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Edwin I. Hatch Nuclear Plant – Units 1 and 2
Response to Request to Additional Information Regarding Application to Adopt
National Fire Protection Association Standard 805

Ladies and Gentlemen:

By letter dated April 4, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18096A936), Southern Nuclear Operating Company (SNC) submitted a license amendment request (LAR) for the Edwin I. Hatch Nuclear Plant (HNP), Units 1 and 2, to adopt National Fire Protection Association Standard 805 (NFPA 805), "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition (ADAMS Accession No. ML010800360), as incorporated into Title 10 of the Code of Federal Regulations, Part 50, Section 50.48(c). On March 29, 2019 the U.S. Nuclear Regulatory Commission (NRC) staff issued requests for additional information (RAIs) (ADAMS Accession No. ML19088A009) to SNC. On May 28, 2019, SNC responded to those RAIs (ADAMS Accession No. ML19151A421).

By electronic correspondence dated August 8, 2019, the NRC staff issued RAIs regarding SNC's May 28, 2019 response. The Enclosure provides the SNC response to the August 8, 2019 RAIs.

The conclusions of the No Significant Hazards Consideration and Environmental Consideration contained in the original License Amendment Request (LAR) have been reviewed and are unaffected by this RAI response.

This letter contains no NRC commitments. If you have any questions, please contact Jamie Coleman at 205.992.6611.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 7th day of October 2019.

Respectfully submitted,

C. A. Gayheart
Director, Regulatory Affairs
Southern Nuclear Operating Company

CAG/RMJ

Enclosure: SNC Response to NRC RAIs

cc: Regional Administrator, Region II
NRR Project Manager – Hatch
Senior Resident Inspector – Hatch
Director, Environmental Protection Division – State of Georgia
RType: CHA02.004

Edwin I. Hatch Nuclear Plant – Units 1 and 2
Response to Request to Additional Information Regarding Application to Adopt National Fire Protection Association Standard 805

Enclosure

SNC Response to NRC RAIs

PRA RAI 05.01 – Update of Fire PRA when Modifications and Implementation are Complete

In its letter dated May 28, 2019, SNC provided updated text for Implementation Item IMP-19 but did not include that same text in LAR Attachment S, Table S-3. The NRC staff requests that SNC update LAR Attachment S, Table S-3 to reflect the wording of the updated Implementation Item IMP-19 provided on page E4-4 of its May 28, 2019 letter.

SNC Response to PRA RAI 05.01

The updated Attachment was subsequently provided by SNC letter dated August 9, 2019.

PRA RAI 07.01 – Treatment of Sensitive Electronics Screening Approach

In its letter dated May 28, 2019, SNC explained that a screening approach was used to preclude internally inspecting each electrical cabinet to determine whether sensitive electronics exist that should be treated using a damage threshold of 3kW/m2. SNC explains that based on their function, certain cabinets were excluded from consideration such as switchgear, motor controlled centers (MCCs), and distribution cabinets, which implies that there are no sensitive electronics associated with switchgear, MCCs, and distribution cabinets; however, SNC did not state this. SNC also explains that "[f]ire risk is already bounded by the fire initiating event treatment (e.g., loss of the panel is bounded by assumed plant trip." The NRC staff interprets this statement to mean that failure of panels that lead only to a plant trip are already modeled in the fire probabilistic risk assessment (FPRA) as contributing to an initiating event, yet, the NRC staff notes that panels that lead to failures affecting plant shutdown need to be fully modeled to accurately account for their risk. In light of these observations, the NRC staff requests that SNC:

a) Clearly indicate whether cabinets screened from consideration based on their function such as switchgear, MCCs, and distribution cabinets do not house sensitive electronics. If SNC cannot conclude that these cabinets do not contain sensitive electronics, then justify screening these cabinets from consideration for damage to sensitive electronics. Otherwise adjust the aggregate analysis in response to PRA RAI 03.

b) Confirm that the panels screened because they are already modeled in the FPRA as contributing to plant trips do not also impact plant shutdown. If this conclusion cannot be reached, then justify screening these cabinets from consideration for damage to sensitive electronics. Otherwise, adjust the aggregate analysis in response to PRA RAI 03.

SNC Response to PRA RAI 07.01

a) The FPRA methodology for treatment of enclosed sensitive electronics will be updated so that electrical cabinets that contain sensitive electronics will not be screened based on the function of the electrical cabinet. Electrical cabinets that contain enclosed sensitive electronics will be treated as such in the FPRA. The results will be included in the aggregate analysis in response to PRA RAI 03. It should be noted that exposed sensitive electronics had already been identified and evaluated in accordance with NUREG/CR-6850 guidance.

b) The FPRA assumes a plant trip for postulated fire scenarios. Failure of electrical cabinets that may result in a plant trip (e.g., turbine generator control cabinets) were therefore screened given the assumed plant trip modeling. Electrical cabinets that contain credited FPRA functions that may impact plant shutdown were not screened from consideration because of the assumed plant trip.

PRA RAI 08.01 – Consideration of Violations in Determining Influencing Factors

In its letter dated May 28, 2019, SNC discussed violations that have occurred in the Cable Spreading Room (CSR), South East (SE) Corner Pump Room, East Cableway Foyer and SE Stairwell and sought to justify the transient influencing factors assigned to these areas. SNC explained that in the CSR, which was designated by a very low maintenance influencing factor, a single 1.5 foot wood two-by-four was found located between two cable trays. SNC further explained that the CSR is designated a Level A transient combustible area requiring permitting and that combustibles are not left unattended except for short periods of time up to an hour. SNC further stated that the wood was likely inadvertently left behind after completion of maintenance work. The NRC staff notes that violations, although inadvertent, can contribute to fire risk. As SNC points out, use of a very low influencing factor requires that no violations have occurred in a reasonable period. In spite of the Level A transient combustible control requirement stated above, it is not clear to the NRC staff why the discovered existence of the section of the wooden two-by-four is not a violation and would not require assigning a higher maintenance influencing factor to the CSR. Therefore, the NRC staff requests that SNC:

a) Justify why the discovery of the wooden two-by-four is not a violation that would require assigning a higher maintenance influencing factor to the CSR. If it cannot be justified that the existence of the wood in the CSR cannot lead to a higher influencing factor for the CSR, then assign a higher maintenance influencing factor to the CSR in the aggregate analysis provided in your response to PRA RAI 03.

Additionally, the disposition for the three non-CSR violations appears to imply that a certain criterion in FAQ 12-0064 "Hot Work/Transient Fire Frequency Influence Factors," (ADAMS Accession No. ML12346A488), is met, though it is not clear from SNC's RAI response whether the criterion is met. Each of the three dispositions state "Per FAQ 12-0064, a low storage rating is to be used for an area where no combustible/flammable material are stored by practice but where combustibles may be introduced subject to a permitting process." However, SNC does not directly state that this criterion is met. Also, FAQ 12-0064 indicates that when assigning a low storage or maintenance influencing factor, that either no violations have occurred or a performance monitoring program is in place demonstrating that the administrative control programs are meeting expectations and objectives. In light of these observations, the NRC staff requests that SNC:

b) Confirm that for the three fire zones (i.e., Fire Zone 2205B - SE Corner Pump Room, Fire Zone 1105 – East Cableway Foyer, and Fire Zone 2103 – SE Stairwell) where the violations cited above have occurred, no combustible/flammable material are stored by practice (though combustibles may be introduced subject to a permitting process).

c) Given that violations have occurred in Fire Zones 2250B, 1105, and 2103, confirm that a performance monitoring program is in place demonstrating that the administrative control program is meeting expectations and objectives.

d) If the criteria stipulated in part (b) and (c) above cannot be confirmed to be met then justify the assignment of a low storage and/or maintenance influencing factor for these three fire zones or use higher ratings in the aggregate analysis provided in your response to PRA RAI 03.

SNC Response to PRA RAI 08.01

a) A Medium storage influence factor per the guidance in FAQ 12-0064 will be assigned to the CSR because of the identification of the condition report related to the discovery of wood in the CSR. The results will be included in the aggregate analysis in response to PRA RAI 03.
b) In addition to the above, the following PAUs were also found to be in violation of the criteria considered for a FPRA "LOW" storage transient influencing factor per FAQ 12-0064 guidance: 2205B, 1105, and 2103. Based on this violation, the storage factor for these PAUs will be increased to Medium to account for the potential for combustible/flammable material. The results will be included in the aggregate analysis in response to PRA RAI 03.
c) The Transient Combustible Control procedure, NMP-ES-035-014, is in place to monitor the storage of combustible material, and have different restrictions based on the location and function of the area. Periodic reviews are performed based on the area to ensure that any violations are recorded and corrected per NMP-ES-035-009.
d) See part b of the RAI response above. The results of these changes will be included in the aggregated response to PRA RAI 03.

PRA RAI 15.b.01 – Change-in-Risk Calculations for Main Control Room (MCR) Abandonment Scenarios

In its letter dated May 28, 2019, SNC stated that change-in-risk calculations for MCR abandonment scenarios are performed in the same manner as other scenarios except that the assumption is made in the compliant plant model that "shutdown is being performed from the alternate shutdown panel." SNC also stated that failures that challenge this mode of safe shutdown or require a recovery action to mitigate failure that does not occur in the MCR or at a remote shutdown panel (RSP) are considered variances from deterministic requirements (VFDRs). Though the approach to identifying VFDRs for MCR abandonment scenarios is explained, SNC does not explain how the compliant plant is modeled versus how the post-transition plant is modeled. (For non-MCR abandonment scenarios, SNC states that basic events with a VFDR function are set to their nominal values, thus eliminating the VFDR by precluding the fire induced failure.)

SNC states that change-in-risk calculations for MCR abandonment scenarios are performed in the same manner as other scenarios except that:

> "The compliant case modeling sets a lower bound limit on the [conditional core damage probability] CCDP to a minimum of 7E-02. This assumed value was justified by using the CCDP of an abandonment scenario due to loss of habitability with no PRA equipment failures. In some instances, this modeling assumption was implemented due to conservatism in the modeling logic for loss of control (LOC) and transferring to the RSP for compliant model scenarios only. In doing so, this assumption has established a quantified 'floor value' for a more accurate change in risk between the compliant case and the variant

> case. This assumption is considered conservative given the human error probability (HEP) for transferring control to the RSP is approximately 7E-02. No lower bound limits were used for conditional large early release probability (CLERP) in the abandonment compliant cases."

Based on the above, the reason for conservatively limiting the compliant plant model CCDP in these scenarios to 7E-02 is not clear to the NRC staff. The cited statement appears to indicate that the modeling was performed to compensate for conservatism in the modeling logic for LOC and transferring to the RSP. The SNC response to PRA RAI 13.c shows that CCDP for fires in the MCR or CSR ranges down to 1E-02 which is significantly lower than the proposed limit of 7E-02 used in the compliant plant model. NRC staff notes that conservatism in the compliant plant case can lead to underestimation of the change in-risk.

In light of these observations, the NRC staff request that the licensee address the following:

a) For MCR abandonment scenarios explain (1) how the post-transition plant is modeled, (2) how the compliant plant is modeled, (3) how the compliant plant modeling is different from the post-transition plant modeling, and (4) how the modeling of the compliant plant has the effect of removing the VFDRs.

b) Concerning the CCDP limit of 7E-02 used in MCR abandonment scenarios:

   i. Explain and justify the limit of 7E-02 used in MCR abandonment scenarios to limit the compliant plant model CCDP. Include an explanation for the statement "*this modeling assumption was implemented due to conservatism in the modeling logic for LOC and transferring to the RSP.*"

   ii. Justify that use of the proposed CCDP limit in the compliant plant model does not lead to underestimation of the change in-risk for these scenario

SNC Response to NRC PRA RAI 15.b.01:

a)

(1) For MCR abandonment scenarios the post transition plant is modeled similarly to other PRA accident sequences. That is, fault tree logic is used to model the applicable success criteria, available functions, applicable failure modes, and required operator actions when establishing and using remote shutdown. A difference in the modeling is that the post transition plant abandonment scenarios do not include circuit failures for equipment available at a remote shutdown panel. The post transition plant PRA models the use of transfer switches at the remote shutdown panels to isolate circuit failures, and credits actions in the current remote shutdown procedures.

(2) For MCR abandonment scenarios the compliant plant is modeled similarly to the other fire area evaluations for non MCR abandonment scenarios. Each abandonment scenario in the post transition plant model is reviewed for fire induced cable impacts associated with VFDRs and the applicable component logic relationship is modified in the PRA software to represent a non-fire induced failure in the compliant plant model. As discussed above, given the MCR abandonment logic is included in the fault tree logic, the fire area evaluations are then performed similarly to those performed for other fire areas as described in SNC's response to RAI 15.

The MCR abandonment compliant plant model does include HRA challenges due to the timing associated with operators performing the necessary steps to establish functions at the remote shutdown panel. The PRA includes an assessment of the available and required time for operator actions during the fire risk evaluations.

(3) The compliant plant modeling is different from the post transition plant modeling in that local recovery actions are not required given there are no fire induced cable impacts in the compliant plant model. Otherwise, for MCR abandonment due to loss of habitability, the compliant and post transition plant modeling is similar. That is, only the functions available for remote shutdown are credited.
For MCR abandonment due to loss of control, the compliant plant model only credits the functions available for remote shutdown, because that is consistent with the fire area deterministic shutdown strategy. The post transition plant model credits available plant functions until a loss of control from the MCR is postulated and control is transferred to remote shutdown. Then, the post transition plant model is consistent with the compliant plant model and only the remote shutdown functions are credited.

(4) The difference in the plant models when the VFDRs are removed in the compliant plant model is that local operator actions are not required. Therefore, operator actions to establish remote shutdown require fewer procedure steps and less time to perform.

b)

i. The MCR abandonment CCDP limit of 7E-02 for the compliant plant model was selected as a surrogate, because the CCDP was representative of the calculated CCDP for the fault tree logic when only the available remote shutdown functions are credited. The surrogate was used because in some scenarios it was identified that the LOC logic was resulting in conservative estimated CCDPs. This was occurring due to the way human failure events were being used in the non-abandonment and in the abandonment fault tree logic. For instance, a long term accident sequence operator action in the non-abandonment logic may not get the available credit once transferred to the remote shutdown logic, because the remote shutdown logic only includes a single action for a function (e.g., start torus cooling) and does not account for different available timings for the potential range of MCR abandonment postulated accident sequences.

ii. A surrogate MCR abandonment CCDP limit will no longer be used in the compliant model. The change in risk will be based on the calculated risk of the compliant and post transition plant models. This is consistent with the other fire area risk evaluations. These results will be included with the response to RAI 03.

PRA RAI 15.d.01 – Credit in the Change-in-Risk Calculation for Modifications

In its letter dated May 28, 2019, SNC does not provide a sufficient explanation to the NRC staff to understand how modifications that do not resolve a VFDR but reduce the risk associated with a VFDR are credited. The response to PRA RAI 15.d stated:

> *"If the modification is associated with a VFDR, the delta risk calculation eliminates the variance via modification."*

The response further states:

> *"If the modification does not mitigate a specific VFDR the modification is credited in both the compliant and variant models to estimate the delta risk between the post transition plant and the compliant model."*

The NRC staff notes that it is possible to propose a plant modification that is "associated" with a VFDR but does not fully resolve or mitigate that VFDR which appears to be the case for modification items 8, 9, 10 and 11 because LAR Attachment S, Table S-2 states for these items that "This modification provides an improvement in delta (Δ) core damage frequency (CDF) and Δ large early release frequency (LERF)." Accordingly, it is not clear to the NRC staff whether implementation items 8, 9, 10 and 11 satisfy the first statement above or the second statement. It appears to the NRC staff that the cited implementation items satisfy neither statement since these implementation items do not appear to resolve a VFDR (and thus make the change-in-risk for the VFDR zero) and they do not appear to be credited in both the compliant and variant plant models because LAR Attachment S, Table S-2 states that they provide an improvement in ΔCDF and ΔLERF.

In light of the above, explain how plant modifications modeled in the FPRA are credited in the compliant and post-transition plant models. Include discussion of modifications that resolve VFDRs, modifications that are not associated with a VFDR, and modifications that reduce the change-in-risk but do not fully resolve a VFDR.

SNC Response to PRA RAI 15.d.01:

As stated in LAR Attachment S, Table S-2, implementation items 8, 9,10 and 11 are proposed cable reroutes on circuits associated with a VFDR for the purpose of reducing delta (Δ) core damage frequency (CDF) and Δ large early release frequency (LERF). Even though these modifications were credited for the purposes of reducing delta risk, they were implemented as stated in the response to RAI 15d. That is, the modifications were credited in the variant model and the compliant model. Therefore, after taking credit for the modification, the delta risk for the associated VFDR is zero. SNC did not implement any risk offsets or utilize any 'negative' delta risk calculations.

The FPRA credits modifications in the following way:

- Modification that resolve a VFDR - if the modification resolves a VFDR, the modification is credited in both the variant and compliant models. Therefore, after taking credit for the modification, the delta risk for the associated VFDR is zero.
- Modification not associated with a VFDR – if the modification is not associated with a VFDR, the modification is credited in both the variant and compliant models.
- Modification that reduces the change-in-risk but do not fully resolve a VFDR – no modifications were credited that reduce the change-in-risk but do not fully resolve a VFDR.

PRA RAI 16.01 – Impact of Uncredited Systems on Transition Change-in-Risk

In its letter dated May 28, 2019, SNC responded to PRA RAI 16 and stated that the extent of untraced cables is about 15% of the FPRA components with cables, and that components with untraced cables were treated in the FPRA by globally failing them in the compliant and post-transition plant FPRA models. SNC further explained that a sensitivity study was performed indicating that if these components were credited in the FPRA, there would be approximately a 25% reduction in the total FPRA risk due "largely" to assuming failure of the feedwater system. SNC also explained that no VFDRs are associated with the feedwater system, and therefore, not crediting this system in the FPRA does not contribute to underestimation of the transition change-in-risk. However, SNC did not indicate whether there are any other uncredited components besides the feedwater system that are associated with a VFDR and could contribute to underestimation of the transition change-in-risk. SNC further stated that the impact from uncredited systems is "largely" from the feedwater system but it is not clear to the NRC staff what the term "largely" means (e.g., Does it mean 51% or 99.9% of the impact?) In light of the above, the NRC staff requests that SNC provide the following information:

a) Explain whether there are any other systems besides the feedwater system associated with a VFDR (i.e., systems that could contribute to underestimation of the transition change-in-risk), and justify that the impact of their exclusion from the FPRA compliant plant model on the transition change-in-risk is inconsequential.

b) If there are other systems besides the feedwater system associated with a VFDR that could contribute to underestimation of the transition change-in-risk and if this treatment cannot be justified in response to part (a) above, then replace this treatment with a more realistic treatment that does not underestimate the change-in-risk and provide the results in the integrated analysis requested in PRA RAI 03.

SNC Response to PRA RAI 16.01

a) There are no other uncredited systems in the FPRA that are associated with a VFDR. Therefore, the uncredited systems in the FPRA do not impact the transition change in risk.
b) See part a.