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10 CFR Part 53: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors

Comment On: NRC-2019-0062-0012

Preliminary Proposed Rule Language: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors

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General Comment

Please see the attached file for my Detailed Comments on Part 53. Thanks.

Attachments

Comments on Part 53-DWH

DWH Comments on Part 53

Framework A:

General Comments:

- 1) Framework A remains as a non-risk-informed process, where the risk for a hazard, feature or condition does not result in a different set of requirements for that plant or design. For advanced reactors, the use of passive or inherent features as well as the use of digital controls can significantly reduce the risk for many hazards or features, and as a result the regulatory burden for these hazards or features should be reduced. One example we have discussed during several public meetings is the risk of internal fire hazards. Many advanced plants include passive systems that ensure reactivity control and decay heat removal are ensured, regardless of the location and size of the fire. The use of digital controls and fiber optic cables then remove the possibility of fire-induced spurious operation, and the fail-safe design ensures that operator actions, including local manual actions are not needed to ensure safe shutdown. However, the Fire Protection requirements refer back to 53.440, which requires fire protection be designed to generally accepted codes and standards, address aging, develop and protect functional design criteria, evaluation of DID, etc. This same set of requirements are required for Seismic Events, Aircraft impact, facility hazards, external hazards, etc. This is of course contrary to the RIPB approach under LMP and NEI-18-04 as endorsed by RG 1.233, which would impose requirements and special treatment based on the risk-significance of the hazard and the resulting LBEs.
 - a. **Recommendation:** It is recommended to re-structure the requirements for non-DBA events consistent with the LMP approach. This can include high level steps described as follows:
 - i. Establish a base set of deterministic requirements for each hazard or event that would be included regardless of risk. In the case of fire, for example, this might include the use of non-combustible cabling and fire resistance material, when ever practical throughout the facility, and protection against fire protection system inadvertent operation. However, the requirement for fire detection and suppression would be part of the risk-informed portion.
 - ii. For those hazards or events analyzed in the PRA, additional requirements are included for those SSCs determined to be SR or NSRSS due to the hazard or event. In the case of fire, again as an example, this would include the use of fire suppression and detection sufficient to protect SR/NSRSS components needed to meet the criteria in 53.440, etc. This would mean that for a fail-safe plant with low risk for a hazard, there are no additional regulatory requirements.
 1. In this approach, it is recognized that the PRA analysis may include features that support the risk results, such as an assumed capability of an SSC, fire separation or suppression embedded in the PRA, or other DID attributes. In this case, the feature or assumptions credited in determining a low risk result would need to be reviewed, considering uncertainty, for additional requirements or NSRSS assessments.

- 2) The current Framework A requires SR and NSRSS components to be protected for numerous hazards and conditions which may not be needed for the hazard/condition. As mentioned in Comment 1, the LMP process would impose requirements and special treatment based on the risk-significance of the hazard and the resulting LBEs, but would not require special treatment (such as seismic capacity) if the SSC is not credited for the hazard or event. Examples in Framework A wording include:
- a. SSCs must be designed and located to minimize the probability and effects of fires and explosions. Non-combustibles and fire resistant materials shall be used... in locations with SR and NSRSS SSCs. Fire detection and suppression systems.... minimize the effect on SR and NSRSS SSCs. Fire protection requirements are listed in numerous places (see specific comment A).
 - b. Suitable instrumentation must be provided so that the seismic response of ... SR or NSRSS can be evaluated.
 - c. 53.480: SSCs “classified as Safety-Related or non-safety related but safety significant must be able to withstand the effects of earthquakes...” Additional requirements for stress, strain and deformation limits, and other seismic analysis requirements.
 - i. Note that Framework A includes a mix of terms, sometimes using NSRSS and other times spelling the term out fully.
 - ii. Note also that the seismic requirement under (B) uses the term “commensurate with their safety significance” – but does not specify seismic risk significance (so a similar issue to the above discussion).
 - d. **Recommendation:** Where the term NSRSS or non-safety-related but safety significant is used in Framework A as applied to a specific hazard or condition, we recommend referring to the specific hazard or condition. For example, when referring to the seismic requirements under 53.480, the wording could be SSCs “classified as Safety Related or non-safety-related but safety significant, and relied upon during a seismic event for meeting the design criteria in 53.450, must be able to withstand the effects of earthquakes...” Similarly for fire, “SR and NSRSS structures, systems, and components credited during a fire event to meet the criteria in 53.210 or 53.220 must be designed and located to minimize, consistent with other safety requirements in this Part, the probability and effect of fires and explosions.”
- 3) 53.890 discusses the Facility Safety Program. The initial discussion includes the scope of internal and external hazards, which under the current deterministic and probability approach involves hazards that may impact the safe operation of the plant. This includes hazards such as high winds, tornados, flooding, etc. Some hazards are covered by other sections, but initially this section appeared to have a process to require analysis of these hazards. However, the subsequent sections brought in “effluents during normal operation” including dose requirements for effluent releases.
- a. **Recommendation:** Please separate into separate discussions the events related to releases during normal operation, and the requirements related to internal and external hazards.
 - b. **Recommendation:** For internal and external hazards, please remove the specific dose requirements, as this is inconsistent with the performance based approaches discussed under other sections such as fire protection. The treatment should allow for a risk-

informed, performance-based approach similar to LMP – which similar to deterministic analysis, screens all hazards potentially impacting the site with screened-in hazards required to be analyzed in detail.

Specific Comments:

- A) 53.440 includes Design Requirements for all hazards and analyzed potential initiating events (PIEs), and is referenced under various sections such as for seismic requirements, fire, aircraft, and the more traditional design basis accident analysis. It is recommended that the reference to “fires and explosions” be removed from (e) (1), since this is covered under the fire protection requirements, which have the same requirements. Similarly, the requirements under (2) to (4) requiring non-combustibles, fire detection and suppression, etc. should be removed as it is covered elsewhere. Related: under 53.450 “Analysis requirements” item (g) “other required analysis” include fire protection requirements under (g) (1) applied to all DBEs and other non-DBAs. Overall, fire requirements should not be repeated multiple times, but retained within the fire protection section only.
- B) 53.450 mentions the “classification of SSCs and human actions”. However, there is nothing in the Framework A that discusses the classification of human actions and what to do with safety significant actions. In most cases, “and human actions” is stricken from the draft.
- C) 53.250 – refers “No single engineered design feature, human action, and or programmatic control, no matter how robust, should be exclusively relied upon to address the range of licensing basis events other than design basis accidents.” Recommend rewording to remove the term “address the range” as this is not specific. Also, the “other than DBAs” doesn’t make sense, and should be removed or clarified.
- D) 53.460, item c – uses the term “human actions needed to prevent or mitigate licensing basis events must be able to be performed reliability...” Recommend this be more specific related to meeting the criteria in 53.230 related to performance of safety functions. Since the PRA will include operator actions, which back up (typically) the automatic function – the PRA “needs” to include the human action in order to meet the PRA standard, but the safety function can be met using the automatic function without operator action. This change should also be considered in other parts of Framework A when mentioning human actions. Reasonable wording on this issue is provided in the first sentence of 53.730 “...human actions needed to fulfil safety functions, prevent or mitigate license basis events, or otherwise meet the safety criteria in 53.210 and 53.22....” (other than the use of the term “needed”).
- E) 53.875, item (b)(1); The current wording can be improved to remove the “performance-based or deterministic”, since the reference to 53.210 and 53.220 already refer to performance-criteria. Other sections that refer back to these sections do not have similar wording. Additionally, DID referred to in 53.250 is related to plant capability and response (referred to in LMP as the plant capability DID). However, the end of the last sentence in the section (b)(1) refers to the traditional fire protection DID of fire prevention, detection and suppression. These features are already addressed in the paragraph above this under (a)(1) related to 53.210. As such, the mention of fire prevention, detection and suppression should be removed from (b)(1).

- F) 53.890 to 895 – the sections uses the term “New or revised hazards” throughout. The facility analysis will have a list of hazards which would be analyzed per the requirements. please remove “new or revised” in all locations.

Framework B:

General Comments:

- 1) I have not provided detailed comments on Framework B, since review of the overall framework is not helpful at this time. Currently, the Framework offers a deterministic approach that provides no benefit over the known licensing processes under Part 50 and 52, but adds additional burden with expanded requirements in several areas. As such, the Framework misses the mark on being able to offer a reduction in Burden for plants with a demonstrated plant risk and safety that is much lower than the current fleet. As a result, it is unlikely that an advanced reactor would utilize framework B, and would instead utilize Part 50 or 52 approaches.
 - a. Recommendation: Framework B should be re-written to offer an approach that reduces burden to plants that are design with an overall lower risk profile, or designed specifically to reduce risk for specific hazards.
 - b. Recommendation: Burden reduction previously discussed such as use of the certified operator program, which is now removed from the current draft of Part 53, should be re-established in the Part 53 approach.
- 2) Much of the wording in Framework B is LWR-centric, such as use of the reactor coolant pressure boundary (many NLWRs do not have pressure in the RCS), examples of events, etc. This should be removed. Use of LWR-specific systems, such as post-accident monitor (not typically used in NLWRs) should be removed. 53.4972 on Mitigation of BDBEs is LWR-centric and should be modified.
- 3) In 53.4731 utilizes risk categories back fit to existing units to reduce burden for SR SSCs that are not risk-significant, while increasing requirements on NSR SSCs that are risk-significant. This approach should be replaced with an approach that allows for non-risk significant SR SSCs to be categorized as NSR. This approach is utilized under LMP, but also supported by other approaches. In general, this occurs when reducing the conservatism placed on the DBA analysis, such as prescriptive requirements on the selection of DBEs/DBAs.