

Mitman, Jeffrey

From: Ferrante, Fernando *NRR*
Sent: Tuesday, July 06, 2010 3:31 PM
To: Pohida, Marie; Mitman, Jeffrey
Subject: RE: Frequency Limits
Attachments: image001.jpg

Thanks for letting me know!

From: Pohida, Marie *MRB*
Sent: Tuesday, July 06, 2010 3:26 PM
To: Ferrante, Fernando; Mitman, Jeffrey
Subject: RE: Frequency Limits

Regarding external hazards and new reactors, RG 1.200 was changed in March 2009 to state:

1.2.5 Screening and Conservative Analysis of Other External Hazards Technical Elements

Screening methods can often be employed to show that the contribution of many external events to CDF and/or LERF/LRF is insignificant. The fundamental criteria that have been recognized for screening-out events are the following: an event can be screened out either (1) if it meets the criteria in the NRC's 1975 Standard Review Plan (SRP) or a later revision; or (2) if it can be shown using a demonstrably conservative analysis that the mean value of the design-basis hazard used in the plant design is less than 10^{-5} per year and that the conditional core damage probability is less than 10^{-1} , given the occurrence of the design-basis-hazard event; or (3) if it can be shown using a demonstrably conservative analysis that the CDF is less than 10^{-6} per year. *It is recognized that for those new reactor designs with substantially lower risk profiles (e.g., internal events CDF below 10^{-6} /year), the quantitative screening value should be adjusted according to the relative baseline risk value.*

From: Ferrante, Fernando *NRR*
Sent: Tuesday, July 06, 2010 3:14 PM
To: Pohida, Marie; Mitman, Jeffrey
Subject: FW: Frequency Limits

Marie,

The e-mail below contains specific references to some of the limits we discussed.

The document I was referring to as a general standard on external events PRA is "ASME PRA on External Events" which refers to frequency limits in Section 4.4.2 Underlying Rationale for Successive Screening, page 14 in the 2007 revision:

There are three fundamental screening criteria embedded in the requirements here, as follows. An event can be screened out either (a) if it meets the criteria in the NRC's 1975 Standard Review Plan (SRP) [7] or a later revision; or (b) if it can be shown using a demonstrably conservative analysis that the mean value of the frequency of the design-basis hazard used in the plant design is less than $\sim 10^{-5}$ /year and that the conditional core damage probability is $< 10^{-1}$, given the occurrence of the design-basis-hazard event; or (c) if it can be shown using a demonstrably conservative analysis that the CDF is $< 10^{-6}$ /year.

Thanks,
Fernando

From: Ferrante, Fernando
Sent: Thursday, November 12, 2009 4:20 PM
To: Franovich, Mike
Subject: RE: Frequency Limits

Mike,

As we discussed, this is what I actually found in NUREG-0800 (saving this e-mail hopefully will prevent me from revisiting this same search in the future):

Page 2.2.1-2.2.2-3 (2.2.1 - 2.2.2 IDENTIFICATION OF POTENTIAL HAZARDS IN SITE VICINITY):

Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. Onsite or nearby facilities that could pose a risk to safe reactor operation include (1) onsite storage such as the use of compressed or liquid hydrogen and propane and (2) industrial, transportation, or military facilities that could involve the use of hazardous materials (e.g., oil or toxic chemicals) or pose other risks (e.g., a barge collision with an intake structure or an airplane crash at the site). On the basis of the information provided in SRP Sections 2.2.1-2.2.2, potential accidents regarded as design-basis events are determined and reviewed under SRP Section 2.2.3. Design-basis events on site or in the vicinity of the nuclear plant are defined as accidents with a probability of occurrence on an order of magnitude of 10^{-7} per year, with potential consequences sufficiently serious to affect the safety of the plant to the extent that 10 CFR Part 100 guidelines could be exceeded. If unfavorable physical characteristics exist, the proposed site may be found acceptable if the facility design includes appropriate and adequate engineering safeguards to compensate for the observed deficiencies. Regulatory Guide 1.91 provides guidance for evaluating postulated explosions on transportation routes near nuclear plants.

Meeting these requirements provides assurance that the plant has adequate protection and can operate with an acceptable degree of safety in the event of an accident caused by the presence of hazardous materials or activities on site and/or at nearby industrial, military, or transportation facilities.

Pages 2.2.3-3/4 (EVALUATION OF POTENTIAL ACCIDENTS):

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

1. Event Probability

The identification of design-basis events resulting from the presence of hazardous materials or activities in the vicinity of the plant or plants of specified type (or, for ESP applications not referencing DC, falling within a PPE) is acceptable if all postulated types of accidents are included for which the expected rate of occurrence of potential exposures resulting radiological dose in excess of the 10 CFR 50.34(a)(1) as it relates to the requirements of 10 CFR Part 100 is estimated to exceed the NRC staff objective of an order of magnitude of 10^{-7} per year.

If data are not available to make an accurate estimate of the event probability (see Technical Rationale 2 below), an expected rate of occurrence of potential exposures resulting radiological dose in excess of the 10 CFR 50.34(a)(1) as relates to the requirements of 10 CFR Part 100, by an order of magnitude of 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower.

Thanks,
Fernando

From: Franovich, Mike
Sent: Thursday, November 12, 2009 12:09 PM
To: Ferrante, Fernando
Subject: RE: Frequency Limits

You may need to search on 10^{-7} 10^{-6} etc... It is definitely in Chapter 2 and/or 3. I searched my e-mail, but the e-mail records for the time I was on rotation were archived on another computer. I had a write-up for Pete Wilson (now in Region I) because he called me on this subject. I recall the standard in the SRP was in relationship to tornados and other natural phenomena. If the frequency/probability (per year) was lower than 10^{-6} with conservative data or 10^{-7} using realistic data, then the hazard could be screened out (e.g., F5 tornados in an area not prone to tornados).

For adequate protection issues, we (me personally) told Duke with Grobe and Cunningham on the line) that is not credible to have dam failure estimates this low for a high hazard dam located only eleven miles from the site.

The ASME PRA standard mimic the NRC's old IPEEE guidance that states if you have failure frequencies for initiating event that are 10^{-5} or greater, there should be mitigation with a failure probability of less than 10 percent. These values are goals and need to be taken with a grain of salt.

From: Ferrante, Fernando
Sent: Thursday, November 12, 2009 10:18 AM
To: Franovich, Mike
Subject: RE: Frequency Limits

Thanks, Mike. I appreciate it. I looked into NUREG-0800 before and all I could find was in Chapter 19:

III.1.3 Parts of the PRA Model Used in Application

To assess the quality of the PRA input for a decision, the licensee identifies which parts of the PRA are used to provide the PRA results called for by the acceptance criteria. For license amendments these include not only the logic model events onto which the cause-effect relationships are mapped, but also all the events that appear together with those events in the affected accident sequences, and the parts of the analysis required to evaluate the necessary results. For some applications, this may be a limited set, but for others, e.g., risk-informing the scope of special treatment requirements, all parts of the PRA model are relevant. In addition, when the assessed impact of a proposed change, measured in terms of Δ CDF or Δ LERF, is greater than $1E-06/\text{yr}$ or $1E-07/\text{yr}$ respectively, the total CDF and LERF are required to be estimated, broadening the scope of review for technical adequacy.

But this appears to be a later inclusion into the SRP of the guidance contained in RG1.174 and RG1.200 for proposed licensing changes. If you have a specific passage available on screening limits, I would greatly appreciate it.

From: Franovich, Mike
Sent: Thursday, November 12, 2009 9:50 AM
To: Ferrante, Fernando
Subject: RE: Frequency Limits

Yes, check the standard review plan NUREG-0800 chapters 2/3 with respect to natural phenomena for frequency/probabilistic aspects used in the deterministic reviews. Also there are PRA standards but those are not relevant to meeting design basis/compliance based requirements. I dig through my e-mail...I think I have the excerpts. The challenge for you folks is how to deal with dam PRA results that are in the $1E-6$ range. I find such results as a numerical value quite dubious to make regulatory decisions as they suggest model incompleteness, short coming in methods, or other biases such as expert opinion that doesn't account for base rate failures that are in the $1E-5$ to $1E-4$ range. Such bias are well documented in the cognitive sciences when looking at human judgment in decision-making processes. Bottom-line is both statistical based and PRA based methods needed to be used in a complementary manner with acknowledgement of each approaches strengths and weaknesses, not the simplistic approach of discarding one methods in favor of another methods because one offers more details which may give interesting insights but not very meaningful or realistic numerical results.

From: Ferrante, Fernando
Sent: Thursday, November 12, 2009 9:34 AM
To: Franovich, Mike *INRR*
Subject: Frequency Limits

Mike,

I hope you are doing well. I have a question for you:

I have been looking for policy documents that define frequency values or ranges which separate credible from non-credible events (or combination of events) for regulatory purposes. I have heard for quite sometime now in informal discussions that $1E-7/\text{year}$ can be used as a screening value. I have been looking for a reference on

this and the closest I have found is ANSI/ANS-2.12 standard which covers what they call "man-made" external events and has some words indicating this threshold can be used (but without elaborating any further). I talked to other APOB staff and it seems they have also not been able to find specific language on this, although they indicated that industry practice usually assumes that events below $1\text{E-}7/\text{year}$ may be screened out, while events between $1\text{E-}7/\text{year}$ and $1\text{E-}6/\text{year}$ may require additional justifications (and events above $1\text{E-}6/\text{year}$ cannot be screened out).

I would greatly appreciate any insights on the matter.

Thank you,

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