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RS-21-037

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Response to Request for Additional Information Regarding License Amendment Request to Adopt TSTF-505, Revision 2

References:

1. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U.S. NRC, "Application to Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, 'Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b,'" dated April 30, 2020

2. Email from J. Wiebe (U.S. NRC) to K. M. Nicely (Exelon Generation Company, LLC), "Clarification of Second Round RAI – Clinton TSTF-505 License Amendment Request," dated February 26, 2021

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. The proposed change modifies Technical Specifications requirements to permit the use of Risk Informed Completion Times in accordance with TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b," (ADAMS Accession No. ML18183A493).

The NRC requested additional information that is needed to complete review of the proposed change in Reference 2. In response to this request, EGC is providing the attached information.

EGC has reviewed the information supporting findings of no significant hazards consideration, and the environmental consideration, that were previously provided to the NRC in Attachment 1 of Reference 1. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. In addition, the additional information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this letter, please contact Mr. Kenneth M. Nicely at (630) 657-2803.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 23rd day of March 2021.

Respectfully,

Patrick R. Simpson
Sr. Manager Licensing

Attachment: Response to Request for Additional Information

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector – Clinton Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

DRA/APLB RAI 02.01 – Treatment of Sensitive Electronics in the Fire PRA

In order to make a finding on the impact of assumptions made in the fire PRA (FPRA) on the proposed RICT program, the NRC staff, in DRA/APLB RAI 02 – Treatment of Sensitive Electronics, requested that the licensee describe the treatment of sensitive electronics for the FPRA, its consistency with the guidance in FAQ 13-0004, and the impact of any deviations on the proposed RICT program. The NRC staff's review of the licensee's response identified multiple assumptions in the modeling of sensitive electronics in the FPRA supporting this application.

The licensee's response explains that the caveats cited in FAQ 13-0004 about configurations, such as surface-mounted electronics, that invalidate the FAQ 13-0004 approach (i.e., configurations for which damage to the sensitive electronics could happen at a lower thermal threshold than identified in FAQ 13-0004) were not explicitly addressed in its FPRA. The response assumes that consideration of such configurations would have negligible impact on fire risk in fire scenarios where only the ignition source and sensitive electronics are damaged from the fire because of the functions associated with sensitive electronics (e.g., a single logic channel).

The licensee identified a gap in its analysis where the exposed sensitive electronics are at a distance away from the ignition source such that damage to sensitive electronics would occur beyond the zone of influence (ZOI) of the ignition source determined by thermoset failure criteria in FAQ 13-0004 (i.e., the ZOI of the ignition source using the sensitive electronics damage criteria extends beyond the ZOI using the thermoset criteria in FAQ 13-0004). To address this gap, the response indicated that a "beyond ZOI" scenario was developed and a full physical analysis unit (PAU) burnout was assumed if a fire from an ignition source has the potential to grow beyond the ZOI of the ignition source. It appears to the NRC staff that the "beyond ZOI" scenario is an assumption made as a modeling simplification. It is unclear to the NRC staff whether this assumption captures the full impact of the gap cited by the licensee. As a result, the NRC staff is unable to evaluate the impact of this assumption on the proposed RICTs.

In its response, the licensee included a limited sampling of sensitive electronics to conclude that the sensitive electronics either 1) have no impact on a PRA credited function, or 2) aren't damaged in the fire or their failure is modeled in the FPRA scenarios. The limited sampling is insufficient to determine the impact of the modeling of sensitive electronics in the FPRA on the RICTs.

Based on the observations above, the licensee's fire PRA includes assumptions related to modeling of sensitive electronics that are simplifications made for modeling convenience. Based on the available information, the NRC staff is unable to determine the potential impact of these assumptions on the proposed RICTs and therefore, whether these assumptions constitute key assumptions for this application. Therefore, address the following:

> Provide justification for the negligible impact on the RICT calculations from the assumptions for modeling sensitive electronics in the licensee's FPRA. The justification can include:

A) A sensitivity study showing that guaranteed failure of sensitive electronics has a minimal impact on the RICTs calculated for LCOs that are most likely to be affected by sensitive electronics. As a part of the response, identify those functions that sensitive electronics perform in the plant.

OR

B) A detailed explanation of the technical basis for the negligible impact. The explanation should:

1) Discuss the functions that sensitive electronics perform in the plant, which of these functions are modelled in the FPRA, and why none of the modeled sensitive electronics can have more than negligible impact on the RICT calculations. Include confirmation that the "sampling results" provided in Table APLB-02-1 of the response are based on a walkdown of sensitive electronics in the plant and that the dispositions provided can be considered to be representative of those sensitive electronics.

2) Summarize your fire PRA modeling approach for evaluating sensitive electronics. In this summary, discuss whether a range of targets sets is assumed in the fire modeling approach for ignition sources, i.e., whether the target sets range from non-propagating fires constrained to the ignition source to scenarios of full PAU burnout. Also, indicate in general how the scenario frequency is established for a target set. Discuss whether the fire PRA modeling analysis is complete with respect to the state of practice or whether gaps exist in this analysis.

3) If sensitive electronics are incompletely analyzed in your PRA, then provide an assessment (e.g., a sensitivity study) on the impact of modelling these sensitive electronics at a lower heat flux damage threshold of 3 kW/m^2 and 65°C for solid state controls components as recommended in Sections 8.5.1.2 and H.2 of NUREG/CR-6850(ADAMS Accession No. ML052580118).

<u>Response</u>

A. N/A – See response to part B below.

B. Technical Basis for Negligible Impact

1) <u>Functions of Sensitive Electronics at Clinton Power Station</u>

In response to the previous revision of this RAI, a plant walkdown was conducted by the Site Risk Management Engineer (SRME) and a Senior Reactor Operator (SRO) on September 11, 2020, to identify the presence of sensitive electronics in the risk-significant areas of Clinton Power Station (CPS). These areas included the Switchgear Rooms, Auxiliary Electric Equipment Room (AEER), and the Main Control Room (MCR) which account for approximately 62% of the Fire CDF and 48% of the Fire LERF.

Details regarding the types of sensitive electronics observed in these areas are provided below:

- Switchgear Rooms

  Temperature transmitters for starting switchgear room cooling were the only observed sensitive electronics in the switchgear rooms. Since switchgear room cooling is not modeled in the PRA, and fires originating in the switchgear rooms already fail the various equipment located in the rooms, failure of these transmitters will have no impact on the RICT calculations.

- AEER

  The offsite power Open Phase Detection system and various overcurrent relays were observed in the AEER. Given that offsite power is failed in all propagating fire scenarios postulated in this area (due to the targets selected within the zone of influence of the ignition source), failure of these sensitive electronics will have no impact on the RICT calculations (since failure of these sensitive electronics are already captured by other fire-induced failures of offsite power).

  In addition, ground indicators were observed on the DC MCCs located in the AEER; however, these indicators are not modeled in the Fire PRA. Therefore, failure of these sensitive electronics would have no impact on the RICT calculations.

- MCR

  In the MCR, various temperature / level indicators were observed on a variety of main control boards (MCBs) and back panels located within the MCR complex (e.g., main steam line temperature, various room temperatures, diesel oil tank level, etc.).

  For MCB fires, NUREG/CR-6850 Appendix L approach is utilized for developing and defining MCB fire scenarios. For each subpanel, the appropriate failures are postulated based upon the controls / indications provided on the panel (e.g., if RHR A controls are located on the panel, RHR A is failed for all fire scenarios that postulate damage to that subpanel). Therefore, failure of the sensitive electronics is captured by the system / function surrogate mapping approach utilized for scenario development.

  For the back panel fires, a similar approach is used. System / function surrogate mappings are identified by evaluating the controls / indications on each panel and mapping those representative failures in the PRA. In addition, cable to/from endpoint data was reviewed to identify any additional systems / functions that should be failed. Therefore, failure of the sensitive electronics is captured by the system / function surrogate mapping approach utilized for scenario development.

For MCR Abandonment fire scenarios, the time to abandonment for the various heat release rates and ignition sources are driven by the smoke layer height and optical density rather than the smoke layer temperature. Since operators would abandon the MCR prior to fire-induced failure of the sensitive electronics, FAQ 13-0004 is not applicable for MCR abandonment fire scenarios.

In summary, the sensitive electronics identified during the walkdown were not associated with Fire PRA credited equipment or their failures were already accounted for by other targets in the target set (e.g., fire-induced failure of a different component that supports the same function). These insights are representative of sensitive electronics found in other areas not explicitly evaluated as part of the walkdown. Therefore, the current approach is appropriate and suitable for risk-informed applications.

2) <u>Treatment of Sensitive Electronics</u>

The Clinton Fire PRA treats sensitive electronics as contained within the electrical cabinets such that the cabinet walls, top, front, and back doors shield the components from radiant energy of an exposure fire and the thermoset failure criteria is retained for these components, which is consistent with FAQ 13-0004. The caveats (e.g., surface-mounted electronics) specified in FAQ 13-0004 are the only aspects of the FAQ that are not explicitly evaluated; however, the insights from part B(1) of this response clearly demonstrate that the caveats presented in FAQ 13-0004 do not pose a challenge to the general treatment of sensitive electronics.

<u>Fire Scenario Development Approach</u>

Figure 3-1 of the Fire Scenario Development Notebook (CL-PRA-021.07.01) [1] summarizes the Fire Propagation Event Tree (FPET) which summarizes the fire scenario development approach.

For each ignition source, a determination is made as to whether or not detailed scenario development is required. If a detailed scenario is not required (e.g., ignition source is located in a non-risk-significant area), then an undeveloped full room burnout is postulated. Otherwise, detailed fire modeling is developed for the ignition source. The detailed fire modeling considers fire growth, secondary combustibles, fire propagation, and detection / suppression as a function of time and heat release rate. Based on the results of the detailed fire modeling, the following types of scenarios are developed, the appropriate targets are selected, and the ignition source's fire ignition frequency is apportioned to the respective scenarios based upon the overall likelihood of target damage for the specified end state.

- "Green": Non-Propagating (i.e., ignition source only)
- "Yellow": Propagating – Finite (i.e., failure of all targets within a user-defined zone of influence identified via walkdowns and/or drawing reviews; more than one Yellow scenario may be assigned to the same single ignition source)

- "Orange": Propagating – Growing (i.e., if the fire is capable of growing beyond the user-defined zone of influence(s), then this portion of the fire is conservatively treated as a full room burnout)
- "Red": Hot Gas Layer
- "Magenta": Multi-Compartment Analysis

In summary, the fire scenario development approach used for the Clinton Fire PRA is consistent with the state of practice used in the industry and fully meets the ASME/ANS PRA Standard.

3) N/A – See responses to part B(1) and B(2) for details.

REFERENCES

[1] Clinton Power Station Fire PRA, Fire Scenario Development Notebook, CL-PRA-021.07.01, Rev. 2, February 2020