Flood Protection Feature Walkdown Enhancements

Introduction

The walkdowns required to respond to Enclosure 4 of Reference 1 (NRC's March 12, 2012 50.54(f) letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*) compare a plant's existing flood protection features to the plant's current licensing basis for flooding.

Enclosure 2 of the same letter requires utilities to complete a flood hazards evaluation for all their sites using the methodologies and guidance applicable to new plant applications. The results of these evaluations are to be compared to the current licensing basis for flooding to determine if the design basis flood evaluation bounds the re-evaluated flood hazard. This comparison is to be performed for all susceptible plant configurations and for the entire duration of the flood conditions. If a licensee's current design basis does not bound the reevaluated flood hazard, the licensee will need to perform an integrated assessment to identify vulnerabilities and actions to address them.

In order to provide the information required by enclosure 2 to the 50.54(f) letter without re-performing the walkdowns required by enclosure 4, it is recommended that utilities capture additional information beyond that necessary to verify conformance with the existing licensing basis. The recommended additional information is described in this document. This information need not be reported to the NRC as part of the Design Basis Walkdowns results requested by Enclosure 4.

Definitions

Cliff Edge

The "Discussion" section in Enclosure 2 of the NRC's 50.54(f) letter states that flooding risks are of concern because of a "cliff-edge" effect, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level. For example, a flood that exceeds the height of a flood barrier by even a small amount could result in a significant amount of water in the area behind the barrier. For the purposes of this guidance, a cliff edge can be defined as the point at which a flood protection feature is impacted by a flood, resulting in potential significant effects on plant equipment and safe operation

Plant Specific Vulnerability

As defined in the referenced 50.54(f) letter, plant-specific vulnerabilities are those features important to safety that when subject to an increased demand due to the newly calculated hazard evaluation have not been shown to be capable of performing their intended functions.

Physical Margin

The Physical Margin for a flood protection feature is the difference between the licensing basis value of a flood protection feature parameter and the value at which a cliff edge effect occurs. The Physical Margin indicates how much a new plant flood evaluation result can increase beyond the current licensing basis without raising a concern about the ability of the flood protection feature to perform its credited function. For example, if the credited height of a flood barrier in the current licensing basis is 10 feet and an unsealed penetration through the barrier exists at 12 feet, the Physical Margin is 2 feet.

Potential Margin

The Potential Margin is the additional amount by which a flood protection feature can be easily improved to accommodate more challenging flood evaluation results. To continue the example above, if the credited height of a flood barrier in the current licensing basis is 10 feet, an unsealed penetration through the barrier exists at 12 feet, and the total height of the barrier is 15 feet, then the Potential Margin is 5 feet (assuming that the unsealed penetration can be readily sealed).

Recommendations

In addition to the information required to respond to Enclosure 4 of Reference 1, the flooding design basis walkdowns should also capture the following information. This information does not need to be reported to the NRC in the flood walkdown report.

Margin Information

- the current licensing basis value for flood protection features,
- the value at which the as-built flood protection feature parameter (such as barrier height, seal pressure rating, sump pump capacity, etc.) becomes a plant specific vulnerability. The difference between this value and its associated licensing basis value defines the Physical Margin.
- the value at which the as-built flood protection feature can no longer perform its credited function. The difference between this value and its associated licensing basis value defines the Potential Margin.

As an example, if the licensing basis of a flood barrier is 10 feet, the lowest unsealed penetration in the barrier is at 12 feet, and the total height of the barrier is 15 feet, both the Physical Margin (in this case, 2 feet) and the Potential Margin (in this case, 5 feet) should be captured. This information will be useful in assessing the implications of the new plant flood evaluation results that will be performed in response to item 2.1 of Reference 1; specifically:

It is recommended that utilities assess Potential Margin information to determine if pre-emptive plant modifications may be advisable in order to avoid a situation where the new plant flood evaluation results challenge existing flood protection features. The decision to pre-emptively modify the plant should be based on the size of the "Potential Margin" and the degree of uncertainty anticipated with the new plant flood evaluations.

Physical and Potential margin information need not be reported to the NRC as part of the walkdown results report required by the response to Enclosure 4 of Reference 1.

Susceptible Plant Configurations

Enclosure 2 of Referenced 1 requires that the potential effect of flooding on the plant must consider all plant configurations that might exist when a postulated flood could occur. The plant conditions considered should include full power operations, startup, shutdown, and refueling. These different plant conditions will not only affect the status of flood protection features, they might also affect what equipment must be protected. The walkdowns are a good opportunity to identify the potential impact of susceptible plant configurations. In doing so, the licensee should consider:

- the range of flood protection feature configurations that may exist during all plant conditions including maintenance periods and
- the time duration available from the point at which a flood warning is received until flooding conditions exist that could affect the credited function of the flood protection feature.

This information does not need to be reported to the NRC in the walkdown report unless it is part of the CLB for a plant.

Flood duration

Enclosure 2 of the Referenced letter requires that the potential effect of flooding on the plant must consider the effects that could occur over the full duration of the flood. For some hazards flood conditions could persist for a significant amount of time. Extended flood duration could present concerns such as:

- Site access,
- Travel around the site,
- Equipment operating times, and
- Supplies of consumables

In order to facilitate assessing the effect of the duration of the floods determined by the new plant flood evaluations, it is recommended that the review and walk through of plant procedures performed as part of the design basis walkdowns consider the implications of a longer flood that may be identified by new plant flood hazard evaluation methods. Flood protection feature limitations based on flood duration should be evaluated as part of the design basis walkdown records. For example, if the duration of the design basis flood is 2 hours and a diesel driven pump is credited with removing water from an area, the total amount of fuel available for the pump and the operating time it represents should be determined and recorded.

This information does not need to be reported to the NRC in the walkdown report. unless it is part of the CLB for a plant.

References.

1. NRC 10 CFR 50.54(f) letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,* dated March 12, 2012