Ameren MISSOURI

Callaway Plant

November 4, 2010

ULNRC-05738

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

10 CFR 50.90

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
UNION ELECTRIC CO.
APPLICATION FOR AMENDMENT TO
FACILITY OPERATING LICENSE NPF-30
COMPLETION TIME EXTENSIONS FOR TS 3.3.2
ENGINEERED SAFETY FEATURE ACTUATION SYSTEM (ESFAS)
INSTRUMENTATION FUNCTIONS
TAC NO. ME2822 (LDCN 09-0039)

References: 1. AmerenUE letter ULNRC-05665 dated November 25, 2009
2. AmerenUE letter ULNRC-05694 dated April 22, 2010
3. AmerenUE letter ULNRC-05704 dated May 14, 2010
4. AmerenUE letter ULNRC-05724 dated August 24, 2010
5. AmerenUE letter ULNRC-05731 dated September 29, 2010

AmerenUE submitted a license amendment request via Reference 1 that proposed changes to Technical Specification (TS) 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," as contained in Facility Operating License Number NPF-30 for the Callaway Plant. AmerenUE responded to NRC requests for additional information (RAIs) in support of that amendment application via References 2 and 3. Those sets of RAIs dealt with the supporting probabilistic risk assessment (PRA) bases for the amendment request.

Reference 4 was a licensee-initiated submittal that noted there were TS markup issues raised by the issuance of Callaway License Amendment 196 several months after Reference 1 was submitted. Reference 5 responded to RAIs tied to the TS markups submitted in Reference 4.

Two additional electronic RAIs were received on October 25, 2010, that deal with the external event risk metrics for fires reported in Reference 1. Attachment 1 provides the responses to those RAIs. New information is provided on Conditional Core Damage Probabilities (CCDPs) starting on page 6 of Attachment 1, and revised risk metrics are provided in Table 2 of Attachment 1 (based on the revised fire quantification documented in Attachment 2).

The conclusions of the licensing evaluations submitted in Reference 1 (i.e., the no significant hazard consideration (NSHC) evaluation and the environmental consideration (EC) evaluation in Sections 5.1 and 6.0 of Attachment 1 to Reference 1, respectively) remain valid and unchanged.

Similar to the original amendment request, there are no commitments contained in this letter. In addition, with regard to the requested license amendment, AmerenUE continues to request that the amendment be made effective upon NRC issuance, to be implemented within 90 days from the date of issuance.

In accordance with 10 CFR 50.91, a copy of this letter is being provided to the designated Missouri State official. If you have any questions on this amendment application, please contact me at (573) 676-8719 or Mr. Tom Elwood at (314) 225-1905.

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

Very truly yours,

Executed on: 11/4/2010

Scott M

Scott Maglio
Regulatory Affairs Manager

GGY/nls

Attachments: 1 – RAI Responses
2 – Internal Fire Quantification

cc:

U.S. Nuclear Regulatory Commission (Original and 1 copy)
Attn: Document Control Desk
Washington, DC 20555-0001

Mr. Elmo E. Collins, Jr.
Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
612 E. Lamar Blvd., Suite 400
Arlington, TX 76011-4125

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
Steedman, MO 65077

Mr. Mohan C. Thadani (2 copies)
Senior Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8G14
Washington, DC 20555-2738

Mr. James Polickoski
Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8B1A
Washington, DC 20555-2738

Index and send hardcopy to QA File A160.0761

Hardcopy:

Certrec Corporation
4200 South Hulen, Suite 422
Fort Worth, TX 76109
(Certrec receives ALL attachments as long as they are non-safeguards and may be publicly disclosed).

Electronic distribution for the following can be made via Tech Spec ULNRC Distribution:

A. C. Heflin
F. M. Diya
L. S. Sandbothe
C. O. Reasoner III
S. A. Maglio
S. L. Gallagher
T. L. Woodward (NSRB)
T. B. Elwood
G. G. Yates
Ms. Diane M. Hooper (WCNOC)
Mr. Tim Hope (Luminant Power)
Mr. Ron Barnes (APS)
Mr. Tom Baldwin (PG&E)
Mr. Wayne Harrison (STPNOC)
Ms. Linda Conklin (SCE)
Mr. John O'Neill (Pillsbury, Winthrop, Shaw, Pittman LLP)
Missouri Public Service Commission
Mr. Dru Buntin (DNR)

ATTACHMENT 1

RAI RESPONSES

REQUEST FOR ADDITIONAL INFORMATION
CALLAWAY PLANT,
UNION ELECTRIC COMPANY,
LICENSE AMENDMENT SUPPLEMENT (LCDN 09-0039)
FOR COMPLETION TIME EXTENSIONS FOR TS 3.3.2,
ENGINEERED SAFETY FEATURE ACTUATION SYSTEM (ESFAS)
INSTRUMENTATION FUNCTIONS
TAC NUMBER ME2822

The NRC staff requests additional information to complete its review of the license amendment request for revision of Technical Specification (TS) 3.3.2, "Engineered Safety Feature System (ESFAS) Instrumentation."

By letter dated November 25, 2009 (ML093290318) and supplemented on August 24, 2010 (ML102371010) and September 29, 2010 (ML102730351), Union Electric Company (licensee) proposed changes to TS 3.3.2 function 6.c, "Automatic Actuation Logic and Actuation Relays (BOP ESFAS)," and related Condition Q; function 6.g, "Trip of all Main Feedwater Pumps," and related Condition J; and function 6.h, "Auxiliary Feedwater Pump Suction Transfer on Suction Pressure – Low," and related Condition O. In section 4.1.2 of Attachment 1 in the licensee's original November 2009 submittal, the licensee provided an internal fire risk evaluation in support of the technical evaluation for this proposed amendment.

Following NRC staff review of Attachment 1, the NRC staff has two additional questions:

Section 4.1.2 of Attachment 1 describes how the risk from internal fires is calculated to account for the proposed 24-hour Completion Time (CT) for a single Balance of Plant (BOP) ESFAS logic channel train. In this calculation as described, the initiating event frequency for each fire area is multiplied by a probability factor. This probability factor is the difference in Auxiliary Feedwater (AFW) system unavailability for the case where one Auxiliary Feedwater Actuation Signal (AFAS) train is unavailable and the case where no components in the AFW or actuation system are unavailable. The staff assessment agrees that this method of calculating the increase in core damage frequency (CDF) would be a conservative estimate if there is no fire damage to any AFW or supporting system component. However, this implicit assumption of no fire damage is not addressed in the submittal. Instead, a sensitivity study is provided which identifies a doubling of the calculated CDF when it is assumed that both motor-driven AFW pumps are unavailable, and only the turbine-driven AFW pump is free from fire damage. In addition, this submittal does not validate this assumption of the turbine-driven AFW pump remaining free from fire damage.

In addition, the staff notes on page 26 of 41 of Attachment 1 that the probability $P_{AFWAFAS1}$ is used in the calculation of the ΔCCDP. The probability value of 4.862E-04 is applied to $P_{AFWAFAS1}$ on page 26, but this value is actually the value for $P_{AFWAFAS4}$ on page 28 of 41. $P_{AFWAFAS1}$ is identified as having a value of 4.909E-04 on page 29 of 41.

Therefore, the NRC staff has the following two additional questions:

Question (1):

Identify which analysis areas have fire scenarios which can cause damage to one or more AFW trains and/or their supporting systems. Then, either provide a more rigorous calculation which accounts for this fire damage, or validate the assumption in the sensitivity study that the turbine-driven AFW pump is not also impacted by the same fire scenario.

Response:

Section 4.1.2 and Attachment 7 of Reference 1 (ULNRC-05665 dated 11-25-09) are replaced with the following text and the results provided in Attachment 2 to this letter.

4.1.2 Internal Fires

The following fire risk evaluation is generally based on the data and methods used in the Callaway Plant Individual Plant Examination of External Events (IPEEE). The IPEEE fire analysis used the EPRI Fire Induced Vulnerability Evaluation (FIVE) method. The IPEEE was submitted to the NRC in June of 1995. The NRC SER on the Callaway IPEEE submittal was issued in September 1999.

Fire Areas of Interest

Attachment 2 is a comprehensive list of all of the fire areas identified in IPEEE Table 4.3.2-1 (except for those areas that obviously do not affect core damage, e.g., the Fuel Building). The column titled "Screen Basis" provides 9 reasons (including the control room fire discussion below) for screening a fire area from further evaluation. These reasons are explained below:

- CCDP = 1.0: The fire area conditional core damage probability (CCDP) was evaluated to be 1.0 in the original fire analysis. Therefore, there is no change in risk due to the BOP ESFAS CT extension.
- No Appendix R or PRA equipment: The fire area has no equipment that is damaged that is credited in the deterministic or PRA fire analyses. Therefore, there is no change in risk due to the BOP ESFAS CT extension.
- Low frequency: The fire area fire frequency is low (below 1E-03 yr^{-1}) and was excluded as was done for the ESW CT extension project. (See LA186, Reference 7 of Attachment 1 to ULNRC-05665.)
- CCDP very low, mitigation not significantly impacted: The fire area original CCDP was very low (approximately 1E-07) such that, when combined with the fire area fire frequency and any impact due to the BOP ESFAS CT extension, the risk impact is negligible (i.e., the difference in AFW unavailability is approximately 1.3E-04, determined in the ULNRC-05665 flood evaluation, and

when considered in combination with other mitigation unavailability such as feed and bleed, the impact is negligible).

- Reactor trip only, mitigation not impacted: The only impact due to a fire in the fire area is a reactor trip. No mitigation is impacted by the fire. Any impact due to the BOP ESFAS CT extension is negligible (i.e., the difference in AFW unavailability is approximately 1.3E-04, determined in the ULNRC-05665 flood evaluation, and when considered in combination with other mitigation unavailability such as feed and bleed, the impact is negligible).
- Thermo-lag barriers credited: The fire area was credited with thermo-lag barriers such that the fire did not cause any damage to mitigation equipment. Any impact due to the BOP ESFAS CT extension is negligible.
- LOOP delta CCDP = 0.0: A fire in the fire area results in a LOOP (or near LOOP) with no other mitigation equipment impacted. A sensitivity study was performed to show that there is essentially no risk increase for a LOOP event during the BOP ESFAS CT extension.
- A fire in the Control Room (fire area C-27) was analyzed separately in the IPEEE with the results presented in IPEEE Section 4.3.6. Recovery of a fire in the control room is dominated by human actions, including manual actions to initiate many functions. Automatic actuation signals are not specifically credited in the analysis. A train of BOP ESFAS out-of-service (OOS) does not impact the ability of the operators to manually actuate AFW from either the control room or the auxiliary shutdown panel (ASP). Thus, there is no risk increase for a fire in the Control Room with respect to the BOP ESFAS CT extension.
- Fire freq = 0: It was determined in the IPEEE that the fire frequency for the fire area was 0. Thus, there is no risk increase for a LOOP event during the BOP ESFAS CT extension.

There are 25 non-screened fire areas that require further evaluation.

The designators of the areas for evaluation are in **bold** text in the column titled "Fire Compartment" in Attachment 2. This evaluation addressed those fire areas identified in **bold** text in Attachment 2.

Fire Frequencies

Attachment 2 lists the fire frequency for each fire area. These values were obtained from the IPEEE. The fire frequencies used in the IPEEE were based upon the EPRI Fire Events Database (NSAC-178L). As was done in the IPEEE, a fire in a given fire area is assumed to fail all PRA-credited equipment in the fire area, as well as fail equipment associated with cable in the fire area, unless the fire area was fire modeled in detail. This evaluation used the fire frequencies listed in Attachment 2, except for those fire areas that were fire modeled. This is discussed below.

Fire Modeled Scenarios

Fire areas A-1A, A-16, and A-27 were fire modeled in the IPEEE due to their high fire frequencies and their potentially high CCDPs.

IPEEE Table 4.3.3.4-5 presents the fire modeling results for fire area A-1A. Six fire scenarios were developed for this fire area. Each scenario is discussed below:

Scenario 1: Has a low fire frequency (approximately 1E-05 yr^{-1}) and only non-safety related cable is impacted. This scenario was neglected.

Scenario 2: CCDP = 0 since no target damage is possible. This scenario was neglected.

Scenario 3: Only non-safety cable is impacted. This scenario was neglected.

Scenario 4: CCDP = 0 since no damage from a hot gas layer (HGL) to any targets. This scenario was neglected.

Scenario 5: Fire frequency of 3.93E-04 yr^{-1}, multiplied by 0.1 to credit non-exposure to transients. So, the fire modeled fire frequency is:

$f_{A\text{-}1A/5} = (3.93E\text{-}04) * 0.1 = 3.93E\text{-}05\ yr^{-1}$

Scenario 6: Fire frequency of 3.93E-04 yr^{-1}, multiplied by 0.1 to credit non-exposure to transients and 0.07 to credit small area of impact for a transient combustible fire. So, the fire modeled fire frequency is:

$f_{A\text{-}1A/6} = (3.93E\text{-}04) * 0.1 * 0.07 = 2.75E\text{-}06\ yr^{-1}$

IPEEE Table 4.3.3.4-8 presents the fire modeling results for fire area A-16. Twelve fire scenarios were developed for this fire area. Each scenario is discussed below:

Scenario 1: This scenario is a failure of a CCW pump due to a fire. Since there are four CCW pumps, this applies to Scenarios 1 through 4. The fire modeled fire frequency is:

$f_{A\text{-}16/1} = 2.64E\text{-}04\ yr^{-1}$

Scenario 5: CCDP = 0 since no damage from a HGL to any targets. This scenario was neglected.

Scenario 6: CCDP = 0 since no damage from a HGL to any targets. This scenario was neglected.

Scenario 7: CCDP = 0 since no damage from a HGL to any targets. This scenario was neglected.

Scenario 8: CCDP = 0 since no damage from a HGL to any targets. This scenario was neglected.

Scenario 9: Fire frequency of 3.26E-05 yr^{-1}, multiplied by 0.05 to credit probability of suppression prior to damage. This results in a frequency of 1.63E-06 yr^{-1} which is very low. In addition, the IPEEE CCDP is low (1E-05). Thus, this scenario was neglected.

Scenario 10: Fire frequency of 3.93E-04 yr^{-1}, multiplied by 0.1 to credit non-exposure to transients and 0.05 to credit small area of impact for a transient combustible fire. This applies to Scenarios 10 through 12. So, fire modeled fire frequency is:

$$f_{A\text{-}16/10} = (3.93E\text{-}04) * 0.1 * 0.05 = 1.97E\text{-}06\ yr^{-1}$$

IPEEE Table 4.3.3.4-10 presents the fire modeling results for fire area A-27. Two fire scenarios were developed for this fire area. Each scenario is discussed below:

Scenario 1: Fire frequency of 1.67E-03 yr^{-1}, multiplied by 0.005 to credit probability of suppression prior to damage and 0.333 to credit manual recovery of the Halon system. The fire modeled fire frequency is:

$$f_{A\text{-}27/1} = (1.67E\text{-}03) * 0.005 * 0.333 = 2.78E\text{-}06\ yr^{-1}$$

Scenario 2: CCDP = 1.0: The scenario conditional core damage probability (CCDP) was evaluated to be 1.0 in the original fire analysis. Therefore, there can be no change in risk due to the BOP ESFAS CT extension. This scenario was neglected.

Probability of Non-suppression

IPEEE Table 4.3.3.2-2 lists the probability of non-suppression of the fire [column heading P(ns)] for the fire areas. The IPEEE references the EPRI FIVE document (EPRI TR-100370) for the unavailability of fire suppression equipment. The unavailability of pre-action sprinkler systems and Halon systems is 0.05. The unavailability of wet pipe sprinkler systems is 0.02. This evaluation credited the probability of non-suppression for fire areas A-17, A-18, C-6, C-9, C-10, D-1, and D-2, as well as what was credited in the fire modeled scenarios above. Attachment 2 lists the probability of non-suppression, taken from IPEEE Table 4.3.3.2-2, in the column labeled "P(NS)".

Conditional Core Damage Probability (CCDP)

- **A-1A, A-4, A-16, A-17, A-20, A-22, A-27, CS, D-1, D-2, ES-1, ES-2, UHS-1, UHS-2**

For many evaluated fire areas, it was conservatively assumed that the increase in unavailability of the AFW system, due to an AFAS train OOS, represents the potential increase in risk for these fire areas. This is conservative because other means for decay heat removal, such as re-establishing main feedwater (MFW) or initiating primary feed and bleed (F&B) cooling, would be available and are unaffected by an AFAS train OOS. Crediting these other means would lower the ΔCCDP for these fire areas.

Fire areas A-4, A-20, CS, D-1, D-2, ES-1, ES-2, UHS-1, and UHS-2 were identified in the ESW CT extension project (see LA186, Reference 7 of Attachment 1 to ULNRC-05665) as having only ECCS pumps failed due to a fire (A-4), or having essentially the baseline CCDP (i.e., no failed fire-PRA-important equipment) (A-20, CS, D-1, D-2, UHS-1, UHS-2), or having normal service water (system EA) available to be used to continue to provide cooling flow to the protected train (ES-1, ES-2). For these areas, the AFW system is unaffected, such that all three trains of AFW are potentially available.

Based upon a review of the preliminary list of failed components per fire area provided for the NFPA-805 fire PRA, the AFW system is unaffected such that all three trains of AFW are potentially available for fire areas A-17 and A-22.

The fire-modeled fire areas target specific cables and/or components instead of assuming a whole room burnup. A review of the IPEEE determined that, for those fire-modeled fire area scenarios identified above (A-1A scenarios 5 and 6, A-16 scenarios 1 through 4 and 10 through 12, A-27 scenario 1), the AFW system is unaffected such that all three trains of AFW are potentially available.

Therefore, for these fire areas the change in CCDP is the increase in the unavailability between the "baseline" AFW results and the AFW results with an AFAS train OOS event. Thus, from the ULNRC-05665 flood evaluation (Attachment 1, page 29):

$$\Delta CCDP_{AFWAFAS} = P_{AFWAFAS1} - P_{AFWORIG}$$

$$= (4.909E\text{-}04) - (3.616E\text{-}04) = 1.293E\text{-}04$$

- **A-13, A-14, A-15, A-18, A-29, A-30, C-6**

A fire in these areas fails either one motor-driven AFW pump (MDAFP), the turbine-driven AFW pump (TDAFP), or one MDAFP and the TDAFP. However, MFW and primary F&B cooling are available for decay heat removal after a fire in these areas.

Therefore, for these fire areas the change in CCDP was estimated by the CCDP for a T(3) event (reactor trip with MFW potentially available, and F&B potentially available) and failing both a MDAFP and the TDAFP. The results were conservative for fire areas in which only one or the other pump fails. A sensitivity was performed wherein the conditional probability of a T(3) event (reactor trip with MFW available) was determined coincident with AL-MDP-FR-MDAFPA set to fail (i.e., probability of AL-MDP-FR-MDAFPA = 1.0), with AL-TDP-FS-TDAFP set to fail (i.e., probability of AL-TDP-FS-TDAFP = 1.0), and the probability of AL-ICC-AF-AFAS4 was kept failed (i.e., probability of AL-ICC-AF-AFAS4 = 1.0). The CCDP value, shown below from that sensitivity calculation, establishes the CCDP for a T(3) event with a MDAFP failed, the TDAFP failed (caused by a fire in A-13, A-14, A-15, A-18, A-29, A-30, or C-6), and a train of AFAS OOS.

$$CCDP_{AFWT3\text{-}AF4} = 4.700E\text{-}04$$

A sensitivity was also performed wherein the conditional probability of a T(3) event (reactor trip with MFW available) was determined coincident with AL-MDP-FR-MDAFPA set to fail (i.e., probability of AL-MDP-FR-MDAFPA = 1.0), with AL-TDP-FS-TDAFP set to fail (i.e., probability of AL-TDP-FS-TDAFP = 1.0), and with nominal failure probabilities for AFAS1 and AFAS4. The CCDP value, shown below from that sensitivity calculation, establishes the "baseline" CCDP for a T(3) event with a MDAFP failed, the TDAFP failed (caused by a fire in A-13, A-14, A-15, A-18, A-29, A-30, or C-6), and with all AFAS available.

$$CCDP_{AFWT3} = 2.236E\text{-}04$$

The change in CCDP for these fire areas is the change in CCDP between the "baseline" event and the event coincident with an AFAS train OOS event. Thus,

$$\Delta CCDP_{AFWT3\text{-}AF4} = (4.700E\text{-}04) - (2.236E\text{-}04) = 2.464E\text{-}04$$

- **C-9, C-10, C-15, C-16**

A fire in these areas fails either one MDAFP, the TDAFP, or one MDAFP and the TDAFP. In addition, a fire in these areas causes significant damage to one train's switchgear, essentially rendering that train's safety-related equipment inoperable. A failure of one train's equipment is similar to the loss of a DC bus special initiator in the Callaway PRA. The loss of DC bus NK01 (TDCNK01) also fails MFW, and thus yields conservative results as compared to the loss of DC bus NK04.

Therefore, for these fire areas the change in CCDP can be estimated by the CCDP for a TDCNK01 event (which also fails a MDAFP) and failing the TDAFP. The results are conservative for fire areas in which only one or the other pump fails. In addition, the IPEEE fire analyses did not credit the non-safety normal charging pump (NCP). Thus,

this pump is assumed to be failed here as well.

First, a sensitivity was performed wherein the conditional probability of a TDCNK01 event was determined. The CCDP value, shown below from that sensitivity calculation, is consistent with the CCDP from the Fourth PRA Update of 1.122E-04 (the Fourth PRA Update was used to perform the internal events quantification for this license amendment).

$$CCDP_{AFWTDNK1} = 1.147E\text{-}04$$

An additional sensitivity was then performed wherein the conditional probability of a TDCNK01 event was determined coincident with AL-TDP-FS-TDAFP set to fail (i.e., probability of AL-TDP-FS-TDAFP = 1.0), BG-MDP-FR-NCP set to fail (i.e., probability of BG-MDP-FR-NCP = 1.0), and with nominal failure probabilities for AFAS1 and AFAS4. The CCDP value, shown below from that sensitivity calculation, establishes the "baseline" CCDP for a TDCNK01 event with the TDAFP failed, the NCP failed (caused by a fire in C-9, C-10, C-15, or C-16), and with all AFAS available. The CCDP is consistent with the CCDP values shown in IPEEE Tables 4.3.3.3-3 and 4.3.3.3-4 for fire areas C-9 and
C-10, respectively. It is conservative with respect to the CCDP values shown in IPEEE Table 4.3.3.2-2 for fire areas C-15 and C-16.

$$CCDP_{AFWC9} = 5.778E\text{-}03$$

A final sensitivity was then performed wherein the conditional probability of a TDCNK01 event was determined coincident with AL-TDP-FS-TDAFP set to fail (i.e., probability of AL-TDP-FS-TDAFP = 1.0), BG-MDP-FR-NCP set to fail (i.e., probability of BG-MDP-FR-NCP = 1.0), and the probability of AL-ICC-AF-AFAS4 was kept failed (i.e., probability of AL-ICC-AF-AFAS4 = 1.0). The CCDP value, shown below from that sensitivity calculation, establishes the CCDP for a TDCNK01 event (with consequential failure of a MDAFP), the TDAFP failed, the NCP failed (caused by a fire in C-9, C-10, C-15, or C-16), and a train of AFAS OOS.

$$CCDP_{AFWC9\text{-}AF4} = 8.951E\text{-}03$$

The change in CCDP for these fire areas is the change in CCDP between the "baseline" event and the event coincident with an AFAS train OOS event. Thus,

$$\Delta CCDP_{AFWC9\text{-}AF4} = (8.951E\text{-}03) - (5.778E\text{-}03) = 3.173E\text{-}03$$

The above three ΔCCDPs were applied to their respective fire areas as shown in the Attachment 2 column titled "Fire CDF Due to an AFAS Train OOS." Note 1 of Attachment 2 delineates the fire areas to which these ΔCCDPs apply.

Increase in CDF Due to Fires

The ICCDP reported below is per Condition entry with the new 24-hour CT and the ΔCDF is based on entering the new 24-hour CT once a year. From Attachment 2:

CDF_{fires} = **1.65E-05 yr^{-1}**

$ICCDP_{fires}$ = (1.65E-05) * (24 / 8760) = **4.52E-08**

ΔCDF_{fires} = 1/yr * $ICCDP_{fires}$ = (1/yr) * (1.65E-05) * (24 / 8760) = **4.52E-08 yr^{-1}**

Using the same approach used for internal events in ULNRC-05665, with ICLERP reported per Condition entry with the new 24-hour CT and ΔLERF based on entering the new 24-hour CT once a year:

ICLERP = **9.55E-11**

ΔLERF = **9.55E-11 yr^{-1}**

Question (2):

Clarify which probabilities are intended for the fire risk evaluation per the discussion above, and provide corrected risk metrics, if necessary.

Response:

The value for $P_{AFWAFAS1}$ on the bottom of page 26 of Attachment 1 to Reference 1 (ULNRC-05665 dated 11-25-09) should be 4.909E-04. This error is corrected in the response to Question 1 above (Attachment 1, page 6).

Impact on Combined Risk Metric Results

Table 1 provides the risk metric results submitted in Reference 1 for this amendment request. Those results are associated with the failure of SA036E, the separation group IV BOP ESFAS actuation logic cabinet. Specifically, the yearly risk contribution from a single TS 3.3.2 Condition Q 24-hour entry per year (ICCDP and ICLERP values apply to each Condition entry) is reflected below:

Table 1					
Risk Metric	Acceptance Criteria	Callaway Results			
		Internal	Flood	Fire	Total
ΔCDF	<1E-06 yr^{-1} very small RG 1.174	7.23E-09 yr^{-1}	3.21E-09 yr^{-1}	8.77E-09 yr^{-1}	1.92E-08 yr^{-1}
ΔLERF	<1E-07 yr^{-1} very small RG 1.174	2.58E-10 yr^{-1}	6.73E-12 yr^{-1}	1.84E-11 yr^{-1}	2.83E-10 yr^{-1}
ICCDP	<5E-07 RG 1.177	7.23E-09	3.21E-09	8.77E-09	1.92E-08
ICLERP	<5E-08 RG 1.177	2.58E-10	6.73E-12	1.84E-11	2.83E-10

In Table 2 below, the fire risk results have been updated to reflect the responses to questions 1 and 2 above.

Table 2					
Risk Metric	Acceptance Criteria	Callaway Results			
		Internal	Flood	Fire	Total
ΔCDF	<1E-06 yr^{-1} very small RG 1.174	7.23E-09 yr^{-1}	3.21E-09 yr^{-1}	4.55E-08 yr^{-1}	5.59E-08 yr^{-1}
ΔLERF	<1E-07 yr^{-1} very small RG 1.174	2.58E-10 yr^{-1}	6.73E-12 yr^{-1}	9.55E-11 yr^{-1}	3.60E-10 yr^{-1}
ICCDP	<5E-07 RG 1.177	7.23E-09	3.21E-09	4.55E-08	5.59E-08
ICLERP	<5E-08 RG 1.177	2.58E-10	6.73E-12	9.55E-11	3.60E-10

Conclusion

The proposed TS changes satisfy the Regulatory Guide 1.174 and Regulatory Guide 1.177 acceptance criteria for very small risk changes.

ATTACHMENT 2

INTERNAL FIRE QUANTIFICATION

Fire Compartment	Description	Screen Basis	Fire Frequency (yr^{-1})	P(NS)	Fire Modeled Fire Frequency (yr^{-1})	Fire CDF Due to an AFAS Train OOS (Note 1) (yr^{-1})
A-1A	Aux. 1974' CVCS, AFW		2.10E-03		3.93E-5/2.75E-6	5.44E-09
A-1B	1988' Pipe Chase Areas	CCDP = 1.0	3.90E-04			
A-1C	Vestibule near area A-1B	No App. R or PRA equipment				
A-1D	NCP Room	low frequency	8.50E-04			
A-2	ECCS Train A Pump Rooms	CCDP very low, mitigation not significantly impacted	2.60E-03			
A-3	Boric Acid Tank Rooms	CCDP very low, mitigation not significantly impacted	1.40E-03			
A-4	ECCS Train B Pump Rooms		2.80E-03			3.62E-07
A-5	Stairway	Reactor trip only, mitigation not impacted	3.90E-04			
A-6	Stairway	Thermo-lag barriers credited	3.90E-04			
A-7	BIT Room	CCDP very low, mitigation not significantly impacted	1.00E-03			
A-8	CVCS Components	low frequency	8.00E-04			
A-9	RHR B HX Room	CCDP very low, mitigation not significantly impacted	3.90E-04			
A-10	RHR A HX Room	CCDP very low, mitigation not significantly impacted	3.90E-04			
A-11	Electrical Chase	low frequency	3.90E-04			
A-12	Electrical Chase	low frequency	3.90E-04			
A-13	MDAFP B		9.50E-04			2.34E-07
A-14	MDAFP A		9.50E-04			2.34E-07
A-15	TDAFP		1.10E-03			2.71E-07

Fire Compartment	Description	Screen Basis	Fire Frequency (yr^{-1})	P(NS)	Fire Modeled Fire Frequency (yr^{-1})	Fire CDF Due to an AFAS Train OOS (Note 1) (yr^{-1})
A-16[Note 2]	CCW Area		1.70E-03		2.64E-4/1.97E-6	1.37E-07
A-17	B Electrical Pen Room		1.90E-03	0.05		1.23E-08
A-18	A Electrical Pen Room		1.20E-03	0.05		1.48E-08
A-19	CB Supply A/C Unit	low frequency	3.90E-04			
A-20	CCW Surge Tank Area		2.30E-03			2.97E-07
A-21	Control Room A/C B	low frequency	9.80E-04			
A-22	Control Room A/C A		1.40E-03			1.81E-07
A-23	MSIV/MFIV Area	low frequency	3.90E-04			
A-24	North Piping Pen Room	low frequency	5.10E-04			
A-25	South Piping Pen Room	low frequency	5.10E-04			
A-26	Chem Storage Area	low frequency	3.90E-04			
A-27	Reactor Trip Switchger Room		2.90E-03		2.78E-06	3.59E-10
A-28A	Aux Shutdown Panel Room A	low frequency	5.60E-04			
A-28B	Aux Shutdown Panel Room B	low frequency	5.60E-04			
A-29	AFW Valves and Pipe Chase		7.20E-04			1.77E-07
A-30	AFW Valves and Pipe Chase		7.20E-04			1.77E-07
C-1	ESW Pipe Space	low frequency	3.90E-04			

Fire Compartment	Description	Screen Basis	Fire Frequency (yr^{-1})	P(NS)	Fire Modeled Fire Frequency (yr^{-1})	Fire CDF Due to an AFAS Train OOS (Note 1) (yr^{-1})
C-2	North Electrical Chase	Reactor trip only, mitigation not impacted	3.90E-04			
C-3	South Electrical Chase	Reactor trip only, mitigation not impacted	3.90E-04			
C-5	HP Access	LOOP delta CCDP = 0.0	3.90E-04			
C-6	HP Access		5.00E-03	0.02		2.46E-08
C-7	North Electrical Chase	low frequency	3.90E-04			
C-8	South Electrical Chase	Reactor trip only, mitigation not impacted	5.60E-04			
C-9	ESF Switchgear Room 1		2.90E-03	0.05		4.60E-07
C-10	ESF Switchgear Room 2		3.20E-03	0.05		5.08E-07
C-11	North Electrical Chase	low frequency	3.90E-04			
C-12	South Electrical Chase	low frequency	3.90E-04			
C-13	Access Control A/C	CCDP very low, mitigation not significantly impacted	1.20E-03			
C-14	Access Control A/C	CCDP very low, mitigation not significantly impacted	1.30E-03			
C-15	Battery and Switchboard Rooms B		1.30E-03			4.12E-06
C-16	Battery and Switchboard Rooms A		2.60E-03			8.25E-06
C-17	South Electrical Chase	low frequency	3.90E-04			

Fire Compartment	Description	Screen Basis	Fire Frequency (yr^{-1})	P(NS)	Fire Modeled Fire Frequency (yr^{-1})	Fire CDF Due to an AFAS Train OOS (Note 1) (yr^{-1})
C-18	North Electrical Chase	low frequency	3.90E-04			
C-19	Column C-3 Electrical Chase	CCDP very low, mitigation not significantly impacted	3.90E-04			
C-20	Column C-6 Electrical Chase	CCDP very low, mitigation not significantly impacted	3.90E-04			
C-21	Lower Cable Spreading Rm	low frequency	4.80E-04			
C-22	Upper Cable Spreading Rm	low frequency	3.90E-04			
C-23	South Electrical Chase	low frequency	3.90E-04			
C-24	North Electrical Chase	low frequency	3.90E-04			
C-25	Column C-6 Electrical Chase	CCDP very low, mitigation not significantly impacted	3.90E-04			
C-26	Column C-3 Electrical Chase	CCDP very low, mitigation not significantly impacted	3.90E-04			
C-27	Control Room	See Attachment 1.				
C-28	Service Area near CR	Reactor trip only, mitigation not impacted	3.90E-04			
C-29	SAS Room and Panel	Reactor trip only, mitigation not impacted	5.60E-04			
C-30	South Electrical Chase	low frequency	3.90E-04			
C-31	North Electrical Chase	low frequency	3.90E-04			
C-32	Column C-6 Electrical Chase	CCDP very low, mitigation not significantly impacted	3.90E-04			
C-33	South Electrical Chase	low frequency	3.90E-04			

Fire Compartment	Description	Screen Basis	Fire Frequency (yr^{-1})	P(NS)	Fire Modeled Fire Frequency (yr^{-1})	Fire CDF Due to an AFAS Train OOS (Note 1) (yr^{-1})
C-34	Column C-6 Electrical Chase	CCDP very low, mitigation not significantly impacted	3.90E-04			
C-35	Control Building 2016 Corridor	Reactor trip only, mitigation not impacted	3.90E-04			
C-36	Column C-6 Electrical Chase	Reactor trip only, mitigation not impacted	3.90E-04			
C-37	Column C-3 Electrical Chase	Reactor trip only, mitigation not impacted	3.90E-04			
CS	Circ and Service Water		1.00E-03			1.29E-07
D-1	B EDG		2.90E-02	0.05		1.87E-07
D-2	A EDG		2.90E-02	0.05		1.87E-07
T-1	Stairwell	Reactor trip only, mitigation not impacted	4.10E-04			
TB-1	Turbine Building	CCDP = 1.0	4.40E-02			
TB-2	Comm Corr. Stairwell	CCDP very low, mitigation not significantly impacted	4.10E-04			
TB-3	Access Area and Hot Lab	LOOP delta CCDP = 0.0	4.10E-04			
ES-1	ESW Pumphouse Train A		1.20E-03			1.55E-07
ES-2	ESW Pumphouse Train B		1.20E-03			1.55E-07
UHS-1	UHS Cooling Tower North		1.40E-03			1.81E-07
UHS-2	UHS Cooling Tower South		1.40E-03			1.81E-07

Fire Compartment	Description	Screen Basis	Fire Frequency (yr^{-1})	P(NS)	Fire Modeled Fire Frequency (yr^{-1})	Fire CDF Due to an AFAS Train OOS (Note 1) (yr^{-1})
INST	Plant Intake	Reactor trip only, mitigation not impacted	8.10E-04			
YD-1A	Manhole w/ A train cable	Fire freq = 0	0.00E+00			
YD-1B	Manhole w/ B train cable	Fire freq = 0	0.00E+00			
YD-1C	Train A emergency fuel oil tank	CCDP very low, mitigation not significantly impacted	4.20E-04			
YD-1D	Train B emergency fuel oil tank	CCDP very low, mitigation not significantly impacted	4.20E-04			
YD-1E	Various yard tanks	CCDP very low, mitigation not significantly impacted	4.20E-04			
YD-1F	XNB01	LOOP delta CCDP = 0.0	8.10E-04			
YD-1G	XNB02	LOOP delta CCDP = 0.0	8.10E-04			
SWYD	Plant Switchyard	LOOP delta CCDP = 0.0	1.10E-04			
MXTR	Main Transformers	Reactor trip only, mitigation not impacted	2.40E-03			
TBXTR	Turbine Building Transformers	Reactor trip only, mitigation not impacted	1.20E-03			
						Total **1.66E-05**

Note 1: ΔCCDP of 2.464 E-04 applied to areas A-13, A-14, A-15, A-18, A-29, A-30, and C-6 to account for a T(3) event with failure of an MDAFP, the TDAFP, and one AFAS train OOS. ΔCCDP of 3.173E-03 applied to areas C-9, C-10, C-15, and C-16 account for a TDCNK01 event with failure of the TDAFP, the NCP, and one AFAS train OOS. ΔCCDP of 1.293E-04 applied to all other areas to account for one AFAS train OOS.

Note 2: Fire area A-16 has 4 scenarios at 2.64E-04yr^{-1} and 3 scenarios at 1.97E-06yr^{-1}.