

Purpose

The purpose of this paper is to propose a process for finalizing licensing basis Fire PRA information during the NRC review of a licensee's conversion to 10 CFR 50.48(c), risk-informed fire protection licensing basis. Finalization of the licensing information would occur at the proposed "freeze point". This paper will also identify methods used to track and control changes to the PRA after the freeze point, as well as identifying criteria for those changes warranting an NRC notification.

Background

Regulatory Guide (RG) 1.200 is intended to provide an acceptable approach for determining if a particular PRA is technically adequate to justify the results and insights used to support any operational or licensing decisions under consideration. The RG states, "When used in support of an application, this regulatory guide will obviate the need for an in-depth review of the base PRA by the reviewers". However, in the case of the 10 CFR 50.48(c), NFPA 805 transitions and other key risk-informed applications, the NRC has been reluctant to use RG 1.200 in this manner. As a result, the NRC conducts extensive Technical Adequacy reviews of both internal event and Fire PRAs for NFPA 805 submittals. The internal event PRA modeling methods have been refined over several decades. Fire PRA modeling methods are fairly well developed, but subject to changes resulting from, for example, testing or operating experience. Long term, the changes result in better modeling and methods. However, the Fire PRA model is an integral tool for NFPA 805 transition (e.g., fire risk evaluations and modifications). New information results in a moving target for both NRC reviewers and the Licensee during Licensing Amendment Request (LAR) development and review, resulting in an unstable review process and significant re-work. Further, since the implementation for many plants will be 18-24 months after submittal of the LAR, it is important to the final licensing decision that the Fire PRA be somewhat predictive of the realism at the time of implementation, similar to new reactor designs where predicted performance is the basis for the licensing decision and the achievement of that predicted performance is verified by the ITAAC process.

Because of that similarity, this paper provides a solution strategy based on the concept of a "freeze point" for licensing basis information. The concept of a freeze point is described in Interim Staff Guidance (ISG) DC/COL-ISG-011, which was specifically developed for applicants seeking a Combined Operating License (COL) or Design Certification (DC) under 10 CFR Part 52. This paper proposes that, similar to the COL guidance, the licensing decisions for NFPA 805 applicants be based on the information provided on and before the freeze point date. New information would be evaluated under existing PRA configuration control processes and industry reportability processes. Unproven assumptions and analyses in the Fire PRA submitted with the LAR would be listed as Implementation Items in the LAR, to be verified during implementation prior to "going live" with the self-approval part of the NFPA 805 license amendment. The stability achieved by implementing a freeze point would simplify the licensing review process and establish a predictable schedule for completion of the reviews.

Comment [NRC1]: For the staff to implement such a process, it would require:

- 1) A well-defined change control process
- 2) Agreement on items that cannot be deferred
- 3) Defined roles and responsibilities for NRC and industry

Comment [J2]: The rigor of NRC's technical reviews is not relevant. The issue we're struggling with is what to do with new information. Suggest that this paragraph be more focused.

Comment [NRC3]: Our investigation of the NRO ISG currently indicates that any freeze point should be done on a submittal that is acceptable at the freeze point. For us this means that the submittal uses only acceptable methods, it is just that other changes after that point (which should be eventually demonstrated to also be acceptable) need not necessarily be reviewed until a later date.

Comment [J4]: These need to be discussed. Note later comment on need for guidelines.

Discussion

Similar to the freeze point described in the ISG guidance for COL applicants, the freeze point for the NFPA 805 applicants would mark that point in time where the licensing basis information from the Fire PRA was considered to be final. It is from this point that the NRC licensing review of the NFPA 805 submittal would commence and, perhaps, end. The NRC would issue the SE based on the information submitted by the licensee in the Fire PRA, subject to verification of the accuracy of the Fire PRA model prior to full transition.

Comment [J5]: Depending on the importance of the new information that arises

The benefits of this concept are greatest for a plant early in transition but could still benefit plants mid-way through the licensing review process.

The process would develop as follows:

An applicant that has not yet submitted the LAR to transition to the risk-informed fire protection would propose a freeze point sometime prior to the submittal of the LAR. In this case, the freeze date may be the actual date of the submittal, but more likely would be the date prior to submittal when it is necessary to stop changing the numbers in order to complete the LAR approval process. Applicants having already submitted would also propose a freeze point. Here, the freeze point may also be the submittal date, but could also be some later date based on changes made to the information in the original submittal through, for example, the Request for Additional Information (RAI) process. The licensee could also “back date” a freeze date to correspond to the point at which the risk results given in the LAR were considered final. In any case, the licensing basis information would be considered, for the purposes of the NRC review, final at the agreed upon freeze point. Consequently, licensing decisions made by NRC would be based solely on the information provided on and before the freeze date.

Comment [NRC6]: I do not believe that the industry actually means or wants this.

Proposal, and concurrence, of the freeze date should be made via formal correspondence between the licensee and the NRC. Once the applicant and the NRC agree on the freeze point, the NRC would generally not require changes to, or sensitivity studies on, the as-submitted Fire PRA in any subsequent RAIs.

Comment [J7]: Depending on the importance of the new information that arises

The applicant would use the already established PRA configuration control processes used at their plant(s) to evaluate, track, and manage the changes identified to the Fire PRA after the freeze date (ref. RG 1.200). These processes could include the Corrective Action Program, as well as existing site procedures already in use for tracking and monitoring changes to the PRA along with the specific tracking mechanisms used in those procedures. Alternatively, a licensee could elect to develop a new specialized tracking mechanism for changes to the Fire PRA throughout the NRC review process. In any case, a formal method of tracking and monitoring any changes made to the Fire PRA after the freeze date should be used by the licensee. It is expected the NRC would focus part of their review on the rigor and completeness of processes used for configuration control of the PRA models.

Most of the changes to the Fire PRA that would be required after the freeze point are not expected to alter the conclusions of the original LAR. For example, these include changes required to the model as a result of plant design or procedure changes. Minor errors in the model, and updates to the model due to, for example, reliability data, unavailability data, and initiating event frequency data updates, are also examples of the type changes that would not normally require a change to the LAR. As part of the configuration control process, the applicant would review each required model change and make a determination as to whether it would affect the conclusions on compliance. They would document the basis for a determination that it would not alter the conclusions, therefore not requiring an out-of-cycle update to the FPRA. The applicant would also make a determination of the cumulative impact of all deferred model changes to assure that an out-of-cycle update is not required.

Comment [NRC8]: It is not the applicant's role to make conclusions regarding compliance in a licensing action. This is the purpose of the NRC's review.

However, there is the possibility that some issues, discovered after the freeze point, would be significant enough to warrant notification to the NRC. To recognize and identify such changes, the applicant would provide written guidance defining the criteria for identifying when a change to the model requires consideration during the review process (e.g., sensitivity studies and/or base model changes) and notify the NRC. Note Licensees with RG 1.200 compliant models have triggers for model updates; however this guidance could be included via a revision to an existing procedure or in a new procedure, or in some other type of formal written instruction or guidance.

Comment [J9]: The NRC should play a role in deciding if the PRA warrants updating for a new issue prior to issuing the NFPA 805 transition license

Some issues which may require immediate notification are:

I) errors significant enough to affect (increase) reported risk values (Δ CDF, Δ LERF) or to cause an increase in those risk values such that compliance with established limits was exceeded,

Comment [NRC10]: also total CDF, LERF

II) Changes needed to ensure compliance with NRC regulations and,

III) Changes needed to address significant vulnerabilities identified in the Fire PRA Model.

Comment [J11]: We should discuss this more.

These type issues would require notification of NRC via formal docketed correspondence.

There are several ways in which these types of issues could be addressed:

- 1) Change the baseline Fire PRA and revise the results. The revised results would be documented in a re-quantification of the baseline CDF, LERF, Δ CDF and Δ LERF and preparation of an updated LAR Att. W.
- 2) Change a proposed modification (a plant design or procedure modification, for example) and implement it in the Fire PRA. This would require a re-quantification of the baseline CDF, LERF, Δ CDF and Δ LERF and an update to both LAR Att. S and LAR Att. W, and possibly updates to LAR Att. C and/or G.
- 3) Leave the Fire PRA results unchanged and commit to achieving the stated performance goals. In other words, commit to the baseline CDF, LERF, Δ CDF and Δ LERF, already claimed in the

original LAR. This would not require any re-quantification, and the verification of the commitment to achieving the risk values would become part of the generic Att. S Implementation Item to update the Fire PRA prior to full transition. The individual confirmatory items would be tracked as part of the applicant's PRA configuration control process, and would not necessarily need to be individually listed in LAR Att. S.

(The above list indicates three *options*; it is not meant to preclude any other option a specific applicant may develop and deem appropriate).

If, rather than changing the Fire PRA, a licensee wishes to use option 3 above:

a) The Licensee may use predicted future performance of systems and components for which the design, installation, and operating procedures are not yet in place. For example, a modification to a system is proposed which will maintain the risk values assumed in the original LAR.

Or,

b) The Licensee may use future accepted methods, techniques, or data. For example, it is believed that changes in reliability data, or unavailability data will maintain the reported risk values.

The concept behind option 3 is that the overall performance goal is established in terms of the upper limit on CDF, LERF, Δ CDF, Δ LERF and other metrics required under RG 1.174. In other words, while the issue warranting notification may have increased the reported risk values based on the current state of knowledge and current accepted methods, the expectation is that RG 1.174 compliance will ultimately be demonstrated by the end of the implementation period based on the evolution of that state of knowledge and future accepted methods.

With option 3, however, the licensee would take a risk that the risk performance goals would not be met, in which case the transition to NFPA 805 would likely be delayed as changes to the Fire PRA are made, possibly followed by a Peer Review.

Below is an example of how this performance goal method may be employed:

Operating Experience has indicated that some PWR Reactor Coolant Pump (RCP) Seals will not function as intended.

Suppose an individual licensee, in the midst of converting to NFPA 805 and past a set freeze point, opts not to change the Fire PRA, but rather commits to achieving the risk performance goals already committed to in the original LAR. In other words, the licensee claims that by the end of the implementation period the LOCA risk will be no worse than indicated in the original submittal, even with the current knowledge about the seals.

Comment [J12]: For option 3, the licensee must conclude that the new information leads to an insignificant change to the PRA results. NRC should review that conclusion and its basis. If some guidelines were established, perhaps NRC would not need to get involved in every example.

The licensee would indicate to the NRC in its formal notification that the risk numbers are not expected to change, or that the upper limits are not compromised, because of a proposed modification. Effectively, the licensee is expecting that the seal design will be improved, or an alternative design will achieve the required performance, or some other technology or methodology improvement will be available and accepted that will verify that the performance credited in the Fire PRA will be achieved.

For example, if after a loss of cooling or injection to the seals the RCP initially does not trip and all cooling is lost, the Fire PRA may assume that the seals will not fail for 30 minutes. This timeframe may be based on the modification of emergency procedures and an HRA that shows that in order to achieve an HEP that supports the risk goal, the operators would need to have 30 minutes of available time to trip the RCPs or restore cooling or injection, which would preclude seal failure. Since the Fire PRA assumes in this case no seal failure for 30 minutes, the performance goal for the seals would be to run for 30 minutes without cooling. Any seal design that could be verified to achieve that would be allowed.

If the RCP were tripped upon the loss of cooling and injection (e.g., station blackout situation), credit in this case could be taken for a reduced probability that a very small or a small LOCA would occur. Suppose the PRA showed that the risk goals would be met if the conditional probability of a very small LOCA was 0.01 and a small LOCA was 0.001. These would then become the performance goals and any seal design that could be verified to achieve that would be allowed.

The same approach could be used for any other input to the PRA, for example that the hot short probability would be less than some value or that the heat release rate for a particular cabinet configuration would be less than some value. These would become Implementation Items, and as long as the condition could be verified before full transition to NFPA 805, it would be acceptable.

Presuming the risk numbers did not change or the upper limits were not compromised after taking credit for the seal performance or other performance parameter as discussed above, the performance goal would be met.

Finally, the licensee must demonstrate, through the Fire PRA, that the post NFPA 805 transition plant achieves compliance under the NFPA 805 criteria. Indeed, this would be an on-going effort throughout the life of the plant. However, immediately following the transition, licensees should document such compliance for the changes occurring post-freeze point, ready and available for inspection by internal auditors and NRC inspectors.

Summary and Conclusion

Establishing a freeze point for NFPA 805 submittals would provide a point at which the licensing basis information for the Fire PRA would be considered final for the purposes of the NRC submittal review.

Following proposal of the freeze date by the licensee, and subsequent approval by NRC, the licensee would implement a change tracking and monitoring program which would track the changes to the Fire

Comment [J13]: The identification of degraded seals is a complicated issue with implications across the fire PRA, and needs further discussion

PRA that occur after the freeze date. Additionally, this change process would identify those changes that are significant enough to warrant NRC notification after the freeze date was set and past. If a change required such notification, the licensee would either change the Fire PRA or claim that the performance goal, based on the risk metrics such as ΔCDF and $\Delta LERF$ presented in the original submittal, would still be met.

Upon completion of the transition to the risk-informed fire protection licensing basis, the licensee would verify and document compliance to the NFPA 805 criteria, considering the changes to the Fire PRA that occurred after the freeze point.

Comment [NRC14]: What if they cannot verify performance? What is the timeline for compliance?

Concluding, use of a freeze point would simplify the review process, thus providing stability to the NFPA 805 review process which has been lacking in the process for many of the fire protection submittals currently under NRC review. There is precedence for using this concept for the NRC review of Part 52 applications.