required actions could be performed within the established time constraints.

Quantitative evaluations on the effects on mechanical attributes involved in the mitigation strategy were not performed, but qualitative evaluation (i.e., response time and available alternatives) are included in the SSA.

Reference
2998-B-048 Rev. 21 - Unit 2 Appendix R Safe Shutdown Analysis Report
8770-B-048 Rev. 31 - Unit 1 Appendix R Safe Shutdown Analysis Report
PSL-ENG-SEMS-98-035 Rev. 4 [2.6.7, 2.6.2.4, 2.3.1] - St. Lucie Unit 1 Appendix R Validation Effort Safe Shutdown Analysis
PSL-ENG-SEMS-98-067 Rev. 4 [2.6.7, 2.6.2.4, 2.3.1] - St. Lucie Unit 2 Appendix R Validation Effort Safe Shutdown Analysis
PSL-FPER-11-002 Rev. 1 - St. Lucie Nuclear Power Plant Units 1 and 2 NFPA 805 Recovery Action Feasibility Evaluation

A

Although the methodology documentation does not consider mechanical damage to components as a result of fire, the SSA includes required actions to manually operate valves that are in the affected fire area. These actions are contingent upon accessibility while the credited actions are those that do not require access to the affected area. Evaluations were performed to determine the effect of maloperation of equipment, and time limits were established as the bounds for mitigation, including manual actions. A manual action feasibility study was conducted to ensure required actions could be performed within the established time constraints.

PSL SSA RAI 05

LAR Attachment B, Section 3.3.1.6 "ESFAS Initiation" identifies the compliance strategy as "Aligns with Intent". Provide an explanation of the portion of the guidance provided in NEI 00 01, "Guidance for Post Fire Safe Shutdown Circuit Analysis," Rev. 2, Section 3.3.1.6 that is not met

RESPONSE:

LAR Attachment B, Section 3.3.1.6 "ESFAS Initiation" is from NEI 00-01 Revision 1. In NEI 00-01 Revision 2 this section is 3.3.1.1.4.1. The wording between the two sections in each revision is the same. Evaluation of multiple instrument cable failures was included in the SSA as potential generators of spurious safety system initiation signals. The evaluations were done at the affected component level, not wholesale at the ESFAS logic level, which the NEI guidance implies should be done. Although specific signal-by-signal analyses are not performed in all cases, all automatic signals that could affect safe shutdown components are included in the SSA. As stated in Step 3 of FAQ 07-0039 "Since NEI 00-01 is a guidance document, portions of its text could be interpreted as 'good practice' or intended as an example of efficient means of performing the analysis. In some instances the commentary presents analytical preferences which can be performed in a number of different ways without impacting the validity of the results. These sections of NEI 00-01 can be dispositioned without further reference." In this case NEI 00-01 states "If not protected from the effects of fire, the fire-induced failure of automatic initiation logic circuits should be considered for their potential to adversely affect any post-fire safe shutdown system function." Because St. Lucie does not analyze automatic initiation circuits directly but analyzes the inputs to the logic and the outputs from the logic as impacting individual components it was felt during the development of the LAR that this does not meet the exact statement in the guidance. However, the results do analyze the impact of spuriously generated automatic initiation signals for the adverse effects on components required for safe shutdown. Therefore, as stated in FAQ 07-0039 the analysis was done in a different manner without impacting the validity of the results. That is why the statement of 'aligns with intent' was chosen.

PSL SSA RAI 06

LAR Attachment B, Section 3.3.1.7 "Circuit Coordination" states "St. Lucie did not follow the methodology in NEI 00-01 but did end up with the same result." Provide more explanation with regard to the scope of circuit coordination used to satisfy NFPA 805. Include in that discussion the types of resolutions for lack of coordination and if any of these resolutions included variance from deterministic requirements (VFDRs), RAs, modifications, electrical raceway fire barrier systems (ERFBS), or "risk evaluation with no further action required."

RESPONSE:

The statement above is based on the revision of the methodology documents in affect at the time of the LAR preparation. The coordination analysis was included in the methodology documents (PSL-ENG-SEMS-98-035 and PSL-ENG-SEMS-98-067) in Attachment 4, Circuit Breaker/Fuse Coordination Study. This study was performed with a focus on safe shutdown load components (the first type of association described in the guidance). The power sources for the essential equipment were reviewed to assure that the circuit protective devices are selectively coordinated, such that the load breakers in the circuit will open to clear a downstream fault prior to the main supply breaker to the power source opening. Any circuits for redundant train equipment which were noted to be routed through the same fire area during the review were evaluated to assure that one train of equipment needed for safe shutdown remains available for a fire in any plant fire area. This evaluation justified the loss of a power supply by looking at the available equipment and power supplies to ensure that at least one train of equipment needed to attain safe shutdown for a fire in any plant area was available. These justifications may have credited redundant equipment but may have also credited existing operator manual actions in the pre-transition safe shutdown analysis (SSA). However, the associated cables were never input to the SSA. This does not follow the guidance in NEI 00-01 because the information was not added to the SSA. The results were valid because circuit coordination was considered and circuits that resulted in additional failures were considered. This documentation was difficult to retrieve and static. This weakness was recognized during the transition project.

The electrical coordination studies were updated in calculations PSL-1FSE-09-001 and PSL-2FSE-08-001. These calculations identified previously unknown weaknesses in the electrical coordination. The issue was captured in Action Request (AR) 574316. This AR generated multiple additional ARs as well as engineering changes to update the SSA with cables that would affect circuit coordination that were previously justified within the electrical calculations. The information generated by the ARs associated with this issue was incorporated into the Fire PRA (by adding cables as associated cables) as well as commitments to resolve issues that require modifications to resolve (LAR Attachment S Table S-1 Items EC 278417, EC 278455, EC 278504, 278508, and EC 278510). The SSA and supporting documentation have not yet been updated but this does not change the results of the analysis supporting the LAR because the cables remaining (after the modifications are complete) that may impact coordination have been included in the risk analysis as associated cables. These remaining coordination issues do not result in any additional VFDRs; the cables that impact the coordination have been incorporated into the fire risk evaluation process. The only remaining tasks are to update the SSA and supporting documents with the information that has already been generated.

PSL SSA RAI 07

LAR Attachment B, Section 3.3.3.2 interlocked circuits whose spurious operation could affect shutdown identifies the compliance strategy as “Aligns with Intent”. Provide an explanation of the portion of the NEI 00-01, Rev. 1, Section 3.3.3.2 that is not met.

RESPONSE:

All portions of NEI 00-01 Section 3.3.3.2 are met; the alignment statement for Section 3.3.3.2 was conservatively assigned “with intent” based on the close association with Section 3.3.3.3 which recommends a relational database. After this review, it is determined that the assignment of “Aligns” is appropriate for Section 3.3.3.2 when taken as a stand-alone statement. Attachment B will be changed appropriately. See the attached markup of LAR Attachment B, Table B-2.

Section 3.3.3.2 refers to Figure 3-3, Safe Shutdown Equipment Selection. This figure refers to Figure 3-4 where Steps 4 through 7 identify interlocked circuits, power requirements and assignment of cables to equipment. NEI 00-01 Section 3.3.3.3 refers to a relational database including interlocks that are typically tabulated with cable associations and applied to affected components as dependencies (e.g., main generator lockout circuits are listed as components with associated cables, then these components are listed as dependencies in the analyses of affected components). Although the overall method recommended in NEI 00-01 Section 3.3.3.3 had not been implemented (no relational database including interlocks), the results are still valid because the safe shutdown analyses include all cables required for equipment function as well as cables that could prevent equipment function or cause equipment mal-operation.

PSL SSA RAI 07 - Mark-up

Attachment B

NEI 04-02 Table B-2, Nuclear Safety Capability Assessment - Methodology Review

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref.
3.3.3.2 Identify Interlocked Circuits and Cables Whose Spurious Operation or Mal-operation Could Affect Shutdown

NEI 00-01 Guidance
In reviewing each control circuit, investigate interlocks that may lead to additional circuit schemes, cables and equipment. Assign to the equipment any cables for interlocked circuits that can affect the equipment.
While investigating the interlocked circuits, additional equipment or power sources may be discovered. Include these interlocked equipment or power sources in the safe shutdown equipment list (refer to Figure 3-3) if they can impact the operation of the equipment under consideration.

Applicability
Applicable

Alignment Statement
~~ALIGNS WITH INTENT~~
ALIGNS

Alignment Basis
The cable selection included all cables required for equipment function as well as cables that could prevent equipment function or cause equipment maloperation. The analysis does consider all potential interlocks and cables that could affect equipment operation in the analysis of the required cables for affected equipment.

Reference
PSL-ENG-SEMS-98-035 Rev. 4 [2.3.2] - St. Lucie Unit 1 Appendix R Validation Effort Safe Shutdown Analysis
PSL-ENG-SEMS-98-067 Rev. 4 [2.3.2] - St. Lucie Unit 2 Appendix R Validation Effort Safe Shutdown Analysis

PSL SSA RAI 08

LAR Attachment B, Section 3.3.3.4, "Routing Cables," and 3.3.3.5, "Routing Raceway," state that "[...] the raceway details would only provide an additional layer of information however, this additional level of detail does not affect the end results since the location cable information is ultimately determined[...]. The end result was several reports from the cable routing system which listed cables by fire area as well as listing cables by fire zone routes. As a result, the raceway information is not important to the results and is not captured in the SSA."

For individual fire scenarios with zones of influence (ZOIs) smaller than a fire zone; explain how targets are identified and included in the analysis. Identify any assumption made for cables without routing information.

RESPONSE:

The intent of NEI 00-01 Section 3.3.3.4 and 3.3.3.5 is to determine the fire area location for each cable. This supports a deterministic analysis by fire area which is the subject of NEI 00-01. St. Lucie has a cable to fire zone (area) relationship but not a raceway to fire zone relationship in its database. This is the case as stated in FAQ 07-0039 that the methodology differs but the results remain valid. The assumed method in NEI 00-01 is that the primary fire zone (area) information is raceway to fire zone. However, the intended result is a list of cables in a fire zone (area). St. Lucie has the intended result of a list of cables in a fire zone (area) but does not use the raceway to fire zone (area) relationship to develop that. For individual fire scenarios in the Fire PRA, walkdowns were performed wherein fixed ignition sources were confirmed, as necessary, and transient ignition sources were identified. Both vertical and horizontal Zones of Influence (ZOI) were calculated based on the properties of the ignition source(s) identified above. An additional walkdown was performed to identify all the equipment, conduit and trays within the zone of influence. These were identified as targets for the scenario. Cable/raceway data is then extracted from the PSL Cable and Raceway Schedule (CARS). Database queries are used to identify all cables routed through the identified raceway, panel or component targets from the CARS database. Any cable without cable routing was walked down and the routing information entered into the CARS database. The component/cable data from the safe shutdown analysis is compared, via database queries, to the cables impacted by the scenarios to generate a list of components impacted by each scenario. It should be noted that the PSL CARS has been transferred to an Edison database. However, the methodology is the same in that raceways (cable tray or conduit) are identified via walkdown and the cables contained within those raceways is obtained from queries in the Edison database.

The scenarios, including the ignition source and the targets are summarized in Attachment A of Report 0493060006.104. The "A" scenarios with zone numbers representing actual plant zones represent the equivalent of an Appendix R exposure fire where everything in the compartment is assumed to fail at the compartment frequency. Most other scenarios are those with a ZOI smaller than a fire zone.

PRA scenario development methodology and the use of raceway information were not utilized to answer/address the concerns of the deterministic approach used to generate Attachment B of the LAR, which is the deterministic approach, or NSCA.

PSL SSA RAI 09

LAR Attachment B, Section 3.5.2.1, "Circuit Failures Due to an Open Circuit," with respect to current transformers (CTs) states that "the potential for secondary fires (especially for CT circuits on ammeters not associated with safe shutdown equipment) requires additional analysis. The licensee commits to ensuring that CT circuits with the potential for secondary fire will be protected from fire-induced open circuits as part of its implementation for NFPA 805." This appears as though future analysis or work will be required.

LAR Attachment S, Table S-2, "Implementation Items," number 10 states, "Review NUREG/CR-7150 Vol. 2 when published to determine if conclusion that an open secondary CT is not a concern [...]." Provide an explanation of what work is still outstanding, and estimate the potential impact to the fire protection program (FPP) as presented in the LAR. Justify why this additional work should not be added as an Implementation Item.

RESPONSE:

LAR Section 4.2.1.1 identifies the process used by PSL to document compliance with NFPA 805 Section 2.4.2. The initial methodology review, documented in the LAR Attachment B, evaluated the existing post-fire safe shutdown analysis (SSA) methodology against the guidance provided in NEI 00-01, Revision 1, Chapter 3, "Deterministic Methodology," as discussed in Appendix B-2 of NEI 04-02. At the time of this initial review, there was no definitive industry or regulatory guidance related to the topic of fire induced open circuits on CT secondary windings (NEI 00-01 Section 3.5.2.1). Subsequent to this initial review, but before the PSL LAR was submitted in March 2013, NEI 00-01 Revision 2 and NUREG/CR-7150 Volume 1 were issued. LAR Section 4.2.1.1 documents the review of NEI 00-01 Revision 1 to Revision 2 (i.e., "gap analysis"). This review included the regulatory guidance contained in the NUREG and concluded that open circuit on the secondary CT windings would not impact the NSCA and would not be considered.

PSL LAR Attachment S, Table S-2 Implementation Item 10 is to review NUREG/CR-7150 Volume 2 (when issued) to determine if the information published in Volume 2 impacts the conclusion that an open circuit on the secondary circuit of a CT does not impact the NSCA and does not need to be considered in the Fire PRA. FPL considers that the information that will be contained in NUREG/CR-7150 Volume 2 will not change the conclusion in this section of the LAR and no future work beyond this review and an update to the supporting documents (PSL-ENG-SEMS-98-035, PSL-ENG-SEMS-98-067) will be required. LAR Attachment B Section 3.5.2.1 was not updated with the results of the NEI 00-01 revision 1 to Revision 2 gap analysis. A markup of the LAR Attachment B, Section 3.5.2.1 is attached to the response to this RAI.

Attachment B

NEI 04-02 Table B-2, Nuclear Safety Capability Assessment - Methodology Review

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref.
3.5.2.1 Circuit Failures Due to an Open Circuit

NEI 00-01 Guidance
This section provides guidance for addressing the effects of an open circuit for safe shutdown equipment. An open circuit is a fire-induced break in a conductor resulting in the loss of circuit continuity. An open circuit will typically prevent the ability to control or power the affected equipment. An open circuit can also result in a change of state for normally energized equipment. For example, a loss of power to the main steam isolation valve (MSIV) solenoid valves [for BWRs] due to an open circuit will result in the closure of the MSIV.

NOTE: The EPRI circuit failure testing indicated that open circuits are not likely to be the initial fire-induced circuit failure mode. Consideration of this may be helpful within the safe shutdown analysis. Consider the following consequences in the safe shutdown circuit analysis when determining the effects of open circuits:

Loss of electrical continuity may occur within a conductor resulting in de-energizing the circuit and causing a loss of power to, or control of, the required safe shutdown equipment.

In selected cases, a loss of electrical continuity may result in loss of power to an interlocked relay or other device. This loss of power may change the state of the equipment. Evaluate this to determine if equipment fails safe.

~~Open circuit on a high voltage (e.g., 4.16 kV) ammeter current transformer (CT) circuit may result in secondary damage.~~

NEI 00-01 Rev 2: Open circuit on a high voltage (e.g., 4.16 kV) ammeter current transformer (CT) circuit may result in secondary damage, possibly resulting in the occurrence of an additional fire in the location of the CT itself.

Figure 3.5.2-1 shows an open circuit on a grounded control circuit.

[Refer to hard copy of NEI 00-01 for Figure 3.5.2-1]

Open circuit No. 1:
An open circuit at location No. 1 will prevent operation of the subjec

Open circuit No. 2:
An open circuit at location No. 2 will prevent opening/starting of the subject equipment, but will not impact the ability to close/stop the equipment.

Applicability
Applicable

Alignment Statement
ALIGNS WITH INTENT

Alignment Basis
PSL safe shutdown analysis ~~generally~~ considers open circuits. Open circuits were considered on CT circuits on ammeters associated with safe shutdown equipment~~, the potential for secondary fires (especially on CT circuits on ammeters not associated with safe shutdown equipment) requires additional analysis. PSL commits to ensuring that CT circuits with the potential for secondary fire will be protected from fire-induced open circuits as part of its implementation for NFPA 805.~~

related to the loss of indication. Based on the guidance provided in NUREG/CR-7150 Vol. 1 regarding the potential for a secondary fire due to fire damage to CT circuits, PSL has concluded that open circuits on the secondary of CTs would not impact the NSCA and would not be considered. Refer to LAR Section 4.2.2.1, "Comparison to NEI 00-01 Revision 2".

Reference
PSL-ENG-SEEJ-11-001 Rev. 0 - NFPA 805 Review of St. Lucie Units 1 & 2 4160V Switchgear Breakers (EC 273329)
PSL-ENG-SEMS-98-035 Rev. 4 [2.5.1.3.b] - St. Lucie Unit 1 Appendix R Validation Effort Safe Shutdown Analysis
PSL-ENG-SEMS-98-067 Rev. 4 [2.5.1.3.b] - St. Lucie Unit 2 Appendix R Validation Effort Safe Shutdown Analysis

NUREG/CR-7150, Volume 1, 10/2012 [6.2]-Joint Assessment of Cable Damage and Quantification of Effects from Fire (JAQUE-FIRE)

PSL SSA RAI 10

LAR Section 4.2.1.1, "Compliance with NFPA 805 Section 2.4.2" states that "the only current transformers with larger turns ratio are located in the turbine building for the power feeds from the startup and auxiliary transformers and the generator output and current transformers located in the switchyard. These do not impact the NSCA (no credit for offsite power)." Clarify what is meant by "no credit for offsite power." Provide more explanation why potential secondary fires do not affect the NSCA. Describe how secondary fires due to CTs were addressed in the Fire Probabilistic Risk Assessment (FPRA).

RESPONSE:

The NSCA for both units do not credit offsite power to achieve and maintain post fire safe and stable conditions. The analysis assumes a loss of offsite power unless that assumption would prevent a mal-operation that could impact safe and stable conditions. The Offsite Power feed to the 4.16 kV Essential/Vital Switchgear is from the 4.16 kV Non-Vital Switchgear located in the Turbine Building Switchgear area. Therefore, any failures in the Turbine Building Switchgear or the feeds to the switchgear from the transformers (auxiliary or startup) do not impact the NSCA. A secondary fire in the Turbine Building Switchgear will not impact the NSCA.

LAR Section 4.2.1.1 documents the review of the guidance provided in NUREG/CR-7150 Volume 1. The regulatory guidance contained in the NUREG concludes that the ignition of a secondary fire from an open circuited CT secondary circuit with a turns-ratio of 1200:5 or less is incredible. As documented in LAR Section 4.2.1.1, all the CTs in safety related areas are 1200:5 or less. For CT ratios larger than 1200:5, NUREG/CR-7150 Volume 1 states that the likelihood of secondary fires was judged to be very low. Evidence could not be found that the open circuit failure would cause a secondary fire, but this could not be proven without additional testing. The open circuit failure would drive the voltage in the CT to higher than the insulation rating and would cause local arcing within the windings of the CT. The arcing drops the voltage as soon as any current flows. This cycle may repeat causing local overheating of the CT but would not damage anything beyond the switchgear compartment where the CT is located. The damage is essentially self-limiting.

With respect to the Fire PRA, a secondary fire due to an open circuit CT need not be considered because NUREG/CR-6850 states that an open circuit is not the primary failure mode. In addition, even given the open circuit, the probability of causing damage beyond the affected CT is also very low. Based on this a fire induced open circuit CT causing a secondary fire that induces additional fire induced failures is considered such a low probability that it would not impact the final risk results. In addition to the judgment that the failure mode is low likelihood and low risk, there is no guidance or accepted approaches for modeling the phenomenon in the Fire PRA. Modeling this type of scenario in the Fire PRA, without an established approach, is considered to be inappropriate without additional testing or guidance. Therefore, secondary fires due to open circuit CTs are not included in the Fire PRA.

PSL SSA RAI 11

LAR Attachment B, Section 3.4.1.5, "Repairs," states that "St. Lucie Unit 1 does not credit any repairs for cold shutdown. St. Lucie Unit 2 takes credit for limited repairs during cold shutdown (i.e., inserting fuses that are part of the normal shutdown procedures)." Provide a more detailed explanation of those repairs. For those fire areas where repairs are necessary to achieve safe and stable, describe the location of these actions. Describe how these are procedurally controlled with parts/fuses/components pre-staged, and how is training conducted to perform this work. Describe whether the cold shutdown repairs are included in the FPRA

RESPONSE:

The referenced section of the LAR pertains to the installation of fuses for the components identified in the table below. The fuse installation occurs at the identified RTGBs in the Control Room. The PIs are the Pressurizer Pressure Low Range Indicators and the valves are the Safety Injection Tank Vents.

Component to be Energized	Action*
PI-1103, PI-1104	Insert RTGB -203 120V AC "SA" fuse F21
PI-1105, PI-1106	Insert RTGB -203 120V AC "SB" fuse F21
V3733	Insert RTGB -206 125V DC "SA" F53, F54
V3734	Insert RTGB -206 125V DC "SB" F117, F118
V3735	Insert RTGB -206 125V DC "SA" F51, F52
V3736	Insert RTGB -206 125V DC "SB" F115, F116
V3737	Insert RTGB -206 125V DC "SA" F57, F58
V3738	Insert RTGB -206 125V DC "SB" F47, F48
V3739	Insert RTGB -206 125V DC "SA" F59, F60
V3740	Insert RTGB -206 125V DC "SB" F49, F50

During normal operation these fuses are not installed in the circuit until directed by 2-GOP-305, *REACTOR PLANT COOLDOWN - HOT STANDBY TO COLD SHUTDOWN*, to enable operation of the respective component while proceeding to cold shutdown conditions. Therefore, this activity is required for all fire areas to energize the protected train equipment because the fuses are normally removed (power removed during power operation). The components identified in the table above <u>are not subject to fire damage</u> in any Fire Area where they are part of the safe shutdown protected train. The activity to install the fuse is part of the normal plant shutdown procedure as directed by 2-GOP-305, the capability is already maintained by the station, and <u>the activity is not the result of fire damage</u>, therefore, such a condition does not constitute a Cold Shutdown (CSD) repair and is not identified as a VFDR because the action is in the control room and part of the normal control room duties during plant cooldown. LAR Attachment B, Section 3.4.1.5 was overly conservative in identifying this activity as a cold shutdown repair. LAR Attachment B Section 3.4.1.5 has been revised and is attached to this RAI response. The insertion of these fuses is part of the normal plant procedures and is included in the internal events PRA as well as the Fire PRA for sequences that require cooldown to cold shutdown conditions.

Attachment B

NEI 04-02 Table B-2, Nuclear Safety Capability Assessment - Methodology Review

2.4.2.4 Fire Area Assessment.

NEI 00-01 Ref.
3.4.1.5 [Repairs]

NEI 00-01 Guidance
Where appropriate to achieve and maintain cold shutdown within 72 hours, use repairs to equipment required in support of post fire shutdown.

Applicability
Applicable

Alignment Statement
ALIGNS

Alignment Basis
~~St. Lucie Unit 1 does not credit any repairs for cold shutdown. St. Lucie Unit 2 takes credit for limited repairs during cold shutdown (i.e. inserting fuses that are part of the normal shutdown procedures). NFPA 805 only requires that the plant be placed in a safe and stable condition post fire. The report PSL-FPER-11-012, "NFPA 805 Fire Protection Evaluation to Define Safe and Stable for Use at St. Luck Units 1 & 2" determined and identified the St. Lucie specific plant operational mode at which condition the fuel can be maintained in a safe and stable condition.~~

St. Lucie Units 1 and 2 do not credit any repairs for cold shutdown. NFPA 805 only requires that the plant be placed in a safe and stable condition post fire. The report PSL-FPER- 11-012, "NFPA 805 Fire Protection Evaluation to Define Safe and Stable for Use at St. Lucie Units 1 & 2" determined and identified the St. Lucie specific plant operational mode at which condition the fuel can be maintained in a safe and stable condition.

Reference
PSL-ENG-SEMS-98-035 Rev. 4 [2.1] - St. Lucie Unit 1 Appendix R Validation Effort Safe Shutdown Analysis
PSL-ENG-SEMS-98-067 Rev. 4 [2.1], Attachment 13 - St. Lucie Unit 2 Appendix R Validation Effort Safe Shutdown Analysis
PSL-FPER-11-012 Rev. 0 [1.0, 2.0] - NFPA 805 Fire Protection Evaluation to Define Safe and Stable for Use at St. Lucie Units 1 & 2

PSL SSA RAI 12

LAR Attachment B, Table B-2, Section 3.1, "C. Spurious Operations," indicates that spurious signals, impact on high-low pressure interfaces, multiple spurious operation (MSO), and common enclosure/power supplies were analyzed for their impact on NSCA. However the staff noted the referenced analysis does not address all of these elements. The referenced analysis does not appear to reflect additional components and power supplies that were added for NFPA 805 considerations of MSO, common enclosure/power supplies, or equipment added for the NSCA. Describe how the additional equipment of the FPRA were added to the nuclear safety equipment list.

RESPONSE:

The subject RAI requests how additional equipment of the FPRA were added to the nuclear safety equipment list. For St. Lucie the equipment required for safe shutdown under Appendix R is the essential equipment list on each unit. This contains the equipment required to mitigate the consequences of a fire as well as the required power supplies for the equipment to function. These essential equipment lists have not yet been updated with equipment/power supplies, etc. required by the FPRA. During the NFPA 805 project it was recognized that the St. Lucie documentation had some weaknesses in that there was no cable-to-component relationships. The safe shutdown analysis was a cable by cable analysis where the cable description was used to describe the cable to component relationship. However, this makes the safe shutdown analysis labor intensive and does not lend itself to any automated processes. As a result, the project developed a separate cable-to-component evaluation that included additions made for FPRA, MSO considerations, common power supplies, etc., to support the identification of VFDRs and performance of fire risk evaluations. This report was updated to capture the latest available information required to the FPRA. This is currently maintained as a separate report (FPLSL120-PR-001) and has not yet been incorporated into the essential equipment list or the safe shutdown analysis.

As part of the transition process after the Safety Evaluation is received, all of this information will be captured in a revised essential equipment list as well as the nuclear safety capability assessment (NSCA) which will be developed from the existing SSA and the above referenced report. This activity is addressed by LAR Attachment S, Table S-2 Implementation Item 16. The above referenced report captured information that currently exists in the corrective action program as well as outstanding engineering changes that have not yet been incorporated into the bases analysis. The response to RAI SSA 13 contains additional information.

PSL SSA RAI 13

LAR Attachment B, Table B-2, Section 3.2.1.6, "Spurious Components," indicates that "the guidance related to multiple spurious operations from NEI 00-01 Revision 2 has been addressed and included in the SSA or entered into the plant corrective action program." A similar statement was made for Section 3.5.1.5, "Circuit Failure Risk Assessment." Provide more detail regarding the resolution of the identified corrective actions. Describe what FPRA equipment/power supplies are still awaiting disposition in the corrective action program and how this will affect the results of the NSCA currently presented in the LAR.

RESPONSE:

The issues related to MSOs identified from the process outlined in Chapter 4 of NEI 00-01 Revision 2, which were not already included in the SSA, were entered into the corrective action program to evaluate appropriate compensatory measures and obtain resolution. In several cases the actual SSA of record had not been completely updated. However, if any corrective action indicated that a VFDR is required, a VFDR was generated and properly analyzed in the fire PRA and documented in Report FPLSL120-PR-001, "Update Review for St. Lucie Units 1 and 2, Impact of ARs and ECs on FREs and Cable to Component Relationships". The appropriate cable to component and cable routing data was developed for these corrective actions and supplied to the Fire PRA. However, some of this data has not been formally incorporated into permanent plant documentation. The open corrective actions are tracking the update of the permanent plant documentation but will not impact the fire PRA or associated NSCA. There are no FPRA equipment or power supplies awaiting disposition in the corrective action program for inclusion in the LAR or the NSCA.

For example, the following Condition Reports/Action Requests had not been fully incorporated into the SSA at the time of the LAR submittal, but the identified VFDRs were generated from the cable to component and cable routing data developed for the issue (Reference 1) for evaluation in the FPRA and inclusion in the LAR.

AR 01680630- VFDR-1C-121, VFDR-1A-78

AR 00459049- VFDR-2B-592, VFDR-2F-261, VFDR-2J-10, VFDR-2O-110

PSL SSA RAI 14

The Fire Risk Evaluations (FREs) described in LAR Attachment C, NEI 04-02, Table B-3, "Fire Area Transition," all refer to evaluating VFDRs generally as "this condition was evaluated for compliance using the performance-based approach of NFPA 805, Section 4.2.4. An FRE determined that applicable risk, defense-in-depth (DID), and safety margin criteria were satisfied without further action." However, there is no specific description of the associated criteria or any other details identified in the LAR. LAR Section 4.5.2.2 generally defines DID and safety margin as listed in NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," but does not describe the methodology, controls, and systems for providing DID and safety margins. Provide additional detail, specific to St. Lucie, of the methods and criteria for evaluating DID and safety margins.

RESPONSE:

The following methods and criteria for evaluating DID and safety margins were extracted from PSL-FPER-11-001, St. Lucie Nuclear Power Plant NFPA 805 Fire Risk Evaluations, Revision 1:

Defense-in-Depth (DID)

Guidance

A review of the impact of the change on DID was performed, using the guidance below from NEI 04-02. NFPA 805 defines DID as:

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

In general, the DID requirement was considered satisfied if the proposed change does not result in a substantial imbalance among these elements (or echelons). The review of DID was qualitative and addressed each of the elements with respect to the proposed change. Fire protection features and systems relied upon to ensure DID were identified in the assessment (e.g., detection, suppression system).

Consistency with the DID philosophy is maintained if the following acceptance guidelines, or their equivalent, are met:

- A reasonable balance is preserved among 10 CFR 50.48(c) DID elements.
- Over-reliance and increased length of time or risk on performing programmatic activities to compensate for weaknesses in plant design is avoided.
- Pre-fire nuclear safety system redundancy, independence, and diversity are preserved commensurate with the expected frequency and consequences of challenges to the system and uncertainties (e.g., no risk outliers). (This should not be construed to mean that more than one NSCA train must be maintained free of fire damage.)
- Independence of DID elements is not degraded.
- Defenses against human errors are preserved.

- The intent of the General Design Criteria in Appendix A to 10 CFR Part 50 is maintained.

DID Process

Each Fire Area was evaluated for the adequacy of DID. In accordance with NFPA 805, Section 2.4.4, Plant Change Evaluation, "the evaluation process shall consist of an integrated assessment of the acceptability of risk, DID, and safety margins." NFPA 805, Section 4.2.4.2 refers to the acceptance criteria in this section. Therefore fire protection systems and features required to demonstrate an adequate balance of DID are required by NFPA 805 Chapter 4.

The VFDRs and the associated Fire Area risk (CDF) and scenario consequences (CCDP values) were evaluated to identify general DID echelon imbalances. Potential methods to balance the DID features were identified ensuring an adequate balance of DID features is maintained for the Fire Area. To aid in the consistency of the review of DID, the following guidance is provided in Table 5-2:

Table 5-2 - Considerations for Defense-in-Depth Determination

Method of Providing DID	Considerations
Echelon 1: Prevent fires from starting	
▪ Combustible Control ▪ Hot Work Control	Combustible and hot work controls are fundamental elements of DID and as such are always in place. The issue to be considered during the FREs is whether this element needs to be strengthened to offset a weakness in another echelon thereby providing a reasonable balance. Considerations include: ▪ Creating a new Transient Free Areas ▪ Modifying an existing Transient Free Area The fire scenarios involved in the FRE quantitative calculation should be reviewed to determine if additional controls should be added. Review the remaining elements of DID to ensure an over-reliance is not placed on programmatic activities to compensate for weaknesses on plant design.
Echelon 2: Rapidly detect, control and extinguish promptly those fires that do occur thereby limiting fire damage	
▪ Detection system ▪ Automatic fire suppression ▪ Portable fire extinguishers provided for the area ▪ Hose stations and hydrants provided for the area ▪ Fire Pre-Fire Plan	Automatic suppression and detection may or may not exist in the Fire Area of concern. The issue to be considered during the FRE is whether installed suppression and or detection is required for DID or whether suppression/detection needs to be strengthened to offset a weakness in another echelon thereby providing a reasonable balance. Considerations include: ▪ If a Fire Area contains both suppression and detection and fire fighting activities would be challenging, both detection and suppression may be required ▪ If a Fire Area contains both suppression and detection and fire fighting activities would not be challenging, require detection and manual fire fighting (consider enhancing the pre-plans) ▪ If a Fire Area contains detection and a recovery action is required, the detection system may be required.

Table 5-2 - Considerations for Defense-in-Depth Determination

Method of Providing DID	Considerations
	▪ If a Fire Area contains neither suppression nor detection and a recovery action is required, consider adding detection or suppression. The fire scenarios involved in the FRE quantitative calculation should be reviewed to determine the types of fires and reliance on suppression should be evaluated in the area to best determine options for this element of DID.
Echelon 3: Provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed	
▪ Walls, floors ceilings and structural elements are rated or have been evaluated as adequate for the hazard. ▪ Penetrations in the Fire Area barrier are rated or have been evaluated as adequate for the hazard. ▪ Supplemental barriers (e.g., ERFBS, cable tray covers, combustible liquid dikes/drains, etc.) ▪ Fire rated cable ▪ Reactor coolant pump oil collection system (as applicable) ▪ Guidance provided to operations personnel detailing the required success path(s) including recovery actions to achieve nuclear safety performance criteria.	If fires occur and they are not rapidly detected and promptly extinguished, the third echelon of DID would be relied upon. The issue to be considered during the FRE is whether existing separation is adequate or whether additional measures (e.g., supplemental barriers, fire rated cable, or recovery actions) are required offset a weakness in another echelon thereby providing a reasonable balance. Considerations include: ▪ If the VFDR is never affected in the same fire scenario, internal Fire Area separation may be adequate and no additional reliance on recovery actions is necessary. ▪ If the VFDR is affected in the same fire scenario, internal Fire Area separation may not be adequate and reliance on a recovery action may be necessary. ▪ If the consequence associated with the VFDRs is high regardless of whether it is in the same scenario, a recovery action and / or reliance on supplemental barriers should be considered. ▪ There are known modeling differences between a Fire PRA and nuclear safety capability assessment due to different success criteria, end states, etc. Although a VFDR may be associated with a function that is not considered a significant contribution to CDF, the VFDR may be considered important enough to the NSCA to retain as a recovery action. The fire scenarios involved in the FRE quantitative calculation should be reviewed to determine the fires evaluated and the consequence in the area to best determine options for this element of DID.

Defense-in-Depth – Recovery Action Considerations

Reliance on Recovery Actions in lieu of protection is considered part of the third echelon of DID. Per NFPA 805, recovery actions are defined as: "Activities to achieve the nuclear safety performance criteria that take place outside of the main control room or outside of the primary control(s) station for the equipment being operated, including the replacement or modification of components."

If the VFDR is characterized as a 'Separation Issue', and the change in risk (ΔCDF and ΔLERF) is acceptable, a recovery action can be considered as a means to provide an adequate level of DID. Guidance on the need to establish/rely upon a recovery action is provided in Table 5-2. The 'additional risk presented by the use of the recovery action', if relied upon for DID, would be characterized as the calculated change in risk of the 'Separation Issue'.

Safety Margin Assessment

A review of the impact of the change on safety margin was performed. An acceptable set of guidelines for making that assessment are summarized below. Other equivalent acceptance guidelines may also be used.

- Codes and standards or their alternatives accepted for use by the NRC are met, and
- Safety analysis acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses) are met, or provides sufficient margin to account for analysis and data uncertainty.

The requirements related to safety margins for the change analysis is described for each of the specific analysis types used in support of the FRE. These analyses can be grouped into two categories. These categories are:

- Fire Modeling
- Plant System Performance

The following guidance on these topics is provided. Additional information is contained in NEI 04-02 Section 5.3.5.3.

Fire Modeling

For fire modeling used in support of the FRE (i.e., as part of the Fire PRA), the results were documented as part of the qualitative safety margin review.

Plant System Performance

This review documented that the Safety Margin inherent in the analyses for the plant design basis events was preserved in the analysis for the fire event and satisfied the requirements of this section.