

From: [Schofer, Fred](#)
To: [Algama, Don](#); [Esmaili, Hossein](#); [Helton, Donald](#); [Murphy, Andrew](#); [Nosek, Andrew](#); [Pires, Jose](#); [Compton, Keith](#); [Barto, Andrew](#); [Wagner, Brian](#); [Chang, James](#); [Armstrong, Kenneth](#); [Lee, Richard](#); [Witt, Kevin](#); [Helton, Shana](#); [Reckley, William](#); [Jones, Steve](#); [Casto, Greg](#)
Subject: Comment resolution matrix for use during today's discussion of RES comments on the Tier 3 Regulatory Analysis
Date: Tuesday, September 10, 2013 10:53:17 AM
Attachments: [Reg Analysis_rA Comment Resolution Matrix.xlsx](#)

Attached for your use during today's 1 PM meeting is a comment resolution matrix.

Thanks,
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NRR/DPR/PRMB
301-415-5682

Regulatory Analysis, Rev. A Comment Resolution Matrix

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No.	Office	Received	Affected Section	Name	Comment	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority						
1	RES	09/04/13	4.3.2.1	J. Pires	Page 29 – I think that the USGS 2008 model considers Western U.S. sites. These Western sites were not addressed in GI-199 and seismic hazard curves were not computed for them. I understand that given the higher design basis seismic loads for Western plants (and the higher seismicity), usually these plants are not grouped with the CEUS plants.	Wording revised as follows: Although the USGS 2008 model does not consider Western U.S. sites (e.g., Columbia, Diablo Canyon, Palo Verde, and San Onofre), these sites are not addressed in Generic Issue 199 (Ref. 76), which focused on the Central and Eastern United States, and therefore are not included in this analysis.										
2	RES	09/04/13	Fig 7, 8, & 9	J. Pires	Figures 7, 8 and 9 – I think that the curves are not necessarily rock hazard curves (I understand that site specific conditions have been accounted for at least in approximation – this needs to be confirmed).	Need input from RES.										
3	RES	09/04/13	Table 12	J. Pires	<p>Frequency of spent fuel uncover for seismic events</p> <p>I was not able to get the results for the lines “this regulatory analysis” using the numbers in Table 8, Table 9 and Table 11. Maybe you would like to check the numbers I got:</p> <table><tr><td>Base Case</td><td>High Estimate Sensitivity</td></tr><tr><td>6.6</td><td>76</td></tr><tr><td>3.3</td><td>34</td></tr></table> <p>The first column used base case inputs (Table 8) and the second column used high estimate inputs (Table 9). Based on the results that you show for the high estimates I think that you might have used numbers similar to the ones here in the analysis.</p>	Base Case	High Estimate Sensitivity	6.6	76	3.3	34	Agree. Table 11 revised.				
Base Case	High Estimate Sensitivity															
6.6	76															
3.3	34															
4	RES	09/04/13	Table 13	J. Pires	<p>Table 13 – Fraction of ...</p> <p>I understand that this table shows the fraction of the operating cycle that results in releases given fuel uncover. I understand that the high number in Bin 3 for PWRs relates to partial draindown conditions (liner tearing at the walls) with some water remaining at the bottom of the SFP (although liner tears might also occur at the bottom of the walls in some plants).</p>	<p>Revised wording to state: Because plant-specific analyses is not available to verify that all U.S. spent fuel pools and racks retain their structural integrity and air-coolable geometry following a beyond-design basis seismic event for all U.S. spent fuel pools, a bounding approach was used to evaluate the sensitivity of assuming the spent fuel is not air coolable following a seismic bin no. 3 or Seismic bin 4 earthquake. For bin no. 3 this modeling represents the scenario in which the seismic event results in a partial draindown condition (i.e., liner tearing at the walls) with some water remaining at the bottom of the spent fuel pool. This was done by assuming a bounding value of 100% for the conditional probability of release for certain cases as shown in Table 12.</p> <p>Revised Table 12 heading to: Fraction of Time Either Excessive Heat or a Partial Spent Fuel Pool Draindown Prevents Natural Circulation Cooling of the Spent Fuel.</p>										
5	RES	09/04/13	Table 14	J. Pires	<p>Table 14</p> <p>I cannot derive the range for the initiating events fuel uncover (second column) shown in Table 14 from numbers in Table 12 (neither with the numbers in the draft that you sent nor with the numbers that I estimated above). The numbers in column 2 affect the numbers in column 4 of Table 14.</p>	Plan to revise table 13 to give release frequencies for low estimate, base case, and high estimate.										

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6	RES	09/04/13	4.3.1.5	J. Pires	<p>Section 4.3.1.5 - Description of representative plants</p> <p>Is the full core offloaded during a PWR outage and, if so, how long does it stay in the SFP? This section indicates that about 45% or so of the assemblies are discharged per cycle but is the core offloaded for some amount of time? This question may be relevant depending on the probability of the cooling system for the SFP failing at lower g's (as a result of loss of power) and its implications on boiloff.</p>	<p>Data was collected for three refueling seasons in the past. Each time all but 1 out of approximately 20 PWRs performed a full core offload as part of refueling. Median time to complete the full core offload was 9 days after shutdown and the median (i.e., 10th of 19 samples arranged from low to high by offload duration) duration of the full core offload was 11 days (time to begin returning fuel to vessel – don't have time when all reused assemblies have been returned to core). Some plants with longer refueling associated with modifications keep the full core in the pool for much longer durations, but it does not get much shorter than 11 days.</p> <p>Boiloff in a PWR is usually less severe than at a BWR because it is easier to ventilate (pool is typically adjacent to truck bay with roll-up door for cask loading) and the spent fuel pool is often in its own ventilation area, so the evolved steam can be kept away from other essential systems. However, there are a few plants where the spent fuel pool is in the auxiliary building without significant separation from the remainder of the equipment.</p>				
7	RES	09/04/13	page 33	J. Pires	<p>Page 33</p> <p>The last paragraph refers to a 'realistic' analysis. I am not sure if a different adjective could be used to qualify the analysis. Maybe it is. (the term 'realistic' is also used in Page 60 (bottom paragraph) and Page 68 (top paragraph) in similar contexts.</p>	Changed "realistic" to "detailed"				
8	RES	09/04/13	4.3.1.5	H. Esmaili	Group 1 - For PB, the power is ~3500 since all other factors (pool capacity, etc.) refer to this pool	Revised to 3500 MWt to be consistent with the SFPS. However, the mean value for this group is ~ 3000 MWt				
9	RES	09/04/13	4.3.1.5	H. Esmaili	Group 1 - 852 assemblies requires both 1x4 (for newly discharged) AND checkerboard dues to pool size limitation	<p>Revised sentence to read:</p> <p>In a low density configuration, the spent fuel pool stores 852 assemblies in which the newly discharged spent fuel is arranged in a 1x4 configuration and the remaining fuel assemblies arranged in a checkerboard pattern.</p>				
10	RES	09/04/13	4.3.1.5	H. Esmaili	Group 3 - This is only true for AP1000, right? ABWR has an elevated pool, and ESBWR has also an elevated pool for temporary storage but the main pool looks like on the ground	Yes, only the COL plants (e.g., AP1000) were modeled.				
11	RES	09/04/13	4.3.1.9	H. Esmaili	1st para - I have seen burnups as much as 53 for the reference plant	Incorporated. Revised high value from 50 to 53 GWd/MTU.				
12	RES	09/04/13	p. 36	H. Esmaili	Full para - What is the source of 95%?	<p>Revised sentence to read:</p> <p>In reality, the effectiveness of post Fukushima improvements to severe accident mitigation measures will depend on a variety of factors, which the Spent Fuel Pool Study did not consider but are expected to increase the likelihood that deployment of mitigation measures is successful. Each plant has developed a plant-specific analysis and strategies for coping with the effects of the beyond-design-basis natural events that may challenge its spent fuel pool cooling and makeup capabilities. For the purposes of this regulatory analysis, it was assumed that mitigation if successfully deployed decreased the conditional probability by a factor of 19 for all initiating events as determined in the Spent Fuel Pool Study.</p>				

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13	RES	09/04/13	4.3.2.9	H. Esmaili	Revised text provided	<p>Incorporated suggested rewording as follows: The spent fuel pool release fractions used in this regulatory analysis is based on the results of the Spent Fuel Pool Study for Group 1 as well as previous spent fuel pool studies. Table 19 shows a comparison of the release fractions between the Spent Fuel Pool Study and previous studies that demonstrates that cesium release fractions are generally less in the Spent Fuel Pool Study when compared to previous studies, and the timing of the release is generally longer.</p> <p>The range of release fractions for this regulatory analysis is shown in Table 20. For the alternative 1 in Group 1, the release fractions are based on the high density cases in the Spent Fuel Pool Study with the low estimate representing cases where the reactor building remains intact, while the base case reflects cases with significant air oxidation as a result of substantial damage to the refueling bay. The high estimate represents a bounding case with large scale damage and relocation of the spent fuel assemblies and subsequent interaction of the fuel debris with the concrete floor. Alternative 2 in Group 1 represent the low density cases from the SFPS. For alternative 1 in the other groups, the range of release fractions is consistent with past studies (see Table 19), but the high estimate is 90% based on insights from the SFPS regarding molten core concrete interaction sensitivity study. The release fractions for Alternative 2 in Groups 2, 3, & 4 are assumed the same as in Group 1 since the releases are dominated by the recently discharged fuel.</p>				
14	RES	09/04/13	General	A.J. Nosek	<p>I have concerns with some of the conclusions we reach, considering some of the quantitative results indicate to me that expedited fuel movement is cost beneficial for potentially many SFPS.</p> <p>Also, I am seeing some inconsistencies in the results from what I expected. I think I was able to identify some of them (see comment 13), but I wasn't able to reproduce your calculations from the information in the report. It would be helpful if you gave the release frequencies (and conditional consequences) you used in the low, medium, and high estimates for all SFPS groups.</p>	Incorporated. See response to comment 5.				
15	RES	09/04/13	Methodology	A.J. Nosek	I will likely have difficulty defending the inputs from RES as used in the Regulatory Analysis. The inputs for the "base case" results are not meant to represent the fleet as a whole. The "base case" is a point estimate calculation, and a point estimate cannot represent the variations from site to site. Furthermore, when variations of the fleet are considered (as is done in the low and high estimates), the regulatory analysis indicate that expedited fuel movement is cost beneficial for potentially many SFPS. A "monte carlo" selection of inputs for the regulatory analysis would be prudent.	A base case calculation was performed along with sensitivities for key variables. In addition, a low estimate, base case, and high estimate calculation was performed. As you correctly point out, it is unlikely that any one site will realistically only have high, low, or even base case parameters.				
16	RES	09/04/13	Conclusions	A.J. Nosek	<p>The results of the RA do not seem to support the conclusion "the NRC's assessment of costs and benefits...is sufficiently low that the added costs involved with expediting the movement of spent fuel for the reference plant is not warranted". Specifically, when considering a more realistic analysis (i.e. the sensitivities), the "base case" results show that moving fuel is cost beneficial for some groups. Even when using the RA Handbook recommendations, results show that moving fuel is cost beneficial for potentially many sites.</p>	Section 6.2 found that the low-density alternative did not pass the safety goal screen. Although, the analysis could have stopped with this finding, a regulatory analysis was performed to estimate the risk reduction and to quantify the benefits and costs if low-density spent fuel pool storage is implemented. The analysis determined that the cost-justified criteria are not met when evaluating the averted accident consequences within 50 miles of the site consistent with the regulatory framework. Sensitivity studies that extend the analyses to consider even stronger earthquakes, higher likelihood of failures, consideration of accident consequences beyond 50 miles of the site on more populous region, among others did identify cases where the benefits outweighed the costs and the net benefit was positive. However, even for these conservatively calculated cases a cost-beneficial conclusion, although necessary, is not sufficient to justify a backfit.				
17	RES	09/04/13	Conclusions	A.J. Nosek	The conclusions based upon the results of this RA appear to be inconsistent with that of the Filtered Vent RA. The recommendation in the filtered vents RA was to implement filtered vents based upon qualitative factors, even though quantitative results indicated otherwise. This RA concludes moving fuel is not warranted, even though quantitative results indicate that it will be cost justifiable in some circumstances. It is not clear what the basis for this difference is.	The first step is to ensure that the proposed regulatory action is a substantial safety enhancement as compared to the Safety Goal Policy Quantitative Health Objectives. If that criteria is satisfied, the second step is to determine whether the direct and indirect costs of implementation are justified in view of this increased protection.				

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18	RES	09/04/13	Scope	A.J. Nosek	The regulatory analysis should consider different fuel patterns as an additional alternative. The SFPS study shows that a 1x8 fuel pattern may significantly more cost beneficial, although this is not considered. This is in contrast to OMB Circular A-4 on how to conduct a regulatory analysis, which states "You should choose reasonable alternatives deserving careful consideration."	This alternative was removed during a Tier 3 Expedited Spent Fuel Transfer EDO alignment meeting				
19	RES	09/04/13	Reporting	A.J. Nosek	I suggest reporting the release frequencies and conditional consequences that you used for the low, medium, and high estimates, for all SFP groups. Currently, I cannot reproduce the calculations	Incorporated. See response to comment 5.				
20	RES	09/04/13	NPV calcs	A.J. Nosek	Since these calculations are considering future offsite consequences, they should also consider expected future population densities and an expected future value of life as to not undervalue future impacts. Both of these naturally go up, as it is the historical trend of the population to grow and the public willingness to pay to avoid more risks as wages increase. Alternatively, consider adding to section "4.5.10 Other Considerations" as a qualitative consideration.	As described in section 5.7.1.2 of the Regulatory Analysis Handbook, the monetary conversion of radiation exposure is to be calculated for the year in which the exposure occurs and then discounted to present value for purposes of evaluating values and impacts.				
21	RES	09/04/13	NPV calcs	A.J. Nosek	Consider not using a discount for health effects as the baseline. The act of monetizing health effects is appropriate in order to compare the impact of health effects and costs. However, treating the value of life as if it is an investment with a rate of return does not make sense. Discounting the value of life is saying that life in the past somehow less valuable than life today. I understand the guidance given in the Regulatory Analysis Handbook likely states to discount benefits. However, in my opinion, for health effects, "no discount" should be considered the baseline. The use of a discount for health effects—especially when simultaneously not crediting future population growth and expected future VSL—will undervalue future impacts. The amount of years of life lost is not a consideration here because an accident in the future would not affect the average age of the public. Alternatively, consider adding to section "4.5.10 Other Considerations" as a qualitative consideration.	See response to item 20. Furthermore, a sensitivity study was performed to reflect a possible future value of the dollar per person-rem conversion factor when updated for an expected future value of statistical life and an updated value for the cancer risk factor as discussed in section 4.4.2.				
22	RES	09/04/13	Consequences beyond 50 mi	A.J. Nosek	I disagree with using a distance truncation of 50 miles for the regulatory analysis. I believe this can significantly underestimate the total offsite consequence for large releases, such as from the estimated source terms in this report. I appreciate the regulatory analysis sensitivity which includes impacts beyond 50 miles. However, this should be considered the baseline, not merely a sensitivity. I understand that this is the guidance given in the Regulatory Analysis Handbook. However, as stated in OMB's Circular A-4, for which the Handbook is based on: "[The scope of] your analysis should focus on benefits and costs that accrue to citizens and residents of the United States. Where you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, those effects should be reported separately. The time frame for your analysis should cover a period long enough to encompass all the important benefits and costs likely to result from the rule." In addition, the "baseline should be the best assessment of the way the world would look absent the proposed action".	The NRC has voluntarily complied with OMB Circular A-4, "Regulatory Guidance," since 1981. Although the OMB section cited has to do with reporting the effects beyond the borders of the US and does not explicitly address the distance from the site. You correctly identify that guidance for evaluating radiological and offsite property damage effects within 50 miles is stated in the Regulatory Analysis Handbook. A sensitivity analysis for effects beyond 50 miles is included as a sensitivity study as information for the Commission.				
23	RES	09/04/13	Executive Summary	A.J. Nosek	: I suggest adding a conclusion on the results of the cost-benefit analysis, and sensitivities.					
24	RES	09/04/13	Executive Summary	A.J. Nosek	Security Events: I understand we do not quantify the likelihoods of security events. However, consider adding it to "section 4.5.10 Other Considerations" to acknowledge it as a qualitative consideration. This could also help the Executive Summary, which by definition is supposed to be a summary of the report.	Security events are not considered in this regulatory analysis as discussed in the Executive Summary.				

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25	RES	09/04/13	Executive Summary	A.J. Nosek	<p>page ix: I suggest the following edit (below) in the executive summary. The analyzed source terms given for this RA are all BWR source terms, which do not consider full core offloads (that place significantly more short-lived radionuclides in the pool) as commonly done for PWRs. That being said, I do not believe the statement is wrong, but we have not done the analysis to support the statement as currently written. In addition, protective actions are not expected to have significant impact early fatalities, since early fatalities are limited for other reasons.</p> <p>Suggested Edit: "Despite the fairly large releases for the spent fuel pool accident progressions analyzed, the consequence analysis for all cases indicated no the Spent Fuel Pool Study indicates there is little potential for offsite early fatalities from acute radiation effects because protective actions were modeled to be effective in limiting doses to the public."</p>	Text change incorporated.				
26	RES	09/04/13	p. 4	A.J. Nosek	Alternatives 1 and 2 make it sound like there are two alternatives considered to the baseline, although alternative 1 is actually the base case. Perhaps consider labeling one as the base case.	Alternative 1 is labeled as the regulatory baseline - maintain the existing spent fuel storage requirements. To evaluate the two alternatives, the delta change between the two alternatives is analyzed. When base case inputs are used, they are used on both alternatives.				
27	RES	09/04/13	Fig 5	A.J. Nosek	p. 24 - Caption is the same as Figure 6. Do you mean "BWR"?	Comment incorporated to be consistent with the source.				
28	RES	09/04/13	Table 11	A.J. Nosek	p. 34 - Table 84 appears to be inconsistent with this table; Table 84 likely needs to be updated.	Comment incorporated.				
29	RES	09/04/13	Table 12	A.J. Nosek	<p>p 34 - I calculate different uncover frequencies. Using the seismic hazards and liner failures in the proceeding tables, I get 6.6 and 76 for group 1, and 3.3 and 34 for group 2.</p> <p>Medium estimate High estimate Bin 3 4 Total 3 4 Total Seismic Hazard 1.70E-05 4.90E-06 5.60E-05 2.00E-05 Liner Failure 0.1 1 1 1 BWR Mk I/II Uncovery Frequency 1.70E-06 4.90E-06 6.60E-06 5.60E-05 2.00E-05 7.60E-05 Liner Failure 0.05 0.5 0.25 1 All others Uncovery Frequency 8.50E-07 2.45E-06 3.30E-06 1.40E-05 2.00E-05 3.40E-05</p>	Agree - see comment resolution 3.				
30	RES	09/04/13	4.3.2.3	A.J. Nosek	<p>p. 36 - "In reality, the effectiveness of post Fukushima improvements to severe accident mitigation measures will depend on a variety of factors, which the Spent Fuel Pool Study did not consider, and which are expected to be more effective more than 95-percent of the time, but are expected to increase the likelihood that deployment of mitigation measures is successful."</p> <p>Comment: I suggest the preceding edit. The original sentence makes it sound like mitigation measures are more than 95% likely, which is unlikely based on the SPFS HRA and potential improvements. I imagine the text may have meant mitigation's effectiveness "if successfully deployed", although this is mostly redundant with the factor of 19 (95% ~ = 1/19).</p>	Comment incorporated. Text revised.				
31	RES	09/04/13	4.3.2.3	A.J. Nosek	<p>p. 36 - "For the purposes of this regulatory analysis, it was assumed that successful mitigation decreased the conditional probability by a factor of 19 for all initiating events as determined in the Spent Fuel Pool Study. Because of uncertainty and variability in designs and strategies between plants, this assumption will be addressed in a sensitivity analysis."</p> <p>Comment: It is not clear where this is assumed, and I see no sensitivities that address mitigation.</p>	<p>The comment correctly identifies that a sensitivity was not performed for mitigation. Text revised as follows:</p> <p>For the purposes of this regulatory analysis, it was assumed that mitigation if successfully deployed decreased the conditional probability by a factor of 19 for all initiating events as determined in the Spent Fuel Pool Study. Because of uncertainty and variability in designs and strategies between plants, this assumption was only used in the evaluation of alternative 2 for low-density spent fuel pool storage.</p>				
32	RES	09/04/13	Table 14	A.J. Nosek	p. 37 - It is not clear what values are used in the low/medium/high estimates in Table 14. Furthermore, it is not clear which SFP group(s) this data is applicable to. Therefore, I cannot follow to reproduce the calculations.	See response to item 5. Plan to revise table 13 to give release frequencies for low estimate, base case, and high estimate.				
33	RES	09/04/13	T 22 & 4.5.4.2	A.J. Nosek	19 - Page 45, Table 22 & Page 66, Section 4.5.4.2: While Surry may represent an average population density within 50 miles, it produces the lowest consequences when the distance is not truncated. Please consider recognizing this somewhere in the report for the sensitivity calculations. This is likely because of the site's proximity to the ocean.	Noted. Surry does produce the lowest consequence when the distance is not truncated but the results are within a factor of 2 of the highest total consequence (at an assumed 88.4% release) which is within the range of uncertainty. It is somewhat surprising that the total consequence does not reflect a greater delta.				

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34	RES	09/04/13	4.3.2.9	A.J. Nosek	p. 43 - I suggest renaming the section to SFP Release Fractions, as this section does not discuss release magnitudes. I also suggest keeping the section on pool inventory next to this section, as these are the two major inputs in deriving the source terms for the RA. I coordinated the rest of my comments on this section with Hossein. Please see his writeup.	Comment incorporated. Section heading renamed.				
35	RES	09/04/13	4.3.2.10	A.J. Nosek	p. 44 - Please delete the last paragraph. This isn't correct.	Comment incorporated. Paragraph deleted.				
36	RES	09/04/13	4.3.2.13	A.J. Nosek	p. 47 - This Evacuation model was only used for releases less than 1 MCI, which I do not believe you used in the RA. Also, the next paragraph is on Met data, not "Emergency Response Modeling". Some of this information is rather detailed and incomplete. Perhaps a better strategy is to reference the offsite consequence analysis done in the Spent Fuel Pool Study, and distinguish what was done differently to expand the analysis to the fleet of SFPs. You may be able to use the input I gave you on July 18th.	Section 4.3.2.13 text was revised to delete Peach Bottom-specified response model discussion. Emergency response model, although not significant, was not modified from Peach Bottom's for any sensitivity studies.				
37	RES	09/04/13	5.1.1	A.J. Nosek	p. 79 - The last paragraph states "None of the spent fuel pool groups achieve a positive net benefit using the current regulatory framework." Is the guidance in the RA handbook considered the "regulatory framework"? Simply updating the RA handbook would make this statement not true. Consider saying more specifically "using the current RA handbook guidance".	The RA Handbook guidance is considered the current regulatory framework. Updating the RA Handbook would not change the statement unless the Commission agrees to policy changes.				
38	RES	09/04/13	Table 56	A.J. Nosek	p. 85 The table indicates that industry implementation of expedited fuel movement costs less at 7% than at 3%. Is this correct?	Section 4.5.6 shows the projected costs to implement each alternative. The difference in costs between implementing the two alternatives shows that there is a greater delta when discounting at 7% than 3%. That is because the costs incurred within 5 years to achieve the low-density storage configuration has a greater impact than those cask storage costs incurred well into the future.				
39	RES	09/04/13	6.2	A.J. Nosek	p100 The last paragraph of this section states that the backfit "would not constitute a substantial increase in protection to public health or safety or the common defense and security, and the costs of this rule would not be justified in view of the increase in protection to safety and security". However, we did not analyze the security benefit of the backfit, only the safety benefit.	As previously discussed in response to comment 24, security events are not considered in this regulatory analysis as discussed in the Executive Summary. This regulatory analysis does not impact conclusions of previously performed security analyses that resulted in that conclusion.				
40	RES	09/04/13	General	B. Wagner	As it stands, I disagree that the current analysis supports the conclusions being made. In summary, the draft analysis is difficult to follow, some of the calculations seem incorrect, and the numerical results of the analysis do not support the regulatory conclusion.	Document revisions were made to resolve discrepancies and issues as documented in this matrix.				
41	RES	09/04/13	Conclusions	B. Wagner	• The conclusions are not supported by the results of the analysis. The "base case" does not account for variations among plants, while the "high estimate" does. Despite this, the decision is made based on the results of the base case. The analysis essentially concludes that no further regulatory action is needed for any plant because the alternative is not cost-beneficial for some plants. To truly demonstrate that the proposed alternative is not cost-beneficial, the analysis should use reasonably limiting values for each parameter to ensure that all plants are bounded. Note that this is essentially what was done in the high estimate, which often resulted in the alternative being cost-beneficial.	See response to comment 15.				
42	RES	09/04/13	Results	B. Wagner	• I was unable to reproduce the results of the analysis leading me to suspect that many of the results are incorrect. Further, not enough information is provided in the report to reproduce the results. The results need a thorough review and more tables summarizing intermediary results should be provided. Some specific suggestions are provided in comments below.	See responses to specific comments below.				
43	RES	09/04/13	General	B. Wagner	• Much language is taken from Appendix D of the SFPS which doesn't make sense in the current context. The phrase "this study" is often used to describe the SFPS.	The term "this study" is used four times in this regulatory analysis. In each case (p.p. viii, 34 (twice), and 45), the preceding sentence identified and referenced the SFPS.				
44	RES	09/04/13	General	B. Wagner	• Many of the values in the report need much more technical justification. Some specific suggestions are provided in comments below.	See responses to specific comments below.				
45	RES	09/04/13	Executive Summary	B. Wagner	• The executive summary is silent on the cost-benefit analysis which constitutes essentially the entire document. The purpose of an executive summary is to summarize the contents of the document so it should include several paragraphs on the results of the cost-benefit, including sensitivities.	Noted.				
46	RES	09/04/13	Alternatives	B. Wagner	• The regulatory analysis doesn't consider other reasonable alternatives such as expedited transfer of less fuel (e.g. 10 year cooled and older) or alternative loading patterns (e.g. 1x8). NRC guidance on performing regulatory analyses, documented in NUREG/BR-0058, states "The list of alternatives should be reasonably comprehensive to ensure that the range of all potentially reasonable and practical approaches to the problem are considered." This is a significant omission, especially considering the recommendation to consider a 1x8 pattern in the SFPS regulatory analysis.	A management decision was made to delete other alternatives being considered so that the regulatory analysis would focus solely on the expedited spent fuel transfer alternative.				
47	RES	09/04/13	Executive Summary	B. Wagner	• Executive summary paragraph 4: Some risk information is discussed. Determining the relative contribution to risk wasn't a goal of the regulatory analysis, which is not a PRA. Consider deleting risk statements.	Noted.				

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48	RES	09/04/13	Executive Summary	B. Wagner	<ul style="list-style-type: none"> Executive summary paragraph 6: The study assumes that mitigation is successful for low density cases and unsuccessful for high density cases. The basis for this assumption is unclear. There isn't any obvious reason density would affect mitigation likelihood. I suggest assuming mitigation fails for both high and low density. Regardless of whether this assumption is changed, it should be removed from the executive summary. It's one of many assumptions, and has a relatively small effect. It's unclear why it should be highlighted in the executive summary. 	This assumption provides the largest delta benefit between the two alternatives.				
49	RES	09/04/13	Table 12	B. Wagner	<ul style="list-style-type: none"> Table 12 "Frequency of Spent Fuel Pool Uncovery for Seismic Events" has incorrect values for the row "this regulatory analysis." 	Incorporated. See response to comment 3.				
50	RES	09/04/13	Table 13	B. Wagner	<ul style="list-style-type: none"> Table 13 "Fraction of Severe Seismic Events that Result in a Partial Spent Fuel Pool Draindown Preventing Natural Circulation Cooling of the Spent Fuel": the title is misleading. The values presented in the table are the fraction of time the fuel is not air coolable due to either excessive heat or a partial draindown. The table should be renamed and the phenomena more adequately explained in the text. 	Incorporated. Table 12 was renamed to "Fraction of Severe Seismic Events that Result in a Partial Spent Fuel Pool Draindown Preventing Natural Circulation Cooling of the Spent Fuel."				
51	RES	09/04/13	Table 14	B. Wagner	<ul style="list-style-type: none"> Table 14 "Release Frequencies for Spent Fuel Pool Initiators": Some of the values in this table are incorrect. 	Incorporated. See response to comment 5.				
52	RES	09/04/13	Table 14	B. Wagner	<ul style="list-style-type: none"> A table summarizing the release frequencies used should be provided. An example is given below in Table 1. 	Incorporated. See response to comment 5.				
53	RES	09/04/13	Table 21	B. Wagner	<ul style="list-style-type: none"> Table 21 "Estimated Cumulative Cesium Inventory Release Fraction Given a Spent Fuel Pool Fire" is an example of where significantly more technical justification should be provided in the text. RES provided these values based on SFPS results and their judgment. Though the values are somewhat arbitrary, there was reasoning behind them that could be conveyed. 	Need input from RES.				
54	RES	09/04/13	Table 22	B. Wagner	<ul style="list-style-type: none"> Table 22 "Population Density within a 50 Mile Radius of U.S. Nuclear Power Plant Sites" lists high, mean, median and low estimates. It's unclear in this table which are used in the low, best and high cases. 	Table 88, Regulatory Analysis Inputs Summary, identifies that the median (the highest of the two low estimates) was used in the low estimate, the mean was used in the base case, and the high estimate was used in the high estimate.				
55	RES	09/04/13	4.3.3.2	B. Wagner	<ul style="list-style-type: none"> The cost calculations assume that casks will have to be severely underloaded based on the 5-year cooling time. This results in a 25%-35% increase in cask costs. This significant cost increase raises the obvious question of why a more reasonable alternative wasn't considered. For example, with 7-year cooled fuel these costs would be significantly lower and the benefits may be similar. The assumptions clearly don't maximize the benefits relative to the costs. 	For this regulatory analysis, the Transnuclear TN-68 dry casks are selected as representative DSCs for the BWR spent fuel for Group 1. For Groups 2, 3, and 4, the Holtec Hi-Storm FW DSC is modeled as representative DSCs for the PWR spent fuel. Based on Table 5, the maximum capacity based on decay heat is reduced by approximately 16%. If additional spent fuel is allowed to remain in the pool, then an analysis to determine what the loading configuration would be and its impact on the accident progression and consequence analysis.				
56	RES	09/04/13	4.3.1.3	B. Wagner	Discount rates - • Section D.3.3.1 of the SFPS states "Historically, regulatory analyses have provided the undiscounted values for the costs and benefits for information purposes, but have not provided them as a sensitivity analysis." Why are undiscounted values not reported in the current analysis?	As discussed in section 4.4.1, a low discount rate value of 2.0 percent is included, which represent the lower bound for the certainty-equivalency rate in 100 years using the random walk model approach to address the concern that interest rates are highly uncertain over time. This				
57	RES	09/04/13	4.4.5	B. Wagner	<ul style="list-style-type: none"> Section 4.4.5 "Sensitivity to a Uniform Fuel Pattern during an Outage": Suggest referencing where the results of this sensitivity are reported. The section is similar (redundant?) to Section 4.5.1.5 	The sensitivity results are reported in section 4.5.1.5.				
58	RES	09/04/13	4.5.1.5	B. Wagner	<ul style="list-style-type: none"> Section 4.5.1.5 "Sensitivity to a Uniform Fuel Pattern during an Outage": It's not clear where these numbers come from. 	Table 35 provides a comparison of the effect on the public health (accident) attribute if a plant operator initially places discharged spent fuel in a uniform pattern and achieves the 1x4 pattern by the end of OCP 2 (i.e., within 25 days) versus placing the fuel directly into the 1x4 pattern				
59	RES	09/04/13	4.5.1	B. Wagner	<ul style="list-style-type: none"> Section 4.5.1 "Public Health (Accident)": This section is one example where I can't reproduce the reported numbers. Rather than 14.3 person-rem per year, I calculate more like 77. Further, the reported numbers seem to contradict those in the SFPS. This analysis uses a release ~3x larger, a release frequency ~10x larger and only calculates an averted dose ~3x larger. The calculation of these values should be verified and should be more apparent in the text. 	Noted.				
60	RES	09/04/13	4.5.1	B. Wagner	<ul style="list-style-type: none"> Section 4.5.1 "Public Health (Accident)": The section says that a population density of 345 is used. This is inconsistent with Table 22 and Table 84. 	Comment incorporated. Made conforming change to section 4.5.1.				
61	RES	09/04/13	4.5.1.1	B. Wagner	<ul style="list-style-type: none"> Section 4.5.1.1 "Population Demographic Sensitivity": Not clear what this section is doing or where the numbers are coming from. Isn't this effect already included in the difference between the base case and high estimate? 	This section shows the impact of varying a single variable within the base case. In this case, it is population demography.				
62	RES	09/04/13	4.5.1.2	B. Wagner	<ul style="list-style-type: none"> Section 4.5.1.2 "Public Health (Accident) Consequences Beyond 50 Miles Sensitivity": The first sentence should be changed to "Because a spent fuel pool fire under certain scenarios and environmental conditions could be expected to result in impacts to public health that extend beyond 50 miles..." to more accurately represent the likely scope of SFP accidents. 	Comment incorporated. The text was revised as follows: Because a spent fuel pool fire could result in impacts to public health that extend beyond 50 miles, this case evaluates the sensitivity of averted public health exposures extending beyond 50 miles from the site, using the base case assumptions and the standard \$2000 per person-rem conversion factor.				

Regulatory Analysis, Rev. A Comment Resolution Matrix

No.	Office	Received	Affected Section	Name	Comment	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
63	RES	09/04/13	4.5.1.4	B. Wagner	• Section 4.5.1.4 "Seismic Initiator Frequency Assumptions Sensitivity": Isn't this already included in the difference between the base case and high estimate? The numbers in the table seem to conflict with previous tables.	This section shows the impact of varying a single variable within the base case. In this case, it is seismic initiator frequency.				
64	RES	09/04/13	Table 44	B. Wagner	• Table 44 "Sensitivity...Loading Pattern of Discharged Fuel": Not clear what numbers were used to generate this table.	This section shows the impact of varying a single variable within the base case. In this case, the uniform high-density fuel pattern consequences replaced the 1x4 high-density fuel pattern consequences.				
65	RES	09/04/13	4.5.10.2	B. Wagner	• Section 4.5.10.2 "Cask Handling Risk": This section erroneously implies that dry cask costs were not included in the analysis when in fact, they were.	This section refers to the incremental labor and equipment costs associated with receiving the casks, moving the cask to the loading area, and moving the cask to the ISFSI.				
66	RES	09/04/13	Table 47	B. Wagner	• Table 47 "Summary of Totals for Alternatives": Table should include low and high estimates since plant variation and uncertainties are not contained within the base case.	Noted.				
67	RES	09/04/13	5.1.4	B. Wagner	• Section 5.1.4 "Sensitivity Analysis": "In this section, a low and high estimate is provided which combines the range of expected spent fuel pool attributes with conservative assumptions to model the range of pool accidents postulated." It's not clear what is being calculated in the low, base and high estimates. If the range of expected attributes are included as described throughout the text, the high estimate should be larger than the base case by at least the ratio of the release frequencies. Looking at the results, this is not usually the case, implying a mistake seems to have been made somewhere.	In the sensitivity analysis section only one variable at a time is varied.				
68	RES	09/04/13	6.1	B. Wagner	• Section 6.1 "Regulatory Analysis": Most of the justification in this section should be included in the executive summary	Noted.				
69	RES	09/04/13	Sensitivity beyond 50 mi	B. Wagner	• The regulatory analysis guidelines should be updated to not recommend truncating results beyond 50 miles. For SFP releases, in many cases the majority of the consequences are beyond 50 miles and a 50 mile truncation is inconsistent with the agency's use of LNT.	Noted. This change is a policy change and requires Commission approval.				
70	RES	09/04/13	6	K. Compton	The logic for the decision is not clearly presented. 1. If the basis for no action is that there is no substantial increase in public health or safety because of the large margin to the safety goals in the no action alternative, then that could be much more clearly stated. In this case, the question of cost-benefitality is moot.	Correct. The basis for no action is there is not a substantial increase in public health or safety for implementing alternative 2, low-density spent fuel pool storage.				
71	RES	09/04/13	6	K. Compton	To the extent that the costs of the proposed alternatives outweigh the benefits, the writeup is somewhat difficult to follow. The costs are dominated by industry implementation and appears to be relatively constrained to around 50MS. The benefits are dominated by averted offsite property and by public health (accident) consequences, which appears more variable, and that is where I would suggest that additional clarity is needed. There seem to be two critical assumptions: whether the benefit should be maximized by assigning the mitigated case to the high density pool, and whether the 50 mile truncation is the baseline.	With respect to the consequence analysis, those are the two critical inputs.				
72	RES	09/04/13	Mitigation	K. Compton	The writeup seems contradictory with respect to whether the effect of mitigation is credited. It is explained in the executive summary that the analysis uses a conservative approach to mitigation by "crediting successful mitigation to the low-density spent fuel pool storage alternative and assuming no successful mitigation for the high-density spent fuel pool storage regulatory baseline". However, the discussion of alternative 1 (p. 4) states that compliance with all current regulatory requirements "is part of the baseline. However, it does not appear that any of the three bulleted items are credited in the alternative 1 baseline. This should be more clearly explained. A recommended approach would be to perform a sensitivity analysis with credit for mitigation and lack of credit for mitigation. It could well be that the assumption of no successful mitigation as the baseline for alternative 1 would, in all cases, drive whether expedited transfer is cost beneficial or not.	See the response to comments 12 and 31. Credit for mitigation was only considered for the low-density storage alternate 2 to maximize the benefit as compared to alternative 1. Section 4.5.10.3 addresses mitigation qualitatively by discussing the additional instrumentation, mitigation equipment, and strategies required under Orders EA-12-049 and EA-12-051. This additional equipment, strategies, and features provided by Orders EA-12-049 and EA 12 051, provide additional accident mitigation capability and would further enhance the likelihood of successful mitigation, thereby further reducing the value for the conditional probability of release used in this regulatory analysis.				
73	RES	09/04/13	OPD	K. Compton	The computation of offsite property damage does not appear to be clearly explained. For example, the description of offsite property on p. 17 and p. 64 appears to be adapted from NUREG/BR-0184 and refers to items such as land, food, water, and tourism. However, (to the best of my understanding) the economic impacts computed by MACCS2 are dominated by the cost of interdiction, i.e., the costs associated with depreciation and loss of use of interdicted land and structures, along with the costs of relocation and decontamination. This is not clearly explained, and the writeup implies that indirect tertiary impacts such tourism are included in the cost estimates. Including these indirect tertiary effects may impact the benefit of averted economic losses.	Noted. The computation of offsite property damage is assumed to be dominated by the cost of interdiction.				

Regulatory Analysis, Rev. A Comment Resolution Matrix

No.	Office	Received	Affected Section	Name	Comment	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
74	RES	09/04/13	50 miles	K. Compton	The basis for the use of 50 miles as the base case is not explained except by reference to the guidance in NUREG/BR-0184. However, that guidance appears to be specific to power reactors. On p. 56 of the reg analysis, it implies that the SFPS model may be the reason for results extending beyond 50 miles ("The Spent Fuel Pool Study uses a plume release model that predicts slow deposition of aerosols. This results in public health consequences that extend beyond 50 miles from the postulated accident site."). The reason for effects beyond 50 miles is the large magnitude of Cs release, not the plume model. Even for power reactors, it is acknowledged on p. 5-40 of NUREG/BR-0184 that "A study is also performed comparing the effect of modeling offsite damage to radii of 50 and 500 miles. It indicates that the choice of radius is significant only for the SSTI accident category, the differences being quite pronounced.". Similar observations can be made by examination of the NUREG-1150 analyses for the Zion plant (NUREG/CR-4551, Vol 7, Rev 1, Part 1, Fig. D.1-5)	The plume model (including the met data) provides the transport mechanism for depositing radioactive cesium.				
75	RES	09/04/13	4.6.10.1	K. Compton	There are assertions of uncertainties on consequence modeling that do not appear well supported and/or that would challenge the conclusions made regarding whether the benefits outweigh the costs. Note that the assertion of uncertainty does not necessarily imply that a conservative treatment was used.	Clarify. This text was provided by RES.				
76	RES	09/04/13	p. 47	K. Compton	P. 47: "These measures are subject to large uncertainties, as it is difficult to model the impact of disruptions to many different aspects of local economies, the loss of infrastructure on the general U.S. economy, or the details of how long-term protective actions would be performed.". If the uncertainties are large, the impact of these uncertainties on the conclusion (that costs outweigh benefits) should be more clearly addressed	Noted.				
77	RES	09/04/13	p. 76	K. Compton	P. 76: "There are also significant uncertainties in the calculation of event consequences in terms of the dispersion and disposition of radioactive material into the site environs. This is due in part to significant uncertainties regarding the degree to which topographical features and other phenomena are modeled at distances away from the evaluated site.". This does not appear consistent with NUREG/CR-6853 (comparison to ADAPT/LODI showed good agreement out to 100 miles), SECY-12-0110 Enclosure 9, or staff testimony related to Pilgrim SAMA analyses when contentions regarding the effects of local meteorological variations (i.e., seabreeze/landbreeze) was dismissed by the ASLB	Noted. The Peach Bottom met data and topographical features were used for all sensitivity cases evaluated? Is that representative for all sites. In the study cited is there good agreement beyond 100 miles?				
78	RES	09/04/13	p.2	K. Compton	"In response to these recent events, the staff has determined that it should confirm that high density spent fuel pool configurations continue to provide adequate protection, and assess whether any safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry cask storage." – Shouldn't the Tier III plan be referenced here rather than the broad considerations that were discussed in the SFPS?	Comment incorporated. Text revised to: In response to these recent events, the staff has determined that it should confirm that high density spent fuel pool configurations continue to provide adequate protection, and assess whether any safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry cask storage as described in a memorandum to the Commission, "Updated Schedule And Plans For Japan Lessons-Learned Tier 3 Issue On Expedited Transfer of Spent Fuel," (Ref. 77).				
79	RES	09/04/13	p. 12	K. Compton	• P. 12: "Away-from-reactor pools constitute the largest volume of interim spent fuel storage.". This does not seem right. Most fuel is stored in dry casks at onsite ISFSI's, correct? Recommend clarification	Comment incorporated. Text revised to: Away-from-reactor pools are used to provide interim spent fuel storage. Typically, they are divided into pools at the reactor site and pools away from the reactor site or offsite although this distinction is not important to this analysis.				
80	RES	09/04/13	p.43	K. Compton	• P. 43: "A comparison of the release characteristics from previous spent fuel pool studies demonstrates that releases of cesium are generally less in the current study than in previous studies"; more accurately, the release fractions are generally less. With a larger inventory, one can have a smaller release fraction but a comparable release magnitude	The first paragraph of section 4.3.2.9 states: The spent fuel pool release fractions used in this regulatory analysis is based on the results of the Spent Fuel Pool Study for Group 1 as well as previous spent fuel pool studies. Table 19 shows a comparison of the release fractions between the Spent Fuel Pool Study and previous studies that demonstrates that cesium release fractions are generally less in the Spent Fuel Pool Study when compared to previous studies, and the timing of the release is generally longer.				
81	RES	09/04/13	p. 44	K. Compton	• P. 44: "Other settings and models necessary for a MACCS2 calculation (e.g., food chain model) were taken from the NUREG-1150 (Ref. 46) study MACCS2 input file prepared for the Surry Power Station. The input file is documented in Appendix C to the MACCS2 code manual (Ref. 67) and is referred to there as Sample Problem-A.". I would not refer to Surry or Sample Problem A. The settings were based on the site specific review conducted for SOARCA and documented in NUREG-1935, NUREG/CR-7110, and the forthcoming best practices NUREG	Noted.				

Regulatory Analysis, Rev. A Comment Resolution Matrix

No.	Office	Received	Affected Section	Name	Comment	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
82	RES	09/04/13	p. 44	K. Compton	• P. 44: "Two important parameters and variables required to model a spent fuel pool site are 1) the population density and distribution and 2) the site meteorology": The impact of meteorological variations across sites does not appear to be discussed in the report	This regulatory analysis modeled the demographics and economic data of 4 nuclear power plant sites. No variation from the Peach Bottom meteorological data was conducted.				
83	RES	09/04/13	p. 47	K. Compton	• P. 47: "This response model assumed that a seismic event would not significantly affect emergency response. This is based on an assessment in NUREG-1935 (Ref. 54) of the same site and seismic event that assumed the damage to local infrastructure is limited to 12 bridges, partly due to the few large structures in the area ": Similar to the comment on meteorology, bear in mind that this observation is highly site specific but the results are used on a fleetwide basis	Noted. See comment 36 in which states: This Evacuation model was only used for releases less than 1 MCI, which I do not believe you used in the RA				
84	RES	09/04/13	p. 48	K. Compton	• P. 48: "Although using a single plant's emergency response modeling and consequence analyses introduce uncertainty especially for estimating consequences for distances far from the site, the expected results are expected to be relatively insensitive near the site. Therefore, the resulting quantitative health objectives used in comparisons to the Commission's Safety Goals represent risk to the average individual within 1 mile and 10 miles of the plant, and should be relatively insensitive to this modeling.": This statement needs to be checked, something does not sound right. EP should not affect consequences at far distances; however, it can significantly affect close-in consequences such as early fatalities	This statement is based on input provided by RES.				
85	RES	09/04/13	p. 55	K. Compton	• P. 55: "Because Cs-137 releases are long-lived, subsequent damages occur over many years.": It is unclear what the half life of the radionuclides has to do with the discount rate, as we do not apply discount rates after the accident, only when rolling up annualized costs for the remaining reactor life.	Comment incorporated. Statement deleted.				
86	RES	09/04/13	p. 80	K. Compton	• P. 80: "Therefore, the use of alternate dose response models would significantly reduce the quantified latent cancer fatalities by at least an order of magnitude.": LCF risk, not latent fatalities. We do not quantify total latent fatalities in the SFPS, only collective dose	Comment incorporated. Revised text to read: Therefore, the use of alternate dose response models would significantly reduce the quantified latent cancer fatality risk by at least an order of magnitude.				

	Office	Status
NRR		Open
NRO		Review Response to Disposition.
NMSS		Closed with Ques.
NSIR		Closed
OPA		
RES		

NOT FOR PUBLIC DISCLOSURE

From: [Witt, Kevin](#)
To: [Merzke, Daniel](#); [Uhle, Jennifer](#); [Taylor, Robert](#); [Schofer, Fred](#); [Kokajko, Lawrence](#); [McGinty, Tim](#); [Casto, Greg](#); [Lombard, Mark](#); [Barto, Andrew](#); [Gendelman, Adam](#); [Campbell, Tison](#); [Mizuno, Geary](#); [Esmaili, Hossein](#); [Gibson, Kathy](#)
Subject: June 19 Chairman Briefing on Spent Fuel Pool Study & Regulatory Analysis
Date: Tuesday, June 18, 2013 3:21:44 PM
Attachments: [ChairmanBrfAgenda\(6-19-13\).docx](#)
[ChairmanBrief-1pager\(6-19-13\).docx](#)
[Schedules\(Tier3-WC-SFPS\(rev6-12-13\)\).pptx](#)

Hello all, please see the attached final documents for the June 19 11am-12pm Chairman briefing on the spent fuel pool study and regulatory analysis. Note that the briefing agenda changed slightly from OGC comments to indicate the regulatory analysis and backfit analysis discussions are focused on the reference plant.

Please let me know if I can provide any additional information.

Thanks,
Kevin

Briefing Agenda for the Chairman
June 19, 2013, 11AM – 12PM

- Recap of Spent Fuel Pool Study Results – High level discussion of results from the study as outlined in the executive summary. Short discussion on qualitative comparison of risks (Appendix B).
- Reference Plant Regulatory Analysis:
 - o Discussion of regulatory analysis process
 - o How the results of the spent fuel pool study were used in the regulatory analysis (including alternatives considered, seismic event modeling and frequency, consequence analysis results, mitigation model, and limitations of the regulatory analysis)
 - o Use of low, best, and high estimates for the regulatory analysis model (including release frequency, occupational worker exposure (accident), long-term habitability criteria, and contamination impacts/costs).
 - o Overview of sensitivity studies included in the spent fuel pool study regulatory analysis (including person-rem conversion factor, replacement energy costs, consequences beyond 50 miles, and variation of conditional release frequencies)
 - o Other considerations in the regulatory analysis (including modeling uncertainties, cask handling risk, mitigation strategies, and qualitative factors including defense in depth)
 - o Regulatory analysis results
- Reference Plant Backfit Analysis:
 - o Results of the backfit analysis contained in the spent fuel pool study according to the criteria in 10 CFR 50.109(a)(8)
- Tier 3 plan:
 - o Discussion of how the insights from this study will inform a broader regulatory analysis of the spent fuel pools at all U.S. operating nuclear reactors
 - o Considers the schedule to support the agency's ongoing waste confidence efforts

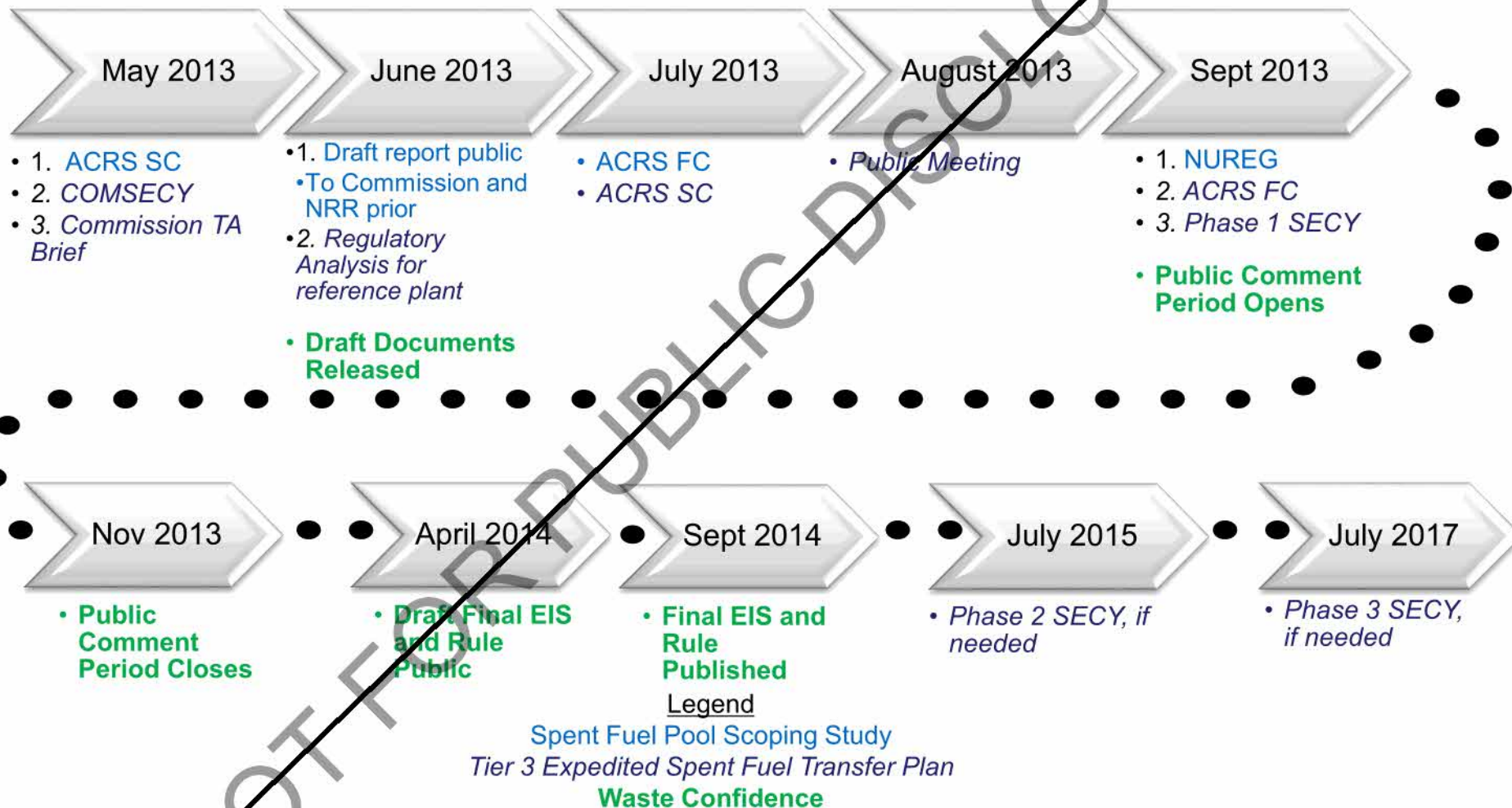
*Note that the staff does not plan to specifically discuss aspects of dry cask storage during this briefing and is open to briefing the Chairman on those aspects in the future if requested. NMSS will attend the briefing to help answer any specific questions that Chairman could have on the operations/doses/costs of dry cask storage for Peach Bottom that are reported in the regulatory analysis.

Spent Fuel Pool Study and Regulatory Analysis Results

June 2013

- The purpose of the study was to determine if accelerated transfer of spent fuel from the spent fuel pool to dry cask storage significantly reduces risks to public health and safety. The study compares high-density and low-density loading conditions and assesses the benefits of post 9/11 mitigation measures.
- The study estimated that the likelihood of a radiological release from the spent fuel pool resulting from the selected severe seismic event analyzed in this study is on the order of one time in 10 million years or lower.
- In the unlikely situation that a leak occurs, this study shows that for the scenarios and spent fuel pool studied, spent fuel is only susceptible to a radiological release within a few months after the fuel is moved from the reactor into the spent fuel pool. After that time, the spent fuel is coolable by air.
- For the hypothetical releases studied, no early fatalities attributable to acute radiation exposure were predicted and individual latent cancer fatality risks are projected to be low.
- This study is consistent with earlier research conclusions that spent fuel pools are robust structures that are likely to withstand severe earthquakes without leaking.
- The study results demonstrated that in a high-density loading configuration, a more favorable fuel pattern or successful mitigation generally prevented or reduced the size of potential releases.
- Low-density loading reduced the size of potential releases but did not affect the likelihood of a release.
- The beneficial effects in the reduction of offsite consequences between a high-density loading scenario and a low-density loading scenario are primarily associated with the reduction in the potential extent of land contamination and associated protective actions.
- The regulatory analysis portion of the study documents a comparison between the safety of high-density fuel pool storage relative to low density fuel pool storage using the initiating frequency and consequences from the study as an indicator of any changes in our understanding of safe storage of spent fuel.
- The application of this study's results to the NRC's regulatory analysis guidelines indicates that requiring the low-density spent fuel pool storage alternative is not justified for the reference plant given the analysis assumptions.
- The risk due to beyond design basis accidents in the spent fuel pool analyzed in this study is sufficiently low that the added costs involved with expediting the movement of spent fuel from the pool to achieve the low-density fuel pool storage alternative are not warranted.
- Sensitivity analyses that extend the analyses beyond the primary area considered also show that the low-density spent fuel storage alternative was not cost justified for any of the discounted sensitivity cases.
- The NRC plans to use the insights from this analysis to inform a broader regulatory analysis of the spent fuel pools at all US operating nuclear reactors.

Major Spent Fuel Pool Transfer Milestones



From: [Witt, Kevin](#)
To: [Taylor, Robert](#); [Skeen, David](#); [McGinty, Tim](#); [Davis, Jack](#); [Casto, Greg](#); [Reckley, William](#); [Kokajko, Lawrence](#); [Bahadur, Sher](#); [Helton, Shana](#); [Schofer, Fred](#); [Gibson, Kathy](#); [Lombard, Mark](#); [Coe, Doug](#); [Craig, Jocelyn](#); [Merzke, Daniel](#); [Bielecki, Jessica](#); [Helton, Donald](#); [Haney, Catherine](#); [Hsia, Anthony](#); [Moore, Scott](#); [Imboden, Andy](#); [Gendelman, Adam](#); [Safford, Carrie](#); [Demoss, Gary](#); [Wagner, Brian](#)
Subject: RE: Alignment Meeting for Upcoming Chairman Briefing on SFPS/RA
Date: Tuesday, June 11, 2013 12:40:48 PM
Attachments: [ChairmanBrfTopics\(6-19-13\).docx](#)

Hello all, please see the attached proposed agenda for the Chairman briefing on June 19. Please let me know if you have any comments or suggestions by COB today. We are planning to provide to Jennifer Uhle for alignment with the Chairman's office.

Thanks,

Kevin

From: Witt, Kevin
Sent: Monday, June 10, 2013 4:24 PM
To: Witt, Kevin; Taylor, Robert; Skeen, David; McGinty, Tim; Davis, Jack; Casto, Greg; Reckley, William; Kokajko, Lawrence; Bahadur, Sher; Helton, Shana; Schofer, Fred; Gibson, Kathy; Lombard, Mark; Coe, Doug; Craig, Jocelyn; Merzke, Daniel; Bielecki, Jessica
Cc: Haney, Catherine; Hsia, Anthony; Moore, Scott; Imboden, Andy; Gendelman, Adam; Safford, Carrie; Demoss, Gary; Wagner, Brian
Subject: RE: Alignment Meeting for Upcoming Chairman Briefing on SFPS/RA

Hello all, thank you for supporting this alignment meeting. As a result of the meeting I have noted the decisions/action items as follows:

- Preferred briefing time is June 19, 11am-12pm
- Attendance for the briefing: Jennifer Uhle, Rob Taylor/Dave Skeen, Fred Schofer, RES (1-2), OGC (1-2)
- NRR/JLD (K. Witt) will propose a detailed list of discussion topics for the briefing by 12pm on June 11 and subsequently distribute to the group for review and comment
- NRR/DSS (T. McGinty) will forward the proposed discussion items to Jennifer Uhle for discussion with the Chairmans office by 5pm June 11
- NRR/JLD (K. Witt) will work with NRR/DPR (F. Schofer) to prepare a one-page outline of the study/reg analysis to use during the briefing by Friday, June 14 and subsequently distribute to the group for review and comment for finalization by June 18.

Please let me know if you have any comments or additional items to consider.

Thanks,

Kevin

-----Original Appointment-----

From: Witt, Kevin

Sent: Friday, June 07, 2013 1:24 PM

To: Witt, Kevin; Taylor, Robert; Skeen, David; McGinty, Tim; Davis, Jack; Casto, Greg; Reckley, William; Kokajko, Lawrence; Bahadur, Sher; Helton, Shana; Schofer, Fred; Gibson, Kathy; Lombard, Mark; Coe, Doug; Craig, Jocelyn; Merzke, Daniel

Cc: Haney, Catherine; Hsia, Anthony; Moore, Scott; Imboden, Andy; Gendelman, Adam; Safford, Carrie; Demoss, Gary; Wagner, Brian

Subject: Alignment Meeting for 6/13 Chairman Briefing

When: Monday, June 10, 2013 2:30 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).

Where: 09-B4

****Update – see attached POP**

<< File: POP-ChmnSpentFuelBrf-MgmtMtg(6-10-13).docx >>

Hello all, the purpose of this meeting is to align on the Chairman briefing scheduled for ~~1045-1145~~ on June 13 **TBD**.

The Chairmans requested briefing topics are as follows:

- Brief summary of the overall findings in the SFPS (consequences/risks)
- Regulatory analysis for perspective (How staff intends to use the results of the study)
- There's a possibility the discussion will run into qualitative risk comparisons

The objective of this meeting is to align on the scope of the briefing and the presenters.

Please forward to anyone else that may have involvement with this briefing.

Conference Line: 1-877-951-5843

Passcode: 28983934

Thanks,

Kevin

Kevin Witt

Project Manager

Japan Lessons Learned Project Directorate

Office of Nuclear Reactor Regulation

US Nuclear Regulatory Commission

Washington, DC 20555

Office (301) 415-2145

NOT FOR PUBLIC DISCLOSURE

Proposed Briefing Agenda for the Chairman
June 19, 2013, 11AM – 12PM

- Recap of Spent Fuel Pool Study Results – High level discussion of results from the study as outlined in the executive summary.
- Regulatory Analysis – Discussion of the regulatory analysis contained in the study to inform whether low density loading should be required at the reference plant, and how the regulatory analysis considers cost estimates of potential protective measures along with other parameters in a cost-benefit analysis. Note that the staff does not plan to specifically discuss aspects of dry cask storage during this briefing and is open to briefing the Chairman on those aspects in the future if requested.
 - o Discussion of regulatory analysis process (including consideration of adequate protection, substantial increase in safety screening criteria, and cost/benefit analysis)
 - o How the results of the spent fuel pool study were used in the regulatory analysis (including alternatives considered, seismic event modeling and frequency, consequence analysis results, mitigation model, and limitations of the regulatory analysis)
 - o Use of low, best, and high estimates for the regulatory analysis model (including release frequency, occupational worker exposure (accident), and long-term habitability criteria)
 - o Overview of sensitivity studies included in the spent fuel pool study regulatory analysis (including person-rem conversion factor, replacement energy costs, and consequences beyond 50 miles)
 - o Other considerations in the regulatory analysis (including modeling uncertainties, cask handling risk, and mitigation strategies)
 - o Regulatory analysis results
 - o Results of the backfit analysis contained in the spent fuel pool study according to the criteria in 10 CFR 50.109(a)(3)
- Discussion of Tier 3 plan to use the insights from this study to inform a broader regulatory analysis of the spent fuel pools at all U.S. operating nuclear reactors while considering the schedule to support the agency's ongoing waste confidence efforts.

From: [Uhle, Jennifer](#)
To: [McGinty, Tim](#)
Cc: [Reckley, William](#); [Casto, Greg](#); [Schofer, Fred](#); [Taylor, Robert](#); [Skeen, David](#); [Kokajko, Lawrence](#); [Bahadur, Sher](#); [Helton, Shana](#); [Gibson, Kathy](#); [Coe, Doug](#); [Lombard, Mark](#); [Hsia, Anthony](#); [Imboden, Andy](#); [Bielecki, Jessica](#); [Merzke, Daniel](#); [Witt, Kevin](#); [Leeds, Eric](#); [Dorman, Dan](#)
Subject: RE: Proposed Agenda for Upcoming Chairman Briefing on SFPS/RA
Date: Wednesday, June 12, 2013 4:10:58 PM
Attachments: [ChairmanBrfTopics\(6-19-13\).docx](#)

Based on a discussion with OGC, I modified the agenda topics slightly. OGC does not want us to mix the reg analysis inputs (ie, what was considered), process and purpose with the backfit process. Is this okay?

-----Original Message-----

From: McGinty, Tim
Sent: Tuesday, June 11, 2013 6:51 PM
To: Uhle, Jennifer
Cc: Reckley, William; Casto, Greg; Schofer, Fred; Taylor, Robert; Skeen, David; Kokajko, Lawrence; Bahadur, Sher; Helton, Shana; Gibson, Kathy; Coe, Doug; Lombard, Mark; Hsia, Anthony; Imboden, Andy; Safford, Carrie; Bielecki, Jessica; Merzke, Daniel; Witt, Kevin; Leeds, Eric; Dorman, Dan
Subject: RE: Proposed Agenda for Upcoming Chairman Briefing on SFPS/RA

Jennifer - as we discussed yesterday, attached is the staff's proposed Agenda for the Chairman's June 19th briefing. We believe it is fully responsive to the initial request, with additional specifics added such that we can provide the briefing that meets the Chairman's expectations. We are requesting that you share the proposed Agenda with the Chairman's Office (Phil/Mike Waters) to confirm that the Agenda will meet their needs, and receive any additional feedback or area's of interest.

Thanks, to Kevin and our Agency colleagues on CC for coordinating the Agenda and participating with us. Tim

-----Original Message-----

From: Witt, Kevin
Sent: Tuesday, June 11, 2013 5:26 PM
To: McGinty, Tim
Cc: Reckley, William; Casto, Greg; Schofer, Fred; Taylor, Robert; Skeen, David; Kokajko, Lawrence; Bahadur, Sher; Helton, Shana; Gibson, Kathy; Coe, Doug; Lombard, Mark; Hsia, Anthony; Imboden, Andy; Safford, Carrie; Bielecki, Jessica; Merzke, Daniel
Subject: Proposed Agenda for Upcoming Chairman Briefing on SFPS/RA

Hi Tim, please see the attached proposed agenda for the upcoming Chairman briefing on June 19 to discuss the spent fuel pool study and the regulatory analysis. I have received feedback from all of our stakeholders that they agree with the proposed agenda (with incorporated edits). Please let me know if I can provide any additional information.

Thanks,
Kevin

Proposed Briefing Agenda for the Chairman
June 19, 2013, 11AM – 12PM

- Recap of Spent Fuel Pool Study Results – High level discussion of results from the study as outlined in the executive summary.
- Regulatory Analysis:
 - o Discussion of regulatory analysis process (its purpose and what is considered in it). OGC wants us to make sure we talk about reg analysis here, not backfit.
 - o How the results of the spent fuel pool study were used in the regulatory analysis (including alternatives considered, seismic event modeling and frequency, consequence analysis results, mitigation model, and limitations of the regulatory analysis)
 - o Use of low, best, and high estimates for the regulatory analysis model (including release frequency, occupational worker exposure (accident), and long-term habitability criteria)
 - o Overview of sensitivity studies included in the spent fuel pool study regulatory analysis (including person-rem conversion factor, replacement energy costs, consequences beyond 50 miles, and variation of conditional release frequencies)
 - o Other considerations in the regulatory analysis (including modeling uncertainties, cask handling risk, and mitigation strategies)
 - o Regulatory analysis results
- Results of the backfit analysis contained in the spent fuel pool study according to the criteria in 10 CFR 50.109(a)(3). What is considered and how it is different from a regulatory analysis.
- Tier 3 plan:
 - o Discussion of how the insights from this study will inform a broader regulatory analysis of the spent fuel pools at all U.S. operating nuclear reactors while
 - o Considers the schedule to support the agency's ongoing waste confidence efforts.

*Note that the staff does not plan to specifically discuss aspects of dry cask storage during this briefing and is open to briefing the Chairman on those aspects in the future if requested.

From: [Witt, Kevin](#)
To: [Uhle, Jennifer](#); [Schofer, Fred](#); [Esmaili, Hossein](#); [Lombard, Mark](#); [Campbell, Tison](#); [Lubinski, John](#); [Kokajko, Lawrence](#); [Skeen, David](#); [Reckley, William](#); [Gibson, Kathy](#); [McGinty, Tim](#); [Casto, Greg](#); [Taylor, Robert](#)
Subject: RE: Spent Fuel Alignment Meeting
Date: Monday, June 17, 2013 11:20:09 AM
Attachments: [ChairmanBrief-1pager\(6-19-13\).docx](#)
[ChairmanBrfTopics\(6-19-13\).docx](#)

Hello all, please see the attached one-pager and agenda to be used for the briefing.

Conference Line: 1-877-951-5843

Passcode: (b)(5),(b)(6)

Thanks,

Kevin

-----Original Appointment-----

From: Taylor, Robert On Behalf Of Uhle, Jennifer

Sent: Monday, June 17, 2013 11:02 AM

To: Schofer, Fred; Esmaili, Hossein; Lombard, Mark; Campbell, Tison; Lubinski, John; Kokajko, Lawrence; Witt, Kevin; Skeen, David; Reckley, William; Gibson, Kathy; McGinty, Tim; Casto, Greg

Subject: FW: Spent Fuel Alignment Meeting

When: Monday, June 17, 2013 3:30 PM-4:00 PM (GMT-05:00) Eastern Time (US & Canada).

Where: NRR-OWFN-13D20-15p

All,

This meeting is being scheduled at Jennifer Uhle's request to align in preparation for Wednesday's Chairman briefing on the regulatory analysis for the spent fuel pool study.

Required attendees are those scheduled to be present at the Chairman briefing: Uhle, Taylor, Schofer, Esmaili, Lombard (or designee), and Campbell (if OGC attendance desired).

The others on distribution are optional for the this afternoon's meeting and are welcome to attend if they desire.

Kevin Witt – Please email the prepared talking points to this distribution list and either bring copies to the meeting or provide them to me before the meeting. Also, please

work to ensure we have a bridge line available for the call to facilitate participation by those located off campus. Thanks.

Best regards,

Rob

-----Original Appointment-----

From: Uhle, Jennifer

Sent: Monday, June 17, 2013 10:07 AM

To: Uhle, Jennifer; Taylor, Robert

Subject: Spent Fuel Alignment Meeting

When: Monday, June 17, 2013 3:30 PM-4:00 PM (GMT-05:00) Eastern Time (US & Canada).

Where: NRR-OWFN-13D20-15p

Briefing Agenda for the Chairman
June 19, 2013, 11AM – 12PM

- Recap of Spent Fuel Pool Study Results – High level discussion of results from the study as outlined in the executive summary. Short discussion on qualitative comparison of risks (Appendix B).
- Regulatory Analysis:
 - o Discussion of regulatory analysis process (including consideration of adequate protection, substantial increase in safety screening criteria, and cost/benefit analysis)
 - o How the results of the spent fuel pool study were used in the regulatory analysis (including alternatives considered, seismic event modeling and frequency, consequence analysis results, mitigation model, and limitations of the regulatory analysis)
 - o Use of low, best, and high estimates for the regulatory analysis model (including release frequency, occupational worker exposure (accident), long-term habitability criteria, and contamination impacts/costs).
 - o Overview of sensitivity studies included in the spent fuel pool study regulatory analysis (including person-rem conversion factor, replacement energy costs, consequences beyond 50 miles, and variation of conditional release frequencies)
 - o Other considerations in the regulatory analysis (including modeling uncertainties, cask handling risk, mitigation strategies, and qualitative factors including defense in depth)
 - o Regulatory analysis results
- Results of the backfit analysis contained in the spent fuel pool study according to the criteria in 10 CFR 50.109(a)(3)
- Tier 3 plan:
 - o Discussion of how the insights from this study will inform a broader regulatory analysis of the spent fuel pools at all U.S. operating nuclear reactors while
 - o Considers the schedule to support the agency's ongoing waste confidence efforts.

*Note that the staff does not plan to specifically discuss aspects of dry cask storage during this briefing and is open to briefing the Chairman on those aspects in the future if requested. NMSS will attend the briefing to help answer any specific questions that Chairman could have on the operations/doses/costs of dry cask storage for Peach Bottom that are reported in the regulatory analysis.

Spent Fuel Pool Study and Regulatory Analysis Results

June 2013

- This study is consistent with earlier research conclusions that spent fuel pools are robust structures that are likely to withstand severe earthquakes without leaking.
- The study estimated that the likelihood of a radiological release from the spent fuel pool resulting from the selected severe seismic event analyzed in this study is on the order of one time in 10 million years or lower.
- For the hypothetical releases studied, no early fatalities attributable to acute radiation exposure were predicted and individual latent cancer fatality risks are projected to be low.
- The study results demonstrated that in a high-density loading configuration, a more favorable fuel pattern or successful mitigation generally prevented or reduced the size of potential releases.
- Low-density loading reduced the size of potential releases but did not affect the likelihood of a release.
- The beneficial effects in the reduction of offsite consequences between a high-density loading scenario and a low-density loading scenario are primarily associated with the reduction in the potential extent of land contamination and associated protective actions.
- The regulatory analysis portion of the study documents a comparison between the safety of high-density fuel pool storage relative to low-density fuel pool storage using the initiating frequency and consequences from the study as an indicator of any changes in our understanding of safe storage of spent fuel.
- The application of this study's results to the NRC's regulatory analysis guidelines indicates that requiring the low-density spent fuel pool storage alternative is not justified for the reference plant given the analysis assumptions.
- The risk due to beyond design basis accidents in the spent fuel pool analyzed in this study is sufficiently low that the added costs involved with expediting the movement of spent fuel from the pool to achieve the low-density fuel pool storage alternative are not warranted.
- Sensitivity analyses that extend the analyses beyond the primary area considered also show that the low-density spent fuel storage alternative was not cost justified for any of the discounted sensitivity cases.
- The NRC plans to use the insights from this analysis to inform a broader regulatory analysis of the spent fuel pools at all US operating nuclear reactors.

From: [Witt, Kevin](#)
To: [Casto, Greg](#); [Schofer, Fred](#); [Reckley, William](#); [Jones, Steve](#)
Subject: Slides for ACRS S/C Meeting on Tier 3 Spent Fuel Transfer
Date: Monday, July 08, 2013 3:08:00 PM
Attachments: [ACRS-Tier3SubCommittee\(7-9-13\).pptx](#)
[ACRS SubCommittee Briefing Summary of Results AdditionalInfo.docx](#)

Hello all, see attached slides for tomorrow's ACRS subcommittee meeting on Tier 3 Spent Fuel Transfer, as well as reference information if needed.

-Kevin

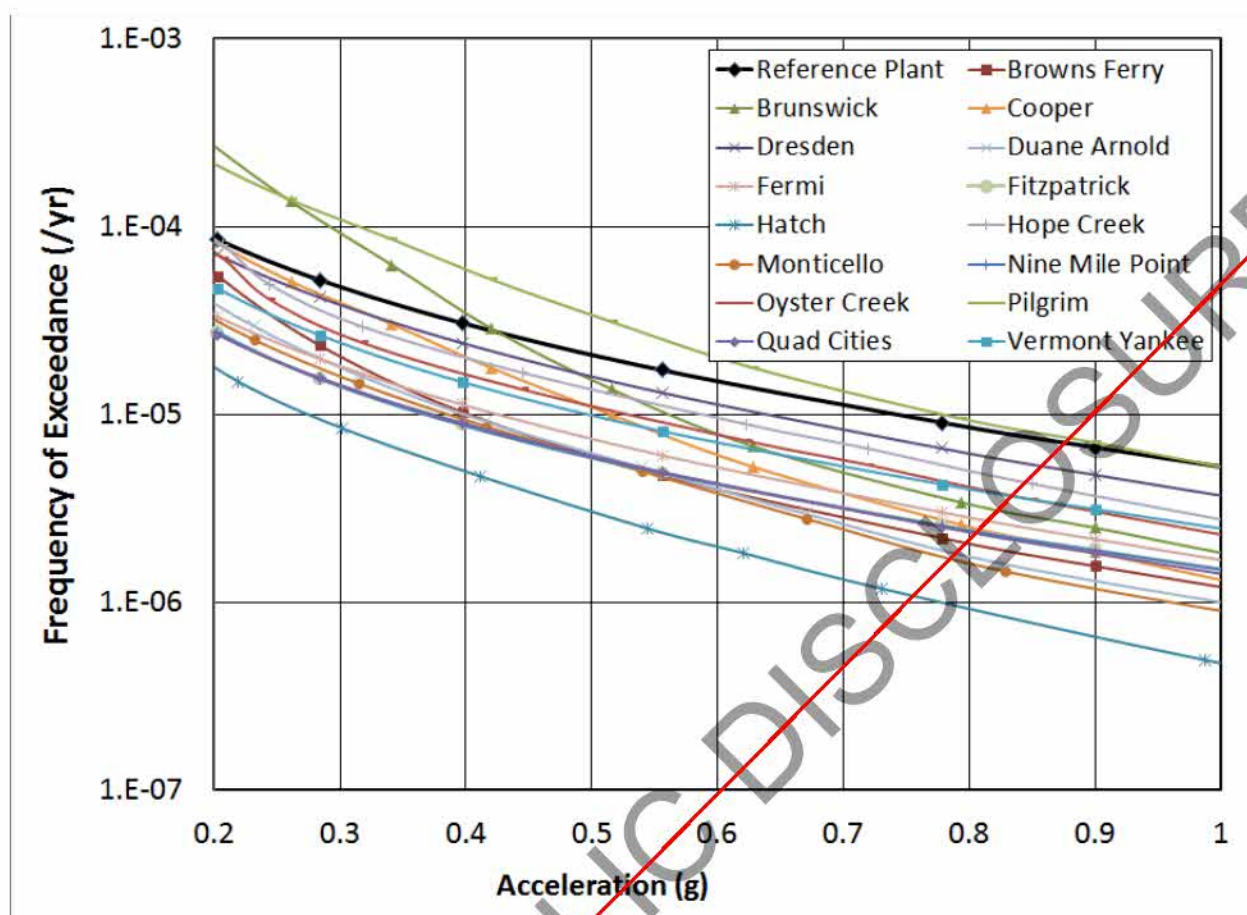


Figure 4 Comparison of annual PGA exceedance frequencies for U.S. Mark I reactors (USGS 2008 model) (rock hazard curves)

Table 74 Release Frequencies for Spent Fuel Pool Initiators

Spent fuel loading configuration		1x4		1x4	
Initiating Event Class	Initiating Event Fuel Uncovery Frequency (per r-yr)	Conditional Probability of Release (Unsuccessful mitigation)	Release Frequency (Unsuccessful mitigation) (per r-yr)	Conditional Probability of Release (successful mitigation)	Release Frequency (successful mitigation) (per r-yr)
Seismic bin no. 3	1.4×10^{-6} (3)	8.2%	1.18×10^{-7}	0.43% (4)	6.18×10^{-9}
Seismic bin no. 4	4.9×10^{-6} (3)	8.2% – 100%	4.03×10^{-7} – 4.9×10^{-6}	0.43% (4)	2.12×10^{-8} – 2.58×10^{-7}
Cask / heavy load	2×10^{-7} (2)	8.2% – 100%	1.64×10^{-8} – 2×10^{-7}	0.43% (4)	8.65×10^{-10} –
LOOP – severe	1×10^{-7} (2)	100%	1.00×10^{-7}	0.43% (4)	5.26×10^{-9}
LOOP – other	3×10^{-8} (2)	100%	3.00×10^{-8}	0.43% (4)	1.58×10^{-9}
Internal fire	2×10^{-8} (2)	100%	2.00×10^{-8}	0.43% (4)	1.05×10^{-9}
Loss of pool cooling	1.5×10^{-8} (1)	100%	1.50×10^{-8}	0.43% (4)	7.89×10^{-10}
Loss of coolant	3×10^{-9} (2)	100%	3.00×10^{-9}	0.43% (4)	1.58×10^{-10}
Inadvertent aircraft	3×10^{-9} (2)	100%	3.00×10^{-9}	0.43% (4)	1.58×10^{-10}
Missiles – general	2.5×10^{-9} (1)	100%	2.50×10^{-9}	0.43% (4)	1.32×10^{-10}
Missiles - tornado	1×10^{-9} (2)	100%	1.00×10^{-9}	0.43% (4)	5.26×10^{-11}
Pneumatic seal	n/a (5)				
Total			7.11×10^{-7} – 5.39×10^{-7}		3.74×10^{-8} – 2.84×10^{-7}

1. Values from NUREG-1353. These numbers were multiplied by the stated conditional probability of having a zirconium fire of 0.25.
2. Values from NUREG-1738
3. Initiating event frequency values from Spent Fuel Pool Study, Table 4. The likelihood of fuel uncovery is a product of initiating event frequency (e.g., 1.6×10^{-5} for seismic bin no. 3), ac power fragility (0.84), and liner fragility (0.1). For seismic bin no. 4, the likelihood of fuel uncovery is a product of initiating event frequency (4.9×10^{-6}), ac power fragility of 1.0, and a liner fragility of 1.0 (e.g., 100-percent likelihood of ac power and pool liner failure).
4. The conditional probability of release with successful mitigation with deployed 50.54(hh)(2) equipment is the quotient of OCP probability (60/730 or 8.2%) divided by the mitigation benefit in reducing the release likelihood (factor of 19). See Section 5.6.3 of the main document for further discussion. Additional mitigation equipment and mitigation strategies under Order EA-12-049 would further enhance the likelihood of successful mitigation, thereby further reducing the value for the conditional probability of release with successful mitigation.
5. As discussed in Table 3 of the main report, the reference plant has gates with mechanical seals to prevent leakage. These seals are kept under pressure by passive mechanical means (i.e., do not depend on air pressure, ac power, or dc power). Therefore, pneumatic seal failures are not applicable for the reference plant.

Based on this information, the values used in this regulatory analysis for F_{release} is are summarized in Table 75.

Table 75 Spent Fuel Pool Release Frequency Estimates

Parameter	Unsuccessful mitigation			Successful mitigation		
	Low	Best	High	Low	Best	High
F_{release}	7.11×10^{-7}			3.74×10^{-8}		
				2.84×10^{-7}		

These release frequency values are subject to the assumption of unsuccessful deployment of mitigation and the other assumptions contained in this analysis and those stated in Table 3 of

DRAFT
Regulatory Analysis Results

Table 103 Summary of Net Benefits for Low-density Spent Fuel Pool Storage Considering All Initiator Events (within 50 miles)

Attribute	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Public Health (Accident)	\$247,700	\$179,500	\$124,600	\$119,700	\$86,700	\$60,200	\$2,520,000	\$1,825,500	\$1,267,000
Occupational Health (Accident)	\$1,300	\$900	\$700	\$700	\$500	\$300	\$21,300	\$15,400	\$10,700
Offsite Property	\$723,300	\$524,000	\$363,700	\$1,073,300	\$777,500	\$539,700	\$4,587,800	\$3,323,400	\$2,306,700
Onsite Property	\$10,400	\$6,900	\$4,300	\$4,480	\$2,950	\$1,830	\$378,600	\$249,600	\$155,800
Total Benefits	\$982,700	\$711,300	\$493,300	\$1,198,200	\$867,700	\$602,000	\$7,507,700	\$5,413,900	\$3,740,200
Occupational Health (Routine)	-\$9,000	-\$24,000	-\$27,000	-\$9,000	-\$24,000	-\$27,000	-\$9,000	-\$24,000	-\$27,000
Industry Implementation	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000
Industry Operation	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000
NRC Implementation	nc	nc	nc	nc	nc	nc	nc	nc	nc
NRC Operation	nc	nc	nc	nc	nc	nc	nc	nc	nc
Total Costs	-\$16,399,000	-\$42,096,000	-\$46,861,000	-\$16,399,000	-\$42,096,000	-\$46,861,000	-\$16,399,000	-\$42,096,000	-\$46,861,000
Net Benefit	-\$15,416,000	-\$41,385,000	-\$46,368,000	-\$15,200,800	-\$41,228,300	-\$46,259,000	-\$8,891,300	-\$36,682,100	-\$43,120,800

Table 106 Dollar Per Person-Rem Sensitivity Analysis of Net Benefits for Low-density Spent Fuel Pool Storage Considering All Initiating Events (within 50 miles)

Attribute	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Public Health (Accident)	\$495,400	\$359,000	\$249,200	\$239,400	\$173,400	\$120,400	\$5,040,000	\$3,651,000	\$2,534,000
Occupational Health (Accident)	\$2,600	\$1,800	\$1,400	\$1,400	\$1,000	\$600	\$42,600	\$30,800	\$21,400
Offsite Property	\$723,300	\$524,000	\$363,700	\$1,073,300	\$777,500	\$539,700	\$4,587,800	\$3,323,400	\$2,306,700
Onsite Property	\$10,400	\$6,900	\$4,300	\$4,480	\$2,950	\$1,830	\$378,600	\$249,600	\$155,800
Total Benefits	\$1,231,700	\$891,700	\$618,600	\$1,318,600	\$954,900	\$662,500	\$10,049,000	\$7,254,800	\$5,017,900
Occupational Health (Routine)	-\$18,000	-\$48,000	-\$54,000	-\$18,000	-\$48,000	-\$54,000	-\$18,000	-\$48,000	-\$54,000
Industry Implementation	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000
Industry Operation	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000
NRC Implementation	nc	nc	nc	nc	nc	nc	nc	nc	nc
NRC Operation	nc	nc	nc	nc	nc	nc	nc	nc	nc
Total Costs	-\$16,408,000	-\$42,120,000	-\$46,888,000	-\$16,408,000	-\$42,120,000	-\$46,888,000	-\$16,408,000	-\$42,120,000	-\$46,888,000
Net Benefit	-\$15,176,000	-\$41,228,000	-\$46,269,000	-\$15,089,400	-\$41,165,100	-\$46,225,500	-\$6,359,000	-\$34,865,200	-\$41,870,100

Table 107 Consequences Extending Beyond 50 Miles Sensitivity Analysis of Net Benefits for Low-density Spent Fuel Pool Storage Considering All Initiating Events

Attribute	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Public Health (Accident)	\$1,783,400	\$1,291,900	\$896,700	\$1,081,200	\$783,300	\$543,600	\$15,735,800	\$11,399,100	\$7,911,700
Occupational Health (Accident)	\$1,300	\$900	\$700	\$700	\$500	\$300	\$21,300	\$15,400	\$10,700
Offsite Property	\$2,139,300	\$1,549,700	\$1,075,600	\$4,968,300	\$3,599,100	\$2,498,000	\$11,586,600	\$8,393,400	\$5,825,500
Onsite Property	\$10,400	\$6,900	\$4,300	\$4,680	\$3,150	\$2,030	\$378,600	\$249,600	\$155,800
Total Benefits	\$3,934,400	\$2,849,400	\$1,977,300	\$6,054,900	\$4,386,100	\$3,043,900	\$27,722,300	\$20,057,500	\$13,903,700
Occupational Health (Routine)	-\$9,000	-\$24,000	-\$27,000	-\$9,000	-\$24,000	-\$27,000	-\$9,000	-\$24,000	-\$27,000
Industry Implementation	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000
Industry Operation	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000
NRC Implementation	nc	nc	nc	nc	nc	nc	nc	nc	nc
NRC Operation	nc	nc	nc	nc	nc	nc	nc	nc	nc
Total Costs	-\$16,399,000	-\$42,096,000	-\$46,861,000	-\$16,399,000	-\$42,096,000	-\$46,861,000	-\$16,399,000	-\$42,096,000	-\$46,861,000
Net Benefit	-\$12,465,000	-\$39,247,000	-\$44,884,000	-\$10,344,100	-\$37,709,900	-\$43,817,100	\$11,323,300	-\$22,038,500	-\$32,957,300

1. nc = not calculated
2. Results are expressed in current dollars (year 2012 dollars) except for the undiscounted cases, which are expressed in constant dollars.

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Regulatory Analysis Results

Table 108 Combined Sensitivity Analysis that Analyzes Consequences Beyond 50 Miles using a Revised Dollar per Person-Rem Conversion Factor on the Net Benefits for Low-density Spent Fuel Pool Storage for All Initiator Events

Attribute	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Public Health (Accident)	\$3,566,900	\$2,583,800	\$1,793,400	\$2,162,500	\$1,566,500	\$1,087,300	\$31,471,600	\$22,798,200	\$15,823,400
Occupational Health (Accident)	\$2,500	\$1,900	\$1,400	\$1,300	\$1,000	\$700	\$42,700	\$30,900	\$21,400
Offsite Property	\$2,139,300	\$1,549,700	\$1,075,600	\$4,968,300	\$3,599,100	\$2,498,000	\$11,586,600	\$8,393,400	\$5,825,500
Onsite Property	\$10,400	\$6,900	\$4,300	\$4,680	\$3,150	\$2,030	\$378,600	\$249,600	\$155,800
Total Benefits	\$5,719,100	\$4,142,300	\$2,874,700	\$7,136,800	\$5,169,800	\$3,588,000	\$43,479,500	\$31,472,100	\$21,826,100
Occupational Health (Routine)	-\$18,000	-\$49,000	-\$54,000	-\$18,000	-\$49,000	-\$54,000	-\$18,000	-\$49,000	-\$54,000
Industry Implementation	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000
Industry Operation	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000
NRC Implementation	nc	nc	nc	nc	nc	nc	nc	nc	nc
NRC Operation	nc	nc	nc	nc	nc	nc	nc	nc	nc
Total Costs	-\$16,408,000	-\$42,121,000	-\$46,888,000	-\$16,408,000	-\$42,121,000	-\$46,888,000	-\$16,408,000	-\$42,121,000	-\$46,888,000
Net Benefit	-\$10,689,000	-\$37,979,000	-\$44,013,000	-\$9,271,200	-\$36,951,200	-\$43,300,000	\$27,071,500	-\$10,648,900	-\$25,061,900

1. nc = not calculated
2. Results are expressed in current dollars (year 2012 dollars) except for the undiscounted cases, which are expressed in constant dollars.

Backfitting Analysis Results

Table 112 Summary of Backfitting Net Benefits for Low-density Spent Fuel Pool Storage for All Initiator Events (within 50 miles)

Attribute	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Public Health (Accident)	\$247,700	\$179,500	\$124,600	\$119,700	\$86,700	\$60,200	\$2,520,000	\$1,825,500	\$1,267,000
Occupational Health (Accident)	\$1,300	\$900	\$700	\$700	\$500	\$300	\$21,300	\$15,400	\$10,700
Occupational Health (Routine)	-\$9,000	-\$24,000	-\$27,000	-\$9,000	-\$24,000	-\$27,000	-\$9,000	-\$24,000	-\$27,000
Total Benefits	\$240,000	\$156,400	\$98,300	\$111,400	\$63,200	\$33,500	\$2,532,300	\$1,816,900	\$1,250,700
Industry Implementation	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000
Industry Operation	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000
NRC Implementation	nc	nc	nc	nc	nc	nc	nc	nc	nc
NRC Operation	nc	nc	nc	nc	nc	nc	nc	nc	nc
Total Costs	-\$16,390,000	-\$42,072,000	-\$46,834,000	-\$16,390,000	-\$42,072,000	-\$46,834,000	-\$16,390,000	-\$42,072,000	-\$46,834,000
Net Benefit	-\$16,150,000	-\$41,916,000	-\$46,736,000	-\$16,279,000	-\$42,009,000	-\$46,801,000	-\$13,858,000	-\$40,255,000	-\$45,583,000

1. nc = not calculated
2. Results are expressed in current dollars (year 2012 dollars) except for the undiscounted cases, which are expressed in constant dollars.

Table 114 Combined Sensitivity Analysis of the Backfitting Net Benefits for Low-density Spent Fuel Pool Storage for All Initiator Events (extending analysis beyond 50 miles and using a Revised Dollar per Person-Rem Conversion Factor)

Attribute	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Public Health (Accident)	\$3,566,900	\$2,583,800	\$1,793,400	\$2,162,500	\$1,566,500	\$1,087,300	\$31,471,600	\$22,798,200	\$15,823,400
Occupational Health (Accident)	\$2,500	\$1,900	\$1,400	\$1,300	\$1,000	\$700	\$42,700	\$30,900	\$21,400
Occupational Health (Routine)	-\$18,000	-\$49,000	-\$54,000	-\$18,000	-\$49,000	-\$54,000	-\$18,000	-\$49,000	-\$54,000
Total Benefits	\$3,551,400	\$2,536,700	\$1,740,800	\$2,145,800	\$1,518,500	\$1,034,000	\$31,496,300	\$22,780,100	\$15,790,800
Industry Implementation	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000	-\$15,660,000	-\$41,820,000	-\$46,770,000
Industry Operation	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000	-\$730,000	-\$252,000	-\$64,000
NRC Implementation	nc	nc	nc	nc	nc	nc	nc	nc	nc
NRC Operation	nc	nc	nc	nc	nc	nc	nc	nc	nc
Total Costs	-\$16,390,000	-\$42,072,000	-\$46,834,000	-\$16,390,000	-\$42,072,000	-\$46,834,000	-\$16,390,000	-\$42,072,000	-\$46,834,000
Net Benefit	-\$12,838,600	-\$39,535,300	-\$45,093,200	-\$14,244,200	-\$40,553,500	-\$45,800,000	\$15,106,300	-\$19,291,900	-\$31,043,200

1. nc = not calculated
2. Results are expressed in current dollars (year 2012 dollars) except for the undiscounted cases, which are expressed in constant dollars.

Table 115 Summary of Combined Sensitivity Analysis Cost Offsets for Onsite and Offsite Property

Attribute	Total Cost Offsets								
	Best Estimate			Low Estimate			High Estimate		
	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV	Undiscounted	3% NPV	7% NPV
Offsite Property	\$2,139,300	\$1,549,700	\$1,075,600	\$4,968,300	\$3,599,100	\$2,498,000	\$11,586,600	\$8,393,400	\$5,825,500
Onsite Property	\$19,400	\$6,900	\$4,300	\$4,680	\$3,150	\$2,030	\$378,600	\$249,600	\$155,800
Total Benefits	\$2,149,700	\$1,556,600	\$1,079,900	\$4,973,000	\$3,602,300	\$2,500,000	\$11,965,200	\$8,643,000	\$5,981,300

1. nc = not calculated
2. Results are expressed in current dollars (year 2012 dollars) except for the undiscounted cases, which are expressed in constant dollars.



Japan Lessons Learned Tier 3 Issue: Transfer of Spent Fuel to Dry Cask Storage

Greg Casto, NRR/DSS/SBPB

Steven Jones, NRR/DSS/SBPB

Fred Schofer, NRR/DPR/PRB

ACRS Subcommittee Meeting

July 9, 2013

Agenda

- Objective & Background
- Regulatory Analysis Process
- Spent Fuel Pool Study Appendix D –
Regulatory Analysis and Backfitting
Discussion
- Preliminary Outline of Regulatory Analysis
for all Spent Fuel Pools

Presentation Objective

- Keep the ACRS informed about the staffs activities on the Japan lessons learned Tier 3 activity on expedited transfer of spent fuel
- Conceptually discuss the staff's plans for expanding the regulatory analysis contained in the Spent Fuel Pool Study (SFPS) reference plant to make it applicable to all Spent Fuel Pools (SFPs)
- Gain ACRS insights for the upcoming Commission paper on this issue

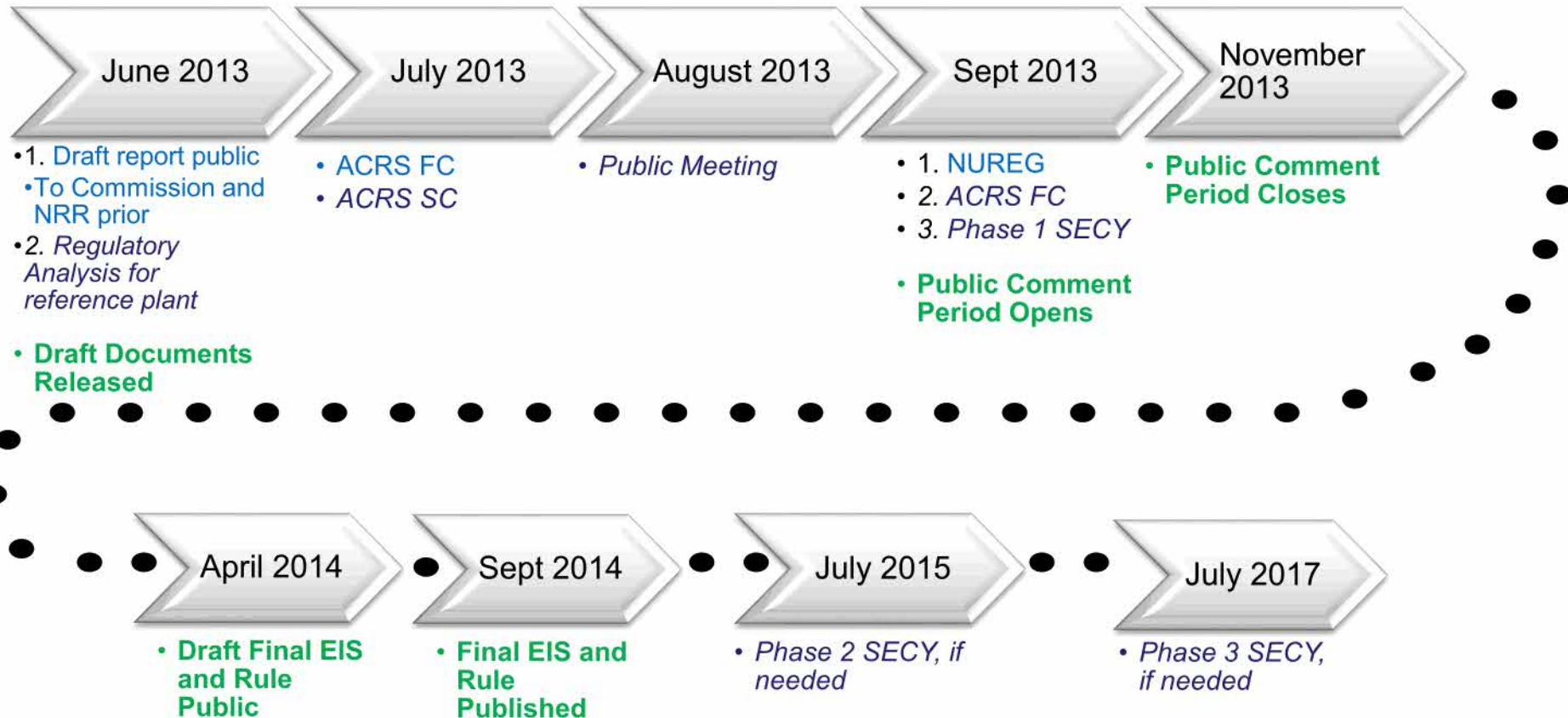
Background

- Objective of Tier 3 Plan:
 - Confirm, using insights from Fukushima, that both SFPs and dry cask storage continue to provide adequate protection, and assess whether any significant safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry casks
 - Provides additional regulatory context of the results from the SFPS
 - Improves the public's understanding of the relationship between the Tier 3 issue, the SFPS and ongoing Waste Confidence activities

Tier 3 Plan

- Three phases with Commission papers:
 - Phase 1 – Evaluate whether substantial increase in public health and safety exists (Commission paper by 9/31/13)
 - Phase 2 – If necessary, perform detailed analysis of costs and benefits (Commission paper by 7/31/15)
 - Phase 3 – If necessary, consider other factors (criticality, mitigating strategies, solar storms, economic consequences, new regulatory framework, etc.) (Commission paper by 7/31/17)

Major Spent Fuel Pool Transfer Milestones



Legend

Spent Fuel Pool Scoping Study
Tier 3 Expedited Spent Fuel Transfer Plan
Waste Confidence

What is a Regulatory Analysis?

An analytical tool provided to decision makers which:

- Recommends a preferred alternative from the potential courses of action studied
- Contains estimates of benefits and costs with a conclusion whether the proposed regulatory action is cost beneficial

Elements of a Regulatory Analysis

- Statement of the Problem and Objective
- Identification of Alternatives
- Estimation and Evaluation of Values and Impacts
- Presentation of Results
- Decision Rationale
- Implementation

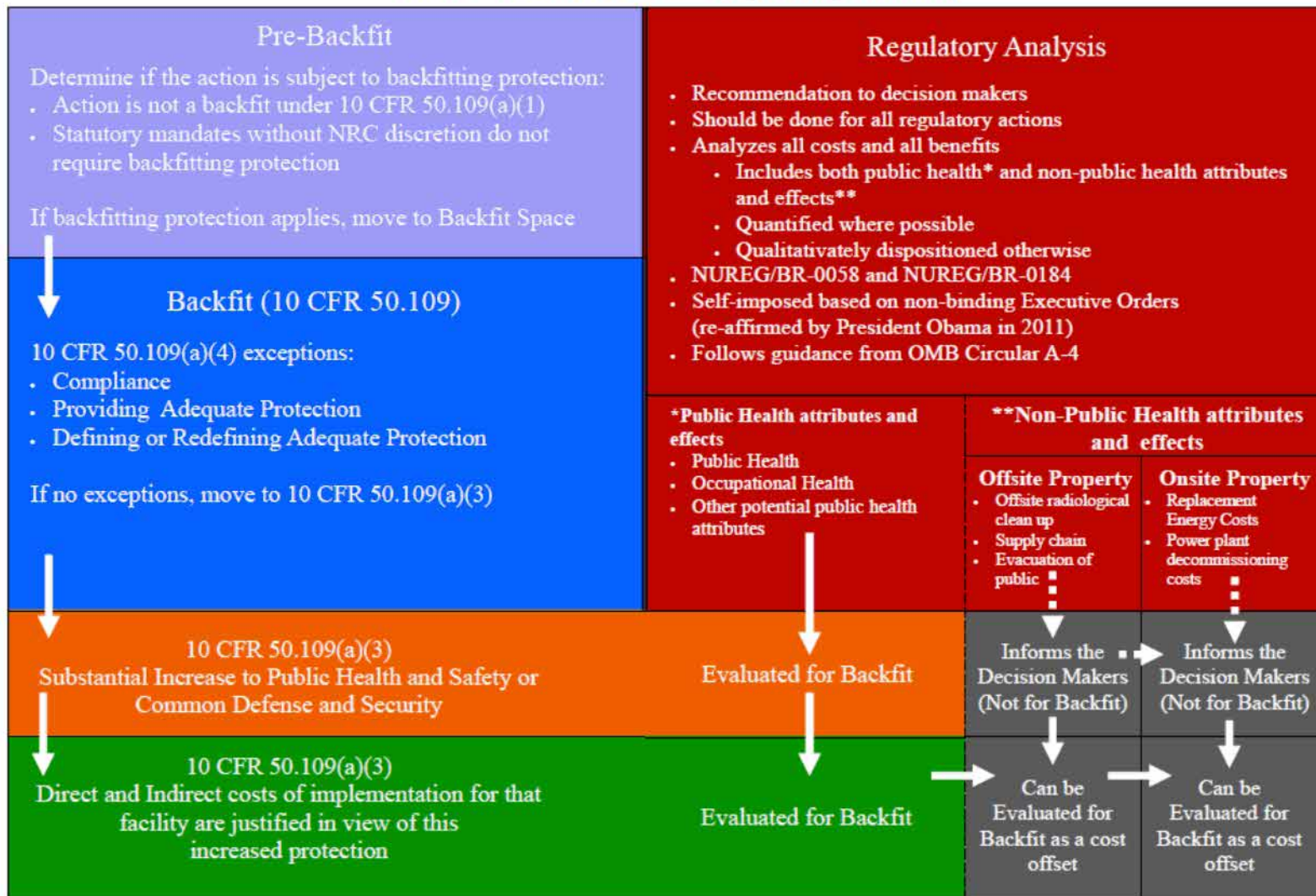
Attributes Considered in a Regulatory Analysis

- Public Health (Accident)
- Public Health (Routine)
- Occupational Health (Accident)
- Occupational Health (Routine)
- Offsite Property
- Onsite Property
- Industry Implementation
- Industry Operation
- NRC Implementation
- NRC Operation
- Other Government
- General Population
- Improvements in Knowledge
- Regulatory Efficiency
- Antitrust Considerations
- Safeguards and Security Considerations
- Environmental Considerations
- Other Considerations



Regulatory Analysis vs. Backfit

REGULATORY ACTIONS (Operating Reactors)



Spent Fuel Pool Study Regulatory Analysis Overview

- The regulatory analysis was performed to provide regulatory context for the Spent Fuel Pool Study
- The analysis assesses whether any significant safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry casks for the reference plant as modeled, and the potential costs associated with such expedited transfer

Data Used in the Regulatory Analysis

- Spent Fuel Pool Initiator Release Frequency
- Duration of On-site Spent Fuel Storage Risk
- Cost/Benefit Inflators
- Dollar per Person-Rem Conversion Factor
- Onsite Property Decontamination, Repair, and Refurbishment Costs
- Replacement Energy Costs
- Occupational Worker Exposure (Accident)
- Long-Term Habitability Criteria
- Other Key Data

Assumptions used in the Regulatory Analysis

- Fuel Assembly Decay Heat as a Function of Burnup and Cooling Time
- Dry Storage Upfront Costs
- Incremental Costs Associated with Earlier Dry Storage Cask Purchase and Loading
- Incremental Annual Independent Spent Fuel Storage Installation Operating Costs
- Dry Storage Occupational Exposure (Routine)
- Number of Projected Dry Storage Casks Required

Sensitivity Analysis

- Present Value Calculations
- Dollar per Person-Rem Conversion Factor
- Replacement Energy Costs
- Consequences Extending Beyond 50 Miles
- Combined Effect of Consequences Extending Beyond 50 Miles and Dollar per Person-Rem Conversion Factor



Reference Plant Regulatory Analysis Results

- Total Cost to the Reference Plant
 - \$47 million (using a 7-percent discount rate)
 - \$42 million (using a 3-percent discount rate)
 - Range from \$16 to \$47 million (sensitivity analyses)
- Value of Benefits to the Reference Plant
 - \$500,000 (using a 7-percent discount rate)
 - \$700,000 (using a 3-percent discount rate)
 - Range from \$500,000 to \$43 million (sensitivity analyses)
- Costs to NRC
 - Were ignored to calculate the maximum potential benefit

Reference Plant Decision Rationale

- Regulatory Analysis
 - Alternative considered does not achieve a cost-beneficial increase in public health and safety for the reference plant
 - The three sensitivity studies also showed that the low-density spent fuel storage alternative was not cost-justified for any of the discounted sensitivity cases
- Backfit Analysis
 - Comparison to Safety Goal Policy Quantitative Objectives
 - No early fatalities predicted within 1 mile from site boundary which meets the individual early fatality risk goal
 - SFP accident represents 0.13% fraction of 1.84×10^{-6} per year societal risk goal
 - Cost-justified criteria are not met when evaluating the averted accident consequences
 - Not met when evaluating the averted accident consequences within 50 miles of the site consistent with the regulatory framework
 - Not met for any of the discounted sensitivity cases that extend the analyses beyond 50 miles

Expanded Regulatory Analysis For All Spent Fuel Pools

- **Objective is to expand the Spent Fuel Pool Study Regulatory Analysis (Appendix D) to all Spent Fuel Pools**
 - SFPS Reference Plant is based on a BWR Mark I with elevated SFP
 - Staff developing methodology to apply SFPS results to other reactors, including PWRs and new reactors

Grouping/Sensitivity Studies

- **Spent Fuel Pool Grouping by Configuration/ Design**
 1. BWR Mark I / II with non-shared spent fuel pool (SFP) located well above grade
 2. PWR & BWR Mark III with non-shared SFP located at grade with at least one exposed side
 3. Advanced reactor SFPs
 4. Shared SFPs
 5. SFPs located below grade
 6. SFPs at decommissioned plants (fuel in pool)
 7. Decommissioned plants with fuel in ISFSI or shipped offsite
- **Sensitivity Studies**
 1. Consequences beyond 50 miles
 2. Population density
 3. Time to achieve low-density SFP loading
 4. Second operating life extension
 5. Discount factors (7%, 3%, 2%, undiscounted)
 6. Dry storage cask pricing and cask capacity

Regulatory Analysis Inputs

Parameter	Low Est.	Best Est.	High Est.
Site seismicity <ul style="list-style-type: none"> Bin 3 (SFPS F4) Bin 4 	2×10^{-6} (V Yankee) 5×10^{-7} (V Yankee)	1.7×10^{-5} (PB3) 4.9×10^{-6}	3×10^{-5} (Brunswick) 4.9×10^{-6}
Ac power fragility	1.0 (bounding)	1.0 (bounding)	1.0 (bounding)
Refueling freq.	24 months	24 months	18 months
Liner fragility <ul style="list-style-type: none"> Bin 3 (SFPS) Bin 4 	0.1 1.0 (bounding)	0.1 1.0 (bounding)	0.1 1.0 (bounding)
Insufficient nat. circ			
Full drain down	8.2%	8.2%	11%
Partial drain down	100%	100%	100%
Flex mitigation likelihood	Higher success than SFPS	Same as SFPS or higher	Same as SFPS

Regulatory Analysis Inputs (cont'd)

Parameter	Low Est.	Best Est.	High Est.
Source term			
Reactor unit MWt rating	1775 (-50%) (Monticello)	3514 (PB3)	3988 (+13%) (Nine Mile)
HD SFP inventory (equiv. cores)	3.0 (-25%) (assumed)	4.0 (PB3)	8 (+200%) (assumed)
1x4 LD SFP inventory	1.1 (assumed)	1.1 (PB3)	4 (+360%) (assumed)
Initial refueling core offload (% core)	33% (-11%) (assumed)	37% (PB3)	50% (+35%) (assumed)
Refueling core offload (% core)	33% (-11%) (assumed)	37% (PB3)	50% (+35%) (assumed)
SFP loading configuration	1x4 immediately (PB3)	Uniform for 25d then 1x4 (assumed)	Uniform for 60d then 1x4 (assumed)
Release fraction	MELCOR	MELCOR	MELCOR

Regulatory Analysis Inputs (cont'd)

Parameter	Low Est.	Best Est.	High Est.
Dose Consequence Analysis			
Population density & demographics	Low density (Pt. Beach)	Same as SFPS (PB3)	High density (PB3)
Weather conditions & modeling	Same as SFPS (PB3)	Same as SFPS (PB3)	Same as SFPS (PB3)
Exposure & health effects modeling	500 mrem annual - LNT	2 rem first year, 500 mrem thereafter - LNT	2 rem annual - LNT
Evacuation assumptions & modeling	Same as SFPS (PB3)	Same as SFPS (PB3)	Same as SFPS (PB3)
Offsite Property Analysis			
Economic data	Site specific using SECPOP2000) (Pt. Beach)	Site specific using SECPOP2000) (PB3)	Site specific using SECPOP2000) (PB3)

Regulatory Analysis Alternatives

- Regulatory Baseline (1x4 high density loading)
- Low-Density Storage (1x4 with empty rack arrangement)
- High-Density Storage (1x8, or other beneficial arrangement)
 - Implementation may require temporary increase in rate of transfer to dry storage may be necessary to free space if re-racking is necessary for criticality prevention reasons.
- Required Mitigation Consistent with Storage
 - Spray capacity sufficient to cool fuel exposed to partial drain down scenarios for all operating cycle phases
 - Enhancements to improve spray deployment reliability above that achieved by Order 12-049, such as permanent installation or increased diversity and redundancy of equipment.

Q&A

From: [Witt, Kevin](#)
To: [Jung, Jan](#); [Uhle, Jennifer](#); [Esmaili, Hossein](#); [Algama, Don](#); [Jones, Steve](#); [Casto, Greg](#); [Schofer, Fred](#); [Reckley, William](#); [Skeen, David](#); [Taylor, Robert](#); [Helton, Shana](#); [Gibson, Kathy](#); [Santiago, Patricia](#); [Dorman, Dan](#); [Wittick, Brian](#); [McGinty, Tim](#); [Kokajko, Lawrence](#); [Leeds, Eric](#)
Subject: Slides for CA Brief on Expedited Transfer of Spent Fuel
Date: Monday, September 23, 2013 12:18:39 PM
Attachments: [Tier3CA-brief\(9-23-13\).pptx](#)

Hello all, see attached slides for the CA brief at 3pm this afternoon. Copies of the current draft COMSECY will be provided to the Commissioner's Assistants in addition to the slides.

Please let me know if I can provide any additional information.

Thanks,
Kevin

Kevin Witt
Project Manager
Japan Lessons Learned Project Directorate
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555
Office (301) 415-2145



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Japan Lessons Learned Tier 3 Issue: Expedited Transfer of Spent Fuel to Dry Cask Storage

Commissioner's Assistant Briefing

September 23, 2013

Agenda

- Objective & Background
- Regulatory Analysis for all Spent Fuel Pools
- Summary of Stakeholder Feedback
- Next Steps

Meeting Objectives

- Outline our activities on the Japan lessons learned Tier 3 activity on expedited spent fuel transfer
- Discuss how the Spent Fuel Pool Study and past studies were used in the regulatory analysis for all spent fuel pools
- Inform Commission offices of the staff's upcoming activities

Background

- Spent Fuel Pool Study initiated in July 2011
 - Evaluates difference in consequences between high and low density SFP loadings at a reference plant
- Tier 3 Project Plan:
 - Determine whether the NRC should consider expedited transfer of spent fuel to dry casks
 - Utilizes information from past SFP studies and SFPS
- Commission provided additional guidance
- Schedules have been aligned to facilitate the public's involvement in the Tier 3 issue, the SFPS, ongoing Waste Confidence activities, and related policy issues

Tier 3 Plan

- Phase 1 – Evaluate whether substantial increase in public health and safety exists - expanded to include regulatory analysis (Commission paper by mid-October)
- Phase 2 – If directed, perform additional analysis (i.e., additional research on expedited transfer risk) (7/31/15)
- Phase 3 – If directed, consider other factors (criticality, mitigating strategies, solar storms, economic consequences, new regulatory framework, etc.) (7/31/17)

Overview

Generic Regulatory Analysis

- Regulatory Assessment
- Expanded Plants (Generic)
- Expanded Scenarios

Regulatory Analysis for Reference Plant (Appendix D)

- Regulatory Assessment
- Specific Plant
- Expanded Scenarios

Spent Fuel Pool Study

- Consequence Study
- Specific Plant
- Specific Scenario

Spent Fuel Pool Study Overview

- Updates public consequence estimates of a beyond-design-basis earthquake affecting a spent fuel pool at a reference plant under high- and low-density loading conditions
- The Study, together with previous research, confirms spent fuel pools adequately protect public health and safety
- The regulatory analysis for the reference plant indicates that faster spent fuel transfer does not substantially enhance safety

Tier 3

Generic Regulatory Analysis

- **The Study's Regulatory Analysis (Appendix D) considers other initiating events such as:**
 - Cask drop
 - Loss of power
 - Partial draindown
- **Tier 3 Expand Evaluation to all Spent Fuel Pools**
 - Conduct regulatory analysis for all spent fuel pools, including PWRs and new reactors
- **Security events previously assessed outside of this analysis**

Groupings

1. BWR Mark I / II with non-shared spent fuel pool (SFP) located well above grade (Excluding Western U.S. Reactor - Columbia)
2. PWR & BWR Mark III with non-shared SFP located at grade with at least one exposed side (Excluding Western U.S. Reactors – Diablo Canyon and Palo Verde)
3. Combined Operating License Holder SFPs (AP-1000)
4. PWRs with Shared SFPs
5. SFPs located below grade with backfill on all sides (not evaluated based on low probability of inventory loss)
6. SFPs at decommissioned plants (fuel in pool) (not evaluated based on low decay heat rate)
7. Decommissioned plants with fuel in ISFSI or offsite

Accident Progression – Group 1

Parameter	Low Est.	Best Est.	High Est.
Site seismic hazard • Bin 3 (0.7g PGA) • Bin 4 (1.2g PGA)	Peach Bottom 1.65×10^{-5} 4.90×10^{-6}	Peach Bottom 1.65×10^{-5} 4.90×10^{-6}	Limerick 2.24×10^{-5} 7.09×10^{-6}
Ac power fragility	1.0 (bounding)	1.0 (bounding)	1.0 (bounding)
Liner fragility • Bin 3 (SFPS) • Bin 4 • Cask Drop	0.1 0.5 1.0	0.1 1.0 (bounding) 1.0	1.0(bounding) 1.0 (bounding) 1.0
Insufficient nat. circ • Bin 3 • Bin 4 • Cask Drop • All Other Initiators	8% 30% 8% 100% (bounding)	8% 100% (bounding) 100% (bounding) 100% (bounding)	100% (bounding) 100% (bounding) 100% (bounding) 100% (bounding)
Release Fraction • Alternative 1 • Alternative 2	3% 0.5%	40% 3%	90% 5%

Accident Progression – Groups 2-4

Parameter	Low Est.	Best Est.	High Est.
Site seismic hazard • Bin 3 (0.7g PGA) • Bin 4 (1.2g PGA)	Peach Bottom 1.65×10^{-5} 4.90×10^{-6}	Peach Bottom 1.65×10^{-5} 4.90×10^{-6}	[Highest in Group] 2.9×10^{-5} to 5.6×10^{-5} 9.1×10^{-6} to 2.0×10^{-5}
Ac power fragility	1.0 (bounding)	1.0 (bounding)	1.0 (bounding)
Liner fragility • Bin 3 (SFPS) • Bin 4 • Cask Drop	0.02 0.16 1.0	0.05 0.50 1.0	0.25 1.0 (bounding) 1.0
Insufficient nat. circ • Bin 3 • Bin 4 • Cask Drop • All Other Initiators	8% 30% 8% 100% (bounding)	100% (bounding) 100% (bounding) 100% (bounding) 100% (bounding)	100% (bounding) 100% (bounding) 100% (bounding) 100% (bounding)
Release Fraction • Alternative 1 • Alternative 2	10% 0.5%	75% 3%	90% 5%

Source Term (MCi Cesium)

Group	Low Est.	Best Est.	High Est.
Source term			
Group 1 (BWR)	40.6	52.7	63.3
Group 2 (PWR)	57.4	67.9	78.2
Group 3 (New)	33.7	44.4	54.2
Group 4 (Shared)	63.6	101.1	142.2

Regulatory Analysis Inputs

Parameter	Low Est.	Best Est.	High Est.
Dose Consequence Analysis			
Population density & demographics	169 people/sq.mi. (Palisades)	317 people/sq.mi. (Surry)	722 people/sq.mi. (Peach Bottom)
Weather conditions & modeling	Same as SFPS (Peach Bottom)	Same as SFPS (Peach Bottom)	Same as SFPS (Peach Bottom)
Habitability Limit & health effects	500 mrem annual - LNT	2 rem first year, 500 mrem thereafter - LNT	2 rem annual - LNT
Evacuation assumptions & modeling	Same as SFPS (Peach Bottom)	Same as SFPS (Peach Bottom)	Same as SFPS (Peach Bottom)
Offsite Property Analysis			
Economic data	Site specific using SECPOP2000) (Palisades)	Site specific using SECPOP2000) (Surry)	Site specific using SECPOP2000) (Peach Bottom)

Regulatory Analysis Results

- For the low estimate and base case, costs outweigh benefits
 - Benefits based on \$2000/person-rem within 50 miles
 - For the high estimate, benefits outweigh industry costs
- Sensitivity Analyses (\$4000/person-rem and consequences beyond 50 miles)
 - For the base case and high estimate, benefits outweigh industry costs
 - When using \$2000/person-rem and consequences beyond 50 miles, only new reactors (Group 3) and shared pool plants (Group 4) the benefits outweigh industry costs

Backfit Analysis Results

- Comparison to Safety Goal Policy Quantitative Health Objectives
 - No early fatalities predicted within 1 mile from site boundary
 - Calculated latent cancer risk is less than Quantitative Health Objectives
 - All cases are similar due to offsite protective actions
 - Individual risk dominated by long-term dose in habitable areas
- Costs outweigh benefits when evaluating the base case averted accident consequences
 - Not met when evaluating the averted accident consequences within 50 miles of the site

Preliminary Findings

- Expedited transfer of spent fuel to dry cask storage does not appear to provide either a substantial increase in the overall protection of public health and safety or a safety benefit that outweighs the associated costs
- The staff's current position is to not pursue expedited transfer of spent fuel to dry cask storage and close this Tier 3 Japan lessons learned activity

Other Alternatives

- Examples include:
 - Alternative loading patterns
 - Direct offload of fuel into more coolable patterns
 - Enhancement of mitigation strategies
- Staff has taken note of these possible improvements but determined that they do not provide a substantial safety enhancement such that generic regulatory action could be pursued

Stakeholder Feedback

- Two public meetings held (August 22 and September 18)
- Letters received from stakeholders
 - Staff drafting responses
- Comments received on Spent Fuel Pool Study
 - To be addressed in final study
- In response to stakeholder feedback, staff has provided additional clarification on specific issues in Tier 3 paper

Next Steps

- Draft Tier 3 Analysis Publicly Available
 - Late September
- Present Tier 3 Analysis to full Advisory Committee on Reactor Safeguards
 - October 2, 2013
- Issue Final Commission Papers
 - October 11, 2013
- Conduct Commission Meeting on Spent Fuel Safety
 - By end of 2013

Q&A

~~NOT FOR PUBLIC DISCLOSURE~~

From: [Schofer, Fred](#)
To: [Jones, Steve](#); [Casto, Greg](#); [Reckley, William](#); [Witt, Kevin](#)
Subject: Tier 3 Expedited Spent Fuel Regulatory Analysis roadmap
Date: Monday, June 24, 2013 3:19:30 PM
Attachments: [RA roadmap rA1.docx](#)

Attached is a suggested approach to expand the SFPS to encompass all licensed nuclear power reactor spent fuel pools. We can discuss this proposal on Wednesday.

Thanks,
R. Frederick Schofer
Senior Cost Analyst
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation
NRR/DPR/PRMB
301-415-5682

Expedited Spent Fuel Draft Analysis Roadmap

Groupings

Groupings based on Spent Fuel Pool Structures

Group	Description	No. of units
1	BWR Mark I and Mark II plants w/ non-shared SFP – SFP located about 100 to 150 ft above grade	31
2	PWR and BWR Mark III plants w/ non-shared SFP – SFP located at grade level with at least one exposed side	majority
3	Shared SFPs	
4	Plants with SFP completely below grade (e.g., only boil off events, so bounded by groups 1, 2, and 3)	6 (verify)
5	Spent fuel stored in spent fuel pools at decommissioning nuclear power plants (not evaluated further, all spent fuel is air coolable)	5
6	Decommissioning nuclear power plant spent fuel transferred to dry storage in an ISFSI or shipped offsite by end of year 2014	19

Additional sub-groups based on seismic hazard, if necessary

- Central and Eastern US
- Western US

Alternatives considered

1. Regulatory baseline
2. Low density storage (1x4) with full offload capability
3. High density storage (1x8) for hottest spent fuel
 - a. May require near-term dry storage to make room in pool for 1x8 storage + full offload capability
 - b. May require longer refueling outage (assume 1 week)
4. Required mitigation consistent with SF storage
 - a. Installed spray with capacity sufficient to cool spent fuel during OCP1/OCP2 for fuel loading used

Modeling inputs

Para	BWR			PWR		
	Low	Best	High	Low	Best	High
Release frequency						
Site seismicity	Use bin 3 & 4 point estimates		Bin 3 and 4 boundary est	Use bin 3 & 4 point estimates		Bin 3 and 4 boundary est
Ac power fragility	0.84 for bin 3 (NUREG-1150), 1.0 for bin 4 (bounding)			0.84 for bin 3 (NUREG-1150), 1.0 for bin 4 (bounding)		
Refueling freq.	24 month	24 month	18 month	24 month	24 month	18 month
Liner fragility	0.1 for bin 3 (SFPS), 1.0 for bin 4 (bounding)			0.1 for bin 3 (SFPS), 1.0 for bin 4 (bounding)		
% time nat circ not sufficient	60/730=8.2% (SFPS)	8.2% (SFPS)	60/547.5=11.0% (SFPS scaled)	8.2% (assumed)	8.2% (assumed)	11% (assumed)
Cask loading area detail	Separated by wall (no cask drop initiating event)	In pool	In pool	Separated by wall (no cask drop initiating event)	In pool	In pool
FLEX mitigation likelihood	20% success HD; 80% success LD	0% success HD; 100% success LD	0% success HD; 100% success LD	20% success HD; 80% success LD	0% success HD; 100% success LD	0% success HD; 100% success LD
Source term						
Reactor unit	1775 (-50%) (Monticello)	3514 (PB-3)	3988 (+13%) (NMP-2)	1500 (-53%) (Ft Calhoun)	3216 (median) (IP-2/3)	4408 (+37%) (Grand Gulf 1)
MWt rating						
HD SF Pool	3.0	3055/764= 4.0	8	4	6	12

Expedited Spent Fuel Draft Analysis Roadmap

Para	BWR			PWR		
	Low	Best	High	Low	Best	High
inventory (equiv. cores)	(assumed)	(SFPS)	(assumed)	(assumed)	(assumed)	(assumed)
1x4 LD SF Pool inventory (equiv. cores)	1.1 (assumed)	852/764 = 1.1 (SFPS)	5 (assumed)	1.1 (assumed)	3 (assumed)	9 (assumed)
Initial refueling core offload (% of core)	33% (assumed)	284/764 = 0.37 Or 37% (SFPS)	50% (assumed)	50% (assumed)	100% (bounding)	100% (bounding)
Refueling core offload (% of core)	33% (assumed)	37% (SFPS)	50% (assumed)	33% (assumed)	37% (SFPS)	50% (assumed)
SFP loading configuration	1x4 immediately (SFPS)	Uniform for 25d then 1x4 (assumed)	Uniform for 60d then 1x4 (bounding)	Uniform for 25d then 1x4 (assumed)	Uniform for 25d then 1x4 (assumed)	Uniform for 60d then 1x4 (bounding)
Release fraction	SFPS scaled based on pool inventory (using equiv cores & MWt rating) (assumed)	Same as SFPS	SFPS scaled based on pool inventory (using equiv cores & MWt rating) (assumed)	SFPS scaled based on pool inventory (using equiv cores & MWt rating) (assumed)	SFPS scaled based on pool inventory (using equiv cores & MWt rating) (assumed)	SFPS scaled based on pool inventory (using equiv cores & MWt rating) (assumed)
Dose Consequence Analysis						
Population density @ 10 mi & distribution	-50% (assumed)	Same as SFPS (assumed)	+50% (assumed – based on Limerick)	-50% (assumed)	Same as SFPS (assumed)	+300% (assumed – based on IP2/3)
Population density @ 50 mi	-50% (assumed)	Same as SFPS (assumed)	+50% (assumed – based on Limerick - 1058)	-50% (assumed)	Same as SFPS (assumed)	+300% (assumed – based on IP2/3 - 2138)
Population density @ 500 mi	-50% (assumed)	Same as SFPS (assumed)	+50% (assumed – based on Limerick)	-50% (assumed)	Same as SFPS (assumed)	+300% (assumed – based on IP2/3)
weather conditions & modeling	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)
Exposure & health effects modeling	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)
Evacuation assumptions & modeling	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)	Same as SFPS (assumed)
Offsite Property Analysis						
Economic data	Same as SFPS (assumed) [based on SECPOP2000]	Same as SFPS (assumed) [based on SECPOP2000]	Same as SFPS (assumed) [based on SECPOP2000]	Same as SFPS (assumed) [based on SECPOP2000]	Same as SFPS (assumed) [based on SECPOP2000]	Same as SFPS (assumed) [based on SECPOP2000]

Sensitivity studies

1. \$4,000 per person-rem conversion factor
2. Consequences extend beyond 50 miles
3. Population density @ 50 miles
 - a. Avg for all sites = ??
 - b. PB = 722per sq mile

Expedited Spent Fuel Draft Analysis Roadmap

- c. Limerick = 1058
- d. IP2 = 2138
- 4. Achieve Low-density spent fuel loading
 - a. 5 yrs
 - b. 10 yrs
 - c. 15 yrs
- 5. Assume 2nd 20 year life extension
- 6. Discount factors (7%, 3%, 2%, undiscounted)
- 7. Cask pricing (20% less, 10%less, same)
- 8. Sensitivity to cask capacity

NOT FOR PUBLIC DISCLOSURE

Expedited Spent Fuel Draft Analysis Roadmap

Operating NRC-Licensed Power Reactors

Unit name	Type	Unit Rating (MWt)
ANO1, U1	PWR	2568
ANO1, U2	PWR	3026
Beaver Valley 1	PWR	2900
Beaver Valley 2	PWR	2900
Braidwood 1	PWR	3586.6
Braidwood 2	PWR	3586.6
Browns Ferry 1	BWR I	3458
Browns Ferry 2	BWR I	3458
Browns Ferry 3	BWR I	3458
Brunswick 1	BWR I	2923
Brunswick 2	BWR I	2923
Byron 1	PWR	3586.6
Byron 2	PWR	3586.6
Callaway	PWR	3565
Calvert Cliffs 1	PWR	2737
Calvert Cliffs 2	PWR	2737
Catawba 1	PWR	3411
Catawba 2	PWR	3411
Clinton	BWR III	3473
Columbia	BWR II	3486
Comanche Peak 1	PWR	3612
Comanche Peak 2	PWR	3612
Cooper	BWR I	2419
DC Cook 1	PWR	3304
DC Cook 2	PWR	3468
Davis Besse	PWR	2817
Diablo Canyon 1	PWR	3411
Diablo Canyon 2	PWR	3411
Dresden 2	BWR I	2957
Dresden 3	BWR I	2957
Duane Arnold	BWR I	1912
Farley 1	PWR	2775
Farley 2	PWR	2775
Fermi 2	BWR I	3430
FitzPatrick	BWR I	2536
Fort Calhoun	PWR	1500
Ginna	PWR	1775
Grand Gulf 1	BWR III	4408
Harris	PWR	2948
Hatch 1	BWR I	2804
Hatch 2	BWR I	2804
Hope Creek 1	BWR I	3840
Indian Point 2	PWR	3216
Indian Point 3	PWR	3216
LaSalle 1	BWR II	3546
LaSalle 2	BWR II	3546
Limerick 1	BWR II	3515
Limerick 2	BWR II	3515
McGuire 1	PWR	3411
McGuire 2	PWR	3411
Millstone 2	PWR	2700

Expedited Spent Fuel Draft Analysis Roadmap

Unit name	Type	Unit Rating (MWt)
Millstone 3	PWR	3650
Monticello	BWR I	1775
Nine Mile 1	BWR I	1850
Nine Mile 2	BWR II	3988
North Anna 1	PWR	2940
North Anna 2 PWR	PWR	2940
Oconee 1	PWR	2568
Oconee 2	PWR	2568
Oconee 3	PWR	2568
Oyster Creek	BWR I	1930
Pallisades	PWR	2565.4
Palo Verde 1	PWR	3990
Palo Verde 2	PWR	3990
Palo Verde 3	PWR	3990
Peach Bottom 2	BWR I	3514
Peach Bottom 3	BWR I	3514
Perry 1	BWR III	3758
Pilgrim 1	BWR I	2028
Point Beach 1	PWR	1800
Point Beach 2	PWR	1800
Prairie Island 1	PWR	1677
Prairie Island 2	PWR	1677
Quad Cities 1	BWR I	2957
Quad Cities 2	BWR I	2957
River Bend 1	BWR III	3091
Robinson 2	PWR	2339
St Lucie 1	PWR	2700
St Lucie 2	PWR	2700
Salem 1	PWR	3459
Salem 2	PWR	3459
Seabrook 1	PWR	3648
Sequoyah 1	PWR	3455
Sequoyah 2	PWR	3455
South Texas 1	PWR	3853
South Texas 2	PWR	3853
Summer	PWR	2900
Surry 1	PWR	2587
Surry 2	PWR	2587
Susquehanna 1	BWR II	3952
Susquehanna 2	BWR II	3952
TMI1	PWR	2568
Turkey Point 3	PWR	2644
Turkey Point 4	PWR	2644
Vermont Yankee	BWR I	1912
Vogtle 1	PWR	3625.6
Vogtle 2	PWR	3625.6
Waterford 3	PWR	3716
Watts Bar 1	PWR	3459
Wolf Creek 1	PWR	3565

Expedited Spent Fuel Draft Analysis Roadmap

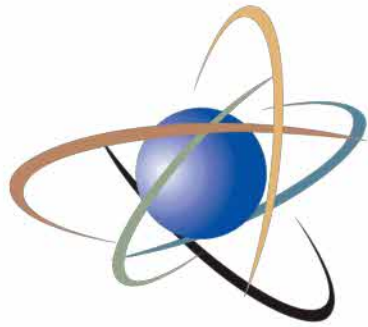
Spent Fuel at Shutdown NRC-Licensed Power Reactors

Unit name	Spent fuel storage status	Grouping
Big Rock Point	ISFSI	6
Crystal River 3	Fuel has been permanently removed from the reactor. Spent fuel stored in SFP	5
Dresden 1	ISFSI except for 108 spent fuel assemblies and one fuel rod basket from Unit 1 are stored in the DNPS Unit 3 SFP	5
Fermi 1	The fuel and blanket subassemblies were shipped offsite in 1973	6
Fort St. Vrain	ISFSI	6
Haddam Neck	ISFSI	6
Humboldt Bay 3	ISFSI	6
Indian Point 1	ISFSI	6
Kewaunee	Fuel has been permanently removed from the reactor. Spent fuel stored in SFP	5
La Crosse	ISFSI	6
Maine Yankee	ISFSI	6
Millstone 1	Stored in Unit 1 spent fuel pool	5
Pathfinder	License terminated and fuel removed from site	6
Peach Bottom 1	All Unit 1 spent fuel has been removed from the site	6
Rancho Seco	ISFSI	6
Saxton	License terminated and fuel removed from site.	6
Shoreham	License terminated and fuel removed from site.	6
SONGS 1	ISFSI	6
SONGS 2, 3	Fuel has been permanently removed from the reactor. Spent fuel stored in SFP	5
TMI 2	TMI-2 spent fuel has been shipped offsite except for some debris in the reactor coolant system.	6
Trojan	ISFSI	6
Vallecitos	Spent fuel has been removed from the site	6
Yankee Rowe	ISFSI	6
Zion 1, 2	Spent fuel stored in the spent fuel pool until completion of fuel transfer to the ISFSI in 2014	6

From: [Witt, Kevin](#)
To: [Casto, Greg](#); [Reckley, William](#); [Jones, Steve](#); [Schofer, Fred](#)
Subject: Tier 3 Public Meeting Slides
Date: Wednesday, August 14, 2013 10:39:29 PM
Attachments: [Tier3-PublicMeeting\(8-22-13\).pptx](#)

Hello all, see attached draft slides for the Tier 3 meeting. I think we need to update the reg analysis portion of the slides. We need to make these slides final by Friday for the public to review before the meeting.

Thanks,
Kevin



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UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Japan Lessons Learned Tier 3 Issue: Expedited Transfer of Spent Fuel to Dry Cask Storage

Public Meeting
August 22, 2013

Agenda

- Objective & Background
- Regulatory Analysis Process
- Spent Fuel Pool Study Appendix D –
Regulatory Analysis and Backfitting
Discussion
- Preliminary Outline of Regulatory Analysis
for all Spent Fuel Pools

Presentation Objective

- Inform stakeholders about the staffs activities on the Japan lessons learned Tier 3 activity on expedited transfer of spent fuel
- Discuss the staff's plans for expanding the regulatory analysis contained in the Spent Fuel Pool Study (SFPS) reference plant to make it applicable to all Spent Fuel Pools (SFPs)
- Gather stakeholder feedback for the upcoming Commission paper on this issue

Background

- Objective of Tier 3 Plan:
 - Confirm, using insights from Fukushima, that both SFPs and dry cask storage continue to provide adequate protection, and assess whether any significant safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry casks
 - Provides additional regulatory context of the results from the SFPS
 - Improves the public's understanding of the relationship between the Tier 3 issue, the SFPS and ongoing Waste Confidence activities

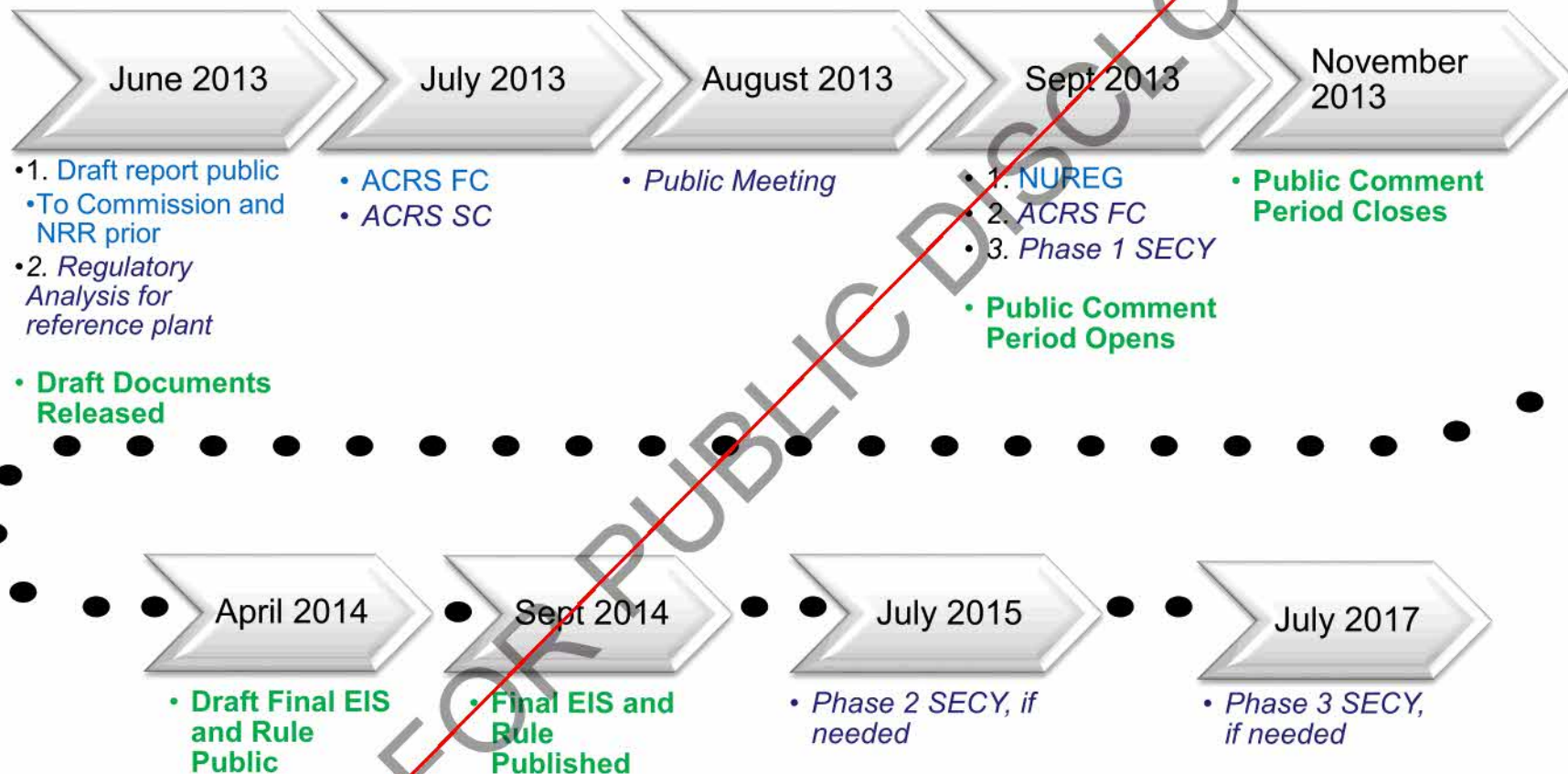
Background, cont'd

- Spent Fuel Pool Study initiated in July 2011
- SECY-12-0095 (7/13/2012) established the general plan to address the transfer of spent fuel to dry cask storage
- SRMs on Commission Meetings affect the issue
 - June 7, 2012 Meeting with ACRS (SRM 7/16/2012)
 - August 7, 2012 Japan Lessons Learned Briefing (SRM 8/24/2012)
 - May 7, 2013 Memorandum to the Commission outlining updated Tier 3 plan

Tier 3 Plan

- Three phases with Commission papers:
 - Phase 1 – Evaluate whether substantial increase in public health and safety exists (Commission paper by 9/31/13)
 - Phase 2 – If necessary, perform detailed analysis of costs and benefits (Commission paper by 7/31/15)
 - Phase 3 – If necessary, consider other factors (criticality, mitigating strategies, solar storms, economic consequences, new regulatory framework, etc.) (Commission paper by 7/31/17)

Major Spent Fuel Pool Transfer Milestones



Legend

Spent Fuel Pool Scoping Study
Tier 3 Expedited Spent Fuel Transfer Plan
Waste Confidence

What is a Regulatory Analysis?

An analytical tool provided to decision makers which:

- Recommends a preferred alternative from the potential courses of action studied
- Contains estimates of benefits and costs with a conclusion whether the proposed regulatory action is cost beneficial

Elements of a Regulatory Analysis

- Statement of the Problem and Objective
- Identification of Alternatives
- Estimation and Evaluation of Values and Impacts
- Presentation of Results
- Decision Rationale
- Implementation

Attributes Considered in a Regulatory Analysis

- Public Health (Accident)
- Public Health (Routine)
- Occupational Health (Accident)
- Occupational Health (Routine)
- Offsite Property
- Onsite Property
- Industry Implementation
- Industry Operation
- NRC Implementation
- NRC Operation
- Other Government
- General Population
- Improvements in Knowledge
- Regulatory Efficiency
- Antitrust Considerations
- Safeguards and Security Considerations
- Environmental Considerations
- Other Considerations

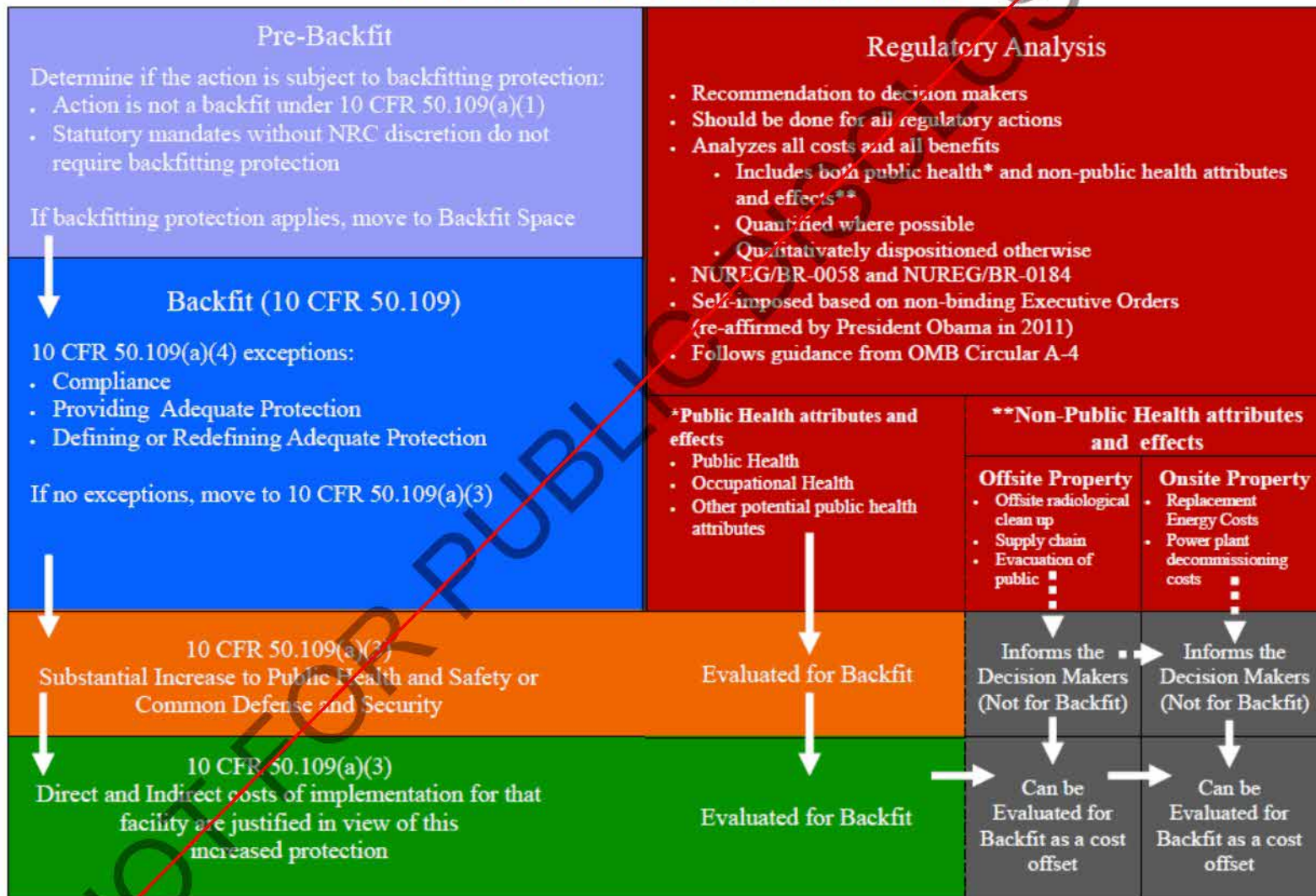


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Protecting People and the Environment

Regulatory Analysis vs. Backfit

REGULATORY ACTIONS (Operating Reactors)



Spent Fuel Pool Study Regulatory Analysis Overview

- The regulatory analysis was performed to provide regulatory context for the Spent Fuel Pool Study
- The analysis assesses whether any significant safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry casks for the reference plant as modeled, and the potential costs associated with such expedited transfer

Data Used in the Regulatory Analysis

- Spent Fuel Pool Initiator Release Frequency
- Duration of On-site Spent Fuel Storage Risk
- Cost/Benefit Inflators
- Dollar per Person-Rem Conversion Factor
- Onsite Property Decontamination, Repair, and Refurbishment Costs
- Replacement Energy Costs
- Occupational Worker Exposure (Accident)
- Long-Term Habitability Criteria
- Other Key Data

Assumptions used in the Regulatory Analysis

- Fuel Assembly Decay Heat as a Function of Burnup and Cooling Time
- Dry Storage Upfront Costs
- Incremental Costs Associated with Earlier Dry Storage Cask Purchase and Loading
- Incremental Annual Independent Spent Fuel Storage Installation Operating Costs
- Dry Storage Occupational Exposure (Routine)
- Number of Projected Dry Storage Casks Required

Sensitivity Analysis

- Present Value Calculations
- Dollar per Person-Rem Conversion Factor
- Replacement Energy Costs
- Consequences Extending Beyond 50 Miles
- Combined Effect of Consequences Extending Beyond 50 Miles and Dollar per Person-Rem Conversion Factor



Reference Plant Regulatory Analysis Results

- Total Cost to the Reference Plant
 - \$47 million (using a 7-percent discount rate)
 - \$42 million (using a 3-percent discount rate)
 - Range from \$16 to \$47 million (sensitivity analyses)
- Value of Benefits to the Reference Plant
 - \$500,000 (using a 7-percent discount rate)
 - \$700,000 (using a 3-percent discount rate)
 - Range from \$500,000 to \$43 million (sensitivity analyses)
- Costs to NRC
 - Were ignored to calculate the maximum potential benefit

Reference Plant Decision Rationale

- Regulatory Analysis
 - Alternative considered does not achieve a cost-beneficial increase in public health and safety for the reference plant
 - The three sensitivity studies also showed that the low-density spent fuel storage alternative was not cost-justified for any of the discounted sensitivity cases
- Backfit Analysis
 - Comparison to Safety Goal Policy Quantitative Objectives
 - No early fatalities predicted within 1 mile from site boundary which meets the individual early fatality risk goal
 - SFP accident represents 0.13% fraction of 1.84×10^{-6} per year societal risk goal
 - Cost-justified criteria are not met when evaluating the averted accident consequences
 - Not met when evaluating the averted accident consequences within 50 miles of the site consistent with the regulatory framework
 - Not met for any of the discounted sensitivity cases that extend the analyses beyond 50 miles

Expanded Regulatory Analysis For All Spent Fuel Pools

- **Objective is to expand the Spent Fuel Pool Study Regulatory Analysis (Appendix D) to all Spent Fuel Pools**
 - SFPS Reference Plant is based on a BWR Mark I with elevated SFP
 - Staff developing methodology to apply SFPS results to other reactors, including PWRs and new reactors

Grouping/Sensitivity Studies

- **Spent Fuel Pool Grouping by Configuration/ Design**
 1. BWR Mark I / II with non-shared spent fuel pool (SFP) located well above grade
 2. PWR & BWR Mark III with non-shared SFP located at grade with at least one exposed side
 3. Advanced reactor SFPs
 4. Shared SFPs
 5. SFPs located below grade
 6. SFPs at decommissioned plants (fuel in pool)
 7. Decommissioned plants with fuel in ISFSI or shipped offsite
- **Sensitivity Studies**
 1. Consequences beyond 50 miles
 2. Population density
 3. Time to achieve low-density SFP loading
 4. Second operating life extension
 5. Discount factors (7%, 3%, 2%, undiscounted)
 6. Dry storage cask pricing and cask capacity

Regulatory Analysis Inputs

Parameter	Low Est.	Best Est.	High Est.
Site seismicity <ul style="list-style-type: none"> Bin 3 (SFPS F4) Bin 4 	2×10^{-6} (V Yankee) 5×10^{-7} (V Yankee)	1.7×10^{-5} (PB3) 4.9×10^{-6}	3×10^{-5} (Brunswick) 4.9×10^{-6}
Ac power fragility	1.0 (bounding)	1.0 (bounding)	1.0 (bounding)
Refueling freq.	24 months	24 months	18 months
Liner fragility <ul style="list-style-type: none"> Bin 3 (SFPS) Bin 4 	0.1 1.0 (bounding)	0.1 1.0 (bounding)	0.1 1.0 (bounding)
Insufficient nat. circ Full drain down Partial drain down	8.2% 100%	8.2% 100%	11% 100%
Flex mitigation likelihood	Higher success than SFPS	Same as SFPS or higher	Same as SFPS

Regulatory Analysis Inputs (cont'd)

Parameter	Low Est.	Best Est.	High Est.
Source term			
Reactor unit MWt rating	1775 (-50%) (Monticello)	3514 (PB3)	3988 (+13%) (Nine Mile)
HD SFP inventory (equiv. cores)	3.0 (-25%) (assumed)	4.0 (PB3)	8 (+200%) (assumed)
1x4 LD SFP inventory	1.1 (assumed)	1.1 (PB3)	4 (+360%) (assumed)
Initial refueling core offload (% core)	33% (-11%) (assumed)	37% (PB3)	50% (+35%) (assumed)
Refueling core offload (% core)	33% (-11%) (assumed)	37% (PB3)	50% (+35%) (assumed)
SFP loading configuration	1x4 immediately (PB3)	Uniform for 25d then 1x4 (assumed)	Uniform for 60d then 1x4 (assumed)
Release fraction	MELCOR	MELCOR	MELCOR

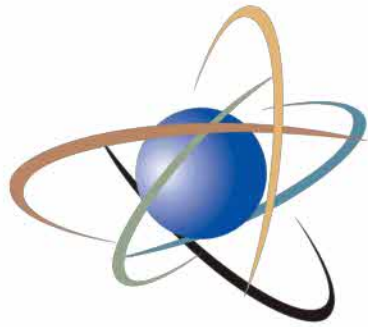
Regulatory Analysis Inputs (cont'd)

Parameter	Low Est.	Best Est.	High Est.
Dose Consequence Analysis			
Population density & demographics	Low density (Pt. Beach)	Same as SFPS (PB3)	High density (PB3)
Weather conditions & modeling	Same as SFPS (PB3)	Same as SFPS (PB3)	Same as SFPS (PB3)
Exposure & health effects modeling	500 mrem annual - LNT	2 rem first year, 500 mrem thereafter - LNT	2 rem annual - LNT
Evacuation assumptions & modeling	Same as SFPS (PB3)	Same as SFPS (PB3)	Same as SFPS (PB3)
Offsite Property Analysis			
Economic data	Site specific using SECPOP2000) (Pt. Beach)	Site specific using SECPOP2000) (PB3)	Site specific using SECPOP2000) (PB3)

Regulatory Analysis Alternatives

- Regulatory Baseline (1x4 high density loading)
- Low-Density Storage (1x4 with empty rack arrangement)
- High-Density Storage (1x8, or other beneficial arrangement)
 - Implementation may require temporary increase in rate of transfer to dry storage may be necessary to free space if re-racking is necessary for criticality prevention reasons.
- Required Mitigation Consistent with Storage
 - Spray capacity sufficient to cool fuel exposed to partial drain down scenarios for all operating cycle phases
 - Enhancements to improve spray deployment reliability above that achieved by Order 12-049, such as permanent installation or increased diversity and redundancy of equipment.

Q&A



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Protecting People and the Environment

Update of Tier 3 Plan – Expedited Transfer of Spent Fuel to Dry Casks & Alignment with SFPSS

Transfer of Spent Fuel Working Group
Japan Lessons Learned Project Directorate
January 22, 2013

Background

- SFPSS work initiated by RES in July 2011
- SECY-12-0095 (7/13/2012) established the general plan to address the transfer of spent fuel to dry cask storage
- SRMs from Commission Meetings affect the project plan
 - June 7, 2012 Meeting with ACRS (SRM 7/16/2012)
 - August 7, 2012 Japan Lessons Learned Briefing (SRM 8/24/2012)
- Multi-office working group (including senior management) addressed these issues representing:
 - NMSS, NRR, NSIR, and RES

Tier 3 Project Plan

- **Three phase Approach**
 - Phase 1 – Evaluate whether substantial increase in public health and safety exists (12/31/13)
 - Consider SFP high density to low density pool configurations
 - Include research studies such as spent fuel pool scoping study, human reliability analysis, and comparative assessments
 - Complete screening analysis according to regulatory analysis guidelines
 - Summarize information and provide to Commission
 - Phase 2 – If directed, perform analysis of costs and benefits for expedited loading to dry storage (6/30/15)
 - Detailed analysis of all direct and indirect costs and benefits to determine cost/benefit ratio
 - Includes fuel loading risk, personnel exposure, security assessments, international practices
 - Phase 3 – If directed, consider other factors (criticality, mitigating strategies, solar storms, economic consequences, new regulatory framework, etc.) (7/31/17)
 - Consideration of items currently under Commission review, and lessons learned from implementation of other JLD activities

Path Forward

- Request changes in SRM direction to consolidate and unify Agency activities on this issue
 - Recommended changes would be requested via communication to Commission via COMSECY
 - Goal to complete COMSECY in February 2013
 - Complete first phase analysis by December 2013

From: [Skeen, David](#)
To: [Reckley, William](#); [Witt, Kevin](#); [Schofer, Fred](#); [Helton, Shana](#); [Bahadur, Sher](#); [Jones, Steve](#)
Subject: URGENT: RES comments on Tier 3 Spent Fuel expedited transfer paper
Date: Monday, September 23, 2013 2:03:36 PM

All,

I got a call from Doug Coe and Stu Richards concerning comments from Brian Sheron and RES staff. I told them to provide whatever written comments they could as quickly as possible so the staff can review and incorporate the comments into the paper, or there needs to be a discussion at the OD level we can set it up ASAP. Given the paper is to go public on Wednesday, we are really under the gun at this point to make changes that can be signed off by tomorrow.

Doug intends to send comments to us within the hour. Stay tuned.

Basically, the comments center around:

1. Providing more discussion of the high cases that could make some plant specific mods cost beneficial
2. Clarifying that the staff is changing the Reg Analysis guidelines to \$4000/person-rem
3. Explaining that this would be the first time the Commission would use QHOs for non-reactor source terms
4. The fact that 1x8 loading could be implemented for little cost at some plants (something the ACRS also brought up)

From: Helton, Donald
To: [Compton, Keith](#); [Nosek, Andrew](#)
Subject: FW: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)
Date: Wednesday, September 10, 2014 3:02:00 PM
Attachments: [Closeout User-Need Request NRR-2011-008 Reassignment of NRC's Dollar Per Person-Rem Conversion Factor Policy.msg](#)

FYI

From: Coyne, Kevin
Sent: Wednesday, September 10, 2014 2:59 PM
To: Witt, Kevin
Cc: Santiago, Patricia; Nakoski, John; Wagner, Brian; Helton, Donald
Subject: RE: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)

Kevin –

I also support Don and Brian's comments below (the only exception I might take is Brian's characterization of the QHOs not capturing any societal risks - but I think this doesn't change his characterization of the issue and I think the point he was really getting at was that there are societal impacts associated with the issue not captured by the QHO metrics). You should also be aware that RES recently closed out a user need for updating the dollar per person conversion factor with a recommendation to use \$5,100 per person-rem. This is documented in a July 10th memo from Dr. Sheron to Dan Dorman (I've attached the ADAMS reference) – so I think the continued use of \$2,000 for these types of cost-benefit analyses is indefensible and places us well outside the rest of the federal family for considering the costs associated with small changes in risk.

Kevin

*Kevin Coyne, P.E., Ph.D.
Chief, Probabilistic Risk Assessment Branch
Division of Risk Analysis, Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(301) 251-7586 (work)
(b)(6) (cell)*

From: Helton, Donald
Sent: Wednesday, September 10, 2014 1:49 PM
To: Wagner, Brian; Witt, Kevin
Cc: Santiago, Patricia; Nakoski, John; Coyne, Kevin
Subject: RE: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)

Kevin W.,

I echo Brian W.'s comments.

Don

From: Wagner, Brian
Sent: Wednesday, September 10, 2014 1:33 PM
To: Witt, Kevin
Cc: Santiago, Patricia; Nakoski, John; Helton, Donald; Coyne, Kevin
Subject: RE: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)

Kevin,

Here are my comments.

The QHOs only measure differences in individual risks, not societal risks. SRM to SECY-93-086 "Backfit Considerations" clarifies that the substantial standard "is not intended to be interpreted in a manner that would result in disapprovals of worthwhile safety or security improvements having costs that are justified in view of the increased protection that would be provided." Recognizing this, the filtered vents regulatory analysis did not use the QHOs and instead relied on qualitative factors and total population dose. In comparison, the 1x8 analysis predicts more dose being averted than the filtered vents analysis and neither the 1x8 analysis nor the filtered vents regulatory analysis would pass a QHO screen. I suggest coordinating with staff working on the filtered vents rulemaking and using the same criteria for both analyses. We should be consistent.

The analysis should include sensitivities such as the low and high estimates in addition to the base case. As stated in the regulatory analysis guidelines (NUREG/BR-0058) "Uncertainties are important to consider and need to be presented in a regulatory analysis."

In addition the analysis should include additional sensitivities for consequences beyond 50 miles and \$4k/person-rem. These are both being considered as part of updating regulatory analysis guidance. Together, these will increase the total benefits by around a factor of 5, which would call into question the conclusion that a 1x8 is not cost-beneficial.

The analysis needs to justify that moving to a 1x8 would cost more than \$2.4 million. This is not obvious given that Peach Bottom does it voluntarily. If there are a few outliers where achieving a 1x8 would be especially difficult/expensive, they could be given special treatment as was done in the license conditions requiring a 1x4 configuration. Further, the analysis should discuss whether the cost is likely to exceed the expected benefit when considering consequences beyond 50 miles and using \$4k/person-rem.

"Although mitigation is likely to be successful, no mitigation is assumed for either alternative."

The likelihood of mitigation being successful has not been established and would require a PRA. Suggest replacing with "Although mitigation may be successful, no mitigation is assumed for either alternative."

Thanks,
Brian

-----Original Message-----
From: Santiago, Patricia

Sent: Monday, September 08, 2014 5:14 PM
To: Nakoski, John; Wagner, Brian
Subject: FW: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)

FYI

I understood this was getting ticketed to both DSA and DRA but am unsure at this point so wanted you to be aware and feel free to email any comments to Kevin Witt.
thanks

-----Original Message-----

From: Compton, Keith
Sent: Friday, September 05, 2014 9:43 AM
To: Witt, Kevin; Santiago, Patricia
Subject: RE: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)

Kevin,

I am sorry that it has taken me so long to get to the review of this document. My comments are appended. You may do with them as you see fit; I hope that you can use them to strengthen the document. Also, given the nature of the discussion, and the importance of the QHO screen in the argument that you are developing, I also strongly recommend that DRA staff be given the opportunity to review this document, as they had raised concerns about the application of the QHO screen for this application. Thanks for the opportunity to comment, and let me know if you need anything else - Thanks!

****COMMENTS APPENDED****

GENERAL COMMENT: Although in the interests of time I did not re-review all of what was in COMSECY-13-0030, the document does not seem to me to be very responsive to the direction to "explain why the "1 X 8" configuration was not found to provide a substantial increase in safety". Based on a quick look, it seems to simply reiterate the logic that was in SECY-13-0030 and does not seem to introduce any significant new information or discussion beyond what was in COMSECY-13-0030 and its supporting documents. However, the question of whether it is adequately responsive is a judgment for you and your management.

COMMENT 1: "The contributions to the overall risks introduced by spent fuel pools located at nuclear power plants were very low and in the range for which the NRC typically takes no regulatory actions." (p.2)

This statement is unclear and not well supported. It seems to imply that spent fuel pool risk is a negligible contributor to overall plant risk. The documentary record seems much more ambiguous. As stated as early as 1987 in NUREG/CR-4982 Section 5.6, "The unique character of fuel pool accidents (potentially large releases of long lived isotopes) makes it difficult to compare directly to reactor core melt accidents. There are no early health effects. The long-term exposure calculations are driven by assumptions in the CRAC modeling and the results are not very sensitive to the severity of the accident." That observation is essentially identical to what we found in the SFPS, which is that the primary impacts are potential doses arising from long-lived Cs-137 groundshine, which must be limited by

(potentially extensive) protective actions such as interdiction and decontamination. Likewise, NUREG-1738 (cf p. 3-45) found that the risks from a SFP accident could be comparable to those of a severe reactor accident for the high ruthenium source term, and about an order of magnitude lower for the low ruthenium source term, although in fairness, I think that we now consider the low ruthenium source term to be the more likely of the two. The recently published Appendix F of NUREG-2157, states that "The risk values in Table F-2 include individual risks and population risks. The individual risk values for both severe reactor accidents and spent fuel pool fires are comparable to each other and both lower than the NRC's Quantitative Health Objectives contained in its Safety Goal Policy Statement (51 FR 30028) for both individual early fatality risk (5×10^{-7} Ryr⁻¹) and individual latent fatality risk (2×10^{-6} Ryr⁻¹) (NRC 2001). As stated above, the population risk values for the two accident types are comparable." I recommend either removing this sentence or, if there is adequate support, providing a much clearer justification, preferably in the form of an documented analysis.

COMMENT 2: "In the case of the other possible improvements mentioned in COMSECY 13-0030, the staff has limited information for specific cases for the reference plant in the spent fuel pool study." (p.2)

I am not sure what this sentence means. I recommend clarification

COMMENT 3: "The safety goal screening evaluation in COMSECY-13-0030 concluded that SFP accidents are a small contributor to the overall risks for public health and safety (less than one percent of the QHOs)." (p. 4)

This statement does not follow. The observation that the accident risk from an SFP accident is a small fraction of the QHO does not mean that it is a small contributor to the overall risk, if the overall risk is also a small fraction of the QHO. Reactor risk is most likely also a small fraction of the QHO (see comments 1 and 5)

COMMENT 4: "However, the rough estimate shows that these costs must be less than \$2.4 million of the averted costs (i.e., benefits) shown in Table 2 to be cost-beneficial. Although sufficient data was not available to explicitly estimate costs for plant operators to implement and maintain a 1 x 8 loading pattern, the costs to shuffle fuel and/or perform early cask loadings is likely to exceed this amount."

This argument appears weak. If you do not have sufficient data to estimate costs, then what is the basis for the assertion that the costs of fuel rearrangement are likely to be greater than \$2.4 million? If this is simply staff professional judgment I recommend being more clear about this and give some basis, even if only qualitative, for that judgment.

COMMENT 5: "Furthermore, even if it is determined through cost-benefit analysis that expected industry costs for implementing the 1 x 8 loading pattern at Boiling Water Reactors with elevated plants was less than this value; available information continues to support the staff's conclusion that the safety benefits do not satisfy the routine thresholds established by the NRC for imposing additional regulatory requirements."

To the extent that the routine threshold referred to in this document is the QHO screen, this argument seems weak. I do not believe (although I could be wrong) that the installation of hardened filtered vents would pass a QHO screen either; however, I believe that staff took

the position that they should be installed. I believe that this statement may place too much emphasis on the use of the QHO screen in decisionmaking.

-----Original Message-----

From: Witt, Kevin

Sent: Thursday, September 04, 2014 11:55 AM

To: Santiago, Patricia; Compton, Keith

Subject: RES review of 1x8 Reg Analysis (COMSECY-13-0030 Addendum)

Hi Pat and Keith, thanks for your help with reviewing the attached addendum to COMSECY-13-0030 which contains the reg analysis for the 1x8 configuration. The attached version is the latest revision. I appreciate your quick review on this, as my management is expecting this to be finished early next week.

Thanks,
Kevin

Rihm, Roger

From: Garrison, Jade
Sent: Friday, July 11, 2014 3:23 PM
To: RidsNrrDpr Resource; RidsNrrDprPrab Resource; RidsResOd Resource; RidsNrrOd Resource; Leeds, Eric; Kokajko, Lawrence; Bone, Alysia; Lappert, Glenna; Helton, Shana; Coyne, Kevin; Brock, Terry; Correia, Richard; Dorman, Dan
Subject: Closeout User-Need Request NRR-2011-008, "Reassignment of NRC's Dollar Per Person-Rem Conversion Factor Policy"

If there are any questions or concerns regarding this package, please contact Alysia Bone at 301-415-1034.

[View ADAMS P8 Properties ML13323B585](#)

[Open ADAMS P8 Package \(Closeout User-Need Request NRR-2011-008, "Reassignment of NRC's Dollar Per Person-Rem Conversion Factor Policy"\)](#)

Thank you,
Jade

Jade Marie Garrison

Division Administrative Assistant
U.S. Nuclear Regulatory Commission
Office of Research
Division of Risk Analysis
Mail stop: CSB/4A 07
(P): 301-251-7568
Jade.Garrison@nrc.gov

From: Helton, Donald
To: [Wagner, Brian](#)
Cc: [Nakoski, John](#); [Coyne, Kevin](#)
Subject: RE: Proposed Resolution of RES Comments on 1x8 Reg Analysis
Date: Friday, September 12, 2014 1:16:00 PM

Brian,

My thoughts from a very quick skim are:

- The first paragraph shouldn't imply that limitations in SECY-13-0112 prevent running sensitivities beyond 50 miles and \$5.1k/p-rem. I understand the relationship when it comes to the low/medium/high, but not these.
- I would be okay with the 2nd paragraph if the word "high" was removed. They don't have enough information on either side of the ledger to know that medium estimates with the >50 miles and \$5.1K/p-rem would not be cost-beneficial.

Don

From: Witt, Kevin
Sent: Friday, September 12, 2014 11:48 AM
To: Wagner, Brian; Helton, Donald
Cc: Casto, Greg; Jones, Steve; Nakoski, John; Coyne, Kevin; Schofer, Fred; Inverso, Tara; Bowman, Gregory; Reckley, William
Subject: Proposed Resolution of RES Comments on 1x8 Reg Analysis
Importance: High

Hi Don and Brian, as we discussed yesterday, we agreed to add some language to the regulatory analysis acknowledging the limitations of the 1x8 regulatory analysis, particularly in regards to the sensitivity studies.

The following paragraph was added to the section entitled "Analysis Limitations"

Due to the limited detailed analysis of 1 x 8 spent fuel loading patterns contained in SECY-13-0112, the staff is unable to easily conduct sensitivity studies, as was done in the staff's analysis for expedited transfer of spent fuel in COMSECY-13-0030. Factors such as the dollars per person-rem conversion factor, consideration of consequences beyond 50 miles, as well as consideration of high estimates on important parameters would generally increase the calculated benefits of changes to loading configurations, as they did for expediting the transfer of spent fuel.

The following sentences were added to the section entitled "Cost-Benefit Assessment"

The staff acknowledges that if sensitivity studies were to be conducted (i.e. consideration of consequences beyond 50 miles and dollars per person-rem conversion factor) that some combinations of high estimates for important parameters can result in large economic consequences, such that the calculated benefits from a 1 x 8 spent fuel loading pattern could outweigh the associated costs. However, even if it is determined through cost-benefit analysis that the potential benefits from implementing the 1 x 8 spent fuel loading pattern exceed the expected industry costs, available information continues to support the staff's

conclusion that the safety benefits do not satisfy the routine thresholds established by the NRC for imposing additional regulatory requirements.

Please let me know if this proposed language is an amenable resolution of your comments on this document. The latest revision of the document is attached.

I would appreciate if you could send me a response as soon as possible, as this is due to OEDO by Monday, 9/15.

Thanks,
Kevin

~~NOT FOR PUBLIC DISCLOSURE~~

From: [Marksberry, Don](#)
To: [Helton, Donald](#); [Wagner, Brian](#)
Subject: FW: Additional Paragraphs
Date: Wednesday, September 25, 2013 1:38:04 PM
Attachments: [COMSECY RA Additional paragraphs.docx](#)

FYI

From: Correia, Richard
Sent: Wednesday, September 25, 2013 1:04 PM
To: Marksberry, Don
Subject: FW: Additional Paragraphs

FYI

Richard Correia, PE
Director,
Division of Risk Analysis
Office of Nuclear Regulatory Research
US NRC

richard.correia@nrc.gov

From: Reckley, William
Sent: Wednesday, September 25, 2013 11:10 AM
To: Coe, Doug; Correia, Richard; Richards, Stuart
Cc: Jones, Steve; Schofer, Fred; Witt, Kevin; Skeen, David
Subject: Additional Paragraphs

To address the RES comments (e.g. #21) regarding QHOs for which the disposition table said we were making changes to the regulatory analysis – attached are two draft paragraphs that we plan to add to the safety goal section (Section 5.4) of the enclosure. Please take a look and offer any issues or suggestions. Thanks..

William D. Reckley
Japan Lessons Learned Project Directorate
william.reckley@nrc.gov
(301) 415-7490

The staff notes that the safety goal policy statement and associated qualitative, quantitative, and subsidiary objectives (e.g., CDF and LERF) were developed for accidents associated with nuclear reactors and the conditions and radioactive materials in an operating reactor core. Given the relationship of the spent fuel pools to the nuclear reactor facilities, it is reasonable to extend the use of the qualitative and quantitative health objectives to this assessment. Previous NRC evaluations of spent fuel pools, including NUREG-1738 and the recent SFPS, included a comparison of the estimated risks from spent fuel pool accidents to the QHOs as part of the rationale for determining that no regulatory actions were warranted to decrease the amount of spent fuel being stored in pools. There are some potential issues in using the traditional approaches in the regulatory analysis guidelines for comparing spent fuel pool risks to the QHOs. As previously discussed, the potential consequences of a spent fuel pool accident can exceed those of reactor accidents in terms of the amount of radioactive material released, the land area affected, and the economic consequences. The safety goal comparison is, however, used only as a measure of health consequences to determine if a potential action provides a substantial safety improvement and relates to the risks to an individual in comparison to other risks that individual faces. Although a spent fuel pool fire might affect larger areas and more people than a reactor accident, the risks to individuals remains bounded by the assessment of the population close to the facility. For this reason the use of the existing QHOs is adequate for determining whether the substantial threshold is met.

The significant difference between the potential consequences of a SFP fire and a reactor accident has led some stakeholders to propose alternate performance measures to help in the decisionmaking process. Such measures could include a revised consideration of economic consequences, a collective dose to populations, or other estimates that reflect the large consequences and reduces the influence of the low event frequencies in assessing the overall risks associated with SFP accidents. Such an approach would be especially useful if the conditional probability of a significant SFP fire is very high for particular event scenarios (a so-called cliff-edge effect). Although the staff has used various conservative assumptions in this assessment in order to estimate the potential benefits of reducing the density of spent fuel stored in pools, the expected ability of pools to retain their integrity and the availability of mitigation capabilities leads the staff to conclude that exceeding design basis values associated with spent fuel pools are unlikely to result in such a cliff-edge effect. Therefore, the staff has not identified this as an area for which it needs to develop new methodologies, guidance or criteria. In the SRM for SECY-12-0110, "Consideration of Economic Consequences Within the U.S. Nuclear Regulatory Commission's Regulatory Framework," the Commission directed the staff to proceed with improvements to the guidance for estimating offsite economic costs. The staff is continuing its efforts and planning related to the SRM and is scheduled to provide the Commission with a paper in December 2013. Factors considered likely to change as a result of the staff's activities (e.g., dollars per person-rem conversion factor) have been addressed in this evaluation through the presentation of additional cases and sensitivity studies.

All,

[View ADAMS P8 Properties ML13133A127](#)
[Open ADAMS P8 Package \(Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor\)" \(SFPS\)\)](#)

All,

We appreciate your support for this effort.

All,

[View ADAMS P8 Properties ML13133A127](#)
[Open ADAMS P8 Package \(Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor\)" \(SFPS1\)](#)



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Compiled Comments on Frozen SFPSS Documents
(Comments in black, helpful info in blue)

#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
1	NSIR	01/22/13	Executive Summary	Eric Shrader	(Pg. iv) "... high-density loading in the SFP, a relatively full SFP" From page 65 of this report "The plant studied actually exceeds this expectation, in that recently-discharged fuel is stored in a 1x8 pattern.	Don A.	(Note: Comment not based of official IOWG SFPSS Report) Addressed in "PriorDispositionBalanced" comments. (#15) In addition, the report has been modified to refer to the "reference plant." The "reference plant" is generally represented by Peach Bottom but with a few differences including the 1x4 configuration.		Closed	Outside Planned Process	--
2	NSIR	01/22/13	Executive Summary	Eric Shrader	(Pg. vi) Highlighted text: For the pattern currently employed at Peach Bottom (1x8), an even shorter time to the point at which the fuel is air coolable via natural circulation could result. While variability in SFP loading configurations was not a focus of this study, Section 10.6 of this report provides additional information regarding the effect of the 1x4 configuration on fuel heatup timing and release magnitude.	Don A.	(Note: Comment not based of official IOWG SFPSS Report) No comment was provided.		Closed	Outside Planned Process	--
3	NSIR	01/22/13	Executive Summary	Eric Shrader	(Pg. vii) Highlighted text: For high-density loading, the size of release could be up to two orders of magnitude larger (these cases are associated with hydrogen combustion events).	Don A.	(Note: Comment not based of official IOWG SFPSS Report) No comment was provided.		Closed	Outside Planned Process	--
4	NSIR	01/22/13	Executive Summary	Eric Shrader	(Pg. vii) Highlighted text: the amount of uninhabitable land interdiction for the studied scenarios could be up to two orders of magnitude higher for the high density loading situation as compared to the low density loading situation	Don A.	(Note: Comment not based of official IOWG SFPSS Report) No comment was provided.		Closed	Outside Planned Process	--
5	NSIR	01/22/13	Executive Summary	Eric Shrader	(Pg.vii) Highlighted text: from the high density loading situation is predicted to result in uninhabitable land interdiction of 0.29 hectares per year and 0.49 displaced individuals per year.	Don A.	(Note: Comment not based of official IOWG SFPSS Report) No comment was provided.		Closed	Outside Planned Process	--
6	NSIR	01/22/13	1	Eric Shrader	(Pg. 4) "a condition representative of the current situation for the selected site (i.e., high-density loading in the SFP, a relatively full SFP, and current regulatory requirements with respect to fuel configuration and preventive/mitigative capabilities)" Because this arrangement is believed to be highly atypical (relative to the fleet), it is not modeled as the base case in this study.	Don A.	(Note: Comment not based of official IOWG SFPSS Report) See response to comment #1 This is closed.		Closed	Outside Planned Process	--
7	NSIR	01/22/13	4	Eric Shrader	(Pg.58) "On the basis of the reported failure criteria, this study assigned a somewhat conservative estimate for the liner failure strain from the point of view of leakage rate in order to characterize the leakage rate for a damage state with small leakage flow rate" Does this mean the study did not calculate the strain that would be produced by the assumed seismic event but rather choose a value know to create the desired failure?	Jose P.	(Note: Comment not based of official IOWG SFPSS Report) The study calculated the strains caused by the earthquake (demands). The reviewer is citing a sentence that refers to strain capacity. Note: This comment is the same as comments #317 from the branch chiefs review and #355 from the division directors review. Please see response to comment #355.		Closed	Outside Planned Process	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
8	NSIR	01/22/13	4	Eric Shrader	<p>(Pg. 59) "Given the estimated width, length and depth for each localized liner tear and their number, it is still necessary to estimate the leakage rate through these tears. Estimation of this flow rate uses the following assumptions (1) the flow rate can be estimated using an equation similar to that used for flow through the concrete cracks and (2) the friction factor for that equation can be calculated on the basis of test results for leakage rates through cracks in pipes. These assumptions are not validated at this time. Therefore, considerable uncertainty exists for the resulting leakage rate estimate."</p> <p>This seems to say the cracks in the SFP caused by the seismic event were not valuated but assumed based on "These assumptions are not validated at this time"</p>	Jose P.	<p>(Note: Comment not based on official IOWG SFPSS Report)</p> <p>The assumptions referred to by the reviewer relate to the leakage rate given the estimated cracks in the liner. The initiation of cracks was calculated separately based on the strain demands and capacities.</p> <p>Note:</p> <p>This comment is the same as comments #318 from the branch chiefs review and #356 from the division directors review.</p> <p>Please see response to comment #356.</p>		Closed	Outside Planned Process	--
9	NSIR	01/22/13	4	Eric Shrader	<p>(Pg 63) "According to the fragility analysis for the NUREG-1150 seismic PRA (Lambright et al., 1990), the median fragility for the reactor building is about 1.6g. The response of the reactor building structure is expected to be more sensitive to the horizontal ground motions than to the vertical ground motions. Natural frequencies of vibration for horizontal modes of vibration of the reactor building are about 7 Hz (i.e., frequencies at which the spectral accelerations of the ground motion for the scenario considered are less than those for the ground motions with the same PGA considered in earlier evaluations of the median fragility). On these bases, failure or severe damage to the reactor building would not be expected for the seismic scenario considered."</p> <p>The HRA input to this study has an assumption that the containment fails. How does one part of the study assume no failure and another assume failure?</p>	Jose P.	<p>(Note: Comment not based on official IOWG SFPSS Report)</p> <p>The HRA is not referring to a seismically induced failure of the containment. Containment failure in this case is due to leakage from a concurrent reactor accident. The text is also modified in the report to reflect that page 63 refers to a seismically induced failure or damage.</p> <p>Note:</p> <p>This comment is the same as comments #319 from the branch chiefs review and #357 from the division directors review.</p> <p>Please see response to comment #357.</p>		Closed	Outside Planned Process	--
10	NSIR	01/22/13	5	Eric Shrader	<p>(Pg 64) "The plant studied actually exceeds this expectation, in that recently-discharged fuel is stored in a 1x8 pattern."</p> <p>The beginning of the study describes using Peach Bottom as the site of study, why are we not using the Peach Bottom practices, we do later in the study for specific procedures?</p>	Don H.	<p>(Note: Comment not based on official IOWG SFPSS Report)</p> <p>Addressed in "PriorDispositionBalanced" comments.</p>		Closed	Outside Planned Process	--
11	NSIR	01/22/13	5	Eric Shrader	<p>(Pg 67) "The cases which assume lack of successful mitigation are presented to (i) acknowledge uncertainties in the effectiveness of these efforts during a beyond-design basis event and (ii) demonstrate the effectiveness of successful mitigation"</p> <p>This could be better stated "The cases presented will demonstrate the potential effects of both successful and unsuccessful mitigation efforts"</p>	Don H.	<p>(Note: Comment not based on official IOWG SFPSS Report)</p> <p>Current language was developed in response to a previous comment documented in "PriorDispositionBalanced" and is intended to convey both the uncertainty and benefit of successful mitigation deployment.</p>		Closed	Outside Planned Process	--
12	NSIR	01/22/13	8	Eric Shrader	<p>(Pg 179) "The PBAPS' procedures do not provide instructions nor PBAPS staffs are trained to provide flow rate that exceeds regulatory requirement and is able to prevent gap release for the OCP1 moderate leak scenarios"</p> <p>From page 188 "...the TSG-4.1 "Peach Bottom Station Operational Contingency Guidelines" is the most applicable procedure to the SFPSS scenarios. The following discusses SFP mitigation strategies per TSG-4.1." The description of two pumps used to provide make up are 600 and 1300 gpm.</p>	James C.	<p>(Note: Comment not based on official IOWG SFPSS Report). In the mitigation equipment discussion, clarified that the 600 and 1300 gpm are the pump capability. PBAPS only demonstrated meeting the flow rate recommendation by 10CFR50.54(hh). The actual flow rate is unknown. In addition, to deliver maximum flow rate for the 1300 gpm pump would need to connect 4 hoses. TSG-4.1 only instructs connecting two hoses.</p>		Closed	Outside Planned Process	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
13	NSIR	01/22/13	8	Eric Shrader	(Pg 182) "Because the earthquake event could be a common cause failure mechanism causing simultaneous damages to Unit 2 and Unit 3, only a half of the available plant staff mentioned above is assumed available for responding to the Unit 3 problem including Unit 3 SFP mitigation. " This event is assumed to occur during a refueling outage (RFO) which would have a significantly larger onsite staffing level than a normal at power weekday or as assumed here weekend and or evening	James C.	(Note: Comment not based of official IOWG SFPSS Report). Language added to state that the staffing consideration does not apply to when either Unit 2 or Unit 3 is in refueling outage.		Closed	Outside Planned Process	--
14	NSIR	01/22/13	8	Eric Shrader	(Pg 186) "• Minimum site staffing levels (i.e., weekend/back shift)" RFO staffing is much higher then weekend/back shift	James C.	(Note: Comment not based of official IOWG SFPSS Report). Reworded to state the staffing discussion is for typical off normal hours (i.e., during a night shift or weekend shift) instead of minimum site staffing. The word "minimum" caused link to the minimum staff requirement.		Closed	Outside Planned Process	--
15	NSIR	01/23/13	ES	Randy Sullivan	(pg.vii) "In general, SFPs have a larger proportion of longer-lived radionuclides, relative to reactors, which are less likely to cause the significant doses required for acute health effects" Wow this comment does not seem correct, Cs in the quantities available certainly can deliver life threatening doses. I think it is the slowly developing accident and evacuation that prevents early fatalities	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) See response to comment #236.		Closed	Outside Planned Process	--
16	NSIR	01/23/13	ES	Randy Sullivan	(Pg.vii) "Therefore, the use of a dose truncation significantly reduces the quantified latent cancer fatalities, by at least an order of <u>magnitude</u> " we did not use dose truncation and the reader will not understand what it is unless explained somewhere	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) See response to comment #238.		Closed	Outside Planned Process	--
17	NSIR	01/23/13	ES	Randy Sullivan	(Pg. vii) "These values are multiplied by the frequency of release (10-7 per year), as to give context to the likelihood" really? do you mean divided? odd way to communicate land contamination,	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) We agree. However presenting the results conditionally removes the likelihood context, which is very important in communicating the results. Removing the quantitative information completely undermines the resolution of previous comments, which stressed the need to be as quantitative as possible.		Closed	Outside Planned Process	--
18	NSIR	01/23/13	ES	Randy Sullivan	(Pg. viii) "• Human reliability analysis for onsite and offsite mitigation efforts following a large seismic event, and specific to the spent fuel pool." that ability to bring in a fire truck and pump water, or bring in the flex equipment and pump water up 6 stories to the pool	Don A.	(Note: Comment not based of official IOWG SFPSS Report) This seems to be a response to another reviewer's comments, and is no longer applicable.		Closed	Outside Planned Process	--
19	NSIR	01/23/13	1	Randy Sullivan	(Pg 2) "• Earlier movement of fuel in to casks that are not approved for shipping or long-term storage will require that fuel to be repackaged later for shipment to the eventual long-term repository or interim storage site." Once again, I must submit that the security status of these options is not the same. The doc is OOU, it seems that this should be addressed. language is proposed as follows: • Physical protection requirements for dry cask storage are not addressed in this study and may be relevant to an overall assessment the risk benefit for earlier movement of fuel to casks	Don A.	(Note: Comment not based of official IOWG SFPSS Report) Report will be public and OOU materials will be removed.		Closed	Outside Planned Process	--
20	NSIR	01/23/13	1	Randy Sullivan	(Pg 2) "Otherwise there is insufficient motivation to spend the additional agency resources associated with a more holistic study, and these resources are better devoted to other aspects of the agency's mission of protecting people and the environment" the tenor of this introduction is rather informal. Is that acceptable agency practice for a NUREG?	Don A.	(Note: Comment not based of official IOWG SFPSS Report) We acknowledge this, and will fix when time allows. This document received a Level 3 review by QTE.		Closed	Outside Planned Process	--

Compiled Comments on Frozen SFPSS Documents
(Comments in black, helpful info in blue)

#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
21	NSIR	01/23/13	2	Randy Sullivan	(Pg. 17) "The intent is to scope some of the associated limitations via sensitivity studies. Recall that unmitigated scenarios are being treated, which in part address the case where a reactor of other-SFP event prevents operator action" The HRA does treat reactor steam FYI	James C.	(Note: Comment not based of official IOWG SFPSS Report) Comment appears to be based on an earlier version of the report with text that no longer exists. In addition, the reviewer is correct that the HRA does treat reactor steam.		Closed	IOWG Review	--
22	NSIR	01/23/13	2	Randy Sullivan	(Pg.24) "Total health effect estimates are not a function of distance, and have no distance <u>truncation</u> . See Section 7.2.3 for more information on this assumption." When did we agree to this? so now we have small doses and millions of people? thought we agree to truncate atPAG?	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) See response to comment #242		Closed	IOWG Review	--
23	NSIR	01/23/13	5	Randy Sullivan	(Pg67) "• At 24 hours, offsite support <u>arrives</u> " as has been consistently stated by NSIR, this assumption is overly conservative, the industry support is designed to arrive in 24 hours, local state and corporate support would arrive sooner	Don H.	(Note: Comment not based of official IOWG SFPSS Report) Similar to "PriorDispositionBalanced" comments. In the context of a large seismic event which may severely damage infrastructure, there will be significant challenges to delivering the necessary equipment. Given these challenges, the authors believe a 24 hour assumption is reasonable. Further, the assumption is consistent with the assumptions made in SOARCA (see NUREG-1935, section 3.2, 1st paragraph)		Closed with Ques.	IOWG Review	--
24	NSIR	01/23/13	5	Randy Sullivan	(pg.67) "• At 24-48 hours, ad hoc actions are planned and staged." ad hoc actions would be planned from about 3 hours on, although resources could limit implementation	Don H.	(Note: Comment not based of official IOWG SFPSS Report) Similar to "PriorDispositionBalanced" comments. As stated above, in the context of a large seismic event, and possibly a concurrent reactor event, the necessary actions will be challenging. Given these challenges, the authors believe the assumption is reasonable. Further, the assumption is consistent with the assumptions made in SOARCA (see NUREG-1935, section 3.2, 1st paragraph)		Closed with Ques.	IOWG Review	--
25	NSIR	01/23/13	5	Randy Sullivan	(Pg.69) "• 30-minute delay associated with manual observation/ <u>decisionmaking</u> ." Is this consistent with the HRA? seems like they assumed longer? (maybe? sorry?)	Don H.	(Note: Comment not based of official IOWG SFPSS Report) The HRA was performed after the rest of the analysis and uses a different set of assumptions. In the case of diagnosis and decisionmaking, the HRA predicted longer times which will affect the likelihood of mitigation being successful.		Closed	IOWG Review	--
26	NSIR	01/23/13	5	Randy Sullivan	(Pg.72) "5.3.3. Considerations for Future Human Reliability Analysis " thought HRA would be attached to report?	Don H.	(Note: Comment not based of official IOWG SFPSS Report) Section 5.3.3 has been removed.		Closed	IOWG Review	--
27	NSIR	01/23/13	7	Randy Sullivan	(P139) "This approach is similar to that used in NUREG-1935. NUREG-1935 used the same dose truncation levels. However, the approach also analyzed an annual dose truncation of 10 mrem agree with Nate Bixler's comment off "The 10 mrem dose truncation level was discarded and was not reported. This paragraph should be deleted"	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) Paragraph deleted.		Closed	IOWG Review	--
28	NSIR	01/23/13	7	Randy Sullivan	(Pg152) "The emergency plans for both states allow for this protective action" thanks Nate Nate's comments: The following discussion defines the cohorts differently that the way they are modeled in MACCS2. On the other hand, Table 26 defines the cohorts the way they are modeled in MACCS2. This difference may confuse the reader, especially the fact that the list defines 7 cohorts but the table only 6. Cohorts should be numbered for easy cross reference to the following table.	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) This is not a comment from Randy to the us. Please delete.		Closed	IOWG Review	--

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29	NSIR	01/23/13	7	Randy Sullivan	(Pg.157) "This cohort will begins evacuating as they hear the order to evacuate for the 10- to 3-mile area, or observe evacuees traveling through the area ." yes probably right, but will not make much difference Nates B comments: If they are observing evacuees traveling through the area, would they not have noticed those evacuating from the EPZ and thus have evacuated earlier?	AJ N.	(Note: Comment not based of official IOWG SFPSS Report) This is not a comment from Randy to the us. Please delete.		Closed	IOWG Review	--
30	NRR	01/29/13	Abstract	E. Bowman	(Pg. ii) "The pools' thick walls and floors provide structural integrity and further protection of the fuel from natural phenomena and debris." Pool's should be singular possessive to match the discussion in the remainder of the paragraph.	Don A.	Fixed Closed		Closed	IOWG Review	--
31	NRR	01/29/13	Abstract	E. Bowman	(Pg. ii) "It is only because such a challenging event is studied that any offsite consequences are predicted." The use of the word "predicted" in this sentence conveys strongly that we believe that in the event the postulated seismic event occurs there will be offsite consequences due to the effect of the event on the SFP. This contrasts with the low conditional probabilities of release provided in tables 32 and 44, the highest of which is 0.69%, and the 0.1 conditional probability of failure cited in item 2 of the Executive Summary on page v. In order to better convey to the uninformed reader that we are not predicting that an consequential event with a conditional probability that low will occur given the unlikely initiating event, I would suggest using the phrase "may be possible" or "may be postulated" rather than the word "predicted." I believe this is important in the Abstract in order to set the proper tone for the paper.	Don A.	Agreed, text changed to "consequences are possible." closed		Closed	IOWG Review	--
32	NRR	01/29/13	Executive Summary	E. Bowman	(Pg. iv) "The renewed interest in spent fuel storage arising from the changes in path forward of the planned geologic repository and from the aforementioned events in Japan has prompted interest in capturing the consequences from postulated accidents associated with high-density SFP storage in an updated safety study." I would change the phrase "... associated with high-density SFP storage ..." to read "... associated with high-density spent fuel storage ..." because it is the spent fuel being stored, not the SFPs.	Don A.	Corrected.		Closed	IOWG Review	--
33	NRR	01/29/13	Executive Summary	E. Bowman	(Pg. v) "1. An event with a frequency of occurrence of 1 in 60,000 years was used in this study...." This contradicts the statement in the Abstract on page ii regarding "a postulated beyond-design-basis earthquake (with an estimated frequency of occurrence of 1 event in 61,000 years)...." The two should be consistent.	Don A.	Corrected.		Closed	IOWG Review	--

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34	NRR	01/29/13	Executive Summary	E. Bowman	<p>(Pg. vi) "Nevertheless, the improved reliable and available SFP indication required by the Order of March 12, 2012 (EA-12-051), is essential to ensure that plant personnel can effectively prioritize emergency actions. The availability of such instrumentation may have changed the mode (makeup versus sprays) deployed for some situations studied here."</p> <p>This seems like a very strong statement to make if we take into consideration that the SFP indication required by that Order is not safety related. Did this study look into whether such instrumentation would survive the seismic event? If we want to make this statement we should be able to address that obvious question.</p>	Don A.	Corrected. "Essential" has been changed to "important."		Closed	IOWG Review	--
35	NRR	01/29/13	Executive Summary	E. Bowman	<p>(Pg. vii, Item 9) "In general, SFPs have a larger proportion of longer-lived radionuclides, relative to reactors, which are less likely to cause the significant doses required for acute health effects."</p> <p>This statement is misleading because it is really the expended fuel rather than the SFPs with the larger proportion of longer-lived radionuclides. Also, it might be better to move the clause relating the proportion to that of fuel within reactors earlier in order to avoid relating the phrase "...which are less likely..." back to the previous object "reactors" rather than "longer-lived radionuclides."</p>	Don A.	"relative to reactors" has been moved. We think the reader will understand that "SFPs" refers to the contents in this context.		Closed	IOWG Review	--
36	NRR	01/29/13	Executive Summary	E. Bowman	<p>(Pg. vii, Item 10) "In both cases without successful deployment of mitigation, the individual latent cancer fatality risk for the studied scenarios is on the order of 10⁻¹⁰ to 10⁻¹¹ per year."</p> <p>Should the units of the risk be fatalities per year rather than merely per year?</p>	AJ N.	This metric is an individual's LCF risk per year. Individual LCF risk is the probability that an individual will die from cancer, and hence is unit less		Closed	IOWG Review	--
37	NRR	01/29/13	Executive Summary	E. Bowman	<p>(Pg. vii, Item 13) "While the likelihood of release is low, the amount of land contamination and the number of displaced individuals can be considerable, and can extend to far distances."</p> <p>The ROP uses the color white for low to moderate safety significance, which is defined as greater than 10⁻⁷ and less than or equal to 10⁻⁶ ΔLERP and the color green for very low safety significance, which is defined as quantitatively less than or equal to 10⁻⁷. Given the discussion in Item 7 on page vi that effective deployment of mitigation reduces release frequency from 10⁻⁷ to 6x10⁻⁹, I would suggest characterizing the likelihood of release in the discussion of item 13 as being "very low" rather than "low" in order to be consistent with the regulatory usage for discussions of release likelihood.</p>	AJ N.	The executive summary is being rewritten, but the text will be changed to "very low."		Closed	IOWG Review	--
38	NRR	01/29/13	Executive Summary	E. Bowman	<p>(Pg. viii, Item 15) "...low end of consequences of pool accidents, due to the substantially different amount of released material."</p> <p>For clarity, I would suggest using "SFP" rather than "pool."</p>	Don A.	Corrected.		Closed	IOWG Review	--

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39	NRR	01/29/13	Executive Summary	E. Bowman	(Pg. viii) "In addition to the specific ongoing regulatory actions mentioned above, there are ongoing actions which seek to further enhance safety at nuclear power plants, such as initiatives related to re-evaluation of seismic hazard, station blackout capabilities, and emergency preparedness staffing." FYI, the rulemaking associated with NTTF Recommendation 4.1 is likely to make the EA-12-049 requirements generically applicable without modifying station blackout requirements to any great extent. It might be a bit of a stretch calling it a separate regulatory action. There is a COMSECY on the subject currently with OEDO.	Brian W.	reference to SBO has been removed.		Closed	IOWG Review	--
40	NRR	01/29/13	Executive Summary	E. Bowman	(Pg. viii) "Hydrogen combustion uncertainty in ex-containment compartments such as a BWR refuel floor." The phrase "ex-containment compartments" could be made more plain language by phrasing it as "compartments adjacent to containment" or something like that. As is, it sounds a bit like jargon.	Don A.	Changed to reactor building		Closed	IOWG Review	--
41	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	(Pg. 20) The text makes use of "B.5.b" in a couple of spots. This should be added to the list of abbreviations and acronyms along with the following definition: "The mitigating strategies requirements initially included in Section B.5.b of Order EA-02-026, dated February 25, 2002, and later made generically applicable in 10 CFR 50.54(hh)(2).	Don A.	Text added as a footnote to Section 5.3.1 of the report.		Closed	IOWG Review	--
42	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	(Pg. 20) "MELCOR not an acronym" While possible true, this is a fundamentally unhelpful thing to include in a document that will eventually be made public. Rather than merely including the disclaimer that it isn't an acronym, which doesn't address whether it is an abbreviation, the other subject of the table this entry could be made value added and responding to the voice of the customer by including a definition for what it is. Doing that, even if you retain the disclaimer that it is not an acronym, could have the benefit of avoiding angoring a reader that looks at this table to find out what MELCOR is. As it is currently written, I would call this entry either muda or muri, neither of which are acronyms, but I'll leave it to you to look up.	Don A.	"MELCOR not an acronym" was used in NUREG-1953 and we are following the same practice.	Also, with respect to the comment on MELCOR not being an acronym, while there was a statement included in the acronym section of NUREG-1953 to the same effect, if it isn't an acronym or abbreviation it doesn't belong on that list. People once thought that the earth was flat, but came to the realization that this was in error and went on to think things that actually add value; if you must really include the disclaimer that MELCOR is not an acronym on the list of acronyms, I would suggest making this a value-added entry in the listing for the sake of uninformed readers that actually use that portion of the report for its intended purpose, to verify what the authors mean when they apparently use acronyms or abbreviations. If you don't, it comes across as a snide comment that the reader making a gross conceptual error and the author has absolutely no interest in	Closed	IOWG Review	--

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43	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	<p>(Pg. 20) "AC alternating current"</p> <p>The use of the capitalized acronym is contrary to the NUREG-0544 usages, which are:</p> <p>AC administrative control advisory committee air conditioning allegations coordinator ac alternating current</p> <p>Note that the lower case "ac" is used on page 7 of Section 1.</p>	Don A.	The document has been corrected for both ac and dc.		Closed	IOWG Review	--
44	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym ACRS is omitted.	Don A.	added		Closed	IOWG Review	--
45	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The abbreviation C for Celsius is omitted.	Don A.	added		Closed	IOWG Review	--
46	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym FAQ is omitted.	Don A.	added		Closed	IOWG Review	--
47	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym GI is omitted.	Don A.	Generic Issue added		Closed	IOWG Review	--
48	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym GSI is omitted.	Don A.	Generic Safety Issue added		Closed	IOWG Review	--
49	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym INL is omitted.	Don A.	Idaho National Laboratory added		Closed	IOWG Review	--
50	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym MPC is omitted.	Don A.	Multi-Purpose Container added		Closed	IOWG Review	--
51	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym PWR is omitted.	Don A.	Pressurized Water Reactor added		Closed	IOWG Review	--
52	NRR	01/29/13	Abbreviations and Acronyms	E. Bowman	The acronym TR is omitted. This acronym is used for EPRI Technical Reports.	Don A.	Added		Closed	IOWG Review	--
53	NRR	01/29/13	Introduction and Background	E. Bowman	<p>(Pg. 1) "At the end of their reactor "life," the assemblies are placed in large pools of water adjacent to the reactor (how adjacent depends on the plant design) that are roughly 12 meters (m) (40 feet (ft)) deep."</p> <p>I would suggest deleting the modifier "reactor" before "life," in this sentence. It's really the life of the fuel assembly, not the reactor, which could be thought of as having a "life" that extends from its licensing to its decommissioning.</p>	Don A.	Modified as requested by the reviewer		Closed	IOWG Review	--
54	NRR	01/29/13	Introduction and Background	E. Bowman	<p>(Pg. 1, second paragraph) "Owing to delays in the identification, licensing and construction of such a repository, U.S. nuclear power plants "reracked" their SFPs in the 1980s and 1990s."</p> <p>Footnote 1 on page iv uses the hyphenated form "re-racked." The usage should be consistent throughout the document.</p>	Don A.	For consistency, hyphenated form "re-racked" is now used throughout the report.		Closed	IOWG Review	--
55	NRR	01/29/13	Introduction and Background	E. Bowman	<p>(Pg. 1, following numbered bullets) "Now, let us consider some less-obvious considerations."</p> <p>sounds redundant. Repeats similar word usages. Considerations is used way to much in this section, you might want to consider whether "consider" is a good verb to use here. It might be worth considering whether a different word could be used.</p>	Don A.	This sentence is removed.		Closed	IOWG Review	--

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56	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 2) "Current licenses for dry cask storage systems limit the ability to transfer of fuel from the SFP to dry storage casks that have been discharged from the reactor less than 5 years." This is unclear.	Don A.	This is now reworded as, "Current licenses for dry cask storage systems limit the ability to transfer fuel from the SFP to dry storage casks that has been discharged from the reactor less than 5 years."		Closed	IOWG Review	--
57	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 2) "Expedited discharging of fuel from the SFP to dry storage increases the frequency of postulated cask drops, which in turn increases the risk of causing damage to the pool or cask that could lead to a radioactive release." This consideration would only be true in the short run. I believe the current position on the ultimate storage place for spent fuel is some off site long term storage location. Expedited discharging of fuel would only increase the frequency of discharges in the near term since it will all eventually have to be moved out of the SFP anyway. The only thing that could change the frequency of postulated cask drops in the long run would be changing the amount of fuel in each cask, which might be an outcome of loading them with hotter fuel, but that is not explicitly cited in this bullet.	Don A.	We think the bullet is adequate for its intent, i.e., it is not considered in SFPSS. We think the bullet is adequate for its intent, i.e., it is not considered in SFPSS.		Closed	IOWG Review	--
58	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 2) "Expedited discharging of fuel increases occupational doses for workers involved with the management and transfer of the spent fuel." Similar to the discussion above, this is only true if you amplify the discussion to include the possibility of reduced radioactivity of older fuel.	Don A.	Please see response to comment # 57.		Closed	IOWG Review	--
59	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 2) "Earlier movement of fuel in to casks that are not approved for shipping or long-term storage will require that fuel to be repackaged later for shipment to the eventual long-term repository or interim storage site." This presupposes that ex-post facto licensure of the casks for shipping or long-term storage will never be possible. I would suggest changing this to read "... may require ..." rather than "... will require ..." in order to avoid taking a conclusory position on that subject.	Don A.	Modified as requested by the reviewer		Closed	IOWG Review	--
60	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 3, second line) "...but we are re-examining this..." typo.	Don A.	Text has been corrected		Closed	IOWG Review	--
61	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 5, first line of second paragraph) "... Unit #3 <u>is</u> used..." typo	Don A.	Text has been corrected		Closed	IOWG Review	--
62	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 6, second bullet) "... (recall that BWR fuel is channeled, which reduces the benefit of cross-flow if the pool were to become drained)." I don't believe a discussion on fuel channeling is included previously, so it would be inappropriate to direct the reader to recall the fact. You could either delete the phrase "recall that" from the parenthetical note or add a discussion of BWR fuel channels to the first paragraph of this section on page 1.	Don A.	"recall" is now changed to "it should be mentioned"		Closed	IOWG Review	--
63	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 6, last line above Section 1.5) "In particular, Section 1 of this report provides the study's key limitations and assumptions." Section 2 provides the assumptions, should this sentence refer to that section?	Don A.	corrected.		Closed	IOWG Review	--
64	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 8) Table 1 includes indication of the presence of two footnotes that are omitted from the report.	Don A.	corrected		Closed	IOWG Review	--
65	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 8) Table 1 uses the convention of $7 \cdot 10^{-6}$ rather than 7×10^{-6} , which is used in the text of the abstract and executive summary. This inconsistency occurs in the text later as well.	Don A.	modified for consistency		Closed	IOWG Review	--

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66	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 8, first full paragraph below Table 1) "... a specific range of ground motions was chosen for this study (see Section 1)." Should this reference be to Section 2?	Don A.	corrected to Section 3.		Closed	IOWG Review	--
67	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 9, first full paragraph) "To faithfully represent these temporally changing conditions..." The adjective "temporally" adds nothing to the sentence and should only be included if you're being paid by the word.	Don A.	"temporally" is deleted.		Closed	IOWG Review	--
68	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg 12 et seq.) Discussion of the National Academies study (NAP, 2006) inconsistently uses the possessive form "National Academies' study."	Don A.	corrected for consistency		Closed	IOWG Review	--
69	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 13) "... (e.g., the "Phase 2" site-specific assessments)." This parenthetical note is a bit cryptic. I would suggest using something like "(e.g., site-specific assessments of licensee response to develop strategies to maintain or restore SFP cooling capabilities.)"	Don A.	this is now added as suggested by the reviewer		Closed	IOWG Review	--
70	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 13, second full paragraph) "... (e.g., the Power Reactor Security Rulemaking codified in 10 CFR 50.54(hh)(2))." Please consider modifying the parenthetical note to say "(e.g., 10 CFR 50.54(hh)(2) as a result of the Power Reactor Security Rulemaking)." There is a sensitivity on the part of stakeholders for characterizing rulemaking activities as codifying requirements rather than taking into account their input and lessons learned.	Don A.	modified as suggested by the reviewer		Closed	IOWG Review	--
71	NRR	01/29/13	Introduction and Background	E. Bowman	(Pg. 16) The titles cited for Orders EA-12-049 and EA-12-051 are the title for the accompanying letters transmitting the Orders rather than those of the Orders themselves.	Don A.	We recognize that, but the letters refer to the dates mentioned in the report.		Closed	IOWG Review	--
72	NRR	01/30/13	Major Assumptions	E. Bowman	(Pg. 23, comment on mode of mitigation deployment) "... This difference in mode of deployment shows the value of the additional instrumentation required by NRC Order EA-12-051." This statement may be overreaching without an examination of the survivability of that instrumentation in the seismic event.	Hossein E.	"... shows the value of", is replaced with "... shows the potential benefit of the additional."		Closed	IOWG Review	--
73	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The abbreviation K for Kelvin is omitted.	Don A.	added to list of acronyms		Closed	IOWG Review	--
74	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym MCCI is omitted.	Don A.	added to list of acronyms		Closed	IOWG Review	--
75	NRR	01/30/13	Major Assumptions	E. Bowman	(Pg. 25, comment on distance/radiation) "... as determined by the Pennsylvania Code Title 25 § 219.51. Total..." Two periods after 219.51.	Don A.	Fixed		Closed	IOWG Review	--
76	NRR	01/30/13	Seismic Hazard Characterization	E. Bowman	(Pg. 27, final line of second paragraph) "...Instead of the ongoing update program" Carriage return at end of line prior to period, which is on line between paragraphs.	Andrew M.	corrected		Closed	IOWG Review	--
77	NRR	01/30/13	Seismic Hazard Characterization	E. Bowman	(Pg. 27, bullets) There is inconsistent usage of spaces between numbers and the units; e.g., 0.1 g to 0.35g in the second bullet.	Andrew M.	corrected		Closed	IOWG Review	--

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78	NRR	01/30/13	Seismic Hazard Characterization	E. Bowman	(Pg. 27, third bullet) Second line uses "USGS (2008) model" rather than "USGS 2008 model."	Andrew M.	corrected		Closed	IOWG Review	--
79	NRR	01/30/13	Seismic Hazard Characterization	E. Bowman	(Pg. 27, fifth bullet) First line uses "USGS model" rather than "USGS 2008 model."	Andrew M.	corrected		Closed	IOWG Review	--
80	NRR	01/30/13	References	E. Bowman	(Pg. 246) Reference NRC, 2008b omits the ADAMS accession no. ML080300179.	Hossein E.	Fixed		Closed	IOWG Review	--
81	NRR	01/30/13	Seismic Hazard Characterization	E. Bowman	(Pg. 36, item (3)) "... It is expected that efforts by the NRC and industry related to Requests for Information in SECY-12-002 (NRC, 2012)..." I believe the reference should be to Requests for Information provided to the Commission in SECY-12-0025 (NRC, 2012f).	Andrew M.	corrected		Closed	IOWG Review	--
82	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym CSCM is omitted.	Don A.	added to list of acronyms		Closed	IOWG Review	--
83	NRR	01/30/13	Scenario Delineation and Probabilistic Considerations	E. Bowman	(Pg. 75, Section 5.6.1, bullet 2) "... Due to the difference from the reactor situation (where dc power to control turbine-driven systems is important in a station blackout)..." N.b., the 50.54(hh)(2) strategies as well as those under development for EA-12-049 include manual initiation of TDAFW if dc power is lost. This isn't really pertinent here, but may be worth acknowledging in a footnote.	Don H.	Acknowledged but the point is largely unrelated to the discussion in the text.		Closed	IOWG Review	--
84	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym GWD is omitted.	Don A.	gigawatt-day added		Closed	IOWG Review	--
85	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym MTU is omitted.	Don A.	metric tons of uranium added		Closed	IOWG Review	--
86	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym RB is omitted.	Don A.	added to list of acronyms		Closed	IOWG Review	--
87	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym CFD is omitted.	Don A.	computational fluid dynamics added		Closed	IOWG Review	--
88	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym CV is omitted. It is also undefined in the text, although Figure 38 hints that it stands for Control Volume.	Don A.	control volume added		Closed	IOWG Review	--
89	NRR	01/30/13	Accident Progression Analysis	E. Bowman	(Pg. 92, first paragraph) "For example, for the flowpath connecting CV113 and CV114 in the fully populated region, the MELCOR input values included a loss coefficient (K) of 3.8, and a friction factor (SFA) of 31.3 (equal to 125/4 since MELCOR uses the fanning friction factor definition)." This presents an ambiguity with the usage of "K" for Kelvin in the remainder of the document.	Hossein E.	reference to K is removed and paragraph is reworded "...included a form loss coefficient of 3.8"		Closed	IOWG Review	--

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90	NRR	01/30/13	Accident Progression Analysis	E. Bowman	<p>(Pg. 106, final paragraph) "Figure 55 shows the water level for the moderate leak, high-density OCP3 scenario. Because of the spray activation at 3 hours (see Figure 56), the bottom of the racks clears for natural circulation airflow more than 1 hour later compared to an unmitigated case (see Figure 49). Finally, the spray flow rate and the leak rate are equilibrated by about 8 hours as required by the hydrostatic head at the bottom of the pool. The actual spray water reaching the bottom of the pool is somewhat less than 200 gpm (0.013 m³/s) in Figure 56 because of heat transfer from spray droplets to the atmosphere and fuel rods.^{30a}</p> <p>Is there sufficient sensitivity to the spray flow rate that a higher one, or spray in combination with makeup would result in an equilibrium head above the bottom of the racks such that natural circulation airflow would be impeded?</p>	Hossein E.	<p>At higher flow rates (e.g., with injection of 500 gpm) – it is possible to block the bottom of the racks. Actually, such a case occurs for mitigated medium leak OCP1 (see page 118 and Figure 73). As explained on page 118, "A combination of radial heat transfer within the assembly; radial heat transfer from the recently discharged, high-temperature fuel to adjacent fuel assemblies; and steam cooling from boiling in the bottom of the assemblies between cells keep the fuel temperature near 1200 K." Therefore, in this case, there is some gas release. However, the same scenario for OCP2 does not lead to a release because the same heat transfer mechanisms are able to keep the temperatures below the gap release threshold of 1173° K. Some calculations are performed for mitigated uniform configuration (see page 206) that shows the sensitivity to higher spray flow rates. Therefore, the effectiveness of the mitigation is a function of decay heat, fuel arrangement, and mode and capacity of mitigation, and natural circulation seems to have a secondary effect (especially for higher water flow rates including both spray and injection modes).</p>	The response included in the block to the left sheds light on the sensitivity to spray flow rates and should be reflected in the report.	Closed	IOWG Review	--
91	NRR	01/30/13	Executive Summary	E. Bowman	<p>(Pg. viii) "In addition to the specific ongoing regulatory actions mentioned above, there are ongoing actions which seek to further enhance safety at nuclear power plants, such as initiatives related to re-evaluation of seismic hazard, station blackout capabilities, and emergency preparedness staffing."</p> <p>FYI, the rulemaking associated with NTF Recommendation 4.1 is likely to make the EA-12-049 requirements generically applicable without modifying station blackout requirements to any great extent. It might be a bit of a stretch calling it a separate regulatory action. There is a COMSECY on the subject currently with OEDO.</p> <p>Further note to the 1/29/2013 comment: COMSECY-2013-0002 has been sent to the Commission and is available in ADAMS at ML13011A034.</p>	Don A.	<p>Thank you for the additional information. Here we are just referring generically to "ongoing actions" so no change is required.</p>		Closed	IOWG Review	--
92	NRR	01/30/13	Accident Progression Analysis	E. Bowman	<p>(Pg. 131, final paragraph) "A significant flow rate could also affect the Emergency Aux Load Centers on elevation 165' (50.2 m)."</p> <p>The abbreviation "Aux" is omitted from the Abbreviations and acronyms. It might be more appropriate to spell out Auxiliary here.</p>	Hossein E.	<p>modified as suggested by the reviewer</p>		Closed	IOWG Review	--
93	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	<p>The acronym RHR is omitted.</p>	Don A.	<p>residual heat removal added</p>		Closed	IOWG Review	--
94	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	<p>The acronym CEC is omitted.</p>	Don A.	<p>Commission of the European Communities added</p>		Closed	IOWG Review	--
95	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	<p>The acronym FGR is omitted.</p>	Don A.	<p>federal guidance report</p>		Closed	IOWG Review	--
96	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	<p>The acronym ICRP is omitted.</p>	Don A.	<p>International Commission on Radiological Protection added</p>		Closed	IOWG Review	--
97	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	<p>The acronym NCRP is omitted.</p>	Don A.	<p>National Council on Radiation Protection and Measurements added</p>		Closed	IOWG Review	--

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98	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym CFR is omitted.	Don A.	Code of Federal Regulations added		Closed	IOWG Review	--
99	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym rem is omitted.	Don A.	Roentgen Equivalent Man added		Closed	IOWG Review	--
100	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym SFPSS is omitted.	Don A.	Spent Fuel Pool Scoping Study added		Closed	IOWG Review	--
101	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym SOARCA is omitted.	Don A.	State of the Art Reactor Consequence Analyses added		Closed	IOWG Review	--
102	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym BEIR is omitted.	Don A.	biological effects of ionizing radiation added		Closed	IOWG Review	--
103	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym BEF is omitted.	Don A.	biological effectiveness factor added		Closed	IOWG Review	--
104	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym DDREF is omitted.	Don A.	dose and dose rate effectiveness factor added		Closed	IOWG Review	--
105	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym FEMA is omitted.	Don A.	Federal Emergency Management Agency		Closed	IOWG Review	--
106	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym EAL is omitted.	Don A.	emergency action levels added		Closed	IOWG Review	--
107	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym SAE is omitted.	Don A.	site area emergency added		Closed	IOWG Review	--
108	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym GE is omitted.	Don A.	General Electric added		Closed	IOWG Review	--
109	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym EAS is omitted.	Don A.	emergency alert system added		Closed	IOWG Review	--
110	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym SIP is omitted.	Don A.	shelter in place added		Closed	IOWG Review	--
111	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym DLTSHL is omitted.	Don A.	delay to shelter added		Closed	IOWG Review	--
112	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym DLTEVA is omitted.	Don A.	delay to evacuation added		Closed	IOWG Review	--
113	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym ESPEED is omitted.	Don A.	speed (WinMACCS input variable) added		Closed	IOWG Review	--
114	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym DURBEG is omitted.	Don A.	duration of beginning phase added		Closed	IOWG Review	--
115	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym DURMID is omitted.	Don A.	duration of middle phase added		Closed	IOWG Review	--
116	NRR	01/30/13	Offsite Consequence Analysis	E. Bowman	(Pg. 158, Table 28) "???" is listed as the value for annual dose limit to members of the public based on EPA/NRC long-term cleanup strategy. It might be better to use the acronym "TBD" for to be determined rather than "???" to convey that it is predecisional rather than we don't have any idea what it will be.	AJ N.	May not be TBD. Replaced with "-".		Closed	IOWG Review	--
117	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The abbreviations Ci and MCi are omitted.	Don A.	curies and megacuries added		Closed	IOWG Review	--

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118	NRR	01/30/13	Offsite Consequence Analysis	E. Bowman	Pp. 160-161 Table 31 extends over two pages and is difficult to read/interpret. Also, this table marks the first use of the convention 6E-09 for 6×10^{-9} ; it is not entirely clear why this shift was made, though it may be due to use by a different group of people of the results.	AJ N.	Fixed.		Closed	IOWG Review	--
119	NRR	01/30/13	Offsite Consequence Analysis	E. Bowman	(Pg. 161, third paragraph) "a human reliability assessment (HRA) is provided in Appendix #." This should probably refer to Section 8.	AJ N.	Corrected.		Closed	IOWG Review	--
120	NRR	01/30/13	Offsite Consequence Analysis	E. Bowman	Pp. 161-162 Table 32 extends over two pages and is difficult to read/interpret. Also, the notes to the table use multiple asterisks, which cause a bit of eyestrain to interpret; it may be more user-friendly for old folks like me to swap in different symbols so we don't have to count the stars.	AJ N.	Fixed.		Closed	IOWG Review	--
121	NRR	01/30/13	Offsite Consequence Analysis	E. Bowman	(Pg. 169) "Table 34: Consequence Comparison – Low/High Density (1x4) Loading" It would be clearer to use the same convention for the title of the table as is used in the first entry, "Low vs. High."	AJ N.	Corrected.		Closed	IOWG Review	--
122	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym PBAPS is omitted.	Don A.	added to list of acronyms		Closed	IOWG Review	--
123	NRR	01/30/13	Human Reliability Analysis	E. Bowman	(Pg. 173, item (2)) "(See Table 5 in this HRA report.)" Reference to the table is unclear and probably represents a former table number prior to incorporation in the overall report.	James C.	The table reference is not necessary and is removed.		Closed	IOWG Review	--
124	NRR	01/30/13	Human Reliability Analysis	E. Bowman	The discussions on pp. 175 and 176 of the 50.54(hh)(2) SFP mitigation locations and Figure 100 should be designated for Official Use Only - Security Related Information and withheld from public disclosure.	James C.	Figure 100 (showing the location of makeup monitors) is removed. Discussion is reword to make it consistent.		Closed	IOWG Review	--
125	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym ORNL is omitted.	Don A.	Oak Ridge National Laboratory added		Closed	IOWG Review	--
126	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym TSG is omitted.	Don A.	technical support guideline added		Closed	IOWG Review	--
127	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym TSC is omitted.	Don A.	technical support center added		Closed	IOWG Review	--
128	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym OSC is omitted.	Don A.	operational support center added		Closed	IOWG Review	--
129	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym SBO is omitted.	Don A.	station blackout added		Closed	IOWG Review	--
130	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym HEP is omitted.	Don A.	human error probability added		Closed	IOWG Review	--
131	NRR	01/30/13	Human Reliability Analysis	E. Bowman	pp. 186-7 are confusing. The text below the header for Section 8.3.2.3 is all bold and centered and Figure 105 is unreadable.	James C.	Format issue, fixed.		Closed	IOWG Review	--
132	NRR	01/30/13	Human Reliability Analysis	E. Bowman	Pg 191 refers to Figure 105, which is absent.	James C.	Corrected. The figure 105 reference was mistakenly added in the text. The reference was removed. This affect all downstream figure numbering. i.e., Figure 106 should be figure 105.		Closed	IOWG Review	--
133	NRR	01/30/13	Human Reliability Analysis	E. Bowman	Pg. 192, Figure 106 is unreadable.	James C.	Replaced by a readable version.		Closed	IOWG Review	--
134	NRR	01/30/13	Consideration of Uncertainty	E. Bowman	Pg. 221, Table 52 extends across two pages and is difficult to read.	Don A.	fixed		Closed	IOWG Review	--
135	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym ICE is omitted.	Don A.	inadvertent criticality event added		Closed	IOWG Review	--

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136	NRR	01/30/13	Other Issues and Observations	E. Bowman	(Pg. 229, final line) "Fukushima Daiichi (5 BWR Mark 1 SFPs)" Weren't there 6 unit specific SFPs and a common one?	Jose P.	We added the BWR with Mark II containment to the report, but the common SPF which is at ground level was not considered relevant for this comparison.		Closed	IOWG Review	--
137	NRR	01/30/13	Other Issues and Observations	E. Bowman	(Pg. 230, third paragraph) ".... According to the NERH (2011b) report, minor leaks of radioactive material (all contained inside buildings) at the <u>Onagwa</u> plant were attributed to sloshing of SFP water." typo	Hossein E.	Fixed		Closed	IOWG Review	--
138	NRR	01/30/13	Other Issues and Observations	E. Bowman	(Pg. 231, first line) "... (e.g., several of the reactors are Mark II reactors instead of Mark I reactors)," Would it be better to characterize the difference between the reactors as having Mark II containments rather than Mark I containments? The reference site for this is a GE Type 4 boiling-water reactor with a Mark I containment, not a BWR Mark I reactor <i>per se</i> .	Brian W.	fixed		Closed	IOWG Review	--
139	NRR	01/30/13	Other Issues and Observations	E. Bowman	(Pg 231, second bullet) "... and Units 6 and 7 of <u>Kahiwazaki-Kariwa</u> ." typo	Don A.	fixed		Closed	IOWG Review	--
140	NRR	01/30/13	Other Issues and Observations	E. Bowman	Pg. 231, table 54 lists Unit 5 twice, once as a Mark I reactor and once as a Mark II reactor. The final one should probably be Unit 6, and it may be more appropriate to refer to them as Mark I and Mark II containments rather than reactors.	Don A.	fixed		Closed	IOWG Review	--
141	NRR	01/30/13	References	E. Bowman	P. 244, The acronyms NAP and NAS are used for references published by the National Academies, with the latter being listed as the National Academy Press vice the National Academies' Press. It's not clear why they are cited differently.	Brian W.	Citations have been changed to NAS.		closed	IOWG Review	--
142	NRR	01/30/13	References	E. Bowman	Orders EA-12-049 and -051 are omitted from the references.	Don A.	reference has been added		closed	IOWG Review	--
143	NRR	01/30/13	Frequently Asked Questions	E. Bowman	(P. 253) "Q13. Why was a large earthquake, particularly one that is beyond design basis for the nuclear power plant studied, chosen as the initiating event for this study?" The phrase beyond design basis is not used as an adjective and shouldn't be hyphenated here. It might be better to say "beyond the design basis."	Don A.	hyphenation is removed as suggested by the reviewer to be consistent with other occurrences		Closed	IOWG Review	--
144	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym AEF is omitted.	Don A.	annual exceedance frequency added		Closed	IOWG Review	--
145	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym HCLPF is omitted.	Don A.	high confidence of low probability of failure added		Closed	IOWG Review	--
146	NRR	01/30/13	Frequently Asked Questions	E. Bowman	(Pg. 254, A14 discussion of Seismic hazard) "... (In other words, the annual exceedance frequency for a 0.1g acceleration has increased from about 4×10^{-6} (0.000004) per year for IPEP-era curves to about 1.8×10^{-5} (0.000018) per year for recent seismic hazard models.)" This seems inconsistent with the initiating event frequencies provided in Table 4, which were 1.7×10^{-5} for bin 3 and 4.9×10^{-6} for bin 4.	Andrew M.	The figure and the text in Appendix A was a generic figure and thus inconsistent with Section 3. It is now removed.	Closed	IOWG Review	--	
147	NRR	01/30/13	Frequently Asked Questions	E. Bowman	(Pg. 256, last line of A18) "... which examined lessons learned from the Fukushima Dai-ichi nuclear accident." This usages is inconsistent with the remainder of the report, which uses "Daiichi."	Don A.	hyphenation is removed where appropriate as suggested by the reviewer		Closed	IOWG Review	--
148	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym QHO is omitted.	Don A.	quantitative health objectives added		Closed	IOWG Review	--

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149	NRR	01/30/13	Frequently Asked Questions	E. Bowman	Pp. 257-8 A22 discusses the Safety Goal Policy Statement, but it is omitted from the references.	Don A.	Mention is part of FAQ, which references a discussion in NUREG-1738		closed	IOWG Review	--
150	NRR	01/30/13	Abbreviations and Acronyms	E. Bowman	The acronym PPG is omitted.	Don A.	pool performance guidelines added		Closed	IOWG Review	--
151	NRR	01/30/13	Appendix B	E. Bowman	(Pg. 261, Title) "APPENDIX B: ASSESSMENT OF PREVIOUS STUDIES OF SAFETY CONSEQUENCES ASSOCIATED WITH LOADING, TRANSFER, AND LONG-TERM DRY STORAGE" typo	Andrew B.	Fixed (Note: Appendix B is now Chapter 10)		Closed	IOWG Review	--
152	NRR	01/30/13	Appendix C	E. Bowman	(Pg. 272, Title) "APPENDIX C: RISK COMPARISON OF SPENT FUEL STORAGE STRATEGIES" typo - maybe there should be two r's...	Brian W.	fixed		Closed	IOWG Review	--
153	NRR	02/04/13	Executive Summary	Kent Wood	On page v, item 1 says the probability of the earthquake is 1 in 60,000. The abstract says 1 in 61,000. For consistency, just use one value throughout the document.	Don A.	See response to comment # 33		Closed	IOWG Review	--
154	NRR	02/04/13	Table of Contents	Kent Wood	Pages for the Abbreviations and Acronyms are not numbered correctly.	Don A.	Will be corrected in the final report		Closed	IOWG Review	--
155	NRR	02/04/13	1	Kent Wood	The fourth bullet in Section 1.6 on page 8 states, "will likely have spent fuel moved around within the SFP (as part of complying with regulatory requirements related to heat distribution, criticality, and Boraflex coupon sampling);". I recommend changing the wording as follows: "will likely have spent fuel moved around within the SFP (as part of complying with regulatory requirements related to heat distribution, criticality, and neutron absorber monitoring);". Boraflex is not the only neutron absorber that has a monitoring requirement.	Don A.	Changes are made as suggested by the reviewer		Closed	IOWG Review	--
156	NRR	02/04/13	6	Kent Wood	The second sentence in the second paragraph of Section 6.2 states, "The SFP racks are freestanding, full length, and top entry and are designed to maintain the spent fuel in a spaced geometry, which precludes the possibility of criticality." I recommend changing the wording as follows: "The SFP racks are freestanding, full length, and top entry and are designed to maintain the spent fuel in a spaced geometry." In high density SFP racks the spacing alone is insufficient to preclude the possibility of an ICE. If it were, they wouldn't need the neutron absorber.	Hossein E.	Changes are made as suggested by the reviewer		Closed	IOWG Review	--
157	NRR	02/04/13	6	Kent Wood	The third sentence in the second paragraph of Section 6.2 states, "The high-density SFP racks are of the "poison" type utilizing a neutron-absorbing material to maintain a subcritical fuel array." I recommend changing the wording as follows: "The high-density SFP racks are of the "poison" type utilizing a neutron-absorbing material, which is part of a system designed to maintain the SFP subcritical." Just as it isn't the geometry alone, it isn't the neutron absorber alone, but rather the entire system.	Hossein E.	Changes are made as suggested by the reviewer		Closed	IOWG Review	--
158	NRR	02/04/13	10.5	Kent Wood	The second sentence in the first paragraph of Section 10.5 states, "If such an event affected a region of the pool (as opposed to only a portion of a particular assembly), and if it occurred at a point in the accident where the fuel was only partially covered, the event could have an important impact on onsite dose rates." This misses two potential effects of the ICE. (1) The ICE will also likely be generating heat which will make cooling the fuel harder. (2) The ICE will be creating new source term nuclides, the short lived. Therefore, I recommend adding a 'counter consideration' for each.	Brian W.	Added the sentence "Further, if an ICE were severe enough to produce significant heat, the fuel will be harder to cool and short-lived radionuclides will be produced."	closed	IOWG Review	--	

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159	NRR	02/04/13	10.5	Kent Wood	The last "advantageous" bullet indicates that LWR fuel assemblies are designed to maximize reactivity. I've seen that statement or something similar elsewhere. However, the basis for that statement I've never seen. I'm not sure it is true. I feel that US LWR fuel assemblies are designed to provide a balanced power production over their entire useful life, which is not the same as being designed for maximum reactivity. Given the large number of variations of fuel assemblies currently in the US LWR fleet, I find it difficult to think they are all designed for maximum reactivity. If there is a reference for this, I'd like to see it.	Brian W.	The phrase is a quote from the June 29, 2012 ORNL report on criticality. However, I agree the statement is a little too strong and have modified it to say "assemblies are generally geometrically designed..."		closed	IOWG Review	--
160	NRR	02/04/13	10.5	Kent Wood	I recommend adding the following 'counter consideration': "PWR SFPs do use borated water so the fact that the SFP may be refilled with unborated water would be a significant deviation from the norm."	Brian W.	The discussion is for the reference plant which is a BWR.		closed	IOWG Review	--
161	NRR	02/04/13	10.5	Kent Wood	I recommend adding the following 'counter consideration': "Termination of a SFP ICE during an event that required deployment of mitigation equipment would be problematic."	Brian W.	Text has been added.		closed	IOWG Review	--
162	NRR	02/04/13	10.5	Kent Wood	Section 10.5 concludes that leaving the SFP uncovered will be worse than an ICE. Is that conclusion based on actual analysis or assumptions? Is it valid even when the zirconium won't burn? (Note, this is essentially repeated in Q&A # 19.)	Brian W.	The conclusion is based on the collective opinion of the severe accident management community. Given the potentially high consequences of a zirconium fire compared to an ICE, during an event operators will not have sufficient information to justify not putting water in the pool, if possible. A detailed analysis investigating this issue is beyond the scope of the study.		Closed	IOWG Review	--
163	NRR	02/05/13	Abstract	Rick Ennis	Please see the IOWG comments folder for detailed comments on changing the Abstract text.	Don A.	(Note that OPA:David Mcktyre and PBRI: Adam Zeidonis wants this change also) This comment may be addressed during the division director review. Changes have been mostly accepted with the exception of the reference to the Fukushima earthquake's PGA which is not directly comparable to that considered in the study.		Closed	IOWG Review	--
164	NRO	02/05/13	3	Bret Tegeler	Report Section 3.0 describes the basis for the Peach Bottom (PBAPS) hazard characterization. While it is understood that the scoping study is aimed at looking at beyond design basis events, it is not clear if the overall approach for developing the GMRS is consistent with current licensing guidance used for new reactors (e.g., RG 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion." It may be helpful to include a brief discussion of how the approach taken differs (if so) from RG 1.208.	Andrew M.	A footnote has been added at the end of Section 3.1 for clarification: "Note that the term GMRS has a specific meaning in the context of Regulatory Guide 1.208 (NRC, 2007b). In this report, the term GMRS is used more generally"		Closed	IOWG Review	--
165	NRO	02/05/13	3	Bret Tegeler	Report Section 3.0, Figure 8, compares the Peach Bottom SSE with the site GMRS. The licensee may be calculating their own GMRS to satisfy NTTF requirements. As the licensee's calculated GMRS may differ from Figure 8, should the report clarify that the GMRS shown is estimated by NRC staff to avoid confusion?	Andrew M.	See response to comment 164		Closed	IOWG Review	--

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166	R II	02/05/13	Abstract	Bernhard	Abstract states "The pool and its supporting systems are located within structures that protect against natural phenomena and flying debris." However the refuel floor is covered by a sheet metal building, not hardly protection from natural phenomena.	Jose P.	This sentence has been removed since it is not relevant to our study.		Closed	IOWG Review	--
167	R II	02/05/13	Table 3, Major Assumptions, pg 20	Bernhard	Assumption states "The seals of the refueling gate do not fail." You might want to validate this assumption. The gate seals for this reactor vintage are usually rubber seals that are sealed with the application of air pressure. Long term, they may not be leak proof, allowing drainage to the bottom of the transfer canal. In addition, there is typically a drain between the two fuel pool/reactor cavity seals that may be open, allowing another drain path after one gate failure	Jose P.	This is clearly described in the paragraph at the end of Section 4.1. Section 2 on assumptions also addresses this question.		Closed	IOWG Review	--
168	R II	02/05/13	4.1.Damage States for the Spent Fuel Pool Structure,pg 38 number(6)(b)	Bernhard	States "Assess liner strains at the intersection of the base of the walls and floor slab in order to assess the potential for liner tearing. Take into consideration details of the attachment of the liner, in discrete locations, to the concrete floor and walls." Distortions that lead to fuel pool gate failure should be considered. distortions on the gate frame, can lead to seal failure, maybe even without air pressure failure, just due to the distortion of the frame.	Jose P.	The estimate of those distortions and the locking mechanisms for the gates (there is a backup gate) lead us to conclude that this is not a credible damage mechanism.		Closed	IOWG Review	--
169	R II	02/05/13	4.2.Other Damage States, pg 61	Bernhard	StatesDeterministic response spectrum analyses with the simplified ANSYS finite element model of the SFP using as input the horizontal ISRS at midheight of the SFP (for the frequencies of interest to sloshing) and considering the low damping of the sloshing mode, show that the sloshing amplitude will not exceed about 20 in." Recommend checking on some info from japan (pre fukushima) at plant with about a meter and a half slosh from ground motion. i think there was a video floating around a few years ago on this. it was not near the shake you are proposing. also a GE engineer at one of the other fukushima units (maybe unit 5 ?) i think observed slosh during that event. half a meter may be too low.	Jose P.	Sloshing is caused by very low frequencies in the ground motions (~ 0.25 Hz). The ground motion for this event does not have significant energy content at these low frequencies. The ground motion for Fukushima is likely to have more significant energy content at those low frequencies and therefore some sloshing would be expected. Still, water level readings reported by TEPCO indicate that water loss from sloshing might have been only about half a meter.		Closed	IOWG Review	--
170	R II	02/05/13	5.3.1. Approach Details and Assumptions, pg 70	Bernhard	States "If the water level is less than 0.9 m (3 ft) above the top of the fuel (thus indicating excessive leakage) then 200 gpm of spray at the top of the pool commences." After you get much below about 1.5 meters above the top of the fuel, radiation levels may impact deployment of the equipment.	Brian W.	Acknowledged. High radiation levels are discussed as part of the justification for analyzing unmitigated scenarios.		Closed	IOWG Review	--
171	R II	02/05/13	5.3.1. Approach Details and Assumptions, pg 71	Bernhard	States "If circumstances led to the uncover of fuel in the SFP, radiation fields on the refueling floor might hamper mitigative actions." high temperature, low oxygen environment may be a problem also because of long boiloff time. gap release prior to full fuel damage may cause very high airborne levels that limit mitigation measure deployment.	Brian W.	Acknowledged. The baseline analysis doesn't consider the reliability of mitigation, mitigated and unmitigated cases are both considered. Offsite support is assumed to be successful regardless of conditions in the reactor building.		Closed	IOWG Review	--
172	R II	02/05/13	8.2.2 Mitigation Equipment, pg 180	Bernhard	With respect to the Diesel-Driven Portable Pump, need a way to measure flow. an insight from fukushima. is this 600 gpm considering all line losses if the firewater system is not available as a suction source? what is the minimum flow to prevent pump damage? will the flows available with the sprays be adequate for the pump to survive long term? the high capacity pump will be even more limited. normal numbers are about 20%of rated minimum flow.	James C.	600 gpm is only for pump capability. The report states the 500/200 gpm recommended flow is met.		Closed	IOWG Review	--
173	R II	02/05/13	8.2.2 Mitigation Equipment, pg 180	Bernhard	PBAPS stores much of its mitigation equipment at grade level. If the warehouse (maybe this equipment is in fails in the earthquake, you may not be able to get to it" If the pathway the pumps must take is full of debris, you do not get to success either.	James C.	The HRA results are under the assumptions of sufficient staff and available mitigation equipment. Plant damages as immediate result of the earthquake affecting human performance causing insufficient staffing and mitigation equipment is qualitatively discussed. The do not factor in the human failure probabilities shown i the HRA section.		Closed	IOWG Review	--
174	R II	02/05/13	External Local Spray or Scrub, pg 182	Bernhard	these ladder trucks are probably not stored in cat 1 seismic structures, and have to cross bridges to get to the plant.	James C.	The ladder truck has no effects on the human failure probabilities.		Closed	IOWG Review	--

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175	NRR	02/06/13	11	S Jones	(Pg. 239) "9. The difference between high-density and low-density loading situations were as follows: * In terms of the likelihood of release within 3 days, no difference was seen. * For high-density loading, the size of release could be up to two orders of magnitude larger (these cases are associated with hydrogen combustion events). A frequency weighted estimate of the increased consequences would be valuable, particularly if the highest consequences were less than a quarter of the total frequency of releases for unmitigated cases.	AJ N.	The bullets following this text compare the consequences between high and low density loadings. The release frequencies are the same, and therefore the comparisons are not affected by frequency-weighting.		Closed	IOWG Review	--
176	NRR	02/06/13	10	S Jones	(pg 236 bullet) Cross section drawings of the reactor building for Unit 4 indicate the presence of a load bearing wall under the South wall (with reference to Figure 18) of the SFP of Unit 4, which does exist for the SFP considered in this study. This results in a longer span for the entire structure of the SFP considered in this study. The bullet indicates that the same load bearing wall is present in both structures, but the final sentence states that the configuration results in a longer span for the structure considered in the study. The basis for a longer span is not clear if both structures have the same load bearing wall.	Jose P.	Text has been corrected to say "which does NOT exist."		Closed	IOWG Review	--
177	NRR	02/06/13	App C	S Jones	(pg 278) Several additional factors may affect a calculation of dry cask risk. Considerable uncertainty exists in the source term expected from cask accident sequences resulting in a significant range in consequences as discussed in Appendix 14. Different cask designs will vary in their ability to resist hazards and may have failure modes not considered in previous studies. There is no standard for performing a dry cask PRA so these issues will have to be addressed on a case-by-case basis. The applicability of the assumptions and limitations of previous studies to any future analysis will have to be carefully considered. The referenced cask studies did not consider errors in the loading of fuel into the cask or errors in the internal preparations of the cask for storage (i.e., draining, vacuum drying, and inerting). Also, the reference to Appendix 14 is unclear.	Brian W.	Fixed reference to Appendix 14. Current language acknowledges limitations of past studies.		Closed	IOWG Review	--
178	NRR	02/06/13	App C	S Jones	(pg 280) "NUREG-1864 used empirical drop data reported in NUREG-1774 to estimate the probability of dropping a cask. Three load drop events were identified from an estimated 54,000 lifts in the 1968-2002 time period, giving a probability of 5.6x10 ⁻⁵ per lift. This probability was considered conservative given that of the three events, only one was a freefall while the other two were uncontrolled descents. The probability of pool damage was not estimated." The drop event data reported in NUREG-1774 was based on an estimate of 54000 very heavy (>30 ton) lifts from 1980 to 2002, and the 3 drop events were not representative of cask handling operations. The three load drops consisted of a mobile crane failure during steam generator replacement and two sling failures during lifts of mobile cranes with an outdoor overhead cranes. All three events were freefalls. Thus, the derived drop probability is very conservative for cask drops because of the use of higher quality handling systems and rigid lifting rigs (e.g., metal union hooks) for cask lifts.	Brian W.	Sentence has been changed to "This estimate may be conservative since cask lifts generally use higher quality handling systems than were used in the drop events."		Closed	IOWG Review	--
179	NRR	02/06/13	Acknol. Pg iii	Casto	(List several people twice (Mitman, Sullivan)	Don A.	extra names removed		Closed	IOWG Review	--

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180	NRR	02/06/13	Pg vi	Casto	#6, first bullet. SFP <u>instrumentation</u> ; last sentence, although I understand what this means from the conclusion, does not make sense as written here. Instead, make statement clear, such as - The availability of this instrumentation enhancement increases the timeliness and successful implementation strategy for mitigation, combined with enhanced mitigation strategies ordered by the NRC in EA-12-049.	Don A.	Please see response to comment 34. In addition, here we are distinguishing between the two modes of mitigation (i.e., makeup for OCP 1 & 2 and spray for later OCPs).		Closed	IOWG Review	--
181	NRR	02/06/13	Pg vi	Casto	Throughout section, if only one bullet, then combine with paragraph. For formatting, need two or more bullets	Don A.	Bullet has been removed.		Closed	IOWG Review	--
182	NRR	02/06/13	Pg vii and throughout SFPSS	Casto	Item 13 - Beginning here, the discussion on condemnation of land does not have a sound basis, and should not be a part of this study. More on this in later section(s), but recommend delete rest of last sentence after "considerable," "Condemned" also is used on item 15 and should be removed.	AJ N.	The word condemned as been replaced by "permanently interdicted" in the executive summary, and a variety of other places. MACCS2 calculates condemned land, and we believe we have a sound basis to discuss the topic. We understand the uncertainties associated with this modeling, which is why we limit discussion to only qualitative remarks (i.e. we do not report the amount of condemned land). However, some level of discussion is appropriate, as removing all discussion of condemned land could allow a misinformed reader to believe most land would be condemned, which is not true.		Closed	IOWG Review	--
183	NRR	02/06/13	pg 2 and throughout SFPSS	Casto	First bullet - Another overall comment, but specific focus throughout the SFPSS is on land contamination, and a number of interjections of that phrase (example, first bullet, second bullet) sway the report to focus on that specific outcome as a desired preventable consequence in itself, versus the overall analysis that radiological consequences are considered in determining action per our regulatory framework. These references should be replaced with "radiological consequences" or "radiological releases " as appropriate for the sentence.	AJ N.	"Land contamination" has been replaced with "offsite consequences" for the examples identified by the reviewer.		Closed	IOWG Review	--
184	NRR	02/06/13	pg 5	Casto	The use of the term "reference plant" is a good one, but starting here there are significant disjointed and sometimes direct references to Peach Bottom. Throughout, editing to the term "reference plant" should be used. Page 5 describes one of the primary relevant differences with Peach Bottom and the study and call for care in using the reference plant terminology, in that Peach's pools have a 1X8 configuration, versus the 1X4 in the study. Additionally, see comments on HRA (section 8) that make direct review of Peach Bottom (in the HRA) no longer align with the SFPSS analysis. The Figure 1 picture of PBAPS should be removed.	Brian W.	The figure has been removed. "Reference plant" is now used more consistently in the text instead of referring to "Peach Bottom."		Closed	IOWG Review	--
185	NRR	02/06/13	1.4, pg 6	Casto	4th bullet - I believe that the HRA does make conclusions on address the successful deployment of mitigation, in direct response to the ACRS. This should be re-written to the conclusion of the HRA (currently) into the SFPSS.	Don A.	Explained in the bullet "These results are then used to drive a human reliability analysis (Section 8) which provides information about what plant conditions impact mitigative reliability, and what range of likelihoods are expected."		closed	IOWG Review	--
186	NRR	02/06/13	1.5, pg 7	Casto	This statement is somewhat informative to security related information. This statement should be removed. (more on security related information in section 10)	Don A.	The text has been modified to "Note that sabotage events have been excluded from the scope of this study."		closed	IOWG Review	--
187	NRR	02/06/13	1.8, pg 16	Casto	Add bullet under second bullet - SECY 12-0095, Recommendation AR 5 "Expedited Transfer of Spent Fuel from Spent Fuel Pools to Dry Storage".	Don A.	done		closed	IOWG Review	--

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188	NRR	02/06/13	2.0 pg 25	Casto	The use of the Gaussian met. Model in MACCS2 would appear to be a primary contributor for plume dispersion and exceedence of dose PAGs to be observed our hundreds of miles. This model is outdated, and agency, industry, and ORO standard model is a puff avection model similar to RASCAL. Preliminary sensitivity studies with RASCAL (and understanding that FASCAL is a 50 mile dispersion model) do not show correlation. Recommend that RASCAL combined with NARAC atmospheric comparisons (which does provide detail level atmospheric modeling be performed and used in this study to allow for more acceptable/realistic comparison of radiological consequences. While it is understandable to want to use MACCS2 because of past study alignment, the land contamination discussion in SFPSS is not comparable to past studies, so it would make sense, if the land contamination aspect is pursued in this study, to use the standard models to review such impacts.	AJ N.	See reply to comment #206, part 3.		Closed	IOWG Review	--
189	NRR	02/06/13	3.2 pg 30	Casto	The 4 bins are introduced, but not well defined. Bin 4 is identified as (somewhere in the SFPSS, section ????) a contributor to SFP draindown, but is not evaluated. A clear discussion of the bins, why each was or was not considered, should be included, probably here.	Andrew M.	Please see the paragraph following Figure 7 in Section 3.2.		Closed	IOWG Review	--
190	NRR	02/06/13	5.3, pg 69	Casto	It is not understood why the licensee would wait until SFP level dropped 5 ft before taking mitigative action. This is inconsistent with the discussion in section 10 HRA, and operator actions are better described there. Additionally, the 30 min. delay time in bullet 3 (for no AC power) does not align with HRA assumption. (Will also comment in section 8). There are several examples, some maybe significant, where non-alignment of HRA with SFPSS are evident.	Brian W.	Given the expected failure of instrumentation the operators will have to manually check level or check for leaks. 5ft was used as the level drop that could be easily detected given other priorities that may be taking precedence. The HRA was performed after the rest of the analysis and uses different assumptions. I've added language in Section 5.3 to make this clearer.		Closed	IOWG Review	--
191	NRR	02/06/13	5.3, pg 70	Casto	First full paragraph - Another reference where spray mitigation is delayed due to pool level, and maybe procedural logic at ref. plant. This is in interesting observation, and could be a mitigating strategy gap. . It appears that the conclusion aludes to non-successful mitigation in OCP 1 and 2 , moderate leak due to this. If this is a gap in mitigating strategy, then it should be more clearly researched, with solution. For instance, if spray is preferable and 500 gpm spray, or greater than 500 gpm makeup (specific value) provides successful mitigation. This is important to recommendations in tier 3, phase 1. Also believe HRA concludes different result (OCP 1 only). These need to align.	Brian W.	Procedural logic at the reference plant generally follows NEI-06-12 R2. It isn't as much a mitigating strategy gap as it is a known limitation of BSb strategies. There is a potential for non-successful mitigation in OCP 1 and 2 depending on assumptions related to mitigating strategy, flow rate, fuel configuration, etc. This has been researched in ODO documents (document available at ML081680027 and transmittal memo for older version at ML061010668). This study assumed the equipment the licensee actually has in place, and did not analyze what would be necessary for mitigation to prevent releases.		Closed	IOWG Review	--
192	NRR	02/06/13	5.4 pg 73	Casto	3rd bullet - This is incorrect. The EPA 400 emergency exposure guidance referenced is 25 REM (not R/hr). This significantly changes your assumptions on ERT capabilities to respond to SFP, and limitation on time versus pool level. In this event, the easy assumption is that maybe multiple teams could spend approx. 15 min/entry to complete installation of spray. Note per HRA that spray placement in "reference plant" is away from pool edge, and likely in a much less than 100 Rem/hr field. HRA defines ERT logic for non-success in more detail, and should be referred to as the single logic for response. Remove this bullet.	Brian W.	Bullet has been modified to accurately describe the EPA guidance. The discussion in this section is intended to inform the reader on the difficulties of performing mitigation under some circumstances. It is not used in the main analysis where mitigation is assumed to occur for the mitigated cases, and to not occur for the unmitigated cases.		Closed	IOWG Review	--
193	NRR	02/06/13	5.4 pg 74	Casto	Fig 33 - Use the figure in the HRA (fig. 99, pg 176)	Brian W.	The figures are now the same.		Closed	IOWG Review	--
194	NRR	02/06/13	6.33, pg 131	Casto	2nd paragraph - States that all mitigated scenarios except OCP 1 have no release. Doesn't this contradict other sections (OCP 1 and 2 in section 5.3). It needs to be clear with the mitigation strategy gaps are, and all sections need to align.	Hossein E.	Section 6 is correct, section 5.3 was unclear and has been modified to respond to a similar comment.		Closed	IOWG Review	--

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195	NRR	02/06/13	6.3.4, pg 131-132	Casto	Discussion of internal flooding consequences needs to be closed out with additional detail explaining the impact of ECCS equipment below the SFP. Ref. to Emerg. Aux. load centers, RHR and core spray pp rooms as potential impacts without concluding the scenario. For instance, in LOOP, water can be addressed by sump pumps as necessary and ECCS equipment remains avail (? Emerg. Aux LC??). In SBO, equipment is not available and 50.54 (hh) and FLEX strategies would apply. Something like that, but this string needs to be closed since it was referenced in SFPSS.	Hossein E.	Expanding upon this discussion is beyond the scope of SFPSS because we have not modeled the reactor response. If there is canned information in the form of a few sentences that could be added to the report, please let us know and we can consider adding it. The commenter should note that RCIC will be used for Reactor response during a SBO, specifically as part of one of the 50.54 (hh)(2) strategies.		Closed with Ques.	IOWG Review	--
196	NRR	02/06/13	7.2.4, pg 137-138	Casto	Lat para. On 137 - Delete last sentence, that is a supposition and negatively implies the likelihood of mitigation success. I don't believe it is pertinent to the study outcome. Overall, subjective discussion should be removed, especially where it is not used in a determination (this is one such example).	AJ N.	Since the time this comment was made, most of this section has either been deleted or reworded/moved. We believe this addresses Greg's concern, however we are uncertain because the original language did not appear needlessly inappropriate. Please see Section 5.3.		Closed	IOWG Review	--
197	NRR	02/06/13	7.3.1, pg 139	Casto	1st para, replace "Peach Bottom" with "reference plant".	AJ N.	Section has been significantly rewritten. The global change has also been made to use the term "reference plant" rather than calling out "Peach Bottom" by name where appropriate.		Closed	IOWG Review	--
198	NRR	02/06/13	7.3.3, pg 143	Casto	NUREGs -6864 (NRC 2005b) and NUREG-6863 (NRC 2011c) should be specifically cited in the report. This allows easier reference to important aspects on this section. 3rd para, delete last 3 sentences "A superior..." as this appears an opinion that discredits the NUREGs and their informed conclusions.	AJ N.	Section has been significantly rewritten		Closed	IOWG Review	--
199	NRR	02/06/13	7.3.3, pg 146	Casto	1st para - 7th line, and throughout forward, replace EPZ with "10 mile radius around the reference plant. "EPZ" is incorrectly used repeatedly to mean the 10 mile radius. As noted on page 143, the EPZ consists of the plume exposure pathway and injection pathway zones. On the last sentence, it should not be assumed that the State of MD would also evacuate the entire 10 mile radius (like PA) as the State plan uses a downwind evacuation and shelter remaining sector policy. If this is used, then some of the assumptions used may be in error, though early evacuation of entire 10 mile radius has a net result of no early fatalities and reduced latent cancers, likely. Since this is a "reference plant" just reference State of PA policy applies, and do not reference MD.	AJ N.	Section has been significantly rewritten, and no longer mentions Maryland in discussion about evacuation		Closed	IOWG Review	--
200	NRR	02/06/13	7.3.3, pg 147	Casto	Recommend using "reference plant" instead of proper names, such as Conowingo Dam Road and Susquehanna River.	AJ N.	Section has been significantly rewritten (no mention of these terms anymore)		Closed	IOWG Review	--
201	NRR	02/06/13	7.3.3, pg 148, 149, 150 - 154	Casto	In title, replace "EPZ" with "10 mile radius of plant" Throughout pg 148 149 and 150 - 154, correct EPZ reference.	AJ N.	In the EP assumptions, the text "• The EPZ is modeled as the area within 10 miles of the site, as an approximation." is added.		Closed	IOWG Review	--

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202	NRR	02/06/13	7.3.4, pg 156 and 157	Casto	Discussion of "condemned" - Determination of condemning land is not logically applied to this study. The use of "interdiction" is a more correct term. Rationale is that the land contamination consideration is for the first year only in this study, and per EPA guidance, total/committed dose from deposition (all sources) that exceeds the PAG results in relocation of individuals until the dose becomes less than the PAG, (from decay, weathering, decon, etc.). Condemnation criteria can not be limited to a single year. As shown from Fukushima: 1) land weathers quickly dependent on conditions (rain, snow, wind, etc) and combined with political, technological, and other considerations, populations can be reintroduced relatively quickly. 2) re-habitation considerations due to dose can change for political reasons, especially relocation dose thresholds are so low (dose/year = 1 - 2 CT scans). 3) exposure controls also apply to agriculture using different criteria (including no threshold) so interdiction can be well beyond PAG dose criteria alone. For all of these reasons, interdiction needs to be clearly defined (PAG dose first year), if included at all. Note that this aspect is currently beyond the regulatory framework, is not addressed in prior studies (so is an anomaly to those studies) and raises issues that are not acceptably analyzed in this study. At best, this should be a determination taken by NSIR EP to evaluate as part of their Tier 3 review of EPZ adequacy, instead of generally and not completely (or in some cases correctly) discussed in this report.	AJ N.	Section has been significantly rewritten in response to the reviewer comments. The amount of land interdiction that is condemned is not reported in this study, and partly because of the reasons you list; however the reader should understand that in general, land interdiction is not necessarily temporary, as it also includes condemned land. Likewise, the reader should understand land interdiction does not necessarily mean land is condemned. The uncertainties that you list here are part of the reason we do not quantify condemned land in this study. While land contamination is not directly considered in the current regulatory framework, it is a significant contributor to economic consequences which is considered.		Closed	IOWG Review	--
203	NRR	02/06/13	7.4, pg 158	Casto	Use of reference plant EPA PAG guidance application of 500 mrem/first year is a little problematic, as it is not representative. Pretty good discussion is included to identify that, but using a "reference plant" with Penn. PAGs is problematic.	AJ N.	Land interdiction in this study is only meant to be an indication of / a surrogate for land contamination. Also, alternative levels for land contamination exist in a sensitivity analysis in section 9, which could help ameliorate this issue.		Closed	IOWG Review	--
204	NRR	02/06/13	7.5, pg 160	Casto	4th para - Statement that 50.54 (hh) prevents release except for moderate leak in OCP 1. I believe there are other references that differ. Need to correct all so that they align. (See comment 8)	AJ N.	Referenced statement is correct. This issue used to exist in part of HRA, but has been corrected. No other unaligned statements are known.		Closed	IOWG Review	--
205	NRR	02/06/13	7.6, pg 161	Casto	3rd para - HRA, section 8	AJ N.	This is corrected.		Closed	IOWG Review	--
206	NRR	02/06/13	7.6, pg 162	Casto	Table 32 - Land interdiction should have 4 (****) - believe. Also note, 2.4 e+6 hectares is about 7850 sq miles, which equals about a 54 mile radius. So, based on area alone, staff (me included) were led to believe that the Gaussian met. Model is pushing a generally straight line plume of contamination out from the plant to get 1st yr 500 mrem doses out to 500 miles. I would need clarification, but I believe that this portion of the report has been misunderstood. Latent cancer calculations out to 500 miles is not aligned with contamination impacts and relocation PAGs, or probably should not be (right?). If correct, then the report needs additional explanation to decouple the land contamination extent with the latent cancer population. Based on introductory RASCAL work using the study source terms (2005 user need) and wind rose approximations shown on table XXX, RASCAL runs appear to model PAG level doses just beyond 50 miles (detailed sensitivity studies with NARAC would be recommended). Bottom line, clear decoupling extent of land contamination, with better context for max case using standard for mets) and clear explanation of why latent cancer NLT (assumed) assumptions call for 500 mile evaluation could help this section significantly be less subject to misinterpretation.	AJ N.	Multiple part comment: 1) 2.4e6 hectares is about 9300 square miles. MACCS2 is a Gaussian plume "segment" model. (While plume segments travel in straight lines, they can travel in different directions depending on how the meteorology likely changes during a release). 2) The reporting LCF risk and relocation PAGs are aligned. LCF risk is non-zero throughout the modeling domain; however, this is not necessarily significant at all distances. For risk communication purposes, we limited the reporting of individual LCF risk to "areas of interest". We concluded that these "areas of interest" should at least include where protective actions are being taken, as it isn't logical to say you can't live there because it is potentially unsafe while at the same time say risk in these areas isn't significant enough to report. Please note, there are two different types of LCF consequences are reported. These are "the number of LCFs" which is the total consequence in the modeling domain, and the "individual LCF risk" which can vary at different distances. 3) The difference between the codes in the extent of land interdiction is interesting. However, differences could be explained by either in the scenario-specific inputs (such as source terms, aerosol sizes, deposition rates, length of release) or the nature of an incident response code that analyzes a single weather trial vs. a PRA code that analyzes hundreds of weather simulations, rather than actual differences in the code models. Complexities in the windfield could somewhat affect the results (as I understand it RASCAL has the ability to treat puff releases), but this is unlikely to account for the difference as both MACCS2 and RASCAL otherwise use similar Gaussian spreading characteristics. A comparison with NARAC was done in 2004 in which MACCS2 (and RASCAL) compared favorably to LODI, not that additional benchmarks		Closed	IOWG Review	--

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207	NRR	02/06/13	7.6 pg 165	Casto	Delete "representative of the EPZ", not correct. (10 miles is plume exposure pathway).	AJ N.	This is corrected.		Closed	IOWG Review	--
208	NRR	02/06/13	7.6, pg 166	Casto	Delete "uninhabitable reference". Section on Land Contamination needs to be re-written. Use of a 30 year condemnation reference is without results, such that it appears that interdiction = condemnation, which is not correct. In reading this section, and Fig. 96, it appears that 3500 sq. miles would equate to 500 miles, which appears to be a straight line met. , maybe. Given the wind rose used on fig. XX, this does not appear to be possible. Recommend this whole section and topic relating to land contamination be completely peer reviewed by NSIR EP as these assertions are significant to staff, Commission, and public interest and if they are bounded by some correctness, they will have large impacts on the agency's credibility and public perception of public health and safety.	AJ N.	The report appropriately differentiates between interdiction and condemnation. Several changes have been made in the report in an attempt to alleviate the reviewer concerns. NSIR EP has reviewed the conclusions and while they take exception to other parts, they have not disputed the land contamination results.		closed	IOWG Review	--
209	NRR	02/06/13	7.6 pg 167	Casto	Attempt to correlate straight line distance of plume travelled fails layman understanding. To explain the Gaussian model, this is partly true but too simple. Detailed explanation probably provides no benefit. Fig 97 when compared to Fig 96 only confuses issue. Again, condemnation explanation in 2nd para sensational, and only complicates issue with no value. In addition, we cannot conclude on long term (30 yr condemnation) and likely small public hot spots will be reclaimed through decon.	AJ N.	The sentence about travelled plume path has since been removed. MACCS2 predicts condemned land, and several changes have been made in the report in an attempt to alleviate the reviewer concerns.		closed	IOWG Review	--
210	NRR	02/06/13	7.6, pg 168	Casto	Fig 98 is very confusing, and again shows relocation out to 500 miles. Also, considering a 500 mile radius (fig not clear on land impacted so likely to be misconstrued by public, NGOs, others as radius, as is EP logic for relocations), 10% can be calculated as an enormous (10s of millions). These figures in general are conducive to public misinterpretation on a significant scale, and the language in the report does not effectively refute that.	AJ N.	Figure 98 used to be a probability distribution of displaced persons. "10%" of all displaced persons are within 200-500 miles (not 10% of everyone with 200-500 miles). Figure 98 has been modified in the report in an attempt to address the reviewer concerns.		closed	IOWG Review	--
211	NRR	02/06/13	7.7 pg 169 and 170	Casto	Tables 34 confusing. It is hard to understand a comparison when the columns have the same values. Table 35 shows consequences, I think, with successful mitigation for both densities, though high is more. Though I understand, it is still confusing the way it is presented. Thinking (public) release, these could be an issue.	AJ N.	We agree. We have updated the tables in an attempt to improve the clarity.		Closed	IOWG Review	--
212	NRR	02/06/13	7.7, pg 171	Casto	1st para - Statement that 50.54 (hh) is not effective for a low density config in a specific scenario. Where is this modeled, and is this a new mitigation strategy gap??? Not what is meant, better explain, I think	AJ N.	My understanding is that the purpose of mitigation is to reduce the likelihood of release, not to eliminate it. Flow rates for B.5.b were chosen based on standards that were commercially available and thus reduce the window of vulnerability; however, B.5.b was not designed to be fully effective for the full operating cycle, just as it was not specifically designed for non-security-related scenarios.		Closed	IOWG Review	--
213	NRR	02/06/13	8.0 throughout	Casto	Some information in this section appears to be security sensitive. Remove references to Peach Bottom and replace with "reference plant". Also, there are still numerous typos and grammatical in the HRA. Re-proof	James C.	OOU information is removed.		Closed	IOWG Review	--
214	NRR	02/06/13	8.1.1 pg 174	Casto	1st bullet - in HRA, this is the only 50.54 (hh) deployed scenario that is not successful, which differs from the SFPSS, I believe. This needs to be expanded, and is in part later but needs clear conclusion on amt. of spray and/or makeup that allows for successful mitigation. This appears to be a gap that should be addressed in recommendations. For footnote 40, this raises a major question with alignment between HRA and SFPSS. Does the HRA analyze the "ref. plant" with a 1X8 configuration. If so, then the results are not useful to this study. If 1X4 is used throughout with same conclusions for 1X4 in ref. plant, then good. Need to confirm that HRA used 1X4, since now that coupled with SFPSS, that becomes obvious.	James C.	The decay heat information in footnote 40 is intended to point out that the differences in the decay heat rates of the hottest fuel of OCP 1 and OCP2 make difference to prevent gap release. The footnote is reworded to clarify the point.		Closed	IOWG Review	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
215	NRR	02/06/13	8.3.2.2, pg 186	Casto	Table 39 response times do not align with the SFPSS. See note prior, but SFPSS reference could be deferred to this section. Although response times may be somewhat suspect, specifically the delay time, the rationale is clearly presented on page 187. Overall, somewhat logical for "PB" but may not be applicable for "ref. plant", especially when drawing conclusions to PWRs. But, overall, this may represent a gap that will be addressed by improved mitigation strategies in Order EA-12-049.	James C.	The time information is based on PB's input. No data available to make the time information for a generic reference plant.		Closed	IOWG Review	--
216	NRR	02/06/13	8.4, pg 190	Casto	1st bullet - Need to be clear whether it is 500 gpm makeup, 200 gpm spray, or both that are inadequate to mitigate. Also, this needs to state what would be adequate so that it can be addressed in Tier 3 or Order. See pg 174 and references in other sections of SFPSS.	James C.	Clarified - 500 gpm of injection is insufficient. No sensitivity calculations were performed to determine the adequate flow rate to prevent gap release in OCP1.		Closed	IOWG Review	--
217	NRR	02/06/13	Section 9, throughout	Casto	Information appears to be security sensitive. Throughout, "medium" is used instead of "moderate". Replace with moderate for consistency. In some sections, appears to have been a different author, style.	Hossein E.	Medium has been replaced with moderate. We're not sure which information the reviewer is considering as being OOU. We believe that the type of information in Section 9 is consistent with the type of information in Sections 6 and 7. Please identify any specific concerns.		Closed with Ques.	IOWG Review	--
218	NRR	02/06/13	pg 210	Casto	Table 44, 46, 47 - Remove "unhabitable"	AJ N.	"unhabitable" has been removed from tables.		Closed	IOWG Review	--
219	NRR	02/06/13	9.7, pg 222	Casto	Land contamination references, same comments as prior (sec. 7).	AJ N.	See the responses to prior reviewer comments on Section 7.		Closed	IOWG Review	--
220	NRR	02/06/13	9.7 overall	Casto	Logic of using unmitigable OCP 3 scenario when mitigation evaluation in HRA and earlier in SFPSS appear to show that burn is not realistically likely. It would appear that the OCP 1 scenario would make sense as it has an unmitigable likelihood due to heat load. Additionally, this is using a 96 hour truncation where the rest of the SFPSS used a 72 hour.	James C.	The reason we chose OCP3 small leak, unmitigated, which had a hydrogen explosion, is because it had the largest release at 72 hours. Section 9.8 considers sensitivity to time truncation for OCP3 small leak, again because it had the highest release. The sensitivity calculations are intended to show sensitivity to accident progression.		Closed	IOWG Review	--
221	NRR	02/06/13	pg 238	Casto	Information appears to be security sensitive.	Hossein E.	We're not aware of any OOU information in this Section, please identify the specific language that is of concern.		Closed with Ques.	IOWG Review	--
222	NRR	02/06/13	pg 239 and 240	Casto	Item 14 - This conclusion needs peer evaluation through NSIR EP, as it is a key contention of the report. Remove "condemned".	AJ N.	NSIR EP has reviewed the conclusions and while they take exception to other parts, they have not disputed the land contamination results. "condemned" has been removed.		Closed	IOWG Review	--
223	NRO	02/06/13	ES	Eric Powell	The objectives of the study are not clearly stated in the Executive Summary. I recommend listing the objectives in bullet form.	Don A.	Objective is stated in the Abstract		closed	IOWG Review	--
224	NRO	02/06/13	All	Eric Powell	This study would benefit from an independent peer review	Don A.	At this point, the document is undergoing internal review and will be reviewed by the ACRS.		Closed	IOWG Review	--
225	R I	02/06/13	1	Sam Hansell	Please see the IOWG comments folder for detailed comments from Sam H.	Don A.	This comment may be addressed during the division director review.	Missing figures have been corrected. Other editorial changes have been fixed as appropriate.	Closed	IOWG Review	--
226	NRR	02/07/13	9	Steve Jones		Hossein E.	Merged with comment 227		Closed	IOWG Review	--

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227	NRR	02/07/13	5, 9	Steve Jones	<p>After revisiting the sensitivity analyses provided in Chapter 9, I recommend one more analysis. I am concerned that the hydrogen combustion modeling may be unrealistic because changes in reactor building leakage have not been evaluated. Section 5.3.1.3 of the PBAPS FSAR states that the insulated metal siding above the refueling floor is installed with sealed joints. While I understand the assumption that the siding remains in place after a large earthquake, I do not understand using nominal (low) reactor building leakage. Page 92 of the SFPSS states: A single control volume models the refueling bay. An open hatch in the southeast quadrant connects (via a flowpath) the refueling room to a boundary condition volume representing the flow connection to the lower sections of the building. The nominal reactor building leakage is modeled at the center elevation of the refueling bay, and the leakage flow from elevations in the simplified model from the lower regions was tuned to match the leakage flow rate of a detailed reactor building model.</p> <p>The sealant used between siding panels could credibly separate during the seismic event, particularly near the corners of the building. Figure 82 of the SFPSS indicates that the hydrogen generation occurs over just a 2 hour period when water level is near the baseplate and steam generation is low (i.e., the reactor building is not pressurized). Increased building leakage under these conditions could prevent hydrogen concentrations reaching values supporting combustion. Increased leakage may also enhance the effect of air cooling by reducing building temperature at this stage of the event.</p> <p>I suggest an additional sensitivity analyses to investigate the effect of changes in reactor building leakage. Separation of the sealant between siding panels could significantly increase leakage and alter the progression of the event in the spent fuel pool. Also, this sensitivity would help assess the effect of hydrogen mitigation vent panels considered for deployment in Japan.</p>	Hossein E.	<p>Four sensitivity calculations were performed to examine the impact of the RB leakage on hydrogen combustion and accident progression. These covered the small leak scenarios in OCP2 and OCP3 without successful deployment of mitigation. Two larger leak sizes were considered, (1) an increase in the nominal leakage area by a factor of 10, and (2) an increase in the nominal leakage area corresponding to area of a blowout panel. In general, while an increase in area by a factor of 10 increases the leakage (typically by a factor of ~5), any further increase in area has no effect since the building pressure adjusts to limit the leakage. The leakage area has no significant impact on accident progression, and since the hydrogen is produced over a relatively short time, the hydrogen mole fraction quickly reaches the 10% threshold for ignition. The Cs release fractions are not significantly altered. In OCP2, Cs release fraction is reduced by ~12% while it is increased by ~2% in OCP3 owing to slight variations in the course of the accident. This will be added to Section 9.</p>		Closed	IOWG Review	--
228	NRO	02/08/13	Abstract	Eric Powell	<p>(Pg.ii) The opening sentences says "best-estimate" I do not think that is an accurate description of the study, because many bounding assumptions were made.</p>	Don A.	<p>We consider the study to be a best estimate. It's not clear what bounding assumptions the reviewer is referring to.</p>		closed	IOWG Review	--
229	NRO	02/08/13	ES	Eric Powell	<p>(pg. v) "Similarly, the selection of a site that has a separate SFP for each reactor (as opposed to a shared pool) is also not intended to suggest that these situations are inherently more vulnerable."</p> <p>It was never stated that a site that has a separate SFP for each reactor was chosen. It seems odd to make this statement without declaring that it was chosen first. Same comment in section 1.2.</p>	Don A.	<p>This statement is for general information. The fact that the site has multiple SFPs isn't important to the analysis.</p>		closed	IOWG Review	--
230	NRO	02/08/13	ES	Eric Powell	<p>(Pg. vii) #15, is this supposed to answer the question on whether operators should expedite transfer of fuel from the SFP to dry cask storage? If so, that should be clearer. Use similar language to what is used in the abstract. If not, there should be another bullet that says the conclusion with regards to that issue. (if I remember correctly, the study didnt find evidence to support expediting the transfer of fuel)</p>	Don A.	<p>Text has been appropriately reworded. The Tier 3 item will address the issue of expedited fuel movement, using SFPSS as one input.</p>		Closed	IOWG Review	--
231	NRO	02/08/13	Introduction and Summary	Eric Powell	<p>(Pg. 1) For facilities licensed to operate an independent spent fuel storage installation (ISFSI), the fuel assemblies are later loaded into casks and moved to the ISFSI.</p> <p>Adding a when this is, either time or some qualifier about when the fuel has cooled, would be beneficial.</p>	Don A.	<p>Text updated.</p>		Closed	IOWG Review	--

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232	NRO	02/08/13	Introduction and Summary	Eric Powell	<p>(Pg. 1) Now, let us consider some less-obvious considerations. The list below presents considerations from the perspective of the pros and cons associated with postulated transitioning from the existing use of high-density racking in the United States back to the use of low-density storage. The list is subdivided into two parts—those considerations that are covered within this study and those that are not.</p> <p>Should say something about dry cask storage, because that's what we are talking about.</p>	Don A.	This study does not explicitly consider dry cask storage, except in Appendix B and C, as mentioned in the text.		Closed	IOWG Review	--
233	NRO	02/08/13	Introduction and Summary	Eric Powell	<p>(Pg 2-3) The reader may quickly note that the first set of considerations are generally pros associated with expedited fuel movement to casks, while the latter considerations are generally cons. Why focus on the pros for this study? The agency's position—that spent fuel storage in either pools or casks is safe—is based on a number of past studies and regulatory activities that are discussed later in this chapter. This regulatory position is solid, but we are re-examining this topic due to potential changes in the state-of-knowledge and stakeholder interest. In reassessing this position, we have started by investigating whether any of the "pros" are more compelling than past studies suggest. If they are, then the issue can be addressed more holistically to see if new information challenges the existing regulatory position. Otherwise, there is insufficient motivation to spend the additional agency resources associated with a more holistic study, and these resources are better devoted to other aspects of the agency's mission of protecting people and the environment.</p> <p>This paragraph stands out as a little too colloquial (e.g. "the reader may quickly..." and "this regulatory position is solid..."). Also, the last sentence should be deleted or reworded. Although it is true it sounds odd to say it in this report.</p>	Don A.	Paragraph has been modified to be less colloquial including the deletion of the text the suggested by the reviewer.		Closed	IOWG Review	--
234	R III	02/08/13		Laura Kozak	It seems to me that the 10 CFR 50.54(hh)(2) equipment is also very likely to be damaged/disabled by such a severe earthquake. I can understand wanting to provide mitigated/unmitigated results, but the mitigation could be due to onsite equipment surviving and being used or being recovered. To me this is a more likely scenario for mitigation. I'd prefer that the mitigation case not focus so intently on the 10 CFR 50.54(hh) equipment as the mitigative measure.	Brian W.	In general, the reference plant's procedures for mitigation involve 10 CFR 50.54(hh)(2) equipment. It's unclear what other equipment would be used for mitigation.		Closed	IOWG Review	--
235	R III	02/09/13		Laura Kozak	There is also mention in several places about additional/improved mitigation being considered under NRC Order EA-12-049. It seems premature to be mentioning this as an additional improved strategy since this additional equipment also will most likely not be designed for such a severe earthquake.	Brian W.	Though the equipment may not be seismically qualified for the analyzed earthquake, the order will increase the likelihood that some equipment will survive an event and be available to help mitigate the event.		Closed	IOWG Review	--

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236	NSIR		exec summ item 9	sullivan	the long vs short halflife nuclide business is not the reason for no fatalities. The time to release allows evacuation to be effective and only the assumed non evacuating cohort is left	AJ N.	<p>MACCS2 predicts early fatalities to not occur in the non evacuating cohort. While the non evacuating cohort is small, any potential early fatalities should be seen in this cohort just like any other, especially when we run hundreds of weather simulations.</p> <p>I agree that long lived radionuclides can cause early fatalities, however they need to be in significant higher quantities to do so. Based on your comment, I decided to look into this a little more. According to the SCALE analyses for SOARCA and SFPSS for Peach Bottom, it appears that PB reactor has 12, 8, and 11 times the total activity that our SFP does in OCP1, OCP2, and OCP3, respectively. (While 1/3rd of the core is being offloaded, we don't assume this process is instantaneous and we don't assume worst case point in time.)</p> <p>It is possible that hotspot relocation is preventing early fatalities in the non-evacuating cohort, which I may check again if time allows. However, the statement would still be technically true, as this is not evacuation.</p>		closed	IOWG Review	--
237	NSIR		exec summ item 10	sullivan	"latent cancer fatalities" is inappropriately used here. "Dose to the public" would be appropriate but the LNT model is a hypothetical projection, to state that cancer fatalities will happen in certainty is wrong.	AJ N.	<p>LCF are projections, and they are based on the uncertain effects of low doses. However, the first sentence is still true for the range of dose response models analyzed. The second sentence should be updated to say "...the individual latent cancer fatality risk within 0-10 miles for the studied scenarios predicted to be on the order of 10-10 to 10-11 per year, based on the linear no threshold dose response model. In addition, the risk within 0-10 miles is dominated by low doses. According to alternate dose response models, excluding the uncertain effects of low doses could reduce the quantified individual latent cancer fatality risk within 0-10 miles significantly."</p>		closed	IOWG Review	--
238	NSIR		exec summ 11	sullivan	"however, these would be a small fraction of the affected population." does not communicate the issue, "small fraction of the expected cancer deaths" I believe is intended. Why are we emphasizing hypothetical fatalities? How does that serve our public? no one will understand "dose truncation" introduced in this manner?	AJ N.	<p>Multiple part comment 1)Change text to:..."however, these individuals would be a small fraction of the affected population." Update: Text changed again to read: "...however, this would be a small fraction compared to cancer fatalities from all causes.</p> <p>2) We will attempt to not overstress LCF. However, NRC policy and safety goals are based on LCF risk, and the number of LCFs is a significant consequence. Some level of discussion is appropriate.</p> <p>3) Dose truncation is now introduced in item 10 of the Exec Summary.</p>		Closed	IOWG Review	--

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239	NSIR		exec summ 12	sullivan	significant releases are avoided with mitigation not just hydrogen combustion	AJ N.	<p>Add: ...hydrogen combustion "and associated large releases".</p> <p>Update: Changed text to say: 12. The amount of land interdiction for the studied scenarios could be up to two orders of magnitude greater for the high density loading situation as compared to the low density loading situation. Also, like releases in the low density loading situation, successfully deployed mitigation in the high density loading situation is predicted to similarly reduce the amount of land interdiction. For both situations, the major difference is driven by hydrogen combustion events and associated large releases, which are only predicted to occur in scenarios with unsuccessful deployment of mitigation.</p>		closed	IOWG Review	--
240	NSIR		viii 5th bullet	sullivan	also study of concurrent reactor accidents would determine the effect on mitigation efforts which was assumed in the HRA	Don A.	We agree with the reviewer. This would be a good topic for additional investigation.		Closed	IOWG Review	--
241	NSIR		pg para 1	sullivan	is the term "highly" atypical true? Perhaps delete highly	Don A.	deleted		Closed	IOWG Review	--
242	NSIR		pg 25	sullivan	<p>"Total health effect estimates are not a function of distance, and have no distance truncation. See Section 7.2.3 for more information on this assumption." We take exception to this technique. It inappropriately maximizes hypothetical consequences by assuming an effect of very small doses on large numbers of people. Truncating at a set distance as was done in SOARCA was directed by EDO. What decision process was used to return to this method of consequence estimation? This issue has been repeatedly raised by the NSIR staff to no effect.</p>	AJ N.	<p>The reviewer states that "This issue has been repeatedly raised by the NSIR staff to no effect." and "This comment has been made repeatedly without being addressed or discussed." To the contrary, this issue has been discussed in multiple IOWG meetings and is a large reason as to why we truncate LCF risk. In addition, this comment is similar to "PriorDispositionBalanced" comments documented in the opposing viewpoints spreadsheet that accompanied the report to management in the original concurrence list, and is also planned to accompany the next concurrence. This was done despite the fact that this issue was not brought up during the previous IOWG review, because we knew it was an outstanding concern to Randy.</p> <p>Regarding the comment itself: SOARCA did not estimate numbers of LCFs, but rather individual LCF risk. This study also truncates the reporting of individual LCF risk, and contrary to the comment, Randy's concern is a significant reason why this was done. That being said, these distances truncations are different than SOARCA. However, the SFPSS has more significant releases than SOARCA. A high density loading configuration has about 6 times the Cs-137 inventory, and sometimes 2 orders of magnitude larger releases. SOARCA did not estimate the distance at which doses are still significant and instead chose a single distance truncation. SFPSS on the other hand, evaluated distance and used a release-specific distance truncation. In that sense, we feel that this study is more informed on this particular issue and has a firmer technical basis in choosing a distance truncation for individual LCF risk.</p> <p>Regarding the number of LCFs, a fatality located at 2 miles or 200 miles is still a fatality, and therefore we do not believe a distance truncation is appropriate in this case. A strategy that applies a distance truncation to low dose areas will artificially reduce the total number of LCFs and it is not consistent with the linear-no threshold (LNT) dose response</p>		Closed with Ques.	IOWG Review	--
243	NSIR		pg 68	sullivan	As NSIR has previously stated, it is not realistic to assume offsite resources will arrive on site for 24 hours. This seems to be an assumption made to maximize consequences. Additionally, it should not take another 24 hours to bring a fire hose up 5 flights of stairs and charge it. The response is not complicated. These assumptions are overly conservative.	Don H.	See response to comment # 24		closed	IOWG Review	--

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244	NSIR		sec 7.1 para 2	sullivan	The assumptions used in SFPSS differ from SOARCA in many respects as has been stated previously: truncation distance for LCF is one important difference	AJ N.	Change paragraph to: "Similarly, the scope and modeling decisions for this portion of the study are similar to NUREG/CR-7009. However, differences exist and are documented below. Differences tend to be due to the nature of a SFP accident compared to a reactor accident, or where the objectives of the SFP Scoping Study are different (e.g., reporting of land contamination).		Closed	IOWG Review	--
245	NSIR		7.2.3	sullivan	first two sentences contradict each other, or are not clear. The decision to harken back to old studies maximizing hypothetical consequences miscommunicates the likely impact of these accidents. NRC does not support estimating consequences of small doses to large populations, and raining out the remaining nuclide at distance is overly conservative and only serves to maximize hypothetical and unlikely consequences. This serves no regulatory purpose... this comment has been made repeatedly without being addressed or discussed.	AJ N.	<p>reply to comment 242, and is similar to "PriorDispositionBalanced" comments. However, with respect to (1) the first two sentences, (2) the NCRP, and (3) boundary weather:</p> <p>(1) Change the subsection to say the following: Consequence metrics that represent a total amount, such as the total land contamination or number of health effects, include all distances in the entire site region and therefore do not have a distance truncation. (A potential exception to this is the size of the MACCS2 grid that can in effect truncate the results. This study verified the modeling domain does not significantly affect the results). However, for consequence metrics reported at several distances, such as individual health effect risk and again land contamination, reported distances include up to the outer edge of the ingestion pathway emergency preparedness zone (50 miles), or a distance at which no more protective actions are predicted, whichever is longer.</p> <p>(2) The NCRP supports the LNT model and supports estimating consequences of small doses to large populations. Specifically, as noted in the SOARCA report and this report, they recommend binning exposures into ranges so they can be considered separately.</p> <p>(3) Boundary weather conditions do not inflate the public dose. The purpose of boundary weather conditions is to account for public doses that could otherwise be unaccounted for in the modeling domain and potentially lead to non-conservative results. However, this does not significantly affect the number of LCFs, as only 0-9% of LCFs are within the range of where boundary weather begins (depending on the scenario), especially since only frequency-weighted values of LCFs are reported.</p>		Closed	IOWG Review	--
246	NSIR		7.2.4 last para	sullivan	the paragraph is incorrect, the HRA does quantify mitigation probability	AJ N.	Clarification made to text, and move to section 7.6		Closed	IOWG Review	--

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247	NSIR		7.3.2	sullivan	after reading this I can not determine whether contaminated food is included in consequence data or not... it should not be, no one is going to eat contaminated food in the US after this accident.	AJ N.	<p>Change the document to say: "While the SFPSS MACCS2 calculations do include the food pathway, the MACCS2 code does not currently represent these consequences in the individual LCF risk results.</p> <p>The food/water pathway cannot be turned off without rewriting the code when land contamination or economic consequences are needed. However, the issue of food interdiction is similar to land interdiction. There is some level that we consider adequately safe, and some level below that exposures occur. The current food interdiction level is based on the PAG formability criteria. I too have reservations on this PAG level, as I understand the applicable PAG are those by the FDA, not EPA. However, I am not inclined to change the food interdiction level from authoritative sources for protective actions, based on a hope that no affected food/water will be consumed. Could you help us understand your technical basis for any affected food being consumed, which is effectively saying the food interdiction level is 0 mrem?</p>		Closed with Ques.	IOWG Review	--
248	RES	02.27.13	ES	Pat Santiago	For the executive summary, the message of the study, why it was initiated, what methods used (e.g., SOARCA tools and methodology), results, and purpose need to be crisp and clear. There are 17 conclusions that may not be conclusions and I urge us to develop a set of not more than 6-7 key messages for readers to clearly know and understand about this study. Further the proposed future work should not be included in the final executive summary rather included in the memo transmitting the study to NRR. It may be included as a placeholder so not to get lost however it detracts from the messages for this study analysis	Hossein E.	Executive Summary is being modified to reflect the reviewer concerns		Closed	IOWG Review	--
249	RES	02.27.13	ES	Pat Santiago	The executive summary has too much detail and may be clearer with some reorganization....a simple outline for what, why, and how we did what we did and the results and limited set of conclusions would help the reader along with some figures that help summarize.	Hossein E.	See response to comment 248.		Closed	BC Review	--
250	RES	02.27.13	7	Pat Santiago	I want to take the opportunity at this time to help develop a framework for how and what to report from MACCS in a consequence analysis. This study is drafted like a NUREG and should be considered for publication as a NUREG. It should also be the leader/model for all future analyses and what and how to report consequences as it has the variety ranging from health effects, land contamination (?economic consequences). I will be working within my branch and with the lead author for Chapter 7 to create the best model. My main comment is that there is too much detail that tends to confuse rather than guide the reader through what was done, how, why, the results and what it all means. Simple is better for this chapter so that the key messages are well developed and understood.	AJ N.	Chapter 7 has been rewritten to address the reviewer's comment.		Closed	BC Review	--

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251	RES	02.27.13	7	Pat Santiago	The discussion of the offsite consequences scope (7.2) should be deleted or significantly reduced to a paragraph on modeling overview or a simple section on methodology. If it was included to respond to other office comments, I recommend an internal office discussion to identify what the recommendations or intent of the other program office comments are prior to writing additional information which may not address the comment or concern. For example, 7.2.2 for the most part appears unnecessary, and dose truncation could be included in the Chapter 9 discussion with dose-response model uncertainty; distance truncation is a definition of the model used and is too much information; and time truncation is not needed since it is what we did and is in Chapter 9.	AJ N.	Section 7 has been modified and reorganized.		Closed	BC Review	--
252	RES	02.27.13	7	Pat Santiago	Section 7.3 appears to be the methodology section. This section should simply state what methods are used and why. As written it raises more questions that go unanswered and raises questions concerning other studies and what was done. Sections 7.3.2 is too much detail and not clear toward the end with additions made to address other office comments. Is there any way to simply reference NUREG 7009 and then add only KEY items that were considered in this study methodology that needs a highlight? (e.g., EP and then refer to SOARCA NUREGs if easier. Also see my hard copy mark up as items that should only be addressed by the states should be deleted from this document.	AJ N.	see the response to comment 251.		Closed	BC Review	--
253	RES	02.27.13	7	Pat Santiago	Section 7.4 appears out of place and is far too much information. There does not seem to be a need to spend so much effort to defend the reporting of land contamination. The rationale for the metrics chosen to report the results can be briefly described in section 7.6.	AJ N.	see the response to comment 251.		Closed	BC Review	--
254	RES	02.27.13	7	Pat Santiago	Section 7.5 belongs in the methodology section as the rationale for source term definition. If Table 31 is included, then it needs to refer back to Tables 22 and 23 to make a better linkage between the source term chapter and the consequences chapter. There was an initial reading that I did and understood Table 22/23 were the source terms and then Chapter 7 would be the consequence analysis of those tables. This is not easy to follow.	AJ N.	see the response to comment 251.		Closed	BC Review	--
255	RES	02.27.13	7	Pat Santiago	I recommend using the style in NUREG 1935 and 7110 to outline the sections needed and then identify any additional sections needed for the SFPSS so that it is simple and easier to find information being sought. (e.g., have a methodology section and put all of the material in 7.2 – 7.5 in that section; other information can be moved to other sections if needed). More explanation for the other tables are needed so that comparisons can be clear and discussed in the relevant sections.	AJ N.	see the response to comment 251.		Closed	BC Review	--

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256	RES	02.27.13	7	Pat Santiago	A standard defined set of metrics is needed (e.g. individual LCF risk within 10 miles; Individual EF risk within 1 mile). A summary table with all metrics followed by each metric presented in more detail is needed (i.e., showing graphs how the metrics vary with distance). Reference NUREG 1935 and 7110 for examples	AJ N.	Section 7 has been reorganized to address the different metrics more systematically.		Closed	BC Review	--
257	RES	02.27.13	9	Pat Santiago	For the uncertainty analysis chapter (9), there is no clear discussion of sensitivities quantified for offsite consequences. A table to show how the health risk measures changed with the criteria would be as useful as that for the reported land contamination criteria. Using tables and graphs similar to NUREG 1935/7110 for this study with additional tables/graphs/figures based on this analysis will help overall understanding of the results.	AJ N.	We think these are appropriately reported, i.e., the sections on MCCI and uniform configuration report both health effects and land contamination, while the land contamination section only reports land contamination sensitivity.		Closed	BC Review	--
258	RES	02.27.13	10	Pat Santiago	Chapter 10 should be omitted as it detracts from the robust study and it either should be included as an appendix with a revised title or simply added as an enclosure to any memo to NRR on this study. A simple paragraph on Fukushima in a summary chapter (now Chapter 11) and an appendix similar to NUREG 1935 should be done.	Brian W.	It is important to highlight the scope of the study and the factors that have not been considered to provide context for the conclusions. Incorporating Chapter 10 material into other sections may be considered if time allows.		closed	BC Review	--
259	RES	02.27.13	11	Pat Santiago	Chapter 11 should perhaps be titled summary ...some of the basic answers to the questions on why the study was done should be summed here with key conclusions (not all 17 conclusions appear to be that rather some appear to be simple statements of facts).	Don A.	It is really not a summary since it contains the main results and conclusions from the study. Note that the Chapter 11 Conclusions will be broken out into a results Section 11.1 and Overall Conclusions Section 11.2		Closed	BC Review	--
260	RES	02.27.13	Appendix A	Pat Santiago	Appendix A should be part of a communications plan and any key information or message should already be captured by the executive summary and summary chapters.	Don A.	Agreed, the FAQ has been removed.		closed	BC Review	--
261	RES	02.27.13	Appendix D	Pat Santiago	Appendix D should be retitled as it is misleading to state historical information. Use NUREG 1935 type format and title might be Commission Direction and ACRS Letter	Don A.	The title has been changed to Commission and ACRS Correspondence		Closed	BC Review	--
262	RES	02.27.13	Gen	Pat Santiago	Are references to a non-public document needed or can this report stand on it's own? NSIR should weigh in if there is any sensitivity to the information in the document.	Don A.	All references to non-public documents have been removed.		Closed	BC Review	--

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263	RES	02.27.13	ES/Conc	Gary DeMoss	<p>While the likelihood of release is low, the amount of land contamination and the number of displaced individuals can be considerable, and can extend to far distances. On average, without successful deployment of mitigation, a release from the high density loading situation is predicted to result in land interdiction risks of 2.9x10⁻³ km² per year and 0.49 displaced individuals per year. These values have been weighted by the frequency of release (10⁻⁷ per year), as to give context to the likelihood. On average, the other scenarios are predicted to have considerably less land interdiction and displaced individuals. While the amount of land interdiction (which is an estimate for the first year after the accident) can be considerable, the fraction expected to be condemned is small.</p> <p>The probabilistic square kilometers per year is not a common or standard measure. I'm not sure what to make of it - is it high, low or even important. While I think it would be useful for ranking the impacts of scenarios or alternatives, I don't think it is appropriate for a major conclusion. It is a useful part of the internal internals of the document.</p>	Brian W.	We agree the metric is not a common or standard measure. However, we could not come up with a better way to communicate the related result of the study.		Closed	BC Review	--
264	RES	02.27.13	7.6	Gary DeMoss	<p>The extent (meaning the maximum distance) of land interdiction in Figure 96 is shorter than might be thought, considering that Figure 95 shows a significant average area of land interdiction between 200 and 500 miles.</p> <p>The land contamination subsection deals with risk metrics that are not usually reported to staff or general public. The subsection explains it pretty well until I get to the above sentence. I get confused as we go from speaking of area and of distance. In reading this, I get lost for what it means from a consequence (what is worse?) standpoint. Hard to follow.</p>	AJ N.	This section looks at how far land interdiction extends (i.e., miles) while the previous section looks at the area of the interdicted land (i.e., square miles).		Closed	BC Review	--
265	RES	02.27.13	Appendix B	Gary DeMoss	This Appendix needs a better introduction to tie it to the SFPSS, and needs a conclusion.	Drew B.	Revised introduction and added conclusion. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
266	RES	02.27.13	Appendix C	Gary DeMoss	This Appendix needs to tie to Appendix B a bit more, and provide a much stronger conclusion. I also have a mark-up that I will give to Brian Wagner.	Brian W.	Comments in the markup have been addressed.		Closed	BC Review	--
267	RES	02.28.13	ES	Kevin Coyne	Item #14. The risk metric km ² per year is not a very intuitive measure of land contamination risk and will not be well understood by members of the public. At a minimum the text should make it clear that this is a frequency weighted average, but the metric of 2.9E-3 km ² /yr still lacks context to make it understandable (is this a big number or small number - the public won't know). I think a better approach would be to introduce a frequency for any land interdiction (e.g., we would expect to interdict any land once every 10,000,000 or we'd expect to have to interdict more than xxx square km no more than once every 20,000,000 years).	Don A.	See the response to comment 263.		Closed	BC Review	--
268	RES	02.28.13	ES	Kevin Coyne	Item #16 - need to define "OCP" earlier if it is going to be used in the executive summary	Don A.	This item has been reworded.		Closed	BC Review	--
269	RES	02.28.13	1	Kevin Coyne	Page 2 - correct last bullet on page to read: "Earlier movement of fuel into casks that are not currently approved..." Otherwise, it gives the impression that the NRC is quite happy to ship or store fuel for the long term in unapproved casks.	Brian W.	This is corrected		Closed	BC Review	--

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270	RES	02.28.13	1	Kevin Coyne	Page 10 - with regard to INL loss of SFP cooling study, please clarify what is meant by flooding associated with SFP accidents. As written, we have not explained that loss of water from the pool sufficient to cause flooding does not necessarily represent a safety challenge to the fuel in the pool itself (important when we are talking about frequencies on the order of 1E-3 per year). Consider at least a footnote to add this context.	Brian W.	Added a reference to Section 6.3.4 where the issue is discussed further.		Closed	BC Review	--
271	RES	02.28.13	2	Kevin Coyne	Page 24 - Major assumptions - Offsite consequence analysis, straight line plume model. The following sentence is a bit difficult to follow: "Therefore, at far distances, the distance associated with the different consequences may be more representative of the total travelled plume path length more so than the absolute distance from release." Please rewrite in a more plain language way and try to prove some context as to how this will impact results (conservative, non conservative, ashes out in the average...). May also want to refer to Section 7.3.1 Plume Segment discussion where we could perhaps provide a figure that explains this concept.	AJ N.	The explanation has been revised. Section 7.3.1 has also been reorganized.		closed	BC Review	--
272	RES	02.28.13	5.1	Kevin Coyne	Page 63 - Delete "(as is the case in reality)" from the table under Fuel loading since this may give incorrect impression that other values in the table do not reflect reality.	Brian W.	done		closed	BC Review	--
273	RES	02.28.13	5.3	Kevin Coyne	Page 67 - Provide some additional context about what is meant by "truncation". A plain language explanation would be appreciated. Some thoughts on this - if we can't say that we believe that the releases are terminated at the truncation point, can we at least provide some perspective on how we determined that continuing the analysis further was of limited benefit.	Brian W.	In general, "truncation" can refer to different situations including time truncation, distance truncation, or dose truncation. These have been appropriately discussed in the report. For time truncation, a sensitivity study is included in the report (see Section 9.8).		closed	BC Review	--
274	RES	02.28.13	5.3	Kevin Coyne	Page 67 - the paragraph at the bottom of the page should acknowledge that the assumed seismic event represents a significant challenge to local emergency response personnel. This is likely a regional scale event. It is quite conceivable that local emergency resources would be unavailable due to handling other issues of public safety significance not involving the nuclear plant.	Brian W.	Agreed. Additional discussion has been added.		closed	BC Review	--
275	RES	02.28.13	5.3	Kevin Coyne	Page 68 - Table 12 - under offsite resources, rather than stating "(see associated text0" simply state "(see Section 5.3)".	Brian W.	done		closed	BC Review	--
276	RES	02.28.13	5.3.1	Kevin Coyne	Page 69 - discussion about SFP level alarms and seismic procedures was deleted. Why? This discussion provided a basis for some of the assumptions made for diagnosis time and response time in the base SFPSS.	Brian W.	Text has been added back in.		Closed	BC Review	--
277	RES	02.28.13	5.3.1	Kevin Coyne	Page 69 - replace "thus leading to a debatably exaggerated timeline" with "thus leading to potentially conservative timeline"	Brian W.	done		closed	BC Review	--

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278	RES	02.28.13	5.4	Kevin Coyne	Page 73 - top of page. The discussion regarding the 25 rem threshold in EPA 400-R-92-001 isn't quite accurate. The dose guideline applies for the full duration of the accident, not on a per hour basis. Suggest rewording to note that it was assumed that workers would spend one hour in the maximally exposed location, so a dose rate of 25 rem/hour would trip this threshold.	Brian W.	text has been clarified.		closed	BC Review	--
279	RES	02.28.13	7.3.1	Kevin Coyne	Page 138 - see earlier comment on Chapter 3 regarding the assumption for the straight line plume model. Please provide a clearer explanation of the impact of these straight-line plume model under variable wind conditions and consider providing an illustrative figure.	AJ N.	The amount of ground contamination is not expected to significantly differ with this modeling approach, although where ground contamination occurs may be somewhat affected. In addition, NUREG xxx shows that MACCS2 agrees well with other codes.		Closed	BC Review	--
280	RES	02.28.13	7.3.3	Kevin Coyne	Page 145 - Please provide a basis for availability of electricity and communications 20 miles from the site given the seismic event of this magnitude (0.7 g).	AJ N.	SFPSS used the "as is" tools for the analysis and this is the same assumption used in SOARCA. The focus in the project was on readily available methods and models, and in cases such as this one, we are not in a position to explore this issue further but rather use the past studies. Updated response: An additional assumption regarding the affect of the seismic event was added to section 2: "The seismic event has a limited affect on emergency response. The study assumed that the seismic event would not significantly affect emergency response. This is based on an assessment in NUREG-1935 of the same site and seismic event that assumed the damage to local infrastructure is limited to 12 bridges, partly due to the few large structures in the area. Also, the extended loss of AC power is assumed to be limited to the EPZ due to the assumption that the strength of the seismic event is from the proximity of the seismic event to the site, rather than being a wider impact from a larger magnitude."	I understand the team's difficulty I defending past EP decisions made for SOARCA, but I think it's important to at least highlight the following: (1) the relationship of the SFPSS seismic event to the one examined in SOARCA (i.e., were they based on the same seismic hazard and bin), and (2) the limitations that exist for this assumption (at a minimum I think we need to acknowledge that there is uncertainty pertaining availability of offsite response and the robustness of evacuation paths). I'm ok with punting to SOARCA for the purposes of the SFPSS, but we should make it clear that we're looking at similar	Closed	BC Review	--
281	RES	02.28.13	7.3.3	Kevin Coyne	Page 147 -General comments on evacuation models- it's not clear how the evacuation modeling has considered collateral impacts on evacuation and emergency planning infrastructure due to an extremely challenging seismic event. Page 146 acknowledges that the previous work done for SOARCA was a "limited seismic evaluation" but only discusses the impact on roadway infrastructure. It would be helpful if the report could illuminate what was not evaluated in the limited evaluation and more specifically state assumptions that are being made relative to evacuation (e.g., emergency responders are not diverted to higher priority public safety issues and can help direct/organize evacuation efforts through alternate means).	AJ N.	Updated response: Please see update in response to comment 280.	I understand the team's difficulty I defending past EP decisions made for SOARCA, but I think it's important to at least highlight the following: (1) the relationship of the SFPSS seismic event to the one examined in SOARCA (i.e., were they based on the same seismic hazard and bin), and (2) the limitations that exist for this assumption (at a minimum I think we need to acknowledge that there is uncertainty pertaining availability of offsite response and the robustness of evacuation paths). I'm ok with punting to SOARCA for the purposes of the SFPSS, but we should make it clear that we're looking at similar scenarios and acknowledge some of the critical uncertainties.	Closed	BC Review	--

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282	RES	02.28.13	7.6	Kevin Coyne	Page 160 for paragraph that begins "Early Fatalities" - I think you meant "For all scenarios, <u>no</u> early fatalities are predicted to occur" (missing the word "no")	AJ N.	This is corrected		Closed	BC Review	--
283	RES	02.28.13	8	Kevin Coyne	Human Reliability Analysis Chapter - needs a thorough technical editing	James C.	The QTE and BC review comments have been incorporated		Closed	BC Review	--
284	RES	02.28.13	8	Kevin Coyne	Page 170 - reword parenthetical "(as described in this report except for this chapter)" to make it more clear (e.g., state which chapters are being referred to - note that Chapter 9 and Appendix B and C were also not part of the original study...).	James C.	The word within the parenthesis are removed.		Closed	BC Review	--
285	RES	02.28.13	8	Kevin Coyne	Page 170 - Clarify what is meant by "Because of the limited resources available to the HRA study, the NRC staff could not perform a detailed PRA for the analysis"? In reality, there was a fair amount of staff effort dedicated to the <u>HRA</u> portion of the analysis. If what we are referring to is that we haven't looked at other PRA considerations (i.e., system reliabilities, portable equipment fragility, accessibility constraints due to failure of stairways/doors/buildings) then we should be specific about what was not considered.. Recall that this was never intended to be a PRA study.. but we should be clear about what was left off the table. Additionally, we should highlight the impact on the confidence of having mitigation equipment available (that is, the likelihood of success would decrease if these things were taken into account and the HRA is merely establishing an upper bound).	James C.	Add "see discussion in section 8.3.1" in the introduction to prevent the question. The HRA scope is discussed in detail in section 8.3.1.	Clarifying Comments: Item 285 - the statement "Because of the limited resources available to the HRA study, the NRC staff could not perform a detailed PRA for the analysis" needs to be revised to clarify what the team is trying to convey. At a minimum we need to make it clear that HRA is only one of the factors that goes into determining the likelihood of successful mitigation - other considerations such as equipment survivability also need to be considered. These limitations should be clearly documented - at least at a	Closed	BC Review	--
286	RES	02.28.13	8.1	Kevin Coyne	Page 171 - Table 36 - Though in general I like the presentation, the placement of the "4.5E-4" is very confusing. Recommend removing the 4.5E-2, replacing it with 0.8% to characterize the general region, and explain how this probability is calculated on Page 172. Also, the colors do not provide any discrimination when printed out in black and white/grayscale, so if the distinction between the orange and green cells is important, another means of identifying this should be found.	James C.	The figure is reworked to provide a clear communication.		Closed	BC Review	--
287	RES	02.28.13	8.1.2	Kevin Coyne	Page 172 - The level of precision provided in the description of the cracks in the SFP liner is ridiculous for this type of study (40 cracks, 101.6 mm in length, 0.37 mm in width...). Recommend either making this description consistent with Chapter 4 or simply say that the small leak results in an initial leak rate of 250 gpm.	James C.	Reworded to not provide the calculation detail details.		Closed	BC Review	--
288	RES	02.28.13	8.1.2	Kevin Coyne	Page 173 - Figure 98. Is this the same as Figure 32? If so, probably don't need Figure 98...	James C.	The same picture for different purposes. It's better to keep as it is.		Closed	BC Review	--
289	RES	02.28.13	8.1.2	Kevin Coyne	Page 174 - Please describe what is meant by "oscillating monitor" - this is not a commonly used term.	James C.	Added (i.e., The nozzles of the SFP makeup).		Closed	BC Review	--

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290	RES	02.28.13	8.1.2	Kevin Coyne	Page 174 - Please provide a reference or technical basis for claiming that workers can be effective up to a 50 percent steam molar concentration. What does this correspond to as far as temperature/humidity?	James C.	The RB building temperature (about 180 F) and oxygen concentration (i.e., about 50% of normal concentration) are provided. Human performance is not sensitive to specific steam mole concentration is discussed to justify the choice of 50% as one of the success criteria.	basis for 50% mole fraction of steam impact on HRA. It's not clear what the technical basis for this assumption is since the report does not provide a technical reference or explain the basis for any expert judgment used. If expert judgment was used, the reasoning and basis for this judgment should be provided (and I think knowledge of the environmental conditions – including temperature - associated with this steam mole fraction would have been a necessary consideration). For example, what visibility level does 50% moles fraction correspond to and how did the team determine that the "psychological impact of situation uncertainty" of 50% mole fraction was different than 25%, 40%, or even 75% mole fraction	Closed	BC Review	--
291	RES	02.28.13	8.2.2	Kevin Coyne	Page 177 - What is the basis for even considering that the fire system would be available? This is not typically a seismically qualified system and the 0.7g earthquake is well above the design basis level.	James C.	PBAPS suggested the fire system may survive the earthquake. The HRA identifies the possible situations but not assess the probabilities of situations.		Closed	BC Review	--
292	RES	02.28.13	8.2.2	Kevin Coyne	Page 177 - What is the basis for assuming that staffing consideration are no longer a factor after the OSC is operational? Even a fully staffed OSC will not have unlimited resources, particularly when the seismic event will (with high likelihood) result in a loss of AC power. It would be expected that OSC resources would also have to deal with power recovery for both units, in addition to SFP considerations.	James C.	Reworded to "The OSC provides additional man power to mitigate plant damage" to prevent confusion.		Closed	BC Review	--
293	RES	02.28.13	8.3.2.4	Kevin Coyne	Page 189 - Figure 189. What is the basis for assuming HEPs of less than 1.0 when TM is less than 1.0? What is the basis for the Time Margin adjustment factors listed on the chart?	James C.	Discussion on how the effects of SPAR-H's performance shaping factors of "available time", "complexity", and "ergonomics/human machine interface" are reflected by the factors shown in Figure 102 is added to the end of section 8.3.2.4.	the [disposition] did not address how the specific time adjustment factors were determined or provide references to the technical basis. If this was based on expert judgment, the HRA team needs to provide what considerations went into the determination of the specific adjustment factors. The report should also better explain the basis for allowing credit for operator actions when the time margin is less than 1.0.	Closed	BC Review	--

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294	RES	02.28.13	8	Kevin Coyne	General - This section ends very abruptly and does not put the specific HEPs into an appropriate context. The detailed event tree is extremely difficult to read and is fairly useless. Recommend that the HEPs be put into a format that links them more directly to the scenarios of interest (perhaps a tabular format could accomplish this?).	James C.	A discussion is added in the end of section 8.3.2.4 to summarize the results. This discussion also provides a table (Table 38) to summarize the results.	Clarifying Comments: • Item 294 – I may be an outlier, but I found the table of HRA values to extremely difficult to read and not well aligned with the context of the scenarios examined in the initial study – In my opinion, this is not the most effective way to convey this information to the public and other stakeholders. The reason for doing the HRA was to help provide insights to the likelihood of successful mitigation – as noted above, the HRA is only part of the answer, but we should bring the section back to what the overall objective of this portion of the study was.	Closed	BC Review	--
295	RES	02.28.13	Appendix B	Kevin Coyne	General - Section needs technical editing and reorganization. Recommend that a section be added that describes the overall process the staff used in pulling together this section. Should probably start with eh summary of prior studies, link this to Table B4, highlight information that was not calculated in NUREG-1864, then go into why a MACCS reanalysis of NUREG-1864 was performed. The information is all there, it's just hard to follow. This section is also written at a very technical level - for a report intended to communicate with h general public, there is a lot of jargon and reference to specific MACCS variable names (e.g., don't need to talk about MAXRS and OALLARM, but if you do, you'll need to describe what they do and why they are important).	Drew B.	Revised layout of Appendix to enhance clarity. Also removed technical references to MACCS variables that were not needed for the discussion. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
296	RES	02.28.13	Appendix B.1	Kevin Coyne	Page 262 - The statement: "In this study, staff limited its focus to offsite safety-related consequences of accidental releases at commercial nuclear power plants, namely the direct impacts due to offsite radiological exposure and the indirect (e.g., economic or land use) impacts of protective measures taken to avert offsite radiological exposure" is confusing. The term "safety-related" has a very specific meaning for the NRC- recommend using a term like "related to public health and safety" instead. Also, if the focus is on health impacts, why do we care about economic land use considerations (except as they apply to repopulation). Recommend rewrite to be a bit more plain language in what we're trying to say.	Drew B.	Revised introduction to clarify and include plain language. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
297	RES	02.28.13	Appendix B.3	Kevin Coyne	Page 264 - under "Changes related to source term and release" - Try to use another term than "core" inventory in the first sentence. Even if this is how MACCS models it, it will confuse the issue since we are modeling the cask fuel inventory.	Drew B.	Revised "core inventory" to "radiological inventory." (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
298	RES	02.28.13	Appendix B.3	Kevin Coyne	Page 254- Not sure what scenario you're referring to when saying "Scenario 3.4 (high Density)". Recommend linking back to the earlier nomenclature (e.g., OCP 1, unmitigated, etc...)	Drew B.	Removed reference to particular scenario, since the particular input deck modified is not important to the discussion. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
299	RES	02.28.13	Appendix B	Kevin Coyne	Check formatting on tables (particularly Table B.3b)	Drew B.	Reformatted Table B.3.b. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
300	RES	02.28.13	Appendix C	Kevin Coyne	Page 274 - Rsp should not be limited to just cask drop, since it represents all SFP risk. That is, define it as the "annual risk of spent fuel pool" only.	Brian W.	fixed.		closed	BC Review	--
301	RES	02.28.13	Appendix C.7.1	Kevin Coyne	Page 279 - why the difference in risk drivers for welded closures and bolted closures. Since there is a difference, the report should explain why.	Brian W.	The methods of analysis were very different and sometimes simplifications and/or bounding assumptions were used in different places in the two studies, making them very difficult to directly compare. Added text referring to different methods of analysis and different analyzed systems.		closed	BC Review	--

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302	RES	02.28.13	8	Sean Peters	Series of tech editing comments were provided for Chapter 8 in hard copy form. Hard copy was provided to James Chang for review.	James C.	Changes are made as suggested by the reviewer		Closed	BC Review	--
303	NMSS	03.05.13	ES	Meraj Rahimi	(pg. v) "A boiling water reactor plant was chosen for this analysis, in part because these types of reactors often prompt more interest from external stakeholders owing to the fact that the Mark I and Mark II designs have spent fuel pools that are elevated relative to ground level." Delete the statement regarding the selection of BWR because of stakeholder interest. The technical reasons are more factual and appropriate for such a official document as opposed to perception or reactionary reasons.	Brian W.	This is statement of fact in light of the Fukushima accident. The technical justifications are also presented in the same paragraph.		Closed	BC Review	--
304	NMSS	03.05.13	Appendix B	Meraj Rahimi	One of the important data point to be used for dry storage study are the damages experienced by the North Anna NUHOMS dry storage system after the summer of 2012 earthquake which exceeded the system design-basis seismic value. This appendix should not be bounded by the previous dry cask studies which consider only the cask drop.	Drew B.	Spoke to commenter - agreed that this is a consideration moving forward with Tier 3 evaluation, but does not need to be explicitly discussed in Appendix B.		Closed	BC Review	--
305	NMSS	03.05.13	Appendix C	Meraj Rahimi	There are no numerical values for the probability and consequences parameters proposed in this appendix. It should be stated clearly at the very beginning that there are no values developed for this proposed method.	Brian W.	The title of the Appendix has been modified to reflect the fact that this is a qualitative analysis.		Closed	BC Review	--
306	NMSS	03.05.13	4	Meraj Rahimi	(Pg. 59) "Given the estimated width, length and depth for each localized liner tear and their number, it is still necessary to estimate the leakage rate through these tears. Estimation of this flow rate uses the following assumptions (1) the flow rate can be estimated using an equation similar to that used for flow through the concrete cracks and (2) the friction factor for that equation can be calculated on the basis of test results for leakage rates through cracks in pipes. These assumptions are not validated at this time. Therefore, considerable uncertainty exists for the resulting leakage rate estimate." This seems to say the cracks in the SFP caused by the seismic event were not calculated but assumed based on "These assumptions are not validated at this time"	Jose P.	This is not the case. The actual size of the cracks was calculated based on the structural analysis. The discussion here refers to the flow rates for which the available methods have uncertainties. Note: This comment is similar to comments #8 (IOWG review), #318 (branch chiefs review) and #356 from the division directors review. Please see response to comment #356.		Closed	BC Review	--
307	NSIR	03.05.13	Executive Summary	Bob Kahler	General Comment: The executive summary of the report is highly technical and detailed. Need to re-write to be concise and provide a plain language summary of report clearly stating the reports conclusions and recommendations. From NUREG-1650: 4.1.7 Executive Summary: An executive summary is optional. This summary is more complete than an abstract. It (1) states the purpose of a report, (2) gives a brief account of the procedures or methodology used, (3) includes a concise overview of the document, and (4) gives major findings, conclusions, and recommendations.	Don A.	See response to comment #349.		Closed	BC Review	--
308	NSIR	03.05.13	Executive Summary	Bob Kahler	Pg v, last sentence should be removed since the licensee information does NOT generally corroborates the assumption made in the study.	Don A.	Text has been modified. Now reads "The site characterization attributes (seismic response, decay heat, radionuclide inventory, etc.) have been based on readily available information that primarily stemmed from sources such as the NUREG-1150 study, seismic information developed by the United States Geological Survey (USGS), the post 9/11 security assessments, and information provided by the licensee."		Closed	BC Review	--

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309	NSIR	03.05.13	Executive Summary	Bob Kahler	Pg vii, 9. "In general, SFPs have a larger proportion of longer-lived radionuclides, relative to reactors, which are less likely to cause the significant doses required for acute health effects" Cs in the quantities available can deliver life threatening doses. It may be more correct to identify that a slowly developing accident and evacuation prevents early fatalities. This reasoning should be expanded upon in item 9.	AJ N.	See response to comment #236.		Closed	BC Review	--
310	NSIR	03.05.13	Executive Summary	Bob Kahler	General Comment: The use of "latent cancer fatalities" needs to be defined in executive summary to give reader perspective. Serious consideration should be given to using another term to describe the risk consequences.	Don A.	Latent cancer fatalities are no longer directly quantified in the report. While we use other metrics such as societal dose as a surrogate for latent cancer fatalities, latent cancer fatalities are a NRC's consequence of interest as documented in the safety goals.		Closed	BC Review	--
311	NSIR	03.05.13	Executive Summary	Bob Kahler	Pg. vii, 13, Specific values were provided for land contamination and displaced individuals for high density loading and unsuccessful mitigation. Yet, "other " scenarios are predicted to have "considerably less" impact. Either provide specific values for each situation or omit for both and give generalities for both situations.	AJ N.	See response to comment #350.		Closed	BC Review	--
312	NSIR	03.05.13	Executive Summary	Bob Kahler	Pg. viii, 15, Too detailed. Only first sentence is needed for executive summary. This is true for most numbered conclusions.	Hossein E.	We agree with the reviewer and the executive summary is being rewritten.		Closed	BC Review	--
313	NSIR	03.05.13	Executive Summary	Bob Kahler	General Comment: Numbered items have a mix of both general statements on assumptions and conclusions. However, some contain recommendations as well. The reader is required to make a self-determination on what is an assumption, conclusion or recommendation. It is recommended that the executive summary be re-written to have a separate section for assumptions, conclusions and recommendations as found in the report.	Hossein E.	See response to comment #351.		Closed	BC Review	--
314	NSIR	03.05.13	Intro and Background	Bob Kahler	Pg 5. Section 1.3, Top paragraph. Report identifies that the "PBAPS situation was viewed to be atypical." The report further states that the only significant example is a 1x8 pattern and then states that the "reference" plant is significantly similar to PBAPS. Since the report results would indicate that the load patterns yield significantly different conclusions, it is misleading to state that the reference plant is significantly similar to PBAPS. On the contrary, it is significantly dissimilar and would align with the previous statement that PBAPS is atypical. This contradiction in statements needs to be rectified. This is a general comment that needs to be addressed in various locations in the report that attempts to state that PBAPS is similar to the reference plant. Otherwise, data from all nationwide sites on fuel load configurations needs to be ascertained to substantiate claim that PBAPS is atypical.	Brian W.	The reference plant was modeled after PBAPS so saying they are significantly similar is accurate. However, the reviewer is correct that the one significant difference (1x8 vs. 1x4 pattern) produced significantly different results. A sentence has been added pointing this out. "In some situations, the 1x8 pattern is predicted to have a significant effect on the amount of radiation released (Section 9.2)."		closed	BC Review	--

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315	NSIR	03.05.13	Intro and Background	Bob Kahler	Pg.6, Seciott 1.5, The report identifies that the majority of the risk from a seismic event is due to the inability of the operator to inject water into the pool for an extended period of time (e.g., days). However, this is based upon a research assumption and not a direct result of the seismic event. As such, NSIR provides the general comment that the research assumption of inability of mitigation efforts to commence for 48 hours is not based upon current Emergency Preparedness program capabilities which would assume that mitigation efforts commence significantly sooner rendering offsite release consequences moot. This acknowledgement of EP capabilities needs to be clearly stated early in the document and continuously throughout. If licensees presented onsite and offsite coordinated emergency response plans with the response assumptions used in this report, a reasonable assurance finding would definitely be in question.	Brian W.	<p>Similar to comments #23, 24, 243 and "PriorDispositionBalanced" comments.</p> <p>Reasonable assurance does not imply zero risk. The offsite response assumptions in this study are specific to the challenging initiating event being considered: a large, beyond-design-basis seismic event. Even assuming this challenging event occurs, the study only predicts releases in a small subset of sequences. Given this, the assumptions are not viewed to be incompatible with a reasonable assurance finding, which we can specifically state in the report, if that would be helpful.</p> <p>As previously discussed, given the effect the large seismic event is expected to have on local infrastructure, and the possibility of a concurrent reactor event, the authors consider 48 hours to be reasonable. Note that this assumption only affects the results if onsite mitigation is unsuccessful. Also note that for moderate leaks in OCPs 1, 2, and 3, fuel is uncovered within 6 hours with releases within 17 hours so mitigation would need to occur much sooner than 48 hours in order to prevent releases.</p> <p>To address similar concerns that have been raised, Section 5.3 has been changed to emphasize that support will arrive within 24 hours and mitigation will begin within 48 hours (truncation still occurs at 48 hours or 72 hours). Further, some of the discussion regarding offsite response by NRC and industry in the SOARCA report is now repeated in this study.</p> <p>If NSIR could refer the team to the approved Peach Bottom offsite coordinated emergency response plan, the team could review the scope of the commitments in terms of the events that these commitments apply to. Clearly if the reference plant has committed to a certain response capability for the specific type of seismic event</p>		Closed with Ques.	BC Review	--
316	NSIR	03.05.13	Major Assumptions	Bob Kahler	Major Assumptions should include the mitigation time is not indicative of current EP environment. This would need to be expanded and NSIR/DPR/DDEP can assist with wording.	Brian W.	<p>Understanding that we have some disagreement in this area there is already an assumption about onsite mitigation, and another about truncation times "Radionuclide releases occur only if the fuel has become uncovered by 48 hours..."</p> <p>Maybe we could add wording to this assumption to make it clear that offsite mitigation has not been specifically analyzed?</p>		Closed with Ques.	BC Review	--
317	NSIR	03.05.13	4 (Pg 58)	Bob Kahler	Under "Liner Strains and Small Leakage Rates", 1st paragraph, "Maximum effective membrane liner strains from strain concentrations at the floor-walls junction are on the order of 0.037 (3.7 percent)." 2nd paragraph, "On the basis of the reported failure criteria, this study assumed a somewhat conservative estimate for the liner failure strain from the point of view of leakage rate in order to characterize the leakage rate for a damage state with small leakage flow rate. Specifically, a liner strain at failure of 0.10 (10 percent) was assumed..." This comment was previously sent and the resolution was, "The study calculated the strains caused by the earthquake demands. The reviewer is citing a sentence that refers to strain capacity." BC comment: clarity needs to be provided in report as to the differences in the types of strains and the reasons/justification for the assumption which appears to be extremely conservative with respect to the design.	Jose P.	<p>Note: This comment is the same as comments #7 (IOWG review) and #355 from the division directors review.</p> <p>Please see response to comment #355.</p>		Closed	BC Review	--

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318	NSIR	03.05.13	4 (Pg 59)	Bob Kahler	Under "Liner Strains and Small Leakage Rates", "Given the estimated width, length and depth for each localized liner tear and their number, it is still necessary to estimate the leakage rate through these tears. Estimation of this flow rate uses the following assumptions (1) the flow rate can be estimated using an equation similar to that used for flow through the concrete cracks and (2) the friction factor for that equation can be calculated on the basis of test results for leakage rates through cracks in pipes. These assumptions are not validated at this time. Therefore, considerable uncertainty exists for the resulting leakage rate estimate." This comment was previously provided and the response given was: "The assumptions referred to by the reviewer relate to the leakage rate given the estimated cracks in the liner. The initiation of cracks was calculated separately based on the strain demands and capacities." BC Comment: Response does not address comment as to why non-validated leakage rates were assumed. If the leakage rate has considerable uncertainty, the variability in the leakage rate should be stated and the assumed leakage rate needs to be justified as to why it was chosen given the considerable uncertainty. More clarity needs to be provided on the basis for the assumed leakage rate.	Jose P.	Note: This comment is the same as comments #8 (IOWG review) and #356 from the division directors review. Please see response to comment #356		Closed	BC Review	--
319	NSIR	03.05.13	4 (Pg 62)	Bob Kahler	"Damage to the Reactor Building and Other Relevant SSCs" Previously provided comment. Response did not address why the HRA assumed containment failure when the SFPSS did not. The two studies should reflect the same assumptions such that mitigation efforts can be aligned between the studies. As it is, the two studies have significantly different mitigation efforts for different reasons. How can a determination be made as to how the two studies support one another with these differences? This is a fundamental question that needs to be answered/clarified within the report.	Jose P.	Note: This comment is the same as comments #9 (IOWG review) and #357 from the division directors review. Please see response to comment #357		Closed	BC Review	--
320	NSIR	03.05.13	Chapter 2	Bob Kahler	1 st paragraph, Doses are calculated at great distance, e.g., 500 miles. Any health effects for small doses at such distance are speculative. As such, there is no value added to the report for this highly speculative result when considering its regulatory purposes. If not removed, then it is recommended that such health effects not be summed but rather segmented into appropriate categories and considered separately.	AJ N.	See response to comment #358		Closed	BC Review	--
321	NSIR	03.05.13	Executive Summary	Bob Kahler	Pg vii, 10, "latent cancer fatalities" is inappropriately used here. "Dose to the public" would be appropriate but the LNT model is a hypothetical projection, to state that cancer fatalities will happen in certainty is wrong. In general, would like to emphasize "public dose" or "exposure" rather than LCF or LC as the connection of low dose to LCF is speculative and/or not useful for regulatory purposes.	AJ N.	See response to comment #237. Regarding the second portion of the comment, LCFs have been removed as a quantitative metric and instead, more emphasis is now put on societal dose; however LCFs are still discussed in broad terms, which consistent with the qualitative safety goals. Please see comment #341.		closed	BC Review	--

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322	NSIR	03.05.13	2 (Pg 25)	Bob Kahler	I have provided the original comment (below) as previously submitted with the disposition/response. The "reviewer response" provides additional BC comment on the issue to be considered / dispositioned. "Total health effect estimates are not a function of distance, and have no distance truncation. See Section 7.2.3 for more information on this assumption." We take exception to this technique. It inappropriately maximizes hypothetical consequences by assuming an effect of very small doses on large numbers of people. Truncating at a set distance as was done in SOARCA was directed by EDO. What decision process was used to return to this method of consequence estimation? This issue has been repeatedly raised by the NSIR staff to no effect.	AJ N.	Individual LCF risk has been separated into appropriate categories and reported as a range based on dose truncation levels, the same as what was done in SOARCA. This SOARCA technique is preferred because it provides a range of results (that can be compared to the qualitative health objectives, for instance). See response to comment #359	There is some confusion as to the statement that dose truncation has been implemented. The comment was not referencing the calculation of consequences with differing truncation models as has been done, but rather the summing of small doses to large numbers of people and reporting accumulated health effects while using the LNT model. At the least, the NCRP technique should be used. It would be preferable to use the techniques of SOARCA and not report speculative dose and health effects beyond the area of regulatory interest to NRC, i.e., 50 miles. Additionally, the reporting of summed health effects, i.e., LCF is not as useful a metric as individual	Closed with Ques.	BC Review	--
323	NSIR	03.05.13	Section 7.3.2	Bob Kahler	BC Comment: I am providing this comment to give the answer to the "disposition question. Please reconsider original comment with this additional information. "after reading this I can not determine whether contaminated food is included in consequence data or not... it should not be, no one is going to eat contaminated food in the US after this accident."	AJ N.	BC Comment: Change the document to say: ""While the SFPSS MACCS2 calculations do include the food pathway, the MACCS2 code does not currently represent these consequences in the individual LCF risk results." The food/water pathway cannot be turned off without rewriting the code when land contamination or economic consequences are needed. However, the issue of food interdiction is similar to land interdiction. There is some level that we consider adequately safe, and some level below that exposures occur. The current food interdiction level is based on the PAG farmability criteria. I too have reservations on this PAG level, as I understand the applicable PAG are those by the FDA, not EPA. However, I am not inclined to change the food interdiction level from authoritative sources for protective actions, based on a hope that no affected food/water will be consumed. Could you help us understand your technical basis for any affected food being consumed, which is effectively saying the food interdiction level is 0 mrem?"	The basis for stating that no contaminated food will be consumed simply comes from the knowledge of public and civil authority reaction to actual and hypothetical radiological incidents. In repeated exercises public officials have decided to condemn a regional crop rather than parse contamination levels. Public reaction to contaminated food would also be extreme and anything even remotely associated with the contaminated area would be eshewed. There is no technical document establishing this outcome, it is just the nature of current society as alternative food sources would be widely available. It can not be said the "no contaminated food would be consumed" as very low levels of radioactivity currently exist in food currently, but the point is that no significant amount of contaminated food would be consumed. Pursuit of dose	Closed with Ques.	BC Review	--
324	NSIR	03.05.13	Executive Summary	Bob Kahler	Pg VII, 14, significant numbers of latent cancer fatalities are predicted... Use of the term "predicted" would convey that the results are real and could be tabulated in the future when the discernability from other cancer causes is not detectable. Additionally, the new wording of "small fraction compared to cancer fatalities from all causes" provides the reader that it is not included in the number of cancer fatalities and is a separate fraction unto itself. It should be reworded to identify that this would be a "small fraction of all cancer fatalities from all causes." Additional clarity should be provided on what that fraction is, if known.	AJ N.	See response to comment #361		closed	BC Review	--

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325	NSIR	03.05.13	Pg 162	Bob Kahler	Add an item 3 for why the latent cancer fatality risk is low because: 3. of the emergency preparedness response mitigation efforts.	AJ N.	The effect of EP on latent cancer fatality risk is minor as compared to long term protective actions. Due to time limitation, this comment may be more fully addressed during the division director review. See response to comment #362		closed	BC Review	--
326	RES	03.12.13	General	Kevin Coyne	is a dual units event or a reactor event within the scope?	James C.	Yes, but with the assumptions of having mitigation equipment and sufficient staff		Closed	BC Review	--
327	WCD	02.28.13	ES	Andy Imboden	(Executive summary – Conclusion 10) The conclusion that there are no offsite early fatalities is important especially given that NUREG 1738 reported 192 early fatalities for one situation. It may be helpful to point this out and explain that the current study removed some conservatism contained in earlier studies. If not here then something could be stated under Conclusion 17, which states the results of the current study and past SFP risk estimates are similar for most consequences – although the statement uses ‘most’ and therefore is accurate it seems to downplay this very large difference in early fatalities	AJ N.	While -1738 had scenarios with no early fatalities, we agree that the fact that -1738 sometimes predicted EF while we do not is significant. This comparison is now made in both section 7 results and the new section 10 comparison to previous studies. The executive summary has significantly changed, and will likely highlight this point when final.		closed	BC Review	--
328	WCD	02.28.13	Pg.1	Andy Imboden	(page 1) second paragraph. This paragraph seems to overlook the role of the U.S. closed nuclear fuel cycle and reprocessing in the design of early plants in the 1960s. The continued storage of fuel after reprocessing was suspended in the U.S. in 1977 led to the expansion of onsite fuel storage. The 1982 Nuclear Waste Policy Act provided an alternative disposal path for spent fuel.	Brian W.	Understood. However the text is not meant to provide a comprehensive history of the fuel cycle.		closed	BC Review	--
329	WCD	02.28.13	Pg.2	Andy Imboden	(page 2) – Under, “This study does not explicitly address...” Second bullet. Please clarify the comment that discharging large amounts of fuel would require a rulemaking. The Commission could require by Order the discharge of older fuel into already-approved casks. Other than codifying this Order, what rule is required to discharge cooled fuel?	Brian W.	Licensed cask systems would have to be amended to include higher heat loads. Rulemaking would be required to list these amendments in 10 CFR 72.214.		Closed	BC Review	--
330	WCD	02.28.13	Pg.2	Andy Imboden	(page 2) – Under, “This study does not explicitly address...” Third bullet. All fuel must be removed from the pool eventually during plant decommissioning. Expedited transfer does not change the amount of fuel that must be transferred, and involves the same number of cask lifts as “normal” transfer. Clarify how expedited transfer alters the risk of causing damage to the pool.	Brian W.	In reality the situation is far more complicated since SFP releases may not be possible a few months into decommissioning when the fuel can be air cooled. However, since the statement doesn't discuss these complications the commenter is correct that total risk doesn't (necessarily) change. To make the statement factually correct, “risk” has been changed to “frequency.”		Closed	BC Review	--
331	WCD	02.28.13	Pg.11	Andy Imboden	(page 11) – Parenthetical phrase “(emergency preparedness for decommissioning reactors).” Consider changing to “(e.g., exemption requests from NRC requirements for offsite emergency preparedness for decommissioning reactors)” or include the other considerations in NUREG-1738, “(exemption requests from NRC requirements for offsite emergency preparedness, financial protection and safeguards for decommissioning reactors).”	Brian W.	Added the “e.g....” text.		Closed	BC Review	--
332	WCD	02.28.13	Section 2 Table 3	Andy Imboden	(Section 2 - Table 3) The tabular format for the major assumptions was very useful and provided a lot of important information in a very efficient and effective manner.	Brian W.	Comment received		Closed	BC Review	--

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333	WCD	02.28.13	Pg.160	Andy Imboden	(page 160) It is pointed out under early fatalities that this is consistent with NUREG-1935, however, this is not consistent with NUREG-1738 which reported 193 early fatalities in Table 3.7-1 – it would be useful to point this out and provide a brief basis for the difference (e.g., overly conservative ruthenium release in NUREG-1738 is a potential cause, and late evacuation assumed for this case).	AJ N.	Comparisons to NUREG-1738 and NUREG-1353 have been added to section 7.		Closed	BC Review	--
334	WCD	02.28.13	Pg159-169	Andy Imboden	(Pages 159-169) – Tables 32 through 35. Please clarify which results are “conditional consequences” and which are not. Table 32 uses the phrase “Conditional** Consequences (Release-Frequency Averaged)” as a column heading. Please explain what is meant by “release-frequency averaged” or remove it from the table. Similarly, Table 33 indicates that all results are “release frequency-weighted” in the top-level heading, but a footnote (*) indicates that some results are frequency-averaged. Please clarify. Additionally, an example of the confusing nature of some of the tables examine the two subheadings in Table 35 – one subheading is “Conditional Consequences” and provides a perspective how the successful deployment of equipment could reduce the consequences, however, the subheading below this is “Consequences” and this gives the reduction factor for frequency weighted consequences which provides a perspective on the significance of how the likelihood is affected or some it seems that is the purpose to contrast this with the “conditional consequences” but with a title of “consequences” it is confusing – it would be helpful to at change the “consequences” subheading to “Release Frequency-Weighted Consequences” that would provide a clearer contrast with the other subheading of “Conditional Consequences”	AJ N.	Tables have been updated to address this concern.		Closed	BC Review	--
335	WCD	02.28.13	7	Andy Imboden	(Figures 94, 95, and 96) – All 3 figures include a footnote that the values are “frequency-weighted” but the title indicates that values are conditional on a release occurring. The results presented are conditional values. Please clarify.	AJ N.	Section 7 has been modified and reorganized. Tables have been updated or removed.		Closed	BC Review	--
336	WCD	02.28.13	Pg.263	Andy Imboden	(Page 263 – Appendix B) Middle of the page: “It provides estimates of the annual risk for one cask in terms of individual probability of a prompt fatality within 1.6 km (1 mile) and a latent cancer fatality within 16 km (10 miles) of the site.” – with a quick read one might get the impression that the dry cask risk includes prompt fatalities, however, there are no prompt fatalities it is reported as “0” – a suggested re-wording to remove this potential source of confusion regarding prompt fatalities is: It provides estimates of the annual risk for one cask in terms of individual probability of a prompt fatality within 1.6 km (1 mile) and a latent cancer fatality within 16 km (10 miles) of the site and also report that there are no prompt fatalities.	Drew B.	Made suggested revision. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
337	WCD	02.28.13	Pg.271	Andy Imboden	(Page 271 – Appendix B) 2nd sentence: “These ranges are usually not bounding, but rather represent uncertainties from select input parameters, depending on the study.” It may be clearer to not state these are not bounding and provide a more descriptive statement on what they represent (e.g., difficult to know the many ways these previous studies are characterized with respect to the word “bounding”). Possibly replacement: “These ranges represent a variety of approaches to are usually not bounding, but rather represent uncertainties from select input parameters, depending on the study.”	Drew B.	Made suggested revision. (Note: Appendix B is now Chapter 10)		Closed	BC Review	--
338	WCD	02.28.13	Pg.167	Andy Imboden	(Page 167). Table 34 is not cited in the text before it appears. It is first cited on the next page. Section 8 seemed to have a large number of acronyms – might want to think of reducing the number to improve readability especially for some of the less common acronyms.	James C.	Text and table locations are moved to have the discussion of the table before the table appears.		Closed	BC Review	--

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339	NMSS	03.28.13	11	Mark Lombard	The results of this study in Section 11 and in other sections need to be put into context by comparison of the results against some standard such as the Quantitative Health Objectives or Qualitative Safety Goals similar to the comparison to the QHOs of NUREG-1738 results discussed on page 13. Some may argue that is comparing apples to oranges but the QSGs are based on risk to the general public of nuclear power versus other societal risks. This would give the public understandable measures to compare the results against as opposed to results without any context.	AJ N.	We agree that some level of comparison is appropriate. Section 7 has been rewritten, and now includes the statement, which will also be integrated into Section 11: When the release frequency is considered, the latent cancer fatality risks from the events analyzed in this study are very small, in the 1E-12 to 2E-11 per year range, when using an LNT dose response model. For perspective, the Commission's safety goal policy related to the cancer fatality quantitative health objective (QHO) represents a 2E-6 per year objective for an average individual within 10 miles of the nuclear plant site (NRC, 1983). While the results of this study are scenario-specific (a beyond design-basis seismic event) and related to a single spent fuel pool, staff concludes that since these risks are several orders of magnitude below the QHO, it is unlikely that the results here would contribute significantly to a risk that would challenge the Commission's safety goal policy (NRC, 1986).		Closed	DivDir Concurrence	--
340	NMSS	03.28.13	General	Mark Lombard	SRM dated July 16, 2012, documented the ACRS comment to ensure that consequences associated with expedited loading, transfer, and long-term storage need to be considered. While Enclosure 1 to the draft SFPSS indicates those areas have been included, the assessment in Appendix B compares consequence results to NUREG-1864, which does not include assessment of the consequences of expedited transfer to dry casks. Appendix C also does not address expedited transfer in the current context of the term to move all but the newest fuel out of the pool. This fact is pointed out in the SFPSS on Page 4, that the study does not address certain considerations, including expedited discharge of fuel from the pool to dry storage.	Brian W.	The approach for responding to the SRM was to obtain near term insights in Appendices B and C within the SFPSS project timeframe. This risk comparison template is intended to inform the Tier 3 working group considering expedited transfer of spent fuel. The Tier 3 plan includes 3 phases. Phase 1 will use this study to determine whether a significant safety enhancement could be achieved by expedited transfer and provide inputs to a regulatory analysis. More detailed treatment of these issues may be addressed as part of subsequent phases of the Tier 3 activity on expedited spent fuel transfer, as necessary.		Closed	DivDir Concurrence	--
341	NMSS	03.28.13	7	Mark Lombard	Why was land contamination included on the study?	AJ N.	The study included land contamination to provide inputs to a regulatory analysis. A paragraph has been added to the introduction to describe the study's relationship to the Tier 3 activities and how the study will be used in the current regulatory process. Other analyses did evaluate land contamination, including some directly (e.g., NUREG/CR-6451, NUREG-4982). Land contamination is already part of NRC's current regulatory framework including being used as input in SAMA/SAMDA analyses and is an input to regulatory/back fit analyses as part of the cost benefit analysis. Chapter 7 was revised to distinguish the safety-related individual health effects measures from other measures that are inputs to the cost-benefit analysis for the regulatory analysis.		Closed	DivDir Concurrence	--
342	NMSS	03.28.13	11	Mark Lombard	The SFPSS should make a recommendation on whether future studies are needed or not and what they would or should entail or point to the Tier 3 effort.	Brian W.	This scope of this study does not include making recommendations for further study. NRR will determine whether further analyses are needed to make any regulatory determinations within NRC's current regulatory framework. A paragraph has been added to the introduction to describe the study's relationship to the Tier 3 activities and how the study will be used in the regulatory process. The following statement has been added to the introduction and results sections of the report: Other aspects of SFP risk that have not been informed by this or past studies, may be addressed by future studies, such as the site Level 3 probabilistic risk assessment (PRA), as documented in SECY-11-0089, "Options for Proceeding with Future Level 3 Probabilistic Risk Assessment Activities," dated July 7, 2011, and the associated staff requirements memorandum; or will be addressed through other inputs to the regulatory decision-making process, as needed.		Closed	DivDir Concurrence	--
343	NMSS	03.28.13	Appendix B	Mark Lombard	Appendix B-why is the first table included on Page B-3? It does not include any data regarding dry cask storage	Andrew B.	Appendix B addresses part of the SRM (dated July 16, 2012) to compare the results of the SFPSS with past studies and consider consequences associated with loading, transfer, and long-term storage. Appendix B provides a comparison of SFPSS results to previous spent fuel pool studies and updated analyses from NUREG-1864 Dry Storage Pilot PRA. Staff will revise the introduction to Appendix B to make this clear. (Note: Appendix B is now Chapter 10)		Closed	DivDir Concurrence	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
344	NMSS	03.28.13	1	Mark Lombard	Page 17-is the reference to a "NAC" study a reference to an "NAS" study? Whatever the answer is should be in the list of acronyms	Brian W.	NAS has been added to the list of acronyms. NAC is the name of a corporation and is not generally spelled out.		Closed	DivDir Concurrence	--
345	NMSS	03.28.13	11	Mark Lombard	Page 230, item 5, third sentence-should read "...the use of the 1x4 pattern..."	Hossein E.	This will be corrected.		Closed	DivDir Concurrence	--
346	NMSS	03.28.13	11	Mark Lombard	Page 230, item 6, second paragraph, first sentence-"...required by the NRC Order..." and second sentence "...have changed the mitigation mode..."	Brian W.	Changes are made as suggested by the reviewer		Closed	DivDir Concurrence	--
347	NMSS	03.28.13	Appendix B	Mark Lombard	Appendix B-the first few sentences in Section 8.3.3 should be moved up to the front of this appendix.	Andrew B.	See response to comment 340 and 343. Revision to Appendix B introduction should make clearer the organization of the Appendix. (Note: Appendix B is now Chapter 10)		Closed	DivDir Concurrence	--
348	NMSS	03.28.13	Appendix B	Mark Lombard	Table B.6-be consistent with use of "e" or "E"	Andrew B.	Fixed. (Note: Appendix B is now Chapter 10)		Closed	DivDir Concurrence	--
349	NSIR	03.29.13	Executive Summary	Mark Thaggard	General Comment: It is acknowledged that the executive summary is not included in the Division Director review and is undergoing a major revision based on prior comments. Comments provided are repeated from the BC level review to ensure that they are dispositioned as a Division Director comment. The previous executive summary of the report was highly technical and detailed. The revised executive summary should be concise and provide a plain language summary of the report clearly stating the reports conclusions and recommendations.	Hossein E.	We agree with the reviewer and the executive summary is being rewritten.		Closed	DivDir Concurrence	--
350	NSIR	03.29.13	Executive Summary	Mark Thaggard	It is acknowledged that the executive summary is not included in the Division Director review and is undergoing a major revision based on prior comments. Specific values were previously provided for land contamination and displaced individuals for high density loading and unsuccessful mitigation. Yet, "other " scenarios are predicted to have "considerably less" impact. In revising the executive summary, either provide specific values for each situation or omit for both and give generalities for both situations.	Hossein E.	The conclusion has been expanded to included mitigated results.		Closed	DivDir Concurrence	--
351	NSIR	03.29.13	Executive Summary	Mark Thaggard	General Comment: It is acknowledged that the executive summary is not included in the Division Director review and is undergoing a major revision based on prior comments. Comments provided are repeated from the BC level review. Numbered items presented had a mix of both general statements on assumptions and conclusions. However, some contain recommendations as well. The reader is forced to make his/her own determination on what is an assumption, conclusion or recommendation. It is recommended that the re-written executive summary have a separate section for assumptions, conclusions and recommendations as found in the report.	Hossein E.	We agree with the reviewer and the executive summary is being rewritten.		Closed	DivDir Concurrence	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
352	NSIR	03.29.13	Intro and Background	Mark Thaggard	Comments provided are repeated from the BC level review. Pg 7, Section 1.3. The report identifies that the "PBAPS situation was viewed to be atypical." The report further states that the only significant example is a 1x8 pattern and then states that the "reference" plant is significantly similar to PBAPS. Since the report results would indicate that the load patterns yield significantly different conclusions, it is misleading to state that the reference plant is significantly similar to PBAPS. On the contrary, it is significantly dissimilar and would align with the previous statement that PBAPS is atypical. This contradiction in statements should be addressed. This is a general comment that needs to be addressed in various locations in the report that attempts to state that PBAPS is similar to the reference plant. Otherwise, data from all nationwide sites on fuel load configurations needs to be ascertain to substantiate claim that PBAPS is atypical.	Hossein E.	Please see the response to comment 314. Similarities refer to plant-specific design that includes the SFP data needed for accident progression (e.g., pool volume, number of racks and assemblies in the pool, decay heat and fission product inventories). As the reviewer correctly points out, the only significant deviation is the use of 1x4 pattern for the base case calculations with additional sensitivity calculations for 1x8 that is more representative of PBAPS. This is made clear in the report on numerous occasions. In addition, the main objective of the present study was comparison with low density where the report assumes a stylized configuration (1x4 + checkerboard).		Closed	DivDir Concurrence	--
353	NSIR	03.29.13	Intro and Background	Mark Thaggard	Comments provided are repeated from the BC level review. Pg.8, Section 1.5, the report identifies that the majority of the risk from a seismic event is due to the inability of the operator to inject water into the pool for an extended period of time (e.g., days). However, this is based upon a research assumption and not a direct result of the seismic event. As such, a general comment that the research assumption of inability of mitigation efforts to commence for 48 hours is not based upon current Emergency Preparedness program capabilities which would assume that mitigation efforts commence significantly sooner rendering offsite release consequences moot. This acknowledgement of EP capabilities needs to be clearly stated early in the document and continuously throughout. If licensees presented onsite and offsite coordinated emergency response plans with the response assumptions used in this report, a reasonable assurance finding would definitely be in question.	Jose P.	Response: The assumptions in the study and the results of the study do not call into question a finding of reasonable assurance. Mitigation times for the study were chosen based on those assumed in SOARCA and informed by Fukushima. Section 5.3 has been revised to include a more detailed description of emergency measures in place in case of severe accidents. This section has also been revised to make clear that the truncation and assumed mitigation times were chosen by the team for purposes of the study. The report also makes clear that the initiating event chosen for analysis is well beyond design basis so a SFP failure resulting in offsite consequences is unlikely. The report also discusses the offsite response and challenges to implementing this response. The report was clarified to explain that NRC analyzes low likelihood beyond design basis seismic events with and without mitigation to gain insights on the safety margin provided by NRC's regulatory framework. The HRA combined with reporting both mitigated and unmitigated results provides informative data to determine possible regulatory enhancements for consideration. The study corroborates the results of past studies. The study concludes that SFPs are robust and not expected to leak as a result of a seismic event, successful mitigation prevents most releases, no early fatalities are expected and individual LCF is low because effective protective actions limits individual exposure.		Closed	DivDir Concurrence	--
354	NSIR	03.29.13	Major Assumptions	Mark Thaggard	Comments provided are repeated from the BC level review - Dispositioning of comment was not complete and needs to be completed as a Division Director comment. Major assumptions should include the fact that mitigation time is not indicative of the current EP environment.	Hossein E.	Response: See comment #353. Section 5.3 has been updated to include a more detailed description of emergency measures in place in case of severe accidents. This section has also been revised to make clear that the truncation and assumed mitigation times were chosen by the team for purposes of the study.		Closed	DivDir Concurrence	--

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355	NSIR	03.29.13	Pg 60	Mark Thaggard	<p>Comments provided are repeated from the BC level review. Under "Liner Strains and Small Leakage Rates", 1st paragraph, "Maximum effective membrane liner strains from strain concentrations at the floor-walls junction are on the order of 0.037 (3.7 percent)."</p> <p>2nd paragraph, "On the basis of the reported failure criteria, this study assumed a somewhat conservative estimate for the liner failure strain from the point of view of leakage rate in order to characterize the leakage rate for a damage state with small leakage flow rate. Specifically, a liner strain at failure of 0.10 (10 percent) was assumed..." This comment was previously sent and the resolution was, "The study calculated the strains caused by the earthquake (demands). The reviewer is citing a sentence that refers to strain capacity." BC comment: clarity needs to be provided in report as to the differences in the types of strains and the reasons/justification for the assumption which appears to be extremely conservative with respect to the design.</p>	Jose P.	<p>Response: To clarify the items raised in the comment, Section 4.4.1 is re-organized so that the part on Damage States and Relative Likelihoods will be at the beginning of section 4.4.1 (it was the last of three parts in this section). This is done to promptly inform the reader that the study treats both the induced strain (demand) and the limiting failure strains (capacity) as random variables. Although, median induced strains are less than median limiting failure strains, the uncertainty assessment shows that there is a small likelihood that the liner would tear.</p> <p>The text in the second and third paragraphs of the part Liner Strains and Small Leakage Rates will be modified to read:</p> <p>An approach and failure criteria for steel liners used in reinforced concrete containments is used here to assess tearing of the SFP liner (Cherry, 2001 and 1996). Failure criteria for liners without corrosion damage reported by Cherry (1996) are used in this study to estimate limiting failure strains for the stainless steel SFP liner. The approach estimates the crack width by multiplying the liner strain at failure by the width of the finite element with the maximum induced effective strain, which is approximately equal to 3.7 mm (0.15 in.) as indicated above.</p> <p>Since both the induced strains (demands) and failure strains (capacity) are treated as random variables, the strain at which the liner would tear, that is the condition at which the induced strain exceeds the limiting failure strain, is also random. An approach for a point estimate</p>		Closed	DivDir Concurrence	--
356	NSIR	03.29.13	Pg 61	Mark Thaggard	<p>Comments provided are repeated from the BC level review. Under "Liner Strains and Small Leakage Rates", "Given the estimated width, length and depth for each localized liner tear and their number, it is still necessary to estimate the leakage rate through these tears. Estimation of this flow rate uses the following assumptions (1) the flow rate can be estimated using an equation similar to that used for flow through the concrete cracks and (2) the friction factor for that equation can be calculated on the basis of test results for leakage rates through cracks in pipes. These assumptions are not validated at this time. Therefore, considerable uncertainty exists for the resulting leakage rate estimate." This comment was previously provided and the response given was: "The assumptions referred to by the reviewer relate to the leakage rate given the estimated cracks in the liner. The initiation of cracks was calculated separately based on the strain demands and capacities." BC Comment: Response does not address comment as to why non-validated leakage rates were assumed. If the leakage rate has considerable uncertainty, the variability in the leakage rate should be stated and the assumed leakage rate needs to be justified as to why it was chosen given the considerable uncertainty. More clarity needs to be provided on the basis for the assumed leakage rate.</p>	Jose P.	<p>Response: the paragraph is modified to read:</p> <p>Given the estimated width, length and depth for each localized liner tear and their number, it is still necessary to estimate the leakage rate through these tears. Estimation of this flow rate uses the following assumptions (1) the flow rate can be estimated using an equation similar to that used for flow through the concrete cracks and (2) the friction factor for that equation can be calculated on the basis of test results for leakage rates through cracks in pipes. These assumptions are not validated at this time. Therefore, considerable uncertainty exists for the resulting leakage rate estimate. The following paragraph addresses the process used to estimate the flow rate through these liner tears as well as sources of uncertainty for this estimation. These uncertainties may result in flow rate estimates that can vary by more than 100 %. It is noted that this damage state (small leakage rate) already is a result of binning the uncertain liner tearing into two discrete tearing conditions to cover a range of uncertainty for liner damage and associated flow rates. Assigning equal likelihood to the two highly distinct damage states acknowledges these uncertainties.</p>		Closed	DivDir Concurrence	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
357	NSIR	03.29.13	Pg 64	Mark Thaggard	Comments provided are repeated from the BC level review. "Damage to the Reactor Building and Other Relevant SSCs" The response to the previously provided comment did not address why the HRA assumed containment failure when the SFPSS did not. The two studies should reflect the same assumptions such that mitigation efforts can be aligned between the studies. As it is, the two studies have significantly different mitigation efforts for different reasons. How can a determination be made as to how the two studies support one another with these differences? This is a fundamental question that needs to be answered/clarified within the report.	Jose P.	Response: The containment in HRA is the primary containment that if failed in a reactor core damage event would make the refueling floor inaccessible for plant staff to inject or spray water into the SFP. The SFPSS assesses offsite consequences. It provides two bounding conditions: 10CFR50.54(hh)(2) mitigation is assumed to be successfully deployed or this mitigation is assumed to not be successfully deployed. The HRA estimates the probability of having successful mitigation for various plant damage states. These two pieces of information (i.e., consequence and probability) complement each other to inform SFP risk. The HRA provides scenario-specific likelihoods for each plant damage state (considering the state of the reactor, offsite power, etc.) The HRA combined with reporting both mitigated and unmitigated results provides informative data to gain insights on the safety margin provided by NRC's regulatory framework as well as possible regulatory enhancements for consideration.		Closed	DivDir Concurrence	--
358	NSIR	03.29.13	Chapter 7	Mark Thaggard	Comments provided are repeated from the BC level review. 1 st paragraph, Doses are calculated at a great distance, e.g., 500 miles. Any health effects for small doses at such distance are speculative. As such, there is no value added to the report for this highly speculative result when considering its regulatory purposes. If not removed, then it is recommended that such health effects not be summed but rather segmented into appropriate categories and considered separately.	AJ N.	Response: Given the uncertainty of low doses on health effects, LCFs is being removed as a quantitative metric. See reply to comment #376 for more information. Land interdiction, displaced persons, and societal dose are reported to inform regulatory analysis under NRC's current regulatory framework. The consideration of distances beyond 50 miles is consistent with most previous research studies (See also the response to comment #372). Individual LCF risk has been separated into appropriate categories and reported as a range based on dose truncation levels, the same as what was done in SOARCA. This SOARCA technique is preferred because it provides a range of results (that can be compared to the qualitative health objectives, for instance).		Closed	DivDir Concurrence	--
359	NSIR	03.29.13	Pg 27	Mark Thaggard	<p>Comments provided are repeated from the BC level review. The original comment (below) as previously submitted with the disposition/response is provided. The "reviewer response" provides additional helpful comment on the issue to be considered / dispositioned. "Total health effect estimates are not a function of distance, and have no distance truncation. See Section 2.2.3 for more information on this assumption." We take exception to this technique. It inappropriately maximizes hypothetical consequences by assuming an effect of very small doses on large numbers of people. Truncating at a set distance as was done in SOARCA was directed by EDO. What decision process was used to return to this method of consequence estimation? This issue has been repeatedly raised by the NSIR staff to no effect.</p> <p>The reviewer states that "This issue has been repeatedly raised by the NSIR staff to no effect." and "This comment has been made repeatedly without being addressed or discussed." To the contrary, this issue has been discussed in multiple IOWG meetings and is a large reason as to why we truncate LCF risk. In addition, this comment is similar to "PriorDispositionBalance" comments documented in the opposing viewpoints spreadsheet that accompanied the report to management in the original concurrence list, and is also planned to accompany the next concurrence. This was done despite the fact that this issue was not brought up during the previous IOWG review, because we knew it was an outstanding concern to Randy.</p> <p>There is some confusion as to the statement that dose truncation has been implemented. The comment was not referencing the calculation of consequences with differing truncation models as has been done, but rather the summing of small doses to large numbers of people and reporting accumulated health effects while using the LNT model. At this point, the NCRP technique should be used. It would be preferable to use the techniques of SOARCA and not report speculative dose and health effects beyond the area of regulatory interest to NRC (i.e., 50 miles). Additionally, the reporting of summed health effects, i.e., LCF is not as useful a metric as individual risk of LCF for risk communication purposes. LCF is often misinterpreted as absolute deaths, rather than an estimate of potential consequences given a conservative treatment.</p>	AJ N.	Response: Given the uncertainty of low doses on health effects, LCFs is being removed as a quantitative metric. See reply to comment #376 for more information. Land interdiction, displaced persons, and societal dose are reported to inform regulatory analysis under NRC's current regulatory framework. The consideration of distances beyond 50 miles is consistent with most previous research studies (See also the response to comment #372). Individual LCF risk has been separated into appropriate categories and reported as a range based on dose truncation levels, the same as what was done in SOARCA. This SOARCA technique is preferred because it provides a range of results (that can be compared to the qualitative health objectives, for instance).		Closed	DivDir Concurrence	--

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360	NSIR	03.29.13	Section 7.3.2	Mark Thaggard	<p>DD Comment: I am providing this comment to give the answer to the "disposition" question. Please reconsider original comment with this additional information. "after reading this I can not determine whether contaminated food is included in consequence data or not... it should not be, no one is going to eat contaminated food in the US after this accident."</p> <p>Change the document to say: "While the SFPSS MACCS2 calculations do include the food pathway, the MACCS2 code does not currently represent these consequences in the individual LCF risk results."</p> <p>The food/water pathway cannot be turned off without rewriting the code when land contamination or economic consequences are needed. However, the issue of food interdiction is similar to land interdiction. There is some level that we consider adequately safe, and some level below that exposures occur. The current food interdiction level is based on the PAG farmability criteria. I too have reservations on this PAG level, as I understand the applicable PAG are those by the FDA, not EPA. However, I am not inclined to change the food interdiction level from authoritative sources for protective actions, based on a hope that no affected food/water will be consumed. Could you help us understand your technical basis for any affected food being consumed, which is effectively saying the food interdiction level is 0 mrem?</p> <p>The basis for stating that no contaminated food will be consumed simply comes from the knowledge of public and civil authority reaction to actual and hypothetical radiological incidents. In repeated exercises public officials have decided to condemn a regional crop rather than parse contamination levels. Public reaction to contaminated food would also be extreme and anything even remotely associated with the contaminated area would be eshewed. There is no technical document establishing this outcome, it is just the nature of current society as alternative food sources would be widely available. It can not be said the "no contaminated food would be consumed" as very low levels of radioactivity currently exist in food currently, but the point is that no significant amount of contaminated food would be consumed. Pursuit of dose consequences through this exposure pathway seems inappropriate.</p>	AJ N.	Response: Latent cancer fatalities are no longer being reported, and MACCS2 does not treat this pathway in individual LCF risk, and therefore the report no longer reports any type of LCF metric from ingestion.		Closed	DivDir Concurrence	--
361	NSIR	03.29.13	Executive Summary	Mark Thaggard	<p>Comments provided are repeated from the BC level review. Significant numbers of latent cancer fatalities are predicted... Use of the term "predicted" would convey that the results are real and could be tabulated in the future when the discernability from other cancer causes is not detectable. Additionally, the new wording of "small fraction compared to cancer fatalities from all causes" provides the reader that it is not included in the number of cancer fatalities and is a separate fraction unto itself. In revising the executive summary this discussion should be reworded to identify that this would be a "small fraction of all cancer fatalities from all causes." Additional clarity should be provided on what that fraction is, if known.</p>	AJ N.	The word "predicted" has been replaced with "estimated", and "small fraction of all cancer fatalities from all causes" has been added. The LNT caveat has been deleted as the statement is true for all dose response models. Also, the last sentence on the dose truncation has been updated to conform with comment #369		Closed	DivDir Concurrence	--
362	NSIR	03.29.13	Pg 150	Mark Thaggard	<p>Comments provided are repeated from the BC level review. Add an item 3 for why the latent cancer fatality risk is low because: 3. of the emergency preparedness response mitigation efforts.</p>	AJ N.	Response: Section 7.2 has since been rewritten to make this point. In addition, the study concludes that SFPs are robust and not expected to leak as a result of a seismic event, successful mitigation prevents most releases, no early fatalities are expected and individual LCF is low because effective protective actions limits individual exposure.		Closed	DivDir Concurrence	--
363	NSIR	03.29.13	2	Mark Thaggard	<p>I don't agree with the assumption that offsite assistance will not arrive for 24 hours and that mitigative efforts with such equipment (e.g., fire truck) does not begin for 48 hours after the initiating event</p>	AJ N.	Response: See response to comment #353. In Section 5.3, "At 24hrs" has been changed to "within 24hrs". Section 5.3 has been updated to include a more detailed description of emergency measures in place in case of severe accidents.		Closed	DivDir Concurrence	--
364	NSIR	03.29.13	8	Mark Thaggard	<p>The HRA improved the study analysis but was unable to judge the effectiveness of offsite resources such as a fire truck. This limitation should be noted as a conservative limitation of the study.</p>	James C.	Response: A table was added to provide an explicit list of scope and assumptions of the HRA study. Further, new text is being explored to clarify.		Closed	DivDir Concurrence	--
365	NSIR	03.29.13	Conclusion 13	Mark Thaggard	<p>The frequencies noted appear to lack consideration of the HRA success probabilities that would, I believe, reduce the frequencies reported.</p>	AJ N.	Response: The reliability of mitigation is not included as stated in Table 3 in Section 2. The conclusion will be expanded to include mitigation results. The HRA provides scenario-specific likelihoods for each plant damage state (considering the state of the reactor, offsite power, etc.) The HRA combined with reporting both mitigated and unmitigated results provides informative data to gain insights on the safety margin provided by NRC's regulatory framework as well as possible regulatory enhancements for consideration.		Closed	DivDir Concurrence	--

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366	NSIR	03.29.13	8.1.2	Mark Thaggard	The dose rate estimate is in error. The peak dose rate at the SFP rail is used whereas the spray would be located some distance back in a lower dose rate region. Additionally, the licensee has shielding on the floor to facilitate placement of the spray.	James C.	Response: Based on the oscillation monitors (or SFP spray nozzles) setup locations as indicated in the procedure TSG-4.1, the authors confirm that the dose rates stated in the report are correct. In addition, NRC staff walked down this strategy at PB in May 2012 with a Region 1 SRA as part of the B.5.b component of the triennial fire inspection with 2 of the individuals (Equipment Operators) assigned to carry out the strategy. At no time did they identify shielding that they anticipated using during deployment of the strategy. Additionally, the plant did not raise this as a result of their fact check of the HRA. Perhaps it is something that has been put in place since May 2012, but if so, it's newer than the snapshot of the plant that we set out to analyze. If the shielding can be confirmed and would have an impact on the results, a qualitative statement to that fact can be added to the report.		Closed	DivDir Concurrence	--
367	NSIR	03.29.13	8.1.2	Mark Thaggard	The timing used in the HRA to denote when mitigation can not be accomplished due to dose rate or steam environment, misjudges the ability of the ERO to perform the relatively simple task of attaching a fire hose to a spray in a challenging environment. For some analyses, one hour of additional time to mitigate would allow success	James C.	Response: The high steam (or high temperature) becoming a limiting factor only occurs in small leak scenarios where the available time for response is greater than 13 hours. Adding one or a few extra hours to the available time has little effects to HRA results. This is because in these situations time is not the dominant factor affecting human performance. Time is more important in moderate leak scenarios in which available time is 6 hours and 2.5 hours for refueling and non-refueling scenarios respectively. The radiation level is the limiting factor in these situations. Based on the SFP spray nozzles setup location indicated in TSG-4.1 the radiation level at the locations at that time is greater than 30 rem/hr. The time is firm in this criterion. To set up the spray nozzles on the refueling floor in a moderate leak scenario where the leakage rate is greater than nozzle injection rate, based on procedure instruction the plant staff would first connect two fire hoses to two spray nozzles and inject water into the SFP, observing the change of the SFP water level (in this case the SFP water level continues lowering), attach a spray head to the spray nozzles each to change from injection mode to spray mode, ensuring the water spray into the SFP, and place a lead bag on top of the spray nozzle each to damp vibration for stable SFP spray. Completing these tasks requires some time. The 30 rem/hr is a reasonable threshold for the activities. Furthermore the study assumptions are consistent with Appendix EE of EPRI TR-1025295 (2012) which is the technical basis for Severe Accident Management that the industry is relying on to update their Accident Management Programs.		Closed	DivDir Concurrence	--
368	NSIR	03.29.13	7.1.4	Mark Thaggard	Please replace the second paragraph with the following: The staff modeled offsite response organization (ORO) decision making based upon the accident sequences, timing, radiological release, knowledge of response activities and the availability of emergency response technical support. Since actions beyond the EPZ would be taken ad hoc, there is no procedural guidance or exercise performance documentation upon which to base assumptions. However, state and local OROs have shown long standing capability and understanding of response to hypothetical radiological accidents. The accidents modeled in the SFPSS are slow to develop relative to the accident scenarios used in evaluated exercises. Additionally, there would be national level assistance to help civil authorities with protective action decision making. While alternative timing could be assumed the staff used a best estimate approach to modeling ORO decision making for protective actions beyond the EPZ.	AJ N.	Response: Text has been added as requested.		Closed	DivDir Concurrence	--
369	NSIR	03.29.13	7.2	Mark Thaggard	This section describes the use of dose truncation models in a manner that suggests they are a method to lower consequences rather than an alternative model. Dose truncation model use should be put in context as alternative and potentially valid health effects model	AJ N.	Response: Dose truncation models provide two benefits, an alternative (and potentially valid) health effects model as well as a tool to better understand the contributions to LNT risk. Section 7.2 has since been reorganized and now is written to better represent the dose truncation models as potentially valid health effect models.		Closed	DivDir Concurrence	--
370	NSIR	03.29.13	Fig 96	Mark Thaggard	The title is confusing; is it meant to be "% of all individuals that are displaced"?	James C.	Response: Section 7.2 has since been rewritten and the figure no longer exists.		Closed	DivDir Concurrence	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
371	NSIR	03.29.13	General	Mark Thaggard	My primary concern with this document is the fact that we are reporting significant results from a highly conservative and very low probability scenario that could be misinterpreted by the public. Accordingly, I believe that a section should be added to the document that discusses the results in the context of safety and adequate protection; i.e., do we still believe that there is adequate protection with the continued use of wet-storage and is there enough of a safety enhancement from a cost-benefit perspective to warrant moving more to the use of dry storage.	Brian W.	<p>Response: As stated in Section 1 of the report the U.S. Nuclear Regulatory Commission (NRC) has maintained that SFPs provide adequate protection of the public health and safety in either low-density or high-density storage configurations. This report does not call into question this finding. The study also does not make any determinations regarding whether there is enough of a safety enhancement from a cost-benefit perspective to warrant moving more to the use of dry storage. That is the role of NRR and the regulatory analysis. A paragraph has been added to explain the study's applicability to the Tier 3 activity and the NRC's current regulatory framework. The study corroborates the results of past studies. This study concludes that SFPs are robust and not expected to leak as a result of a seismic event, successful mitigation prevents most releases, no early fatalities are expected and individual LCF is low because effective protective actions limits individual exposure.</p> <p>Updated response, as of May 5, 2013: Since this comment was made, a cost-benefit analysis was added to the report as Appendix D, "Backfitting Analysis to Determine the Maximum Safety Benefit of Expedited Transfer of Spent Fuel at a Reference Plant." This cost-benefit analysis was performed by NRR and concluded that "The risk due to beyond design basis accidents in spent fuel pools, while not negligible, is sufficiently low that the added costs involved with</p>		Closed	DivDir Concurrence	--
372	NSIR	03.29.13	General	Mark Thaggard	The use of our models at great distance (i.e., up to 500 miles) becomes speculative and indicates a level of fidelity that likely exceeds their veracity. There are uncertainties in source term, dispersion modeling, weather at distance and deposition at distance. The results are reported with excessive confidence. It would be more appropriate to provide estimates out to a distance that the analysis tools could more confidently calculate (e.g., 50 miles) and estimate qualitatively the potential impacts further away. A statement that the relocation could potentially extend to 500 miles in the worst case, would be more appropriate than reporting the results as the agency best estimate.	AJ N.	<p>Response: Though MACCS2 has been benchmarked against other Atmospheric Transport and Dispersion models up to 100 miles with favorable results, the authors acknowledge that uncertainty exists. In light of this, we have added the statement:</p> <p>The accuracy of atmospheric transport and deposition models tend to decrease with distance, and therefore the results should be viewed with caution.</p> <p>In addition, the figures showing land contamination and displaced individuals at specific distances have been replaced with tables that more generally report these consequences at 0-50, 0-100, and 0-500 miles, which is largely consistent with most past research studies.</p>		Closed	DivDir Concurrence	--
373	NRO	03.29.13	---	Theresa Clark	The comments below represent a high-level review of the "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" dated March 2013 (also known as the spent fuel pool (SFP) scoping study) by divisions in the Office of New Reactors. These comments should be addressed before sending the report to the Advisory Committee on Reactor Safeguards (ACRS). It is suggested that any comments that are not addressed be shared with the ACRS. Incorporation of these comments should help with the risk-communication challenge posed by presenting the information in this report.	---	---	---	---	DivDir Concurrence	--

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
374	NRO	03.29.13	General	Theresa Clark	The report needs to describe how its results could be useful in making regulatory decisions on matters including the Japan lessons-learned Tier 3 recommendation on assessment of the transfer of spent fuel to dry-cask storage and recent Commission direction on economic consequences. In responding to this comment, a fuller characterization of the purpose and usefulness of the report should be added, including an explanation of how the study's point-estimate approach is appropriate in the context described above.	Hossein E.	<p>Response: NRR will determine whether further analyses are needed to make any regulatory determinations within NRC's current regulatory framework. A paragraph has been added to describe the study's relationship to the Tier 3 activities and how the study will be used in the regulatory process. Using representative point-estimates with sensitivities for important parameters is appropriate in research studies to be able to gain insights and data for regulatory decision-making in a reasonable period of time.</p> <p>The study used design, operational, and location data for a reference site for which we already had information available, a BWR Mark I with an elevated SFP. The report also considered a 1x4 pattern (required after some time after offloading) as well as sensitivity analysis for more favorable loading (1x8) and less favorable loading (checkerboard and uniform) and sensitivities for other key parameters that will provide insights for analysis of other plants.</p>		Closed	DivDir Concurrence	--
375	NRO	03.29.13	General	Theresa Clark	The report needs to describe the relationship between the study results and our current approach to approving nuclear power plant sites and designs. In addition to describing this approach, a column could be added to the assumptions in Chapter 2 to provide context relative to the current regulatory approach for licensing nuclear power plants and plants' licensing bases. Accordingly, the conclusions could also be reframed to highlight the robustness of our regulatory framework for the safe operation of nuclear power plants, e.g., that mitigation strategies provide a significant reduction in release rates.	Hossein E.	<p>Response: NRR will use the study in making related Tier 3 regulatory determinations within NRC's current regulatory framework. A paragraph has been added to describe the study's relationship to the Tier 3 activities and how the study will be used in the regulatory process. The study's conclusions include that successful mitigation generally prevented releases. (Note that there were mitigated scenarios that resulted in releases.)</p>		Closed	DivDir Concurrence	--
376	NRO	03.29.13	General	Theresa Clark	The Staff Requirements Memorandum (SRM) on SECY-08-0029 directed the State-of-the-Art Reactor Consequence Analyses (SOARCA) to use individual cancer fatality risk as its latent cancer health-effects metric. The study should follow the same approach by using this metric and not reporting the total number of cancer deaths. For example, Chapter 7, Table 29 reports total latent cancer fatalities per year. Also, Chapter 11, conclusion 11 states "For scenarios with large releases, significant numbers of latent cancer fatalities are predicted when using a dose-response model based on the linear-no threshold hypothesis; however, this would be a small fraction compared to cancer fatalities from all causes."	AJ N.	<p>Response: Given the uncertainty of low doses on health effects, LCFs is being removed as a quantitative metric. For clarification, SECY-08-0029 and the related SRM did not "direct" SOARCA to exclude the reporting of LCFs or other potential societal health effects. Rather, the Commission agreed to the staff's recommendation that SOARCA should report individual LCF risk. The basis for reporting individual LCF risk can be found in the Qualitative Safety Goals (QSGs). However, the QSGs also provide the basis for reporting societal health impacts, as they are an important measure of the safety of nuclear power in general. Therefore while LCFs are not quantified in the report, they are still discussed in broad terms. Societal dose as a surrogate provides a</p>		Closed	DivDir Concurrence	--
377	NRO	03.29.13	General	Theresa Clark	A memorandum to the Commission dated April 3, 2007 (OUO-SII), stated that the staff would not report land contamination/economic consequences in SOARCA because of modeling and policy issues. SRM-COMPBL-08-0002/COMGBJ-08-0003 directed the staff to develop an improved economic consequence model for the MELCOR Accident Consequence Code System (MACCS). This SRM also stated that the resulting model may be applied to the SOARCA results if so directed by the Commission. The study should follow the same approach by not reporting land contamination.	AJ N.	<p>Response: Land contamination and economic consequences results from MACCS2 models are routinely used as inputs in NRC's current regulatory framework in backfit/regulatory analyses and, in SAMAs/SAMDA analyses, and have been reported in previous research studies (e.g. NUREG/CR-6451, NUREG/CR-4982). Regarding the use of MACCS2 for SAMAs analyses, the ASLB has ruled that the models are adequate for the regulatory purpose (Accession No. ML11200A224).</p> <p>A paragraph has been added to the introduction to describe the study's relationship to the Tier 3 activities and how the study will be used in the regulatory process. Chapter 7 was revised to distinguish the safety-related individual health effects measures from other measures that are inputs to the cost-benefit analysis for the regulatory analysis. NRR will use these measures within NRC's current regulatory framework.</p> <p>Regarding the memorandum to the Commission dated April 3, 2007, current staff updated its position on MACCS models in Enclosure 9 of SECY-12-0110 stating:</p> <p>It is not obvious to current MACCS2 experts at both the NRC and Sandia National Laboratories (SNL) that rehabilitation and clean up, land contamination area, or economic models and results are excessively conservative. Economic results and some land contamination area results are controlled by user inputs and could be biased to be either conservative or non-conservative, depending on the input values selected by the user. A MACCS2 user's guide and code manual is available for reference when deciding various parameter inputs. Other land contamination areas produced by MACCS2 are influenced chiefly by the Gaussian plume and deposition modeling. Based on the 2004 benchmarking study, these values do not appear to have either a conservative or non-conservative bias.</p> <p>The new economic model is not relevant to this study. It has not been completed and is not available for use at this time. Enclosure 9 of SECY-12-0110 also provides details on this project.</p>		Closed	DivDir Concurrence	--

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378	NRO	03.29.13	2	Theresa Clark	Table 3 (the last entry on page 19) includes this sentence: "Vertical spectral accelerations as high as horizontal accelerations are justified on the bases that nearby earthquakes control the ground motions spectra for this event and that the frequencies of interest for the study are frequencies near or above 10 Hz." Provide the basis for the assumption that nearby earthquakes control the estimated ground motions at the reference site.	Jose P.	Response: The revised report now reads: A few studies (e.g., McGuire, Silva, and Costantino, 2001; ASCE, 1999) indicate that for rock sites and frequencies near and above 10 Hz, and especially nearby seismic sources, vertical spectral accelerations may be as high as or exceed horizontal spectral accelerations. For this study, the frequencies of interest are, for the most part, frequencies near or above 10 Hz. Therefore, the assumption of equal vertical and horizontal spectral accelerations was deemed to be a reasonable starting assumption. This assumption is also supported by seismic hazard de-aggregation with the USGS (2008) model (http://earthquake.usgs.gov/hazards/apps/#deaggint) which indicates that for the seismic bin of interest (high PGA, low likelihood events) the contributors to risk would be moderate magnitude earthquakes at nearby distances.		Closed	DivDir Concurrence	--
379	NRO	03.29.13	2	Theresa Clark	Table 3 (the first entry on page 20) includes this paragraph: The current seismic assessment uses a model and code generated by the US Geological Survey (USGS, 2008). The USGS 2008 information is being further developed and updated by a group of stakeholders, including the NRC, in a collaborative study which includes (a) the seismic source zone characterization, and (b) the ground motion attenuation models. In addition, the NRC is developing independent methods and computer codes, which will be publicly available when completed, to combine (a) and (b). Although part (a) of this updating effort has been completed in early 2012, part (b) and the computer code development are still ongoing. Therefore, this study used the earlier USGS information instead of the ongoing update program. a. It seems that the intent of this paragraph is to reference the recently published Central and Eastern United States Seismic Source Characterization (CEUS SSC) model. Instead of saying: "The USGS 2008 information is being further developed and updated by a group of stakeholders, including the NRC, in a collaborative study," the paragraph should reference the CEUS SSC model and note that it is a new seismic source model cosponsored by EPRI, DOE, and NRC. Also, clarify that CEUS SSC is independent of the USGS 2008 model. b. Change "ground motion attenuation models" to "ground motion prediction equations (GMPEs)" and make the distinction that the GMPE update effort was not part of the CEUS SSC model and it is an industry effort, which is still in progress. c. Add a sentence to justify the use of the USGS 2008 model for the purposes of this scoping study, since the USGS hazard model is not endorsed by the NRC in licensing new reactors (currently the CEUS SSC model is the NRC approved starting model). d. Add a disclaimer stating that the use of the USGS hazard is not consistent with the hazard defined in the licensing basis for new reactors. This comment also applies to Section 3.1 (page 29, 2nd paragraph).	Jose P.	Response: The revised report will read (note that for a scoping study of this type we try to the extent possible, to avoid references to application reviews or licensing-related activities) A group of stakeholders, which includes the NRC, is developing a new probabilistic seismic hazard model in a collaborative study which comprises two parts: (1) the seismic source zone characterization and (2) the ground motion attenuation models. In addition, the NRC is developing independent methods and computer codes, which will be publicly available when completed, to combine parts (1) and (2) above. Although part (1) of this updating effort has been completed (NRC, 2012b), it was not completed at the start of this scoping study. In addition, part (2) and the computer code development are still ongoing. Therefore, this study used the existing USGS (2008) model instead of the model in the ongoing program.		Closed	DivDir Concurrence	--

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380	NRO	03.29.13	2	Theresa Clark	<p>7.4. Table 3 (the first entry on page 22) includes this paragraph:</p> <p>In general, for an aftershock to cause subsequent additional damage to a structure, it would have to occur much closer to the site than the main event and with characteristics, for example frequency content, that would make the structure especially vulnerable to it. The earthquake ground motion considered in the SFP scoping study is a probabilistic quantity that aggregates motions from events with various magnitudes and distances to the site. For this site, this probabilistic ground motion already tends to be controlled by relatively close events in the larger magnitude range for the credible seismic sources. This main shock cracks the SFP studied but its structure is still stable after the earthquake and it cracks in a manner that allows for additional loading cycles at this level. Under these conditions, earthquake ground motions greater than those for the main shock would be needed to further damage the SFP. This is unlikely given that the ground motion considered is already controlled by close events with magnitudes near the credible upper magnitudes for the site.</p> <p>It would be better to just state that current probabilistic seismic hazard analysis (PSHA) models do not consider aftershocks and that is why they were not considered in this study. Otherwise the statements in the above paragraph would lead to the following comments that should be clarified:</p> <p>a. There is no discussion on the controlling earthquakes and the associated annual exceedance frequencies to support the statement that "[f]or this site, this probabilistic ground motion already tends to be controlled by relatively close events in the larger magnitude range for the credible seismic sources."</p> <p>b. Aftershocks can be numerous and substantial (especially if the study is considering very low probability events).</p> <p>c. Aftershocks could in fact be closer to the site than the main shock, and that could be significant since the report stated previously that the estimated ground motions at the reference site are controlled by nearby events.</p>	Jose P.	<p>Response: We verified that the contributing earthquakes are nearby events and the report has been modified to read:</p> <p>In general, for an aftershock to cause subsequent additional damage to a structure, it would have to occur significantly closer to the site than the main event as well as spectral accelerations at frequencies that would make the structure vulnerable to the ground motion. For this site, and for events associated with PGAs and spectral accelerations of interest for risk assessment (high PGA, low likelihood events), the main contributors to the ground motion hazard for this site are expected to be moderate magnitude nearby earthquakes (http://earthquake.usgs.gov/hazards/apps/#designing). The main event would crack the SFP studied but its structure would be stable after the earthquake and would crack in a manner that is expected to resist additional loading cycles at this level. Under these conditions, earthquake ground motions with damage potential greater than that for the main event would be needed to further damage the SFP. This is thought to be unlikely given that the contributors to the ground motion hazard are already nearby events.</p>		Closed	DivDir Concurrence	--
381	NRO	03.29.13	Pg29	Theresa Clark	Section 3.1 (page 29, 3 rd paragraph) mentions the hazard estimates for a rock site. The report should discuss the implications for soil sites, as well as the implications of sites with different controlling earthquakes. Clarify how SFP characteristics vary between different operating plants and what are the implications of this variation	Jose P.	Response: The study focuses on, to the extent possible, a site-specific hazard estimate to avoid assumptions that are not realistic. The site chosen is a rock site. Consideration of the items raised would be out of the scope of the work. See also the response to Comment #393.		Closed	DivDir Concurrence	--
382	NRO	03.29.13	Pg29	Theresa Clark	Section 3.1 (page 29, paragraphs 4 to 6) includes bullets that compare the USGS 2008 hazard estimates for the reference site with the LLNL and EPRI results. The report should clarify the purpose of these comparisons.	Jose P.	Response: The report has been revised to read:		Closed	DivDir Concurrence	--
383	NRO	03.29.13	Pg31	Theresa Clark	Section 3.1 (page 31, Figures 4 and 5) should indicate in the figure captions that these are hard rock hazard curves	Jose P.	Response: The captions have been modified to address the comment.		Closed	DivDir Concurrence	--
384	NRO	03.29.13	Pg33	Theresa Clark	Section 3.2 (page 33, last paragraph) includes this statement: "In addition to the PGA, ground motions at a site are also characterized by their frequency content expressed in terms of response spectra. Based on the USGS 2008 model, a uniform hazard site Ground Motion Response Spectrum (GMRS) (NRC, 2007b) was derived for the GI-199 study and used in this study." It is incorrect to combine the term uniform hazard response spectra with the term GMRS. In addition, Footnote 5 states that "the term GMRS has a specific meaning in the context of Regulatory Guide (RG) 1.208 (NRC, 2007b). In this report, the term GMRS is used more generally." The report should describe how the response spectrum for the selected site was developed. If it is not consistent with the definition of the GMRS in RG 1.208, then use a different name. Clarify whether the response spectrum for the reference site shown in Figure 7 is a uniform hazard response spectrum. In addition, do a global search for "GMRS" because it is used throughout the report.	Jose P.	<p>Response: The footnote has been deleted. After further examination, it was confirmed that the GMRS in the report is based on the guidance in Regulatory Guide 1.208 used in conjunction with USGS (2008) model. This is clearly noted in the report and repeated often. Use of a different hazard model and maybe a more detailed analysis might produce a somewhat different GMRS. We do not think that the footnote is needed because the assumptions are clearly indicated. Also, as per the response to the comment related to the use of the USGS (2008) model (comment 379) we prefer not to make references to licensing review aspects in a study of this type.</p> <p>Nevertheless, when referring to the GMRS, the text in the report will be modified to replace "site GMRS" with "reference GMRS." Also, the text at the end of Section 3.2 and after Table 5 will be modified to read:</p> <p>In addition to the PGA, ground motions at a site are also characterized</p>		Closed	DivDir Concurrence	--
385	NRO	03.29.13	Pg34	Theresa Clark	In Section 3.3 (page 34, 1st and 2nd paragraphs), change "Peach Bottom" to "reference site" and do a global search for further changes because "Peach Bottom" appears in multiple places.	Jose P.	Response: The report will be searched for that and the change made as appropriate, which include the occasions noted in this comment. Note that the report identifies the plant on which the reference plant is based.		Closed	DivDir Concurrence	--

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386	NRO	03.29.13	Pg35	Theresa Clark	The second paragraph on page 35 includes this statement: Vertical spectral accelerations and the vertical PGA are taken to be the same as the horizontal spectral accelerations and PGA. This is assumed on the bases that nearby earthquakes would control the ground shaking spectra for this event and that the frequencies of interest for this study are frequencies above 5 Hz (ASCE, 1999) (McGuire, Silva and Costantino, 2001). The report should describe how controlling earthquakes were determined.	Jose P.	Response: The report has been revised to read: A few studies (e.g., McGuire, Silva, and Costantino, 2001; ASCE, 1999) indicate that for rock sites and frequencies near and above 10 Hz, and especially nearby seismic sources, vertical spectral accelerations may be as high as or exceed horizontal spectral accelerations. For this study, the frequencies of interest are, for the most part, frequencies near or above 10 Hz. Therefore, the assumption of equal vertical and horizontal spectral accelerations was deemed to be a reasonable starting assumption. This assumption is also supported by seismic hazard de-aggregation with the USGS (2008) model.		Closed	DivDir Concurrence	--
387	NRO	03.29.13	Pg35	Theresa Clark	Section 3.3 (page 35, 2nd paragraph) describes other "ground motion response spectra of interest for this study." Clarify which response spectra were used in the structural analysis described later in the report.	Jose P.	Response: The report has been revised to clarify this. In addition information from Section 4 will be brought to Section 3.3. The end of section 3.2 will include the following: These spectra are of interest for comparison purposes. The spectra in		Closed	DivDir Concurrence	--
388	NRO	03.29.13	11	Theresa Clark	Chapter 11, conclusion 5, footnote 43 gives the timeframe during which the fuel cannot be cooled by air. The Information Security Branch of NSIR should be consulted to confirm that this information is not security-related sensitive unclassified non-safeguards information, because the study is intended to be made publicly available.	Jose P.	Response: The RES staff views the information as non-sensitive because it stems from the plant's response to a large seismic event (something an adversary cannot generate). Staff will confirm with NSIR and revise the report if necessary.		Closed	DivDir Concurrence	--
389	NRO	03.29.13	11	Theresa Clark	Chapter 11, conclusion 6 seems to imply that the additional spent fuel pool instrumentation required by Order EA-12-051 is not effective for mitigating spent fuel pool accidents. Text should be added to this conclusion to explain its technical basis.	Jose P.	Response: The report indicates that the required instrumentation is important to provide reliable indication to ensure that plant personnel can prioritize emergency actions. Further indication can affect which mitigation strategy is deployed as discussed in Chapter 2 of the report. Consideration of EA-12-051 was outside the scope of the study because it was not implemented by industry or verified by NRC at the time the plant was analyzed.		Closed	DivDir Concurrence	--
390	NRO	03.29.13	11	Theresa Clark	Chapter 11, conclusion 7 seems to imply that the additional mitigation capabilities required by Order EA-12-049 were not credited in the study. The additional mitigation capabilities required by Order EA-12-049 should be credited to improve the study's realism.	Jose P.	Response: Consideration of EA-12-049 was outside the scope of the study because it was not implemented by industry or verified by NRC at the time the plant was analyzed.		Closed	DivDir Concurrence	--
391	NRO	03.29.13	11	Theresa Clark	Chapter 11, conclusion 16 states the study demonstrates that past spent fuel pool risk estimates from large seismic events are similar to this study for most consequence metrics. Text should be added to this conclusion to explain its technical basis.	Jose P.	Revised to add reference to Appendix B comparisons.		Closed	DivDir Concurrence	--
392	RES/DE	?	General	?	This report provides the methodology and results of a limited-scope consequence study to update the best-estimate consequences expected from the application of a postulated beyond design-basis earthquake (with an estimated frequency of occurrence of one event in 61,000 years) to a selected U.S. Mark I boiling-water reactor spent fuel pool. The primary objective of the study is to provide updated and publicly available consequence estimates of a representative, postulated spent fuel pool severe accident under high density and low density loading conditions. These estimates can then inform ongoing discussions as to whether action should be taken to require operators of U.S. nuclear power plants to expedite movement of fuel from the spent fuel pool to onsite, dry cask storage. I would delete the last sentence and replace it with this: These estimates can be used to confirm that the current industry strategy favoring high density fuel storage in spent fuel pools remains adequately safe and whether a change in strategy towards low density fuel storage in spent fuel pools might represent a significant safety improvement.	Brian W.	Response: We did not change the wording as suggested, but we did revise the wording to say "The study will be used to inform regulatory decision-making regarding whether expedited transfer of spent fuel from spent fuel pools to casks is justified." Additionally, a paragraph has been added to the report to describe the study's relationship to the Tier 3 activities and how the study will be used in the current regulatory process.		Closed	DivDir Concurrence	--

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393	NRR	03.29.13	General	Jack Davis	From a DSS perspective, we believe the report needs to be revised to clearly indicate why the study was done, why we chose the seismic response that we did, and how this compares to what would be expected at our 104 nuclear plants (or at least put in perspective that this is representative of a small subset of U.S. reactor designs). I really liked Rich's characterization in that the message is that we evaluated at the design basis and got no release. We doubled it and got no release, we tripled it and got no release so we went to four times the design basis and finally got a release for a very small number of unmitigated scenarios.	Hossein E.	<p>Response: The report was revised to incorporate the following points that address this comment:</p> <ul style="list-style-type: none"> • The study was done to confirm the results of past studies using state-of-the-art tools, as well as Fukushima insights, in a publicly available study. • The study will inform the Tier 3 activity by providing an updated technical basis for any regulatory action and input for the regulatory analysis. • The study used design, operational, and location data for a reference site for which we already had information available, a BWR Mark I with an elevated SFP. The report also considered a 1x4 pattern (required after some time after offloading) as well as sensitivity analysis for more favorable loading (1x8) and less favorable loading (checkerboard and uniform) and sensitivities for other key parameters that will provide insights for analysis of other plants. • The report was revised to make clearer that a low likelihood beyond design basis seismic event with and without mitigation was chosen to gain risk insights that could not be gained using a less severe seismic initiator. NRC analyzes low likelihood beyond design basis seismic events with and without mitigation to gain insights on the safety margin provided by NRC's regulatory framework. • The study concludes that the SFP is robust and not expected to leak, successful mitigation prevents most releases, no early fatalities are expected and individual LCF is low because effective protective actions limits individual exposure. (Note that high and low density mitigated moderate leak scenarios in the first week (OCP 1) resulted in releases, all other scenarios that resulted in releases were unmitigated and within the first few months (OCP 1, 2, 3) after shutdown.) 		Closed	DivDir Concurrence	--
394	NRR	03.29.13	General	Jack Davis	DSS also challenges why we are evaluating land contamination since no previous study directly discussed this issue. Considering that the Commission is currently reviewing whether to change its long-standing policy on addressing land contamination, it may be premature to evaluate this particular aspect in the report at this time.	AJ N.	<p>Response: The study included land contamination to provide inputs to a regulatory analysis. A paragraph has been added to the introduction to describe the study's relationship to the Tier 3 activities and how the study will be used in the current regulatory process. Other analyses did evaluate land contamination, including some directly (e.g., NUREG/CR-6451, NUREG-4982). Land contamination is already part of NRC's current regulatory framework including being used as input in SAMA/SAMDA analyses and is an input to regulatory/backfit analyses as part of the cost benefit analysis. Chapter 7 was revised to distinguish the safety-related individual health effects measures from other measures that are inputs to the cost-benefit analysis for the regulatory analysis.</p>		Closed	DivDir Concurrence	--
395	FSME	05.07.13	Pg. ii	Kimyata MorganButler	3rd paragraph lines 5 and 7: studies should be "study's" in one place, and "studied" in the next line	Kathy G.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
396	FSME	05.07.13	Pg. 16	Kimyata MorganButler	add a "d" to increase	Don A.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
397	FSME	05.07.13	Pg. 21	Kimyata MorganButler	Add the Major assumption. Right now is just says "Seismic Hazard models". The last line of the comment column "This study used the existing USGS (2008) model instead of the model in the ongoing program" would be a good addition	Andrew M.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
398	FSME	05.07.13	Pg. 23	Kimyata MorganButler	change the assumption wording. Delete "enters" and say "No significant debris generated by the seismic event would damage the SFP"	Brian W.	The point is whether the debris enters the pool, thus creating the potential for structural damage to the racks OR flow area blockage at the assembly exits - the wording change would only address damage to the SFP structure itself.		Closed	Outside Planned Process	
399	FSME	05.07.13	Pg. 141	Kimyata MorganButler	2nd paragraph, line 6 – The period is missing after the parentheses at the end of the sentence.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
400	FSME	05.07.13	Pg. 151	Kimyata MorganButler	add "are" before "consistent with NRC's safety goals (NRC 1986)	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	

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401	FSME	05.07.13	Pg. 9	Kimyata MorganButler	Consider adding more explanation following the simple sentence "Note that sabotage events have been excluded from the scope of this study".	Brian W.	We originally had more explanation about how some of the phenomenology may be applicable to sabotage events, but received comments expressing concern that even that much may be sensitive so it was deleted.		Closed	Outside Planned Process	
402	FSME	05.07.13	Pg. 23	Kimyata MorganButler	Major assumption "Aftershocks are not likely to induce subsequent damage to the SFP": If this is the case, why did TEPCO reinforce spent fuel pool number 4 if subsequent aftershocks would not induce additional damage. This assumption should be reviewed.	Jose P.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
403	FSME	05.07.13	Pg. 24	Kimyata MorganButler	Are you sure "core shuffle", vice full core offload, is "typical for BWRs"	Brian W.	Yes, based on conversations with Steve Jones.		Closed	Outside Planned Process	
404	FSME	05.07.13	Pg. 25	Kimyata MorganButler	Major assumption "50.54(hh)(2)...: What impact did the earth quake have on the makeup delivery systems? Where they functional? What damage was observed to systems at Onagawa NPS? The PGA at Onagawa was almost identical to your base case.	Brian W.	Whether or not the equipment survives the earthquake was not analyzed. This is one of the uncertainties that justifies the unmitigated results as discussed in Section 5.3.2 of the report.		Closed	Outside Planned Process	
405	FSME	05.07.13	4	Kimyata MorganButler	Pg. 38: last paragraph, line 1: Change "Section 9.7 provides" to Section 10.6 provides"	Don A.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
406	FSME	05.07.13	Pg. 66	Kimyata MorganButler	last paragraph: Comment: for the scenario considered, seismically induced failure or severe damage to the reactor building would not be expected for the scenario considered. This scenario is considered by the authors as a moderate earthquake. Are moderate earthquakes by definition considered beyond design basis? This should be clarified.	Jose P.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
407	FSME	05.07.13	Pg. 75	Kimyata MorganButler	second paragraph: The SFP water level decreases by 0.5 m (1.5 ft) due to sloshing in this paragraph, but only sloshing "is not considered to cause more than 1 ft of water loss" on page 65. Amount of water loss and units reported are not consistent.	Jose P.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
408	FSME	05.07.13	Pg. 82	Kimyata MorganButler	line 2: revise to "...frequency of approximately one event in 60,000 years for Delta, PA." The frequency is unit and location specific.	Jose P.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
409	FSME	05.07.13	Pg. 91	Kimyata MorganButler	Table 19, class 13. Is the name of the class really Boron even though it also includes silicon and phosphorus?	Hossein E.	MELCOR groups chemical elements into classes for tracking purposes in the radionuclide model package. MELCOR classes are set up for similar chemical characteristics and volatility. There are good reasons for including these three into the same class. All three are network-forming near metals. Boron and phosphorus readily substitute for silicon in silicates, and all form hard rocksalt like refractory solids with metallic Zr.		Closed	Outside Planned Process	
410	FSME	05.07.13	Pg. 91	Kimyata MorganButler	paragraph 2, line 5: Is the September 2001 date correct. Cycle 18 for Peach Bottom was September 2011 (see page 93 of the report).	Hossein E.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
411	FSME	05.07.13	Pg. 145	Kimyata MorganButler	paragraph 4: Consider Deleting or expanding explanation. The methodology of truncation should be either be removed from the document or explained more clearly. One criticism that could be made is that under the truncation methodology, no public exposures in Japan would be considered nor would the majority of worker exposures (if thyroid organ dose due to iodine is excluded, which is appropriate of the scenario under consideration).	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
412	FSME	05.07.13	Pg. 149	Kimyata MorganButler	paragraph 4: The failure of roadway infrastructure likely is underestimated and is very site specific for rural Pennsylvania. Significant structural damage to roadways (not just bridges) impeded the emergency vehicle response to Fukushima Daiichi.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
413	FSME	05.07.13	Pg. 149	Kimyata MorganButler	last paragraph: the assumption there is no power loss beyond 20 miles may be underestimated. Power outages due to the earthquake exceeded 200 km due to the toppling of transmission towers, especially in Fukushima Prefecture.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
414	FSME	05.07.13	Pg. 153	Kimyata MorganButler	Table 29, Overall Consequence Results, Low Density, Measures related to cost benefit analysis: Is it correct that mitigation credit under 50.54(HH)(2) results in more land interdiction and displaced individuals than no mitigation? Are the low density, no mitigation credit numbers correct? If correct, an explanation in the text might be useful.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	

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415	FSME	05.07.13	Pg. 153	Kimyata MorganButler	Table 29 Consider deleting from the table the middle portion on Conditional Consequences. This information may be misused. It is listed, for example, as "Individual Latent Cancer Fatality Risk within 10 miles" and you have values of E-4. Consider changing this discussion from table format to verbage. The lower portion of the table that provides the cancer fatality risk based on the event occurring is E-11 or 12. That result aligns better with the message of the report.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
416	FSME	05.07.13	Pg. 154	Kimyata MorganButler	Section 7.2.1, paragraph 1, lines 6-7: Delete "however, these radionuclides yield exposures that are more chronic in nature and are relatively less likely to result in high acute doses." Reason: this is factually incorrect. The principle isotope of concern is cesium, a gamma emitter. The nature of the isotope isn't the issue, it's the concentration (Bq/m2) of the radionuclide in the environment.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
417	FSME	05.07.13	Pg. 154	Kimyata MorganButler	paragraph 2: The projection of no early fatalities is incorrect. There are likely to be fatalities associated with evacuation of hospitalized patients as was demonstrated in Japan. A correct statement would be no early fatalities attributable to radiation exposure.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
418	FSME	05.07.13	Pg. 155	Kimyata MorganButler	paragraphs 3, 4 and 5: Consider Deleting or developing the rationale for using the alternate dose response. It is not clear how and why these alternate dose responses are used. Perhaps, no discussion of alternative dose response models should be included in the report. The NRC risks accusations of white washing the LCF data if it not clear why and how these numbers are being used. (see comment below for pg 237)	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
419	FSME	05.07.13	Pg. 155	Kimyata MorganButler	Paragraph 4, line 1 residents is spelled incorrectly	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
420	FSME	05.07.13	Pg. 156	Kimyata MorganButler	Table 30: Consider Deleting or expanding explanation Reason: The conditional individual information is bound to confuse the lay audience especially given the very low likelihood of an event occurring. The information concerning truncation could be described as an industry whitewash of the long term health consequences of effluent or accidental releases if it is not clearly articulated why we are using alternative dose response models.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	

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421	FSME	05.07.13	Pg 157	Kimyata MorganButler	paragraph 1: A comment about the impact of precipitation (rainout) is needed. The impact of precipitation at Fukushima Daiichi is evident based on ground deposition to the northwest of the NPP.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
422	FSME	05.07.13	Pg. 157	Kimyata MorganButler	Consider Deleting based on comment on Page 155, paragraphs 3, 4 and 5 above: o Page 157, paragraph 2, last sentence:	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
423	FSME	05.07.13	Pg. 158	Kimyata MorganButler	Consider Deleting based on comment on Page 155, paragraphs 3, 4 and 5 above: o page 158, Figure 92: Delete 620 mrem/y and 5 rem/y truncation bars	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
424	FSME	05.07.13	Pg. 158	Kimyata MorganButler	Consider Deleting based on comment on Page 155, paragraphs 3, 4 and 5 above: o Page 158, paragraph 1, last sentence	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
425	FSME	05.07.13	Pg. 206	Kimyata MorganButler	Table 48, Uniform Pattern Consequence Results, Measures related to Health and Safety of Individuals: Delete this section. Reason: The section can be misinterpreted and will detract from the message that consequences associated with the accident are very low, as described in the section below describing consequences per year.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
426	FSME	05.07.13	Pg. 207	Kimyata MorganButler	Table 49 and paragraph 2: Delete. Reason: see general comment.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
427	FSME	05.07.13	Pg. 237	Kimyata MorganButler	#11, last sentence—This sentence should either be deleted or expanded to give a clear statement on why the truncated doses were used. (It seems that truncated doses are being used to give a range of uncertainty. If this is the case, perhaps this should be represented more clearly in the tables and discussion associated with the truncated numbers. (also see #6 under the Communications Plan section below)	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
428	FSME	05.07.13	Pg. 230 and Pg. 170	Kimyata MorganButler	Also – verify land interdiction numbers for low density with and without mitigation (230; 170)	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
429	FSME	05.07.13		Kimyata MorganButler	NOTE: this comment on deleting “conditional consequences” applies to other Tables also – For Example Tables 48 and 49 on pages 206-207.	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
430	FSME	05.07.13		Kimyata MorganButler	There are OOU markings on document. Resolve with NSIR. You state the report will be publicly available. Pg. 69 covers actual SFP loading pattern...which may have been OOU in the past. Verify.	Don A.	Beyond staff reviews by the IOWG, BC, DivDir. We have also sent the document out for fact check to PB earlier. We will again send the document out to PB on 06.10.13 for purposes of reviewing for SRI		Closed	Outside Planned Process	
431	FSME	05.07.13		Kimyata MorganButler	In the introduction, the authors discuss the rationale for using Peach Bottom as the base case for this study. This should be reiterated throughout the study so as to not encourage members of the public from criticizing the report because the plant is located in a rural area which is seismically more stable than other plants around the nation. The overall consequence results are fairly unique to Peach Bottom.	Brian W.	It's not clear where else in the report this justification would fit. The authors agree that the study is site-specific and that results are expected to vary for other sites. The authors have attempted to be clear that this study is not attempted to generically answer the expedited transfer question.		Closed	Outside Planned Process	
432	FSME	05.07.13		Kimyata MorganButler	The authors should acknowledge that the frequency of occurrence of earthquakes vary by geological and geographical area. Although the Peach Bottom occurrence is quite low (1.7E-05), the Great East Japan earthquake with a magnitude 9.0 was a 1 in 1,000 to 1,200 year occurrence. The PGA at Fukushima, 180 km distant, was approximately 0.5 g, yet the predicted frequency of occurrence in Figure 2 varies from 6E-6 to 2E-5. How is this reconciled without discussing regional variations?	Jose P.	The study addresses a reference plant and site. Figures 4 and 5 in Ch. 3 provide a brief insight on local seismic hazard variability. Regional seismicity is out of the scope of the study. Section 4.3 addresses two actual events in Japan but not their likelihood.		Closed	Outside Planned Process	
433	FSME	05.07.13		Kimyata MorganButler	In multiple sections of the report, the authors switch back and forth between “SI units (traditional units)” and “Traditional units (SI units)”. Paragraph 1 on page 64 is just one example where the reported units were interchanged within the same paragraph. Stick with one format.	Hossein E.	The various units came from different sources and documents. Some are design information that were originally in British units and it was appropriate to cite them as is (with conversion to SI units in parenthesis). Others were assumptions, defaults, and setpoints (e.g., for models) in SI units as part of this study, and it was appropriate to cite them as is (with conversion to British units in parenthesis).		Closed	Outside Planned Process	

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434	FSME	05.07.13		Kimyata MorganButler	The authors report Latent Cancer Fatality Risk in terms of LNT which is advocated by the scientific community. As such, reference to alternative models and the calculation of risk with dose truncation should be deleted. These calculations are not scientifically defensible and will detract from the overall methodology being addressed. If dose truncation of 5 rem in the first year and 10 rem lifetime were applied to the Japanese public and a majority of the Fukushima Daiichi nuclear power station workers, then no LCFs would be predicted; a result that would not be publicly accepted. If these models are given to give a range of uncertainty, this should be clearly explained and perhaps presented in a more clear way in the tables (i.e. table 29 and 49)	AJ N.	Comments superseded by FSME comments on 05.20.13		Closed	Outside Planned Process	
435	FSME	05.07.13		Kimyata MorganButler	Item (3) Consider deleting "inadvertent" before "aircraft crashes"	Brian W.	The word is deliberately used to distinguish between inadvertent aircraft crashes that were considered by past safety studies and deliberate aircraft crashes that were considered in the security assessments and the recent Part 52 rulemaking.		Closed	Outside Planned Process	
436	NRR	05.15.13	Pg. 184	Eric Bowman	noted that the description of the storage location for the diesel driven portable pump on page 184 would be considered Official Use Only – Security Related Information, as would any specific details of the storage locations for the 50.54(hh)(2) equipment.	Jose P.	I assume that this refers to the description in Section 8.2.2. This was changed to remove the reference to the location. It does not seem necessary. Instead the text now says 'a trailer near the pump'.		Closed	OD Concurrence	
437	NRR	05.15.13	D-1	Eric Bowman	One other minor thing; the NRC seal used on page D-1 is incorrect because it has brown tail feathers. The correct ones to use are available at http://www.internal.nrc.gov/ADM/branding/seals.html . See the sentence directly above the Guidance section	Fred S.	Agree. deleted NRC seal.		Closed	OD Concurrence	
438	NRR	05.16.13	ii	Eric Bowman	The Foreword uses the phrase "beyond design basis accidents" to discuss the risks studied in this paper rather than "beyond-design-basis events." I'm not sure why we are characterizing the study as being on accidents as it seems to me to be better categorized as a study on the risk of events rather than accidents.	Kathy G.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
439	NRR	05.16.13	v	Eric Bowman	The first sentence of the second full paragraph reads "The study's analyses shows that a release from a spent fuel pool accident after the severe earthquake at the reference plant could occur between six out of a billion times and one out of 10 million times per year." The description of the units strikes me as odd since it starts out as an event frequency of once per 60,000 years (or, perhaps, 1.7 times every 100,000 years) and is diminished by the subsequent dimensionless probabilities. It strikes me that it would be better discussed as being "six times every billion years or one time every 10 million years." (Note: Please discuss this with Jose before making changes, and this conflicts with a comment he had.)--AJ Nosek	Kathy G.	addressed		Closed	OD Concurrence	
440	NRR	05.16.13	2	Eric Bowman	The list of Abbreviations and Acronyms includes the entry "MELCOR - not an acronym," but omits a variety of other items that are similarly situated. For example, NUREG, LSDYNA, CORSON, SCALE, MAVRIC, BONAMI, CENTRM, DENOVO, FW-CADIS and VELCOR are also not acronyms, but are used within the document in all capital letters (as is MELCOR) but omitted from the list of acronyms. If there is value perceived in highlighting those instances where there is a usage of proper names for things in all capital letters that are not acronyms, it should be internally consistent throughout the document. (N.b., the proper usage of LSDYNA appears to be LS-DYNA and it seems to be a partial acronym with the LS standing for Livermore Software.)	Don A.	See Comment 588		Closed	OD Concurrence	
441	NRR	05.16.13	10	Eric Bowman	The second to last paragraph includes "Error! Reference source not found." repeated three times.	Brian W.	Inserted reference to section 2.2.		Closed	OD Concurrence	

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442	NRR	05.16.13	17	Eric Bowman	The discussion in the middle of page 17 on the NTTF Report omits mention of recommendation 4.1, which would have added SFP cooling to SBO capabilities. Of significant note, the order resulting from the evolution of the recommended 4.1 rulemaking and the recommended 4.2 order is the regulatory action that puts in place requirements for SFP cooling, while the items discussed from recommendation 7 only put in place requirements for an SFP level instrument.	Brian W.	Suggested changes have been made.		Closed	OD Concurrence	
443	NRR	05.16.13	28	Eric Bowman	The units chosen for the study assumptions for temperature shift from K to C under different portions of this page. I'm not sure that there is a good reason for the change, but it might be worth considering making them consistent. Also, the results of the analyses appear to be in K vice C, which might make that a more useful unit to use, or at least to translate the assumption to parenthetically.	Hossein E.	Some setpoints and default values are provided in K as they pertain to numerical values in models. Some values in C are direct references to other reports. This is appropriate for this report.		Closed	OD Concurrence	
444	NRR	05.16.13	29	Eric Bowman	The final assumption comment on this page uses the acronym AC rather than ac for alternating current. The use of lower case letters, which would match the list of abbreviations and acronyms, would better match the standard agency usage.	Brian W.	changed to lowercase.		Closed	OD Concurrence	
445	NRR	05.16.13	31	Eric Bowman	The first full paragraph starts out with the sentence "For each of these, large seismic events and severe weather LOOP events are logically the most relevant initiators, as they are the type of initiators that are most likely to initiate an accident at the reactor and SFP, while simultaneously hampering further accessibility to key areas, key systems and components, and key resources." It might be better to discuss the latter as being a severe weather SBO; for a LOOP alone the availability of emergency diesel generators would prevent an accident at the reactor and SFP.	Jose P.	See response to comment #600.		Closed	OD Concurrence	
446	NRR	05.16.13	50	Eric Bowman	The abbreviations E, W, N, and S are omitted from the list of abbreviations and acronyms.	Don A.	Added		Closed	OD Concurrence	
447	NRR	05.16.13	86	Eric Bowman	The common usage for NEI documents should be NEI 06-12 rather than NEI-06-12.	Jose P.	Checked that this change was made in the current version of the report.		Closed	OD Concurrence	
448	NRR	05.16.13	88	Eric Bowman	The final bullet includes "Error! Reference source not found." repeated three times.	Brian W.	Inserted reference to section 2.3.		Closed	OD Concurrence	
449	NRR	05.16.13	93	Eric Bowman	The bullet preceding Section 5.6.2. includes "Error! Reference source not found." repeated three times.	Brian W.	Inserted reference to section 2.3.		Closed	OD Concurrence	
450	NRR	05.16.13	176	Eric Bowman	Section 8.1.1 bullet (1) makes the statement "As mentioned earlier, the water in this scenario would take 9 days to decrease to the fuel rack top." I could not find this mention previously in the document and it does not match the licensee's reported time to boiling to the top of fuel in their EA-12-049 integrated plan (ML13059A305 at page 30) which is 95 hours for non-outage conditions and 33 hours for the design basis heat load.	James C.	The 9 days (changed to 7 days to be consistent with the other section of the report) is based on the SFPs calculation for the reference plant. James disagrees using EA-12-049's number for the calculation. There are differences between the actual situation (i.e., SFPs calculation) and regulatory requirement (EA-12-049). The HRA calculation should be based on actual situation.		Closed	OD Concurrence	
451	NRR	05.16.13	184	Eric Bowman	The description of the location of the 50.54(hh)(2) equipment storage on this page should be designated for Official Use Only - Security Related Information per SRM-SECY-04-191.	James C.	Removed from the text.		Closed	OD Concurrence	
452	NRR	05.16.13	249	Eric Bowman	There are a number of references to the PBAPS FSAR, but it is not listed as a reference.	Brian W.	The FSAR is not public so it can be referred to in the text but not included in the reference list.		Closed	OD Concurrence	
453	NRR	05.16.13	B-7	Eric Bowman	The paragraph immediately preceding section B.7.2 includes "Error! Reference source not found." repeated three times.	Andrew B.	Formatting will be corrected		Closed	OD Concurrence	
454	NRR	05.16.13	B-10	Eric Bowman	The final paragraph includes "Error! Reference source not found." repeated three times.	Andrew B.	Formatting will be corrected		Closed	OD Concurrence	
455	NRR	05.16.13	B-11	Eric Bowman	The first partial paragraph on the page and Section B.7.7 both include "Error! Reference source not found." repeated three times.	Andrew B.	Formatting will be corrected		Closed	OD Concurrence	
456	NRR	05.16.13	D-1	Eric Bowman	The NRC seal used on this page is the improper one (it has brown tail feathers).	Fred S.	Agree. Deleted NRC seal.		Closed	OD Concurrence	
457	RES	05.16.13	D	Hossein Esmaili	General - Appendix D should be reviewed for consistency with the rest of the report. Some of the materials and paragraphs in this appendix are direct quotes from the main body of the report and can be properly referenced and not repeated. Another example is the reference to page 67 of the report on page D-25 "In this configuration, the reference plant spent fuel pool stores 852 assemblies (Spent Fuel Pool Study, p.67)." The pagination may have changed.	Fred S.	Incorporated. Figure, section, and table references were checked and modified to use cross-referencing. Appendix D references to pages in the main report were changed to section references using cross-referencing. SFPs, p. 67 was converted to SFPs section 5.1 [appeared in §D.3.2.3.9] and SFPs, p. 7 was changed to SFPs section 1.3 [appeared in §D.3.4.6].		Closed	OD Concurrence	
458	RES	05.16.14	D	Hossein Esmaili	A list of assumptions and potential conservatism may be beneficial to put the results in context. For example, assuming 100% leak for seismic bin 4, and not considering the added risk of cask handling.	Fred S.	The 100% linear fragility for seismic bin 4 is addressed in Table 73. The cost and risk impacts associated with the cask handling is discussed in section D 2.2.		Closed	OD Concurrence	

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459	RES	05.16.15	D	Hossein Esmaili	The conditional probability of release value of 8.57% for Seismic bin 4 is based on an ac power fragility value of 1.0, an OCP probability value of 60/700 or 8.57%, and a liner fragility of 1.0. There may be some uncertainty in the cooling time during the operating cycle for Bin 4 since the extent of damage to the pool is not known and may differ from Bin 3 that predicted 60 days in the operating cycle. The analysis appropriately takes a bounding approach to liner failure probability of 1.0. This should be acknowledged in the report, but the break-even analysis suggests that the release frequency must at least increase by a factor 36 to meet this objective.	Fred S.	Agree. Revised the following text to Table 73, note 6, "The conditional probability of release value of 8.57% based on an ac power fragility value of 1.0, an OCP probability value of 60/700 or 8.57%, and conservatively assumes a liner fragility of 1.0 (e.g., 100-percent likelihood of pool liner failure) for a bin 4 earthquake and for a cask drop within the pool.		Closed	OD Concurrence	
460	RES	05.16.16	D	Hossein Esmaili	Two end dates for the operating license are given, 2028 in section D 3.2.3.1 and 2034 in section D 3.2.2.3.	Fred S.	The Peach Bottom Unit 3 license expires on 7/2/2034 per http://www.nrc.gov/info-finder/reactor/pb3.html . Conforming changes were made to section D 3.2.3.1.		Closed	OD Concurrence	
461	RES	05.16.17	D-15	Hossein Esmaili	10,000 µSv per hour is 1 rem per hour, and not 10.	Fred S.	Agree. Comment incorporated.		Closed	OD Concurrence	
462	RES	05.16.18	D-17	Hossein Esmaili	Table 7 should be modified to get rid of doses for April and May that are within the ranges specified in the Radiation Exposure column (e.g., 69.3 in April corresponding to > 250). More importantly, the analysis in Table 8 is mainly based on the Fukushima accident, but somehow it is tied to the "Immediate Accident Occupational Exposure for a Spent Fuel Pool Fire" in Table 8. Fukushima did not involve a SFP accident. The other accidents referenced in Table 9 were also not SFP accidents.	Fred S.	Table 7 was modified to remove doses for April and May that are not within the ranges specified in the Radiation exposure column. Spent fuel pool occupational accident occupational exposure are based on post reactor accident values that occurred at TMI-2, Chernobyl, and Fukushima consistent with guidance contained in the RA Handbook, appendix C.10, "Value-Impact Analysis of Accident Preventive and Mitigative Options for Spent Fuel Pools (NUREG/CR-5281)."		Closed	OD Concurrence	
463	RES	05.16.19	D-24	Hossein Esmaili	Sections D 3.2.3.9 states that "In 2012, the reference plant has 3,819 fuel assemblies stored .." The main body of report assumes 3055 assemblies and allows for 764 empty cells for full core offload. The issue is consistency.	Fred S.	Agree. The analysis is based on a high-density SFP inventory of 3,055 assemblies, a number based on the pool capacity of 3,819 assemblies, reduced by 764 assemblies to accommodate a full core offload capability. Comment incorporated.		Closed	OD Concurrence	
464	RES	05.16.20	D-28	Hossein Esmaili	It is stated that "These values are based on the MACCS2 and PRA analyses described in further detail in the Spent Fuel Pool Study and other referenced documents." Reference to PRA should be deleted, and it appears in other parts of the appendix. SFPSS is not a PRA, although probabilistic considerations are used.	Fred S.	Replaced "MACCS2 and PRA analyses" with "MACCS2 analyses and probabilistic considerations"		Closed	OD Concurrence	
465	RES	05.16.21	D3.4.10.4	Hossein Esmaili	Changes to the paragraph -> "In section 9.2 of the Spent Fuel Pool Study, a sensitivity analysis is provided in which a more favorable fuel pattern is considered in which eight cold assemblies surround each hot assembly (i.e., 1x8 fuel assembly pattern). Although only a few sensitivity analysis were performed using this configuration, the results looked promising. Preliminary findings are that for OCP3, there is no zirconium fire and no release from the fuel, but in OCP2, a zirconium fire is predicted, but the releases are lower compared to 1x4 pattern. none of the highest power fuel assemblies undergoes zirconium fire for small leak scenarios in OCP2 and OCP3, which had the highest release because of hydrogen combustion. The fuel thermal response has a uniform heatup when compared to the 1x4 pattern because there is more mass to absorb heat. Furthermore, the high density loading configuration allows for the storage of a total of 2,771 assemblies in the reference plant spent fuel pool, which allows for 764 empty cells for a full core offload and may result in similar reductions in risk to the low-density storage option evaluated without the significant capital costs for implementation. Further evaluation of this alternative and possibly other loading configurations for all operating cycle phases is recommended in order to consider these alternatives in a backfitting analysis."	Fred S.	Agree. Comment incorporated.		Closed	OD Concurrence	

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466	RES	05.17.13	General	Don Helton	I have restricted my review (other than 2 items noted below) to the up-front material and the Regulatory Analysis, to minimize the time impact on other projects. Overall, the preface materials (SECY, Foreword, and ES) do a reasonable job of balancing the varied internal stakeholder views, in my opinion. The comments below are intended to improve specific communication aspects, and in the case of the bolded comments (those that would collectively cause me to non-concur if not addressed) to ensure the staff's ability to defend the material. Maintaining the aforementioned balance is critical, and invasive changes made to the report prior to issuance could easily undermine that perceived balance. All comments are referenced to the version of the SECY/report in ADAMS on 5/13/13.	Team	No response required		Closed	OD Concurrence	
467	RES	05.17.13	General	Don Helton	The inclusion of the Regulatory Analysis (RA) in Appendix D brings in a new set of baggage associated with past agency assertions about the costs and benefits of spent fuel transfer. The NRC has refuted claims by intervenors that this action is cost-beneficial, most notably in the agency response to a 2003 paper by Robert Alvarez et al., of which the current NRC Chairman was a co-author. Very specific claims are made in the agency's response (e.g., that industry implementation estimates of \$3.5-7 billion dollars is an under-estimate. When SFPSS was a draft research study, ensuring consistency or issuing a revised fact sheet would have been a logical down-stream step. Now, the staff will be put in the position of trying to defend potential inconsistencies immediately. Each time the regulatory analysis is referred to, there needs to be a statement that says that the staff is in the process of comparing the results of the RA to past agency positions (or the like), and cognizant staff need to be given the time to thoroughly do this comparison.	Fred S.	Added the following to section D.3.2.3, "Assumptions." The costs presented in this analysis are based on estimates by the author or cited documents. It should be noted that this is a generic cost estimate and should be used accordingly. Site specific features may result in higher or lower costs than those estimated.		Closed	OD Concurrence	H
468	RES	05.17.13	General	Don Helton	Concerns were expressed by a previous reviewer that providing times to air coolability are inherently ODO-SII; RES staff pushed back, but requested that NSIR's Information Security Branch arbitrate – what is the status of that?	Don A.	RES is still pending a response from RES/ISB. Note that the report will be provided, in full, to PB for SRI review on 06.10.13 also		Closed	OD Concurrence	H
469	RES	05.17.13	InfoSECY	Don Helton	Background section – The enclosed report is not a risk study, and the first paragraph of the SECY should not indicate that the study examines SFP risks. It should indicate that the study examines the potential consequences from a postulated beyond-design basis accident, as the title of the study and the ES reflect.	Don A.	Orig: The enclosed report documents a study performed by the Office of Nuclear Regulatory Research to continue the examination of the risks associated with the storage of spent fuel in spent fuel pools. New: The enclosed report documents a study performed by the Office of Nuclear Regulatory Research to examine the potential consequences from a postulated beyond-design basis accident in the storage of spent fuel in spent fuel pool		Closed	OD Concurrence	H
470	RES	05.17.13	InfoSECY	Don Helton	Discussion, 1st para. – Rather than saying that NUREG-1738 used "sometimes bounding" assumptions and models without further explanation, stick with "simplifying" which is already there. The report excerpt from which this was pulled describes NUREG-1738's sometimes bounding assumptions, and thus provides the context for the modifier.	Don A.	Orig: These studies used simplified and sometimes bounding assumptions and models to characterize the likelihood and consequences of beyond-design-basis SFP accidents. New: These studies used simplified and assumptions and bounding models to characterize the likelihood and consequences of beyond-design-basis SFP accidents		Closed	OD Concurrence	
471	RES	05.17.13	InfoSECY	Don Helton	Discussion, 2nd para. – This should state that the study results will be used by NRR, in conjunction with past, more comprehensive studies to inform...	Don A.	Orig: The results of the study will be used by the Office of Nuclear Reactor Regulation (NRR) to evaluate what future regulatory actions the NRC might undertake, including whether expedited transfer of spent fuel from SFPs into dry cask storage is justified New: The results of the study will be used by the Office of Nuclear Reactor Regulation (NRR), in conjunction with past, more comprehensive studies to inform the question of whether expedited transfer of spent fuel from SFPs into dry cask storage is justified		Closed	OD Concurrence	H

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472	RES	05.17.13	Foreword	Don Helton	1st paragraph says that we study BDBAs to understand margin, which is true. However, we also study them to estimate risk to the public, which by design, emanates from BDBAs.	Kathy G.	addressed		Closed	OD Concurrence	
473	RES	05.17.13	Foreword	Don Helton	3rd paragraph should say "likelihood and consequences" rather than "risks and consequences."	Kathy G.	addressed		Closed	OD Concurrence	
474	RES	05.17.13	Foreword	Don Helton	4th paragraph currently says: "very severe, highly unlikely, earthquake"...the modifiers very and highly do not benefit the point being made, they simply add undefined verbage without improving the reader's understanding of the quantitative context. If the seismic bin #3 earthquake is very severe does that make the unstudied seismic bin #4 earthquake very, very severe? If the event is highly unlikely, what does that make the design-basis large break LOCA which has a lower estimated frequency of occurrence? The modifiers should be removed	Kathy G.	addressed		Closed	OD Concurrence	
475	RES	05.17.13	Foreword	Don Helton	As worded, the 4th & 5th paragraphs basically say that we looked at both public health and environmental consequences, and the public health effects are equivalent to past studies. This leaves a clear gap with respect to how the environmental consequences compare, which is in fact covered in the ES and the report. Given the desire for simplicity in the foreword, it is more appropriate to say that this report further corroborates past studies' conclusions that SFP accidents are low likelihood, high consequence events.	Kathy G.	addressed		Closed	OD Concurrence	
476	RES	05.17.13	Foreword	Don Helton	Last paragraph should not tie the Reg. Analysis to the results of this study alone. That RA was rightfully informed by past studies as well.	Kathy G.	addressed		Closed	OD Concurrence	H
477	RES	05.17.13	Foreword	Don Helton	Last paragraph should reference the Tier 3 initiative, rather than making it sound like the RA done for this 1 plant is the final decision on the EFM issue. Currently this point doesn't appear to be clearly made until the 10th page of the RA (last paragraph of Section D.3.2.2).	Kathy G.	addressed		Closed	OD Concurrence	
478	RES	05.17.13	ES	Don Helton	3rd paragraph, 1st line – it's not clear what is meant by "scientifically validated" – recommend deleting "scientifically"	Kathy G.	addressed		Closed	OD Concurrence	
479	RES	05.17.13	ES	Don Helton	4th paragraph, "The study also shows even when 10 CFR 50.54 (hh)(2) mitigation measures are unsuccessful, a lower likelihood of a release is predicted than in previous studies." – Unless this exact sentence appears in the appendix that compares SFPSS to past studies, it is too amorphous of a statement for the staff to defend in isolation. When using the EPRI hazard curve results from NUREG-1738, this statement is not true (it's only with the additional context of adding the LLNL hazard curve results in that it becomes defensible). I recommend deleting the sentence.	Kathy G.	addressed		Closed	OD Concurrence	
480	RES	05.17.13	ES	Don Helton	4th paragraph, "Analysis also shows that the spent fuel pool is only susceptible to a radiological release within a few months after the fuel is moved from the reactor into the spent fuel pool. After that time, the spent fuel is coolable by water, steam, or air." It is imperative that a "for the scenario and SFP studied" be added. Otherwise, the reader is left viewing this as a true statement for all SFPs and all scenarios, which will (i) contradict past and future NRC statements regarding the coolability of fuel during partial draindown events, (ii) conceivably lead to a mis-interpretation of the study's results in the context of decommissioning EP requirement exemption reviews, and (iii) lead to contentions about the integrity of this ES. This is not a theoretical concern; I observed this exact mis-understanding occur during a Senior Reactor Analyst counterpart meeting on May 15th, 2013.	Kathy G.	addressed		Closed	OD Concurrence	H
481	RES	05.17.13	ES	Don Helton	Figure ES-1: suggest adding "at least" to "Within the first 3 days of the event" since much of the time the release would be much later than 3 days.	Kathy G.	Done as the reviewer suggested.		Closed	OD Concurrence	
482	RES	05.17.13	ES	Don Helton	Figure ES-1: suggest changing "Late in Operating Cycle" to "Remainder of the Operating Cycle" – otherwise the reader is left wondering what happened to the middle of the operating cycle	Kathy G.	Done as the reviewer suggested.		Closed	OD Concurrence	

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483	RES	05.17.13	ES	Don Helton	1st bullet after Figure ES-1: "The study finds liner damage is the only way to cause a radiological release in less than 3 days." Again, a "for the scenario and SFP studied" is imperative, for the same reasons as cited above.	Kathy G.	addressed		Closed	OD Concurrence	H
484	RES	05.17.13	ES	Don Helton	1st paragraph after the bullets on page iv: This wording makes it sound like hydrogen generation and combustion is only relevant for high-density loading cases, as opposed to the intended point which is that only the high-density loading leads to combustion of hydrogen for the scenario/SFP studied.	Kathy G.	The reference to the less potential for hydrogen explosions for low density cases assumes such an event is possible for the high density cases (specifically small leak cases in OCP2 and OCP3). The word "studied" is now added after "The low-density pool releases ..."		Closed	OD Concurrence	
485	RES	05.17.13	ES	Don Helton	Same paragraph – the description of a 1x8 is misleading because one of the two cited cold assemblies is dedicated to a different hot assembly – should say something like 'hotter fuel surrounded by additional cold assemblies relative to the 1x4 pattern)	Kathy G.	addressed		Closed	OD Concurrence	
486	RES	05.17.13	ES	Don Helton	Same paragraph – suggest ending the last sentence with '(resulting in lower peak fuel temperatures)' – otherwise it is not clear why more heat transfer to cold assemblies correlates to lower radiological release fractions	Kathy G.	addressed		Closed	OD Concurrence	
487	RES	05.17.13	ES	Don Helton	Figure ES-2: The note on the ac fragility stating that Order EA-12-049 and EA-12-051 will reduce this probability is incorrect. These orders do not affect the fragility of the electrical distribution system. They seek to improve the capabilities the plant has for dealing with severe external hazards, and they may increase the probability that the plant will successfully mitigate the accident. Even an SFP measurement capability with independent power doesn't change the probability that there will be no power to the SFP cooling system, RHR pumps, etc., which is what this item in the figure deals with. At best, this note is associated with the wrong item in the figure.	Kathy G.	addressed		Closed	OD Concurrence	H
488	RES	05.17.13	ES	Don Helton	Pg. vi, final 2 paragraphs - The comparison to the Quantitative Health Objectives is misleading in several respects. First, the individual LCF risk does not always peak within 10 miles of the plant (and this is demonstrated by Figure 96 in the present report). Second, the QHOs are intended to compare all sources of risk from the NPP to societal risks, and the agency assumes that the SFP contribution to that risk can be neglected in comparison to that of the reactor, for the aspects of risk captured by the QHOs. As such, what is done here is equivalent to ignoring the first significant figure of a number when doing a comparison. The point has already been made that the frequency-weighted consequences from this study are low. The real point trying to be driven home in this passage is that the estimated frequency-weighted consequences are "in the noise" relative to other contributors to cancer risk, not that this study demonstrates compliance with the Commission's Safety Goal. As such, I recommend comparing the results directly to the cancer risk numbers already cited, and removing the Safety Goal comparison. If anything, this makes the argument more compelling (by suggesting an additional 3 orders of magnitude margin).	Kathy G.	Adding explanation from SOARCA		Closed	OD Concurrence	

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
489	RES	05.17.13	General	Don Helton	Text was removed from Section 1.8 and the Conclusions which described future work that might be beneficial, based on the assumptions made in this study, pending NRR's path forward on the associated Tier 3 item. This text was removed over the protest of staff in RES/DRA, on the basis that, "All of this is a potential wish list, and would point out to the reader that the NRC may not have a good understanding of what can happen with SFP accidents after all. It does not add credibility to the study and provides fodder for others to expound on what we don't know, which we provide in an NRC written and approved document." [Ref: 4/26/13 email from Greg Casto to Kathy Gibson] Meanwhile, NRR has placed an OQU User Need Request in to concurrence requesting RES to conduct an experimental program to look at thermal hydraulic and accident progression modeling issues unique to partial draindown and boiloff SFP accidents, neither of which contributed to the SFPSS frequency-weighted consequences [ML13133A055]. The coincidence of these actions places the authors of the report in an indefensible position as to why we are outwardly not acknowledging knowledge gaps while inwardly pursuing future (and costly) research. The original text from Section 1.8 and the Conclusions should be re-instated.	Kathy G.	addressed. Still evaluating need for UNR		Closed with Ques.	OD Concurrence	H
490	RES	05.17.13	ES	Don Helton	AI has identified an apparent error made (by me) very early in the project formulation with respect to the definition of OCP time windows. Specifically, on 9/9/11, I appear to have made an error in updating the OCP definitions, by changing the overall representative operating cycle window from 730 days (outage + non-outage) to 700 days (i.e., not including the outage time in the overall cycle definition). I've no explanation for why I would have deliberately done this, since the unit goes in to outage mid-September every other year, and is thus clearly on a 24 (rather than 23) month operating cycle (outage + non-outage). This only affects the time window for OCP5, but affects the fractional contribution of all OCPs. The changes are pretty minor in the grand scheme of things, but nevertheless, the report needs to be updated to either (a) acknowledge this error and point out that the impact is minor or (b) update all aspects of the report to be consistent with the 24 month (730 day) OCP definition. Currently is Should be OCP1 0.9% Sums to 8.3% 0.8% Sums to 7.9% OCP2 2.4% 2.3% OCP 3 5% 4.8% OCP 4 25.7% 24.7% OCP5 66% 67.4% Total 100% 100%	Brian W.	Added a footnote to Table 15 in Section 5.1 "After results were calculated based on a 700 day operating cycle, the authors realized that the correct operating cycle length should be 725 days (including the 25 day outage) rather than 700 days (which didn't include the outage). This error is expected to have a small impact on the overall results."	Closed	OD Concurrence		
491	RES	05.17.13	D	Don Helton	Pg. D-4 states that both means of spent fuel storage provide adequate protection of public health and safety and the environment. I don't believe that adequate protection as defined by the NRC includes the environment. Rather, I believe the similar statement, excluding 'and the environment,' in D.5.1.1.1 is correct. Please verify, and update as appropriate.	Fred S.	Agree. Incorporate by deleting the phrase "and the environment." The term "adequate protection" is not defined in the AEA; it is a subjective, yet mandatory standard. Under applicable case law, the NRC must have "reasonable assurance" that there is "adequate protection" of public health and safety before approving a licensing action. [Power Reactor Development Co. v. Int'l Union, Electrical Workers, 367 U.S. 396, 407 (1961); Nader v. Ray, 363 F. Supp. 946, 954 (D.D.C. 1973)].		Closed	OD Concurrence	H
492	RES	05.17.13	D	Don Helton	Section D.2.2, 1st paragraph – The statement that going to low-density racking would not significantly improve fuel coolability needs to be tempered. The statement is more defensible for BWR fuel (where channel boxes prevent cross-flow irrespective of the rack walls) and under the assumption that licensees would not simultaneously be required to remove channel boxes prior to SFP storage (which can be done). The SFPSS assumption related to this is stated in the "Scenario Delineation and Probabilistic Treatment" entries in the Section 2.1 assumptions table. Separately, the first sentence in the 2nd paragraph of Section D.3.2.3.1 would be a convenient place to remind the reader that you did not assume the pool was re-racked.	Fred S.	Incorporated. The first sentence in the second paragraph of Section D.3.2.3.1 is revised as follows: The reference plant has 3,819 fuel assemblies stored in the spent fuel pool in a high-density 1x4 loading configuration using the existing high-density racking.		Closed	OD Concurrence	

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493	RES	05.17.13	D	Don Helton	Same paragraph: the closing to the paragraph is too heavily slanted toward the pros of the alternative, in that it over-states the decrease in decay heat for the low-density situation, which the table near the beginning of Section 11 shows is only ~15%. Meanwhile, it doesn't point out the converse points: that it has practically the same amount of short-lived radionuclides, almost as much decay heat, and that the additional water can delay clearing of the baseplate (and thus natural circulation of air) should the pool become drained.	Fred S.	Agree. Revised section D.2.2, 1st paragraph, last sentence to read: Because of the low-density spent fuel pool loading, this alternative has less longer-lived radionuclide inventory such as Cesium-137 (Cs-137) present in the spent fuel pool, a lower overall heat load in the pool, and a slight increase in the initial water inventory that displaces the removed spent fuel assemblies. This additional water in certain situations could delay the clearing of the baseplate, which would temporarily inhibit natural air circulation cooling under and up through the racks should the spent fuel pool completely drain.		Closed	OD Concurrence	
494	RES	05.17.13	D	Don Helton	Table 2 has several administrative issues as follows: o The first two instances of footnote 3 are associated with initiating event frequencies, whereas footnote 3 describes fragilities. These two instances should simply say that they are taken from the main report. o The 1x4 successful mitigation column has a number of instances where footnote 3 is referenced, but footnote 5 is intended. o "LOOP - severe" should be "LOOP - severe weather" o The pneumatic seal row has a reference to footnote 8, which does not exist.	Fred S.	Incorporated.		Closed	OD Concurrence	
495	RES	05.17.13	D	Don Helton	Table 2 contains a number of assumptions that are understandable in the context of the RA (we had to assume something, we didn't have a good number, and we'll later try to convince you in the break-even analysis in D.4.4.1 that we're not close enough to a threshold for things like this to matter). But these assumptions are not described in a way that acknowledges their arbitrary nature, and they are statements that the staff cannot defend on the basis of physical processes. They need to be appropriately qualified. These include: o The use of the conditional probability of 0.69% and 0.036% for initiating events other than cask drops and seismic events. These other events don't lead to leakage at the base of the pool, and often do not have concurrent ac failure, so conditional probabilities that credit air coolability for large portions of the operating cycle and account for liner fragility simply do not have any relevance. Most would actually have a conditional probability of 0.0 with the 72-hour truncation time assumed in the main body of the report or 1.0/0.0 with no truncation (for the unsuccessful/successful deployment of mitigation cases). o The reference plant does not use pneumatic seals. o The liner fragility of 1.0 for seismic bin #4 and the cask drop event is by definition conservative. Meanwhile, applying the coolability window to those events may be non-conservative (fuel geometry may not be preserved). For the current frequency estimate of 6e-7, different assumptions on these 2 values can change the overall release frequency by a factor of 30. Thus, it is really important to appropriately characterize these assumptions and to tie their acceptability to the break-even analysis. o Related to the above, every reference to 5.57e-7 (or whatever number that eventually becomes), and in particular its appearance in multiple places in Section D.5, needs to cite that it is subject to the assumption of unsuccessful deployment of mitigation and the other assumptions stated in Table 2. Otherwise, this value will gain a life of its own that will lose the important baggage that comes with it.	Fred S.	Revised Table 2 which lists the use of conditional probabilities to derive the release frequencies for spent fuel pool initiators as discussed in the resolution to comment #617. Pneumatic seals are shown in the table as N/A as they are not used in the reference plant. Added the following text to first paragraph under Table 73: This release frequency value is subject to the assumption of unsuccessful deployment of mitigation and the other assumptions contained in this analysis and those stated in Table 3 of the main study.		Closed	OD Concurrence	H
496	RES	05.17.13	D	Don Helton	Pg. D-15 indicates that fuel recovery occurred in the Fukushima Dai-ichi Unit 2 spent fuel pool, as opposed to the reactor. This is a mis-quote of the reference being paraphrased and needs to be corrected.	Fred S.	Agree. Changed phrase to "exposure of the unit 2 reactor fuel rods"		Closed	OD Concurrence	H
497	RES	05.17.13	D	Don Helton	Section D.3.4 - It appears that "beyond the postulated accident site" needs to be replaced with "beyond 50 miles"	Fred S.	Incorporated.		Closed	OD Concurrence	
498	RES	05.17.13	D	Don Helton	A word search should be done in the RA to replace "PRA" with "probabilistic considerations" - this may seem like a trivial change to some, but it's a very important distinction because it has embedded implications about scope, and over-states what was done in the main body of the report.	Fred S.	Incorporated. Replaced PRA in text to "probabilistic considerations"		Closed	OD Concurrence	H
499	RES	05.17.13	D	Don Helton	There are a number of cross referencing issues, wherein the cross-reference to Section 3.2.2.x is off by 1. The instances I noted appear in D.3.4.1, D.3.4.2, and D.3.4.3.	Fred S.	Incorporated. Figure, section, and table references were checked and modified to use cross-referencing. Appendix D references to pages in the main report were changed to section references using cross-referencing.		Closed	OD Concurrence	

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500	RES	05.17.13	D	Don Helton	Please consider changing the labels for PH2 and PH3 in Table 22. As is, it's not clear from the table that both include impacts beyond 50 miles.	Fred S.	Incorporated. Deleted first column from tables 21 and 22, which contained the labels PH1, PH2 and PH3. Also made conforming changes to section D.3.4.1 to remove usage of these labels in the text.		Closed	OD Concurrence	
501	RES	05.17.13	D	Don Helton	Section D.3.4.5 – It's not clear if the author is aware that for this seismic event, NUREG-1150, SOARCA, and contemporary PRAs would estimate a very high likelihood of core melt in both reactors. On the other hand, this section's wording may simply reflect the nature of an RA focused on the SFP.	Fred S.	This analysis focuses only on the spent fuel pool. No change required.		Closed	OD Concurrence	
502	RES	05.17.13	D	Don Helton	Section D.4.4 – It is very confusing to refer to a sensitivity analysis as the best estimate, recognizing that the terminology is intended to separate the sensitivity to the actual best estimate from the sensitivity to the actual low and high estimates. As is, a reader flipping back to the appendix and landing on Table 33 and the related text will walk away thinking that the undiscounted best estimate result is that it is cost-beneficial.	Fred S.	Agree. Revised Table 33 title to denote that these results reflect a Sensitivity Analysis.		Closed	OD Concurrence	H
503	RES	05.17.13	D	Don Helton	The comparison of SFP risks to the CDF and LERF QHO surrogates is not consistent with the derivation of these surrogates. It is most problematic for the CDF, which is a latent cancer QHO surrogate, and for which a large reactor release is not necessarily limiting in terms of conditional close-in public health effects. More specifically, the derivation of 10-4/year relies on the use of a conditional probability of an individual becoming a latent fatality (CPLF) taken from the Surry NUREG-1150 reactor analysis (see NUREG-1860, Appendix D for a sample derivation). At a minimum, it should be acknowledged in the RA that these surrogates were derived using reactor accident characterizations. More broadly, it's not clear why this section is needed, given that the cost-benefit analysis has been performed.	Fred S.	Agree. Added text to acknowledge that these surrogates were derived using reactor accident characterizations. This section is required for all backfit screens.		Closed	OD Concurrence	H
504	RES	05.17.13	D	Don Helton	The discussion in the second paragraph of Section D.5.2 should be revised. Reactor / fuel handling building failure is not an underlying assumption. The reactor / fuel handling buildings of US plants, even with the filtration systems in operation (which presumes ac power), will not "bottle up" an SFP zirconium fire regardless of whether any structural failure has occurred. Significant holdup of fission products may occur, but this only affects the magnitude of the radiological release, not the fact that one would be occurring. I suggest simply deleting the 2nd sentence in the paragraph.	Fred S.	Incorporated. 2nd sentence deleted.		Closed	OD Concurrence	
505	RES	05.20.13	General	Kimyata Morgan Butler	The authors present a comprehensive study of the impact of a beyond design-basis earthquake on a Mark 1 BWR spent fuel pool and the impact of high density versus low density loading on accidental releases of radioactive material from the SFP. The study should be released for public comment contingent upon a number of general and specific recommendations which are intended to improve the documentation of the study and minimize public confusion	Team	No response required		Closed	OD Concurrence	
506	RES	05.20.13	Intro and Background	Kimyata Morgan Butler	In the introduction, the authors discuss the rationale for using Peach Bottom NPS as the base case for this study. This should be reiterated throughout the study, so as to not encourage members of the public from criticizing the report because the plant is located in a rural area which is seismically more stable than other locations (e.g., California) around the nation. The overall consequence results are fairly unique to Peach Bottom. More importantly, additional uncertainty analyses should be included in Chapter 9 which should address differences in geological stability (e.g., the 9.0 M earthquake in Japan was a 1:1,000 year occurrence, or examine the impact of beyond-design-basis earthquakes at SONGS) as well as the differences between rural and urban settings (e.g., Indian Point) and the impact an earthquake could have on infrastructure (power transmission, roads, bridges, etc) and emergency response.	Brian W.	As the commenter notes, this is a site-specific study. We did not analyze an SFP in a more seismically-active area, or in a more populated area. A more general analysis will be considered as part of the overall Tier 3 effort for this area. The impact of the earthquake on nearby infrastructure was outside the scope of the study, which used the assumptions from SOARCA. Damaged infrastructure could affect offsite response times which was considered in a sensitivity analysis (Section 9.8).		Closed	OD Concurrence	

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507	RES	05.20.13	General	Kimyata Morgan Butler	Throughout the report, the authors switch back and forth between "SI units (traditional units)" and "Traditional units (SI units)." This is particularly notable when it occurs within the same paragraph or footnote. We recommend that one format be used and this format be standardized throughout the entire report before public release.	Hossein E.	Please see the response to comment 433. The various units came from different sources and documents. Some are design information that were originally in British units and it was appropriate to cite them as is (with conversion to SI units in parenthesis). Others were assumptions, defaults, and setpoints (e.g., for models) in SI units as part of this study, and it was appropriate to cite them as is (with conversion to British units in parenthesis).		Closed	OD Concurrence	
508	RES	05.20.13	7	Kimyata Morgan Butler	<p>The authors report Latent Cancer Fatality (LCF) risk in terms of use of the linear, no threshold (LNT) hypothesis which is advocated by the scientific community, but also advocate the use of an LNT model but truncating the first 5 rem/y exposure, 10 rem lifetime exposure, and 620 mrem/y. FSME strenuously objects to the truncation of dose as employed in this study.</p> <p>The use of the LNT hypothesis to late health effects was assessed by independent expert elicitation and a report prepared for the Nuclear Regulatory Commission and the Commission of European Communities (NUREG/CR-6555, vol 2). The experts did not believe there was a threshold dose in Gy, for low LET (gamma) radiation administer at a uniform rate below which there is no radiation-induced cancer risk. A similar view was expressed by the National Academies in their 2005 report on the Health Risks from Exposure to Low Levels of Ionizing Radiation as well as in the 2008 report of the United Nations Scientific Committee on the Effects of Atomic Radiation.</p> <p>The use of the LNT hypothesis (versus other methodologies) was discussed in SECY-08-0029, dated March 4, 2008 and approved by the Commission in SRM-</p>	AJ N.	<p>The approach in SFPSS is consistent with that was reported in SOARCA. We believe the dose truncations provide insights that we hope to report, however we are working to better communicate their meaning:</p> <p>1) The word "model" has been deleted from the text when associated with the dose truncation results.</p> <p>2) Section 7.2.2 paragraphs 5-6 has been replaced with "Because the health effects that would be induced by low dose radiation are uncertain, staff performed a sensitivity analysis to understand how the risks would change if computed health risks were limited to those arising from higher doses. The upper truncation level used in this sensitivity analysis corresponds to a treatment consistent with the HPS position statement (5 rem annually and 10 rem lifetime). The second truncation level corresponds to the average annual dose to the public from medical and background radiation exposures in the United States (620 mrem annually).</p>		Closed with Ques.	OD Concurrence	
509	RES	05.20.13	v	Kimyata Morgan Butler	<p>Page v, paragraph 3, lines 7-8: Delete sentence "It is more difficult for these radioactive materials to lead to radiation doses high enough to result in early fatalities."</p> <p>Reason: incorrect assessment. As figure 36 illustrates, dose rates near the SFP with water at the top of the fuel hardware can result in lethal exposures 15 to 20 minutes of exposure. Many of the longer lived radioisotopes are gamma emitters like cesium and cobalt.</p>	Kathy G.	Study analyzes offsite doses to public, not onsite to workers.		Closed	OD Concurrence	
510	RES	05.20.13	vi	Kimyata Morgan Butler	<p>paragraph 2, line 3: change to read "The study shows no early fatality risk attributable to radiation exposure and risk of an individual latent cancer ..."</p> <p>Reason: While no early fatalities attributable to radiation exposure are likely to occur, inadvertent deaths associated with the ordered or anticipated evacuation cannot be excluded.</p>	Kathy G.	addressed		Closed	OD Concurrence	
511	RES	05.20.13	vi	Kimyata Morgan Butler	<p>Page vi, second paragraph, last sentence: This is backwards. The results are several orders of magnitude lower than the safety goal. But the sentence says that the safety goal is set lower than the results. This needs to be fixed. A similar sentence in the Conclusions is written correctly.</p>	Kathy G.	addressed		Closed	OD Concurrence	
512	RES	05.20.13	vii	Kimyata Morgan Butler	<p>Page vii, paragraph 1, line 7: change to read "early fatalities attributable to radiation exposure were predicted and individual latent cancer fatality..."</p> <p>Reason: While no early fatalities attributable to radiation exposure are likely to occur, inadvertent deaths associated with evacuating hospitalized patients cannot be excluded and in fact occurred in Japan during the evacuations that occurred in March 2011.</p>	Kathy G.	addressed		Closed	OD Concurrence	
513	RES	05.20.13	2	Kimyata Morgan Butler	<p>Acronyms: change to read "MELCOR not an acronym Methods for Estimation of Leakages and Consequences of Releases"</p> <p>Reason: accuracy</p>	Hossein E.	MELCOR is not an acronym. It is sometimes incorrectly stated to be an acronym in some reports.		Closed	OD Concurrence	
514	RES	05.20.13	10	Kimyata Morgan Butler	<p>item number 3: change to read "(3) inadvertent aircraft crashes"</p>	Brian W.	This is what the text already says.		Closed	OD Concurrence	
515	RES	05.20.13	13	Kimyata Morgan Butler	<p>Figure 1: Re-size the figure to fit the page.</p>	Brian W.	Figure sometimes resizes during printing or conversion to pdf. Saved as .png to attempt to remedy problem.		Closed	OD Concurrence	

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
516	RES	05.20.13	25	Kimyata Morgan Butler	Major assumption "Aftershocks are not likely to induce subsequent damage to the SFP": If this is the case, why did TEPCO reinforce spent fuel pool number 4 if subsequent aftershocks would not induce additional damage. This assumption should be reviewed	Jose P.	At the request of NRO, the comment for this assumption has been revised to read: "The main event would crack the SFP studied, but the SFP's structure would be stable after the earthquake and would crack in a manner that is expected to resist additional loading cycles at this level." Part of the reasons for reinforcing the SFP (provide additional support) for Unit 4 were concerns related to possible damage to the SFP structure or its supports from the H2 combustion event.		Closed	OD Concurrence	
517	RES	05.20.13	25	Kimyata Morgan Butler	Major assumption "50.54(hh)(2)...: What impact did the earth quake have on the makeup delivery systems at the Fukushima NPS? Where they functional? What damage was observed to systems at Onagawa NPS? The PGA at Onagawa was almost identical to your base case	Jose P.	I understand that the Japanese plants listed in the comment did not have 50.54(hh)(2) equipment.		Closed	OD Concurrence	
518	RES	05.20.13	30	Kimyata Morgan Butler	Major assumption "The effect of low dose radiation on latent cancer fatalities...": Delete Reason: see General comment.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
519	RES	05.20.13	43	Kimyata Morgan Butler	Chapter 4, last paragraph, line 1: Change "Section 9.7 provides" to Section 4.3 provides" Reason: Accuracy. Current text is from an obsolete version	Jose P.	This change has been made.		Closed	OD Concurrence	
520	RES	05.20.13	93	Kimyata Morgan Butler	Figure 36: Re-size the figure to fit the page	James C.	Fixed.		Closed	OD Concurrence	
521	RES	05.20.13	95	Kimyata Morgan Butler	section 5.6.3, line 2: revise to "...frequency of approximately one event in 60,000 years for Delta, PA." Reason: The initiating event frequency is unit and location specific.	Jose P.	Added "for the reference plant."		Closed	OD Concurrence	
522	RES	05.20.13	104	Kimyata Morgan Butler	paragraph 2, line 5: Is the September 2001 date correct. Reason: Cycle 18 for Peach Bottom was September 2011 (see page 106, Radionuclide Inventories, lines 2-3).	Hossein E.	Yes, but as stated in the report "A comparison of the present decay heat results with values calculated by the utility in 2001 show agreement to be better than 3 percent over all cooling times ..."		Closed	OD Concurrence	
523	RES	05.20.13	107	Kimyata Morgan Butler	footnote 17: Change font size from 10 to 9	Hossein E.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
524	RES	05.20.13	120	Kimyata Morgan Butler	footnote 24, line 1: Change to read "water temperature is 82 degrees F (28 degrees C) Reason: consistent with water temperature described on line 5 of the same footnote.	Hossein E.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
525	RES	05.20.13	155	Kimyata Morgan Butler	1. paragraph 1, lines 4-5: Delete "These short-lived radionuclides are the largest potential contributors to early doses and acute health effects." Reason: untrue. Acute health effects most likely will be associated with external exposure to gamma emitting radionuclides which generally have longer half-lives (e.g. cesium-134 and cesium-137).	AJ N.	See response to comment #534		Closed	OD Concurrence	
526	RES	05.20.13	157	Kimyata Morgan Butler	paragraph 1: Comment: data for acute health effects are developed from NUREG/CR-7161 which used information documented in NUREG/CR-6555, an expert international solicitation, that concluded there is no threshold for latent cancer deaths	AJ N.	See response to comment #508.		Closed	OD Concurrence	
527	RES	05.20.13	158	Kimyata Morgan Butler	paragraph 4 - Paragraph on the dose and dose rate effectiveness factor: The dose coefficients used in Federal Guidance Report 13 account for a dose and dose rate reduction since these coefficients only apply to low doses and dose rates (see chapter 7 of FRG-13. From the flow of the text, it would appear that the values in Federal Guidance report 13 (in the preceding paragraph) are then further modified by a DDREF. Is this really what happened? Seems like factors are being double counted and the latent cancer risk underestimated by a factor of 2 for cancers other than breast.	AJ N.	The following text has replaced the beginning of the fourth paragraph of page 156: "The FGR-13 coefficients, as implemented in MACCS2, include a dose and dose rate effectiveness factor (DDREF), which has been incorporated in the dose-response modeling for the long-term phase of the offsite consequences and to the dose-response modeling for the early-phase (i.e. the first week) for doses less than 20 rem...."		Closed	OD Concurrence	

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528	RES	05.20.13	158	Kimyata Morgan Butler	paragraph 5: Delete. Reason: this methodology is contrary to staff recommendations included in SECY-08-0029 dated March 4, 2008 and approved by the Commission in SRM-SECY-08-0029 dated September 10, 2008. The approved recommendation is to calculate the average individual likelihood of early fatality and latent cancer fatality expressed as an average probability of a population-weighted, average individual dying from cancer conditional to the occurrence of a severe accident and the calculation would include both LNT and the truncation of doses below 100 microSievert (10 millirem) to distances up to 160 km (100 miles). The HPS position statement, although considered, was specifically not recommended by the staff nor approved by the Commission.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
529	RES	05.20.13	162	Kimyata Morgan Butler	last paragraph: Comment: the assumption there is no power loss beyond 20 miles and the minimal damage to road infrastructure may be underestimated. Power outages due to the 2011 Japanese earthquake exceeded 200 km due to the toppling of transmission towers, especially in Fukushima Prefecture. The study site is very rural and is not representative of units at Indian Point or SONGS. This should be carefully reviewed as part of the uncertainty analysis in Chapter 9.	AJ N.	See response to comment 280.		Closed	OD Concurrence	
530	RES	05.20.13	164	Kimyata Morgan Butler	paragraph 1, lines 6-9: Referring to the "effective organ" is incorrect. Rather, discuss exposure in terms of "committed dose equivalent to an organ or tissue".	AJ N.	Incorporated.		Closed	OD Concurrence	
531	RES	05.20.13	164	Kimyata Morgan Butler	Section 7.2, paragraph 1, lines 2-5: Change to read "Individual risk of early death attributable to acute radiation exposure and latent cancer fatality, as well as societal risk of latent cancer fatalities collective dose, are measures of the radiological health impact of the accident and consistent with NRC's safety goals (NRC, 1986). In this study, societal dose is used as a surrogate for the societal impact of latent cancer fatalities." Reason: The first change clarifies that the study examines lack of early fatalities attributable to radiation exposure. The second change clarifies that the authors are examining changes in "collective dose" (societal dose has no meaning in the radiation protection community). The collective dose, expressed as person Sv or man Sv, can be compared with other power reactor accidents such as TMI, Chernobyl, and Fukushima Daiichi NPS. Note that replacing societal dose with collective dose is required in 25 occasions in this document.	AJ N.	See response to comment #533 and #544. No change required for the rest. We agree that collective dose can be compared with other accidents, which one reason why we report it. Nevertheless, the "Safety Goals for the Operation of Nuclear Power Plants," 51 FR 28044 identifies latent cancer fatality risk as the metric of interest.		Closed	OD Concurrence	
532	RES	05.20.13	166	Kimyata Morgan Butler	Table 33: Delete the section of the table entitled, "Measures Related to Health and Safety of Individuals." Reason: This will simplify the table, avoid redundancy with estimates of early fatality risk, and minimize confusion about the frequency of LCF risk. The later could lead to misinterpreted and this will detract from the message that consequences associated with the accident are very low, as described in the section below describing consequences per year.	AJ N.	See response to comment 550.		Closed	OD Concurrence	
533	RES	05.20.13	166	Kimyata Morgan Butler	Table 33: Change to read "Individual Early Fatality Risk (/yr) attributable to radiation exposure" Reason: Clarification. This study did not address as causes of early death, particularly death associated with transportation accidents or death attributable to the relocation of critical, hospitalized patients.	AJ N.	Incorporated. "Attributable to radiation exposure" added to description of no early fatalities throughout all applicable areas in the text. No action required for tables. The tables are already complicated, and this measure is supported by the fix in the text.		Closed	OD Concurrence	

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534	RES	05.20.13	154	Kimyata Morgan Butler	Section 7.2.1, paragraph 1, lines 6-7: Change to read "For all scenarios, no offsite early fatalities attributable to radiation exposure are predicted to occur. Due to radioactive decay, spent fuel pools tend to have significantly less shorter-lived radionuclides (e.g. I-131) than reactors. Short-lived radionuclides tend to have more activity, and therefore, have more ability to cause the significant doses required for acute health effects. Spent fuel pools can hold significantly more longer-lived radionuclides (e.g. Cs-137) than a reactor, however the release of these radionuclides yield exposures that are more chronic in nature and are relatively less likely to result in high acute doses. Despite this, Acute..." Reason: As written, the above health implications are factually incorrect. The principle isotope of concern is cesium, a gamma emitter. The nature of the isotope isn't the issue, it's the concentration (Bq/m3 (air) or Bq/m2 (ground deposition)) of the radionuclide in the environment.	AJ N.	Comment incorporated throughout section 7, conclusions, and Executive Summary. (Note: Because of effective protective actions as modeled in this study, it is assumed that radionuclides do not cause acute health effects from exposures after the emergency phase (~1 week). During the emergency phase period, shorter-lived radionuclides such as I-131 have significantly higher activity levels. However, the previous text did not consider significant differences in Sv/Bq for different radionuclides which will further complicate the issue. Please see the document for the final the full rewrite.)		Closed	OD Concurrence	
535	RES	05.20.13	167	Kimyata Morgan Butler	paragraph 2, line 1: Change to read "The projections of no early fatalities attributable to radiation exposure in this study..." Reason: As stated previously, there are likely to be fatalities associated with evacuation of hospitalized patients as was demonstrated in Japan. A correct statement would be no early fatalities attributable to radiation exposure.	AJ N.	See response to comment 533.		Closed	OD Concurrence	
536	RES	05.20.13	168	Kimyata Morgan Butler	paragraphs 3 and 4: Delete. Reason: As discussed in the general statement, there is no scientific basis for calculating LCF using a LNT model, then discarding exposures below 620 mrem/y or 5 rem/yr or 10 rem lifetime. Given the habitability criteria used in the study, if low doses are truncated, there is zero LCF risk because all of the dose is excluded to include during the emergency phase.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
537	RES	05.20.13	168	Kimyata Morgan Butler	paragraph 5: Change to read "A number of factors can affect quantified individual LCF risks, particularly the very small values from dose truncation results. These include potential variations of the real application of protective actions, different protective action levels, or consideration of ingestion doses. Nevertheless, the overall conclusions that with an LNT calculation, individual LCF risk is mainly from long-term chronic exposures, and that dose truncations significantly lower the estimated individual LCF risk, remain valid." Reason: see previous comment.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
538	RES	05.20.13	169	Kimyata Morgan Butler	Table 34: Remove rows describing conditional LCF risk with any truncation. Reason: see previous comments. Did the authors truncate exposures above 500 mrem/yr which is consistent with the Pennsylvania habitability criteria? If not the LNT LCF risk numbers are overestimated.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
539	RES	05.20.13	170	Kimyata Morgan Butler	paragraph 1: A comment about the impact of precipitation (rainout) is needed. Reason: The impact of precipitation at Fukushima Daiichi is evident based on ground deposition to the northwest of the NPS	AJ N.	No change required. Consideration for rain is considered in the modeling, however, the exact effect of rain on the consequences in these sequences have not been analyzed. This could make a good potential sensitivity analysis, but this is not conducive at this point in the project.		Closed	OD Concurrence	
540	RES	05.20.13	170	Kimyata Morgan Butler	paragraph 2, last sentence: Change to read "Because risk mainly comes from doses that are constrained to be less than dose limits for habitation and ingestion, a dose truncation model can predict significantly fewer latent cancer fatalities." Reason: see general comment	AJ N.	See response to comment 508.		Closed	OD Concurrence	
541	RES	05.20.13	170	Kimyata Morgan Butler	Figure legend for Figure 97, second sentence: Delete. Reason: see previous comments on dose truncation and comment 34.	AJ N.	See response to comment 508.		Closed	OD Concurrence	

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542	RES	05.20.13	171	Kimyata Morgan Butler	Figure 97: Delete 620 mrem/y and 5 rem/y truncation bars from all distances. Reason: see general comment. These frequencies do not consider the Pennsylvania habitability criteria, hence there is no radiation exposure to consider and the LCF risk is zero.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
543	RES	05.20.13	171	Kimyata Morgan Butler	paragraph 1, lines 9-16, last three sentences: Delete. Reason: see general comment. See comment 34 above.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
544	RES	05.20.13	174	Kimyata Morgan Butler	Table 37: Change "Societal Dose (Person-Sv)" to "Collective Dose (Person-Sv)" Reason: see comment #23 above.	AJ N.	Comment incorporated throughout document.		Closed	OD Concurrence	
545	RES	05.20.13	174	Kimyata Morgan Butler	Section 7.3, paragraph 4, line 1: Change to read "The reduction in societal-collective dose (and latent cancer fatalities) ..." Reason: see comment #23 above.	AJ N.	See response to comment 544.		Closed	OD Concurrence	
546	RES	05.20.13	175	Kimyata Morgan Butler	Table 38: Change column 1 in two locations to read " Societal Collective Dose (Person-Sv)" Reason: see comment #23 above.	AJ N.	See response to comment 544.		Closed	OD Concurrence	
547	RES	05.20.13	180	Kimyata Morgan Butler	Section 8.1.2, paragraph 2, line 1: Change to read "The SFPSS groups the SFP damage..." Reason: editorial. Remnant from an earlier version	James C.	Editorial issues have been fixed.		Closed	OD Concurrence	
548	RES	05.20.13	201	Kimyata Morgan Butler	Section 8.4, paragraph 3, line 2: Change to read "The SFPSS did not perform..." Reason: editorial. Remnant from an earlier version	James C.	Editorial issues have been fixed.		Closed	OD Concurrence	
549	RES	05.20.13	203	Kimyata Morgan Butler	Chapter 9: General Comment. The selection of PBNPS and the earthquake scenario are situational dependent and likely do not reflect the off-site consequences that might occur at other NPSs. Additional sensitivity analyses should be conducted to examine geologically stable sites vs unstable geological areas (e.g., SONGS - California); rural vs urban areas (e.g., Indian Point) and the impact on emergency response, evacuation times, impact on infrastructure to include transportation networks, and early fatalities attributable to non-radiation causes.	AJ N.	No change required. I agree that these can provide worthwhile insights. However, we don't have time for items that fall outside the direct scope of our study. You may want to consider forwarding these comments onto NRR's work on characterizing SFP risk in the Regulatory Analysis for expedited spent fuel transfer for generic SFPs or to the Level-3 PRA project in RES.		Closed	OD Concurrence	
550	RES	05.20.13	220	Kimyata Morgan Butler	Table 52, Uniform Pattern Consequence Results, Measures related to Health and Safety of Individuals: Delete this section. Reason: The section can be misinterpreted and will detract from the message that consequences associated with the accident are very low, as described in the section below describing consequences per year.	AJ N.	Staff is sensitive to how the results can be misused, however, all SFP studies (e.g. NUREG-1738, NUREG-1353, NUREG/CR-4982, NUREG/CR-5281, NUREG/CR-6251) have reported conditional results. The issue is that while frequency-weighted consequences are informative, reporting these metrics alone obscure the impact in the event of a SFP release, as well as make comparisons to be past studies impossible. Many other steps have been taken to minimize the potential to misuse results, including not reporting latent cancer fatalities, and only reporting average results.		Closed	OD Concurrence	
551	RES	05.20.13	220	Kimyata Morgan Butler	Table 52, Uniform Pattern Consequence Results: Change "Societal Dose (Person-Sv)" to "Collective Dose (Person-Sv)" Reason: see comment #23 above.	AJ N.	See response to comment 544.		Closed	OD Concurrence	
552	RES	05.20.13	221	Kimyata Morgan Butler	paragraph 1, line 2: Change to read "When there is a release, no offsite early fatalities attributable to radiation exposure are predicted." Reason: see comment #25 above	AJ N.	See response to comment 533.		Closed	OD Concurrence	
553	RES	05.20.13	221	Kimyata Morgan Butler	Table 53 and paragraph 2: Delete. Reason: see general comment and previous comments.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
554	RES	05.20.13	223	Kimyata Morgan Butler	Table 45: Change "Societal Dose (Person-Sv)" to "Collective Dose (Person-Sv)" Reason: see comment #23 above	AJ N.	See response to comment 544.		Closed	OD Concurrence	
555	RES	05.20.13	229	Kimyata Morgan Butler	paragraph 3, line 1: Change to read "No early fatalities attributable to radiation exposure are predicted for these sequences." Reason: see comment #25 above.	AJ N.	See response to comment 533.		Closed	OD Concurrence	

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556	RES	05.20.13	237	Kimyata Morgan Butler	Table 62: Change to read "Early fatalities attributable to radiation exposure (0 to 500 miles)" Change to read "Societal Collective dose within 50 miles in Person-Sv" Change to read "Societal Collective dose within 500 miles in Person-Sv" Add footnote new footnote 4 to SFPSS Results that note the results are location dependent and reflect collective doses for a rural area. Reason: see previous comments.	AJ N.	See response to comment 533.		Closed	OD Concurrence	
557	RES	05.20.13	238	Kimyata Morgan Butler	Paragraph 3, line 1: Change to read "The lack of any early deaths attributable to radiation exposure in this study is consistent with results..." Reason: See comment #25 above.	AJ N.	See response to comment 533.		Closed	OD Concurrence	
558	RES	05.20.13	238	Kimyata Morgan Butler	Paragraph 3, line 1: Change to read "the societal collective dose..." Reason: see comment #23 above	AJ N.	See response to comment 544.		Closed	OD Concurrence	
559	RES	05.20.13	248	Kimyata Morgan Butler	paragraph 9, lines 1-3: Change to read "For all scenarios, offsite early fatalities attributable to radiation exposure are predicted not to occur. In general, relative to reactors, SFPs have a larger proportion of longer-lived radionuclides, which are less likely to cause the significant doses required for acute health effects." See comments #17 and #23 above	AJ N.	See response to comment #533 and #534.		Closed	OD Concurrence	
560	RES	05.20.13	248	Kimyata Morgan Butler	paragraph #10, line 1: Change to read "in both in both high and low density loading ..." Reason: editorial.	AJ N.	Comment incorporated.		Closed	OD Concurrence	
561	RES	05.20.13	248	Kimyata Morgan Butler	paragraph #10, lines 8-10: Delete "According to alternative dose response models, excluding the uncertain effects of low doses could reduce the quantified individual latent cancer fatality risk within 10 miles significantly." Reason: See general comment	AJ N.	See response to comment 508.		Closed	OD Concurrence	
562	RES	05.20.13	248	Kimyata Morgan Butler	paragraph #11, lines 7-9: Delete "Therefore, the use of a dose truncation model estimates at least an order of magnitude fewer latent cancer fatalities, which provides perspective on the range of dose response uncertainty". Reason: See general comment. Also, the statement is untrue. The number of latent cancer fatalities would be zero. All exposure below 620 mrem/y is discounted and the Pennsylvania habitability criteria prohibits exposure above 500 mrem/y, so there is no public total effective dose to consider.	AJ N.	See response to comment 508.		Closed	OD Concurrence	
563	RES	05.20.13	250	Kimyata Morgan Butler	paragraph 1, line 1: Change to read "early fatalities attributable to radiation exposure were predicted and ..." Reason: see comment #23 above.	AJ N.	See response to comment 533.		Closed	OD Concurrence	
564	NRR	05.20.13	General	Kevin Witt	NRR recommends that RES provide the draft copy of the SFPSS to Peach Bottom on June 10 to give the licensee sufficient time to determine whether there is any security or proprietary related (SUNSI) information	Don A.	Accepted. RES will provide PB with a draft copy of the report on 06.10.13 for SRI and SUNSI review		Closed	OD Concurrence	
565	NRR	05.20.13	InfoSECY	Kevin Witt	Change all instances of "report" to "study" to be consistent throughout document	Don A.	Updated where appropriate		Closed	OD Concurrence	
566	NRR	05.20.13	General	Kevin Witt	Globally change decision-makers to decisionmakers	Don A.	Updated		Closed	OD Concurrence	
567	NRR	05.20.13	General	Kevin Witt	Revise footnotes so that their format is consistent, specifically with Appendix D	Brian W.	will be addressed as time allows.		Closed	OD Concurrence	
568	NRR	05.20.13	General	Kevin Witt	Fix broken reference links - "Error! Reference source not found."	Fred S.	Brian: Fred, I fixed all of them except one in your section. I fixed the one in Appendix D.		Closed	OD Concurrence	
569	NRR	05.20.13	General	Kevin Witt	Check all figure titles to reflect "spent fuel pool scoping study"	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	

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570	NRR	05.20.13	General	Kevin Witt	Recommend consistent use of the phrase "low" or "very low," not a mixture of the two terms. An alternative phrase could be "less than 1/xxx,000" or a similar consistent very low statement throughout.	AJ N.	The foreward paragraph 4 has been updated so that "likely" and "highly unlikely" now both say "likely". Also, in executive summary page 3 last full paragraph, "very unlikely" is now "unlikely". No other changes required, as no specific reference in the report is given. We agree that they should be used consistently. Please note, however, that in many cases the terms are being used to refer to different criteria.		Closed	OD Concurrence	
571	NRR	05.20.13	ii	Kevin Witt	Throughout the Foreword, recommend changing the phrase "beyond design basis accidents" to "beyond-design-basis events." The study is better categorized as a study on the risk of events rather than accidents.	Kathy G.	Accepted.		Closed	OD Concurrence	
572	NRR	05.20.13	ii	Kevin Witt	Foreword – In the 4th paragraph after the 2nd sentence, add the following statement: "In order to produce some probability of failure to a spent fuel pool, the study used seismic forces between four (4) and eight (8) times greater than a the maximum earthquake expected to occur at the reference plant location and significantly greater than the earthquake that occurred on March 11, 2011 near Fukushima, Japan."	Kathy G.	Proposed disposition by Jose P. --- The design basis earthquake is the most severe earthquake that has been historically observed for the site and surrounding area with a margin (General Design Criteria 2). It is not clear what "maximum earthquake expected to occur" means or if it is stronger or weaker than the design basis. A comparison to the ground motions at Fukushima is not as simple as the statement in the comment. Either don't include the new text proposed in the comment or use: In order to produce some probability of failure to a spent fuel pool, the study used seismic forces between four (4) and eight (8) times greater than the earthquake used in the design of the reference plant.		Closed	OD Concurrence	
573	NRR	05.20.13	ii	Kevin Witt	Foreword – Modify 5th paragraph as follows: The study results are consistent with past studies' conclusions that spent fuel pools are likely to withstand severe earthquakes many times beyond the design basis without leaking. In the unlikely situation that a leak and radiological release does occur, the study shows public health effects are generally the same or smaller than earlier studies indicated due to the effectiveness of protective actions including relocating people and decontamination.	Kathy G.	Proposed disposition by Jose P. ---- "Many times" for other plants may not mean what it means for the reference plant (4 or 8 times). Proposed edits are: Remove "many times beyond the design basis" with "beyond the design basis" or just revert back to the original text.		Closed	OD Concurrence	
574	NRR	05.20.13	Abstract	Kevin Witt	Abstract – Modify last sentence as follows: The study will inform the question of moving ongoing Japan lessons learned Tier 3 evaluation of whether regulatory action is needed to require expedite transfer of spent fuel from spent fuel pools to dry storage sooner than current practice	Kathy G.	ok or Brian S words		Closed	OD Concurrence	
575	NRR	05.20.13	iv	Kevin Witt	Fix page numbers to run from foreward to executive summary (page# starts over at ES)	Kathy G.	Will be updated before June 10th release to Commission and ACRS		Review Comm.	OD Concurrence	
576	NRR	05.20.13	ES	Kevin Witt	Executive Summary (ES) – Fix line spacing of bulleted items to be consistent with rest of report.	Kathy G.	addressed		Closed	OD Concurrence	
577	NRR	05.20.13	iii	Kevin Witt	ES – Figure ES-1 should show consistent frequency numbers throughout the figure, such as 1/60,000. Recommend that all frequencies be shown as 1/xx,000 (instead of additional percent conditional probability).	Kathy G.	Don't agree.		Closed	OD Concurrence	

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
578	NRR	05.20.13	iv	Kevin Witt	ES – Modify 3rd paragraph as follows: This study presents realistic analysis using modern, scientifically validated, deterministic methods and assumptions, as well as probabilistic insights where practical. Previous studies have shown that earthquakes present the most risk for spent fuel pools, so this analysis considered a severe earthquake with ground motion several four (4) to eight (8) times stronger than that associated with the design-basis earthquake the maximum earthquake that could be expected to occur for the reference plant, and significantly greater than the earthquake that impacted the Fukushima 1 nuclear power plant. The This beyond-design-basis earthquake severity was selected to challenge the spent fuel pool integrity. The study considered two broad categories of spent fuel configuration:	Kathy G.	Proposed disposition by Jose P. --- The design basis earthquake is the most severe earthquake that has been historically observed for the site and surrounding area with a margin (General Design Criteria 2). It is not clear what 'maximum earthquake expected to occur' means or if it is stronger or weaker than the design basis. A comparison to the ground motions at Fukushima is not as simple as the statement in the comment. Possible text is: (or just use 'several times' instead of four to eight times) This study presents analysis using modern, scientifically validated, deterministic methods and assumptions, as well as probabilistic insights where practical. Previous studies have shown that earthquakes present the most risk for spent fuel pools, so this analysis considered a severe earthquake with ground motion four (4) to eight (8) times stronger than that associated with the earthquake used in the design of the reference plant. This beyond-design-basis earthquake severity was selected to challenge the spent fuel pool integrity. The study considered two broad categories of spent fuel configuration.		Closed	OD Concurrence	
579	NRR	05.20.13	iv	Kevin Witt	ES – Modify 4th paragraph, 3rd sentence as follows: For the severe earthquake considered in this study, it is likely that the power to normal spent fuel pool cooling systems will be assumed to be lost. This study does not consider the post-Fukushima improvements required by NRC and being implemented by the all US nuclear power plants that are intended to increase the likelihood of restoring or maintaining power and mitigation capability during severe accidents.	Kathy G.	addressed		Closed	OD Concurrence	
580	NRR	05.20.13	v	Kevin Witt	ES – Recommend revision of first sentence of the second full paragraph as follows: "The study's analyses shows that a release from a spent fuel pool accident after the severe earthquake at the reference plant could occur between six times out of a every billion times years and one out of time every 10 million times per years." The description of the units is odd since it starts out as an event frequency of once per 60,000 years (or, perhaps, 1.7 times every 100,000 years) and is diminished by the subsequent dimensionless probabilities	Kathy G.	addressed		Closed	OD Concurrence	
581	NRR	05.20.13	v	Kevin Witt	ES – Modify 3rd paragraph, 4th sentence as follows: "certain predicted simulated accident"	Kathy G.	Not accepted. Predicted is a word we use when analyzing scenarios, not simulated.		Closed	OD Concurrence	
582	NRR	05.20.13	vi	Kevin Witt	ES – Remove 1st sentence of 1st paragraph as this is a misleading description of the cost benefit analysis, where much more than displacement and land contamination is considered.	Kathy G.	addressed		Closed	OD Concurrence	
583	NRR	05.20.13	vi	Kevin Witt	ES – Modify 1st paragraph to reflect the Chapter 10 results where the consequences are frequency weighted.	Kathy G.	addressed		Closed	OD Concurrence	
584	NRR	05.20.13	vi	Kevin Witt	ES – Modify 3rd paragraph, 3rd sentence as follows: As a result, comparison of these the calculated latent cancer fatality risks in this study to the NRC safety goal is necessarily incomplete."	Kathy G.	Accepted.		Closed	OD Concurrence	
585	NRR	05.20.13	vii	Kevin Witt	Add the following paragraph to the end of the ES: The NRC's criteria for requiring a backfit (as denoted in Title 10 of the Code of Federal Regulations, (10 CFR) Section 50.109, "Backfitting Rule") are not met when evaluating the accident consequences within 50 miles of the site consistent with the regulatory framework. Sensitivity analyses that extend the analyses beyond 50 miles also show that the low-density spent fuel storage alternative was not cost justified for any of the discounted sensitivity cases, and was only marginally justified if discounting was not applied. Therefore, the expedited transfer of spent fuel from pools to dry cask storage containers at the reference plant does not meet the cost-justified substantial safety enhancement criterion.	Kathy G.	addressed		Closed	OD Concurrence	
586	NRR	05.20.13	xix	Kevin Witt	All 34 tables located in Appendix D are missing from the List of Tables.	Brian W.	List of tables has been updated.		Closed	OD Concurrence	
587	NRR	05.20.13	1, D-2	Kevin Witt	There are two listings of abbreviations and acronyms. Recommend deletion of page D-2, or, if two listings are required, their names should be consistent.	Fred S.	Agree, title changed to be consistent with main report.		Closed	OD Concurrence	

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588	NRR	05.20.13	2	Kevin Witt	The list of Abbreviations and Acronyms includes the entry "MELCOR - not an acronym," but omits a variety of other items that are similarly situated. For example, NUREG, LSDYNA, CORSOR, SCALE, MAVRIC, BONAMI, CENTRM, DENOVO, FW-CADIS and VELCORS are also not acronyms, but are used within the document in all capital letters (as is MELCOR) but omitted from the list of acronyms. The proper usage of LSDYNA appears to be LS-DYNA and it seems to be a partial acronym with the LS standing for Livermore Software.	Don A.	MELCOR has been removed from the Acronym list		Closed	OD Concurrence	
589	NRR	05.20.13	5	Kevin Witt	1st paragraph – Change the phrase "pros" to "benefits" and "cons" to "disadvantages"	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
590	NRR	05.20.13	5	Kevin Witt	Modify 3rd sentence of 4th paragraph as follows: In order to determine whether regulatory actions needs to be taken in this area, the NRC has prepared a plant-specific regulatory analysis to which will inform the generic determination of evaluate this issue.	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
591	NRR	05.20.13	5	Kevin Witt	9 lines from page bottom – remove colon and space so that it is changed from (see APPENDIX D:) to (see APPENDIX D).	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
592	NRR	05.20.13	5	Kevin Witt	Delete the remaining text in the paragraph starting with "A regulatory analysis..." The reason for this deletion is that these sentences describe a separate Tier 3 analysis, not the reference plant specific analysis contained in Appendix D	Don A.	Added as suggested by the reviewer		Closed	OD Concurrence	
593	NRR	05.20.13	7	Kevin Witt	The last paragraph is confusing, as written. Suggest revising to: "PBAPS has two General Electric (GE) Type 4 BWRs with Mark I containments, Units #2 and #3. Unit #3 is used by the SFPSS when unit-specific information is required. Unit #1 is no longer in operation. Each reactor Units #2 and #3 each have has a dedicated SFP, and the pools do not share a common refueling floor, as is the case with some plants of this design."	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
594	NRR	05.20.13	11, D-17	Kevin Witt	Format for table notes are inconsistent (see Table 1 (p. 11) and Table 6 (p. D-17). Revise accordingly.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
595	NRR	05.20.13	17	Kevin Witt	Discussion on the NTTF Report, recommend adding NTTF recommendation 4.1, (adding SFP cooling to SBO capabilities). The order resulted from the evolution of the recommended 4.1 rulemaking and the recommended 4.2 order, which puts in place requirements for SFP cooling, while the items discussed from recommendation 7 only put in place requirements for an SFP level instrument.	Brian W.	See response to comment #442		Closed	OD Concurrence	
596	NRR	05.20.13	19	Kevin Witt	Last bullet in first set of bulleted items – Change SECY 11-0089 to SECY-11-0089.	Don A.	Updated		Closed	OD Concurrence	
597	NRR	05.20.13	20	Kevin Witt	Last paragraph incorrectly identifies the content of each of the study appendices. Revise accordingly.	Brian W.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
598	NRR	05.20.13	28	Kevin Witt	Change units of temperature to be consistent (units of C and K are both used on this page)	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
599	NRR	05.20.13	29	Kevin Witt	The final assumption comment on this page uses the acronym AC rather than ac for alternating current. The use of lower case letters, which would match the list of abbreviations and acronyms, would better match the standard agency usage.	Brian W.	changed to lowercase.		Closed	OD Concurrence	
600	NRR	05.20.13	31	Kevin Witt	The first full paragraph starts out with the sentence "For each of these, large seismic events and severe weather LOOP events are logically the most relevant initiators, as they are the type of initiators that are most likely to initiate an accident at the reactor and SFP, while simultaneously hampering further accessibility to key areas, key systems and components, and key resources." It might be better to discuss the latter as being a severe weather SBO; for a LOOP alone the availability of emergency diesel generators would prevent an accident at the reactor and SFP.	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
601	NRR	05.20.13	37	Kevin Witt	Several locations in the document frequency numbers are not in superscript (1x10-5 should be 1x10 ⁻⁵)	Brian W.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
602	NRR	05.20.13	50	Kevin Witt	The abbreviations E, W, N, and S are omitted from the list of abbreviations and acronyms.	Don A.	Updated		Closed	OD Concurrence	
603	NRR	05.20.13	70	Kevin Witt	Recommend adding a direct comparison of 0.7g to the "g" loads experienced during other earthquakes.	Jose P.	Those comparisons are provided in Tables 10 to 14 in subsequent pages of Ch. 4.		Closed	OD Concurrence	
604	NRR	05.20.13	86	Kevin Witt	The common usage for NEI documents should be NEI 06-12 rather than NEI-06-12	Jose P.	I checked that this change was made in the current version of the report.		Closed	OD Concurrence	

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605	NRR	05.20.13	Pg 90	Kevin Witt	Modify 3rd bullet as follows: At a water depth of 0.6 m (2ft) above the top of the fuel, the projected dose at the maximally exposed location on the refueling floor surpasses 25 rem in one hour, and would be expected to increase quickly to much higher dose rates that could prevent personnel actions on the refueling floor. 25-rem is the value above which actions can be taken to save lives or protect large populations, on a voluntary basis, (as defined in Table 2-2 of U.S. Environmental Protection Agency (EPA) 400 R 92 001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," issued May 1992)	Brian W.	The suggested modification would imply that 25 rem in one hour would not prevent personnel actions on the refueling floor. Given the expected uncertainty during an event leading to fuel uncover, it is the authors expectation that actions will not be taken at this dose rate level. This expectation is corroborated by EPRI-TR-1025295, which provides the basis for SAMGs.		Closed	OD Concurrence	
606	NRR	05.20.13	Pg 136	Kevin Witt	For the OCP1 moderate leak, discussion appears to state that the rationale for B.5.b failure is because make up is used and not spray. Elsewhere, (sensitivity study), insufficient spray is discussed. This needs to be clarified as to which case occurs. It is suggested that for a moderate leak using current information available to control room staff, (INPO SFP leakoff), it would be obvious to operators that spray would be used for moderate leaks (1800 gpm). Overall comment, it needs to be clear in the study what the mitigative gaps are, and why they are believed to occur. OCP specific discussion is scattered throughout the SFPSS, and there is no summary of this issue in "Results	Brian W.	Though some sensitivities were performed on mitigation, the intent of the study was not to evaluate the benefit of one form of mitigation over another, or to uncover gaps in mitigation. These issues are covered in detail in the security studies.		Closed	OD Concurrence	
607	NRR	05.20.13	7	Kevin Witt	The rationale for the very large relocation footprint still appears to grossly overestimate the probability of it's occurrence. As discussed in section 9, page 201 and section 10, page 229, it appears that either an OCP2 unmitigated small leak or an OCP3 unmitigated small leak results in the 9400 sq. mile relocation footprint. This section does not state, and should, that the release scenarios that result in the large releases are from the most easily mitigated scenarios. Some figures used in Commission briefings, showing approximate release consequences relative to the OCP scenarios are not in Section 7 and would serve as a better explanatory tool than the figures in this section. Some relevance between the more likely unlikely scenarios, (OCP1 mitigative gap) (OCP3 mitigative gap) which result in much smaller land contamination footprints, would provide some relevance. Specific statements to provide better context to the described extensive contamination would be important here	AJ N.	I agree. However, there are a couple complicating factors. Stating that "the large releases are easier to mitigate because they are small leaks" overstates our ability to predict large releases. In our sensitivities, many times the opposite effect occurred, that being the faster moderate leak accident progressions were more likely to have large releases. (See the results for the uniform configuration sensitivity and for the multi-unit sensitivity.) Therefore, small factors in the accident progression influence large releases and these are not well understood. In addition, because other potential complications that can affect the accident, how "easily mitigated" an accident is will not be clear without more work. These complications include potential situations without enough available staff or equipment, or multi-unit/concurrent reactor complications. For instance, either accidents at multiple pools/reactors or even a seismic event itself can challenge the availability of equipment. Even the relative difference on the sequences is still not fully clear, as complications may not affect each accident sequence equally. Footnote added to the Overall Consequence Results table which states: "Largest releases here are associated with small leaks (although sensitivity results show large releases are possible from moderate leaks). Assuming no complications from other SFPs/reactors or shortage of available equipment/staff, Section 8 shows that there is a good chance to mitigate the small leak event."		Closed	OD Concurrence	
608	NRR	05.20.13	Pg 171	Kevin Witt	Table 36 appears to be in error. Low density mitigated releases are higher than not mitigated. The next sentence below states that "these estimates should be weighted against the likelihood of the accident", so that should be shown or referenced. It is open ended, as written. Throughout, "EPZ" is not correctly used. EPZ refers to 1) plume exposure EPZ – approx. 10 miles radius, and 2) ingestion pathway EPA – 50 miles. For somewhat knowledgeable laypersons, incorrectly using EPZ term may be problematic to quotes mis-informing emergency response capabilities. Recommend correcting use of EPZ	AJ N.	Multiple part comment. 1) Footnote added to table 35 and 36 with the following footnote: "Mitigation can moderately increase release size (see Section 6.3); the effect is small compared to the reduction in release frequency." No change required for table 33 and 34, as these tables already have the footnote. 2) Crosslink reference added to table 33, which weight the likelihood to the consequence. 3) A footnote is added the first time EPZ is mentioned, which reads: EPZ in this study refers to the plume exposure pathway EPZ with a radius of about 10 miles from the reactor site. This should not be confused with the ingestion pathway EPA with a radius of about 50 miles.		Closed	OD Concurrence	

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609	NRR	05.20.13	8	Kevin Witt	The HRA needs to have the plant specific references removed (Peach Bottom units, specific procedure references, floor plan labeling), and use "reference plant" discussion	James C.	The text is removed. The term reference plant is used.		Closed	OD Concurrence	
610	NRR	05.20.13	176	Kevin Witt	Recommend revision of Section 8.1.1 bullet (1) makes the statement "As mentioned earlier, the water in this scenario would take 9 days to decrease to the fuel rack top." This was not mentioned previously in the document and it does not match the licensee's reported time to boiling to the top of fuel in their EA-12-049 integrated plan (ML13059A305 at page 30) which is 95 hours for non-outage conditions and 33 hours for the design basis heat load	James C.	See comment #450.		Closed	OD Concurrence	
611	NRR	05.20.13	184	Kevin Witt	The description of the location of the 50.54(hh)(2) equipment storage on this page should be designated for Official Use Only- Security Related Information per SRM-SECY-04-191	James C.	See comment #451.		Closed	OD Concurrence	
612	NRR	05.20.13	249	Kevin Witt	There are a number of references to the PBAPS FSAR, but it is not listed as a reference	Brian W.	See response to comment #452		Closed	OD Concurrence	
613	NRR	05.20.13	D-1	Kevin Witt	The NRC seal used on this page is the improper one (it has brown tail feathers).	Fred S.	Agree. deleted NRC seal.		Closed	OD Concurrence	
614	NRR	05.20.13	General	Kevin Witt	Recommend adding a New Section after Section 10 "Assessment of Previous Studies" and Before Section 11 "Results and Conclusions." Please see the actual WORD document for complete text for this comment	Don A.	Added. The provided text is added as a new Section 11 with the results and conclusions section now Section 12.		Closed	OD Concurrence	H
615	NRR	05.20.13	11	Kevin Witt	Recommend revision of Chapter 11 "Results and Conclusions" as follows... Please see the actual WORD document for complete text for the above comment.	Kathy G.	Recommended changes have been considered. At this time no changes to the Results and Conclusions are planned		Closed	OD Concurrence	H
616	RES	05.20.13	D-10	AJN	Please consider using different letters for calculations of release frequency. R = FxC appears to be risk equals frequency times consequence. Perhaps Frelease= sum(Finitiator * Prelease)	Fred S.	Incorporated		Closed	OD Concurrence	
617	RES	05.20.13	D-11	AJN	Table 2: Release Frequencies for Spent Fuel Pool Initiators... Please see the actual WORD document for complete text for this comment	Fred S.	Agree. Revised Table 2 consistent with your suggestions.		Closed	OD Concurrence	
618	RES	05.20.13	D-17	AJN	Table 6: Average Accident Occupational Exposure at Fukushima Dai-ichi Nuclear Power Plant from March to May 2011 Comment: I estimate the equivalent amount of total worker exposures for a SFP could be significantly higher than that of a reactor for two reasons: 1) A SFP contains significantly more inventory. Radioactive decay will not change significantly on a month-to-month basis (¹³⁵ I-137 has a half-life of 30 years). 2) The activity levels in reactors (immediately after SCRAM) are expected to fall below the activity levels of a SFP relatively quickly (24 hours?). Consider stating that a SFP accident compared to a reactor accident could significantly affect the total worker dose, and this is a source of uncertainty. Perhaps you can state that the significance is small compared to the expected public dose, if that is the case	Fred S.	Incorporated into section D.3.2.2.8		Closed	OD Concurrence	
619	RES	05.20.13	D-17	AJN	Table 7: Estimated Immediate Accident Occupational Monthly Exposure at Fukushima Comment: The "total monthly doses" in table 7 are from multiplying the workers in table 6 by the dose levels in table 7? Please consider clarifying this. Also, I suggest adding units to Table 7.	Fred S.	Incorporated		Closed	OD Concurrence	

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620	RES	05.20.13	D-18	AJN	Table 9: Long-Term Accident Occupational Exposure for a Spent Fuel Pool Fire Comment: Is this for "onsite" occupational exposures, correct? The societal dose from MACCS2 includes occupational exposures from offsite protective actions, specifically offsite decontamination.	Fred S.	No change required. As described in section D.3.1 under Occupational Health (Accident), this attribute measures occupational health effects associated with site workers.		Closed	OD Concurrence	
621	RES	05.20.13	D-19	AJN	Table 10: Long-Term Habitability Criterion Comment: For what it matters, my current understanding is that the 2 rem limit first year may better represent the EPA PAGs for a SFP, more so than the 4 rem in 5 years that I believe you may currently be using for the best estimate. I need to verify this with others though.	Fred S.	No change required.		Closed	OD Concurrence	
622	RES	05.20.13	D-19	AJN	Table 10: Long-Term Habitability Criterion Comment: How did you scale the societal dose based on these criteria, and what scaling did you use? Did you use my computer spreadsheet, and for what distance? In the report, I reported a similar sensitivity, but these were differences in land contamination, not societal dose. My computer spreadsheet is based on a single source term, although that is probably okay to get a rough estimate.	Fred S.	No change required. Results based on computer spreadsheet.		Closed	OD Concurrence	
623	RES	05.20.13	D-20	AJN	Projected Number of Outages and Spent Fuel Assemblies Comment: It is a 24 month operating cycle. The report misstates this.	Fred S.	Incorporated Revised text to reflect 24 month cycle.		Closed	OD Concurrence	
624	RES	05.20.13	D-27	AJN	Consequences Beyond 50 Miles Comment: I disagree with using a distance truncation of 50 miles for the regulatory analysis, as I believe this can significantly underestimate the total offsite consequence for large releases, such as from the estimated source terms in this report. I appreciate the regulatory analysis sensitivity which includes impacts beyond 50 miles. However, this should be considered the baseline, not merely a sensitivity. I understand that this is the guidance given in the Regulatory Analysis Handbook. However, as stated in OMB's Circular A-4, for which the Handbook is based on: "[The scope of] your analysis should focus on benefits and costs that accrue to citizens and residents of the United States. Where you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, these effects should be reported separately. The time frame for your analysis should cover a period long enough to encompass all the important benefits and costs likely to result from the rule." In addition, the "baseline should be the best assessment of the way the world would look absent the proposed action".	Fred S.	No change required. As stated in section 4.3.3, "Estimation of Values," in NUREG/CR-0058 (RA Guidance), "In the case of nuclear power plants, changes in public health and safety from radiation exposure and offsite property impacts should be examined over a 50-mile distance from the plant site." Radiological impacts beyond 50 miles are addressed as a sensitivity analysis.	Please keep me informed when we hope to update guidance. I hope to forward this comment on when we do.	Closed with Ques.	OD Concurrence	

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625	RES	05.20.13	D-27	AJN	<p>Consequences Beyond 50 Miles</p> <p>For some of the high-density storage cases, this results in public health consequences that extend beyond the postulated accident site. The accuracy of the model decreases with distance because of the atmospheric effects that would break up the plume. To conservatively capture effects beyond 50 miles, this regulatory analysis will evaluate the public health and safety and economic consequences estimated by the plume model beyond the 50-mile distance from the plant site as a sensitivity analysis.</p> <p>Comments: Please delete "For some of the high-density storage cases". For all the analyzed releases, most of the societal dose is projected to be from exposures beyond 50 miles. Please delete "The accuracy of the model decreases with distance because of the atmospheric effects that would break up the plume". This could give the impression that the radioactive material somehow dissipates without consequence. (If a statement about the accuracy is desired, I suggest "While the accuracy of the model decreases with distance, the amount of public exposure beyond 50 miles in the event of a release is expected to be is significant.") Please delete the word "conservatively". Our benchmark to the more complex NARAC code indicates that MACCS2 is not conservative beyond 50 miles, and in fact, while MACCS2 is appropriate for our uses, it indicates we may be somewhat underestimating the amount of ground contamination at far distances.</p>	Fred S.	Incorporated suggested text changes.		Closed	OD Concurrence	
626	RES	05.20.13	D-26	AJN	<p>Present Value Calculations</p> <p>Comment: Since these calculations are considering future offsite consequences, they should also consider expected future population densities and an expected future value of life as to not undervalue future impacts. Both of these naturally go up, as it is the historical trend of the population to grow and the public willingness to pay to avoid more risks as wages increase.</p>	Fred S.	No change required. Assumption that no additional population growth was evaluated beyond that contained in SFPSS, section 7.1.3 is included in section D.3.2.2.10. Willingness to pay escalation is included in the dollar per person-rem conversion factor sensitivity analysis so no change is required.	Please keep me informed when we hope to update guidance. I hope to forward this comment on when we do.	Closed	OD Concurrence	
627	RES	05.20.13	D-26	AJN	<p>Present Value Calculations</p> <p>Comment: Consider not using a discount for health effects as the baseline. The act of monetizing health effects is appropriate in order to compare the impact of health effects and costs. However, treating the value of life as if it is an investment with a rate of return does not make sense. Discounting the value of life is saying that life in the past somehow less valuable than life today.</p> <p>I appreciate the regulatory analysis sensitivity which includes no discount, and I understand the guidance given in the Regulatory Analysis Handbook likely states to discount benefits. However, in my opinion, for health effects, "no discount" should be considered the baseline. The use of a discount for health effects—especially when simultaneously not crediting future population growth and expected future VSL—will undervalue future impacts. The amount of years of life lost is not a consideration here because an accident in the future would not affect the average age of the public.</p>	Fred S.	No change required. This comment is inconsistent with NUREG-1530, "Reassessment of NRC's Dollar Per Person-Rem Conversion Factor Policy and with the RA Handbook. However, your suggested no discount case is provided as a sensitivity analysis.	Please keep me informed when we hope to update guidance. I hope to forward this comment on when we do.	Closed with Ques.	OD Concurrence	
628	RES	05.20.13	D-28	AJN	<p>Table 20: Summary of Public Health (Accident) for Low-density Spent Fuel Pool Storage (All Initiators)</p> <p>Comment: Consider rewording the title to clarify this is a comparison of the high and low density.</p>	Fred S.	No change required. The supporting text referring to this table clarifies that this table provides a summary of the delta benefit for averted public health (accident) radiation exposure.		Closed	OD Concurrence	

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629	RES	05.20.13	D-28	AJN	The best estimate values are based on the reference site's population density of 495 people per square mile within a 50-mile radius from the site and result from the release of radionuclides from a full spent fuel pool (Spent Fuel Pool Study, p A-4). Comment: My calculations give a population density of 722 people/mi ² , as projected to 2011. Also, I cannot find the reference you cite here.	Fred S.	Agree. Incorporated revised regional demographic		Closed	OD Concurrence	
630	RES	05.20.13	D-28	AJN	Comment: I suggest the following small edit: The low estimate case reflects the net decrease in health benefit between of a spent fuel pool with low-high-density storage compared to a pool with high-low-density storage if the more stringent Pennsylvania protective action guides are used following an event challenging spent fuel pool cooling. The high estimate case reflects the additional calculated health benefits that result if a less stringent 2 rem annual dose limit is used	Fred S.	Incorporated suggested text changes.		Closed	OD Concurrence	
631	RES	05.20.13	D-28	AJN	Table 21: Sensitivity Analyses of Public Health (Accident) Benefits for Low-density Spent Fuel Pool Storage for All Initiating Events (within 50 miles) Comment: I suggest stating what the sensitivity is in the title, and other titles, as appropriate.	Fred S.	No change required. The sensitivities modeled are described in the text referring to the table.		Closed	OD Concurrence	
632	RES	05.20.13	D-29	AJN	Table 22: Sensitivity Analyses of Public Health (Accident) Benefits for Low-density Spent Fuel Pool Storage for All Initiating Events (beyond 50 miles) Comment: I suggest adding the word "including" to "beyond 50 miles" in all relevant parts of the RA, to clarify that these calculations do not exclude 0-50 miles.	Fred S.	Incorporated.		Closed	OD Concurrence	
633	RES	05.20.13	D-31	AJN	As Table 25 shows, the estimated total cost offset for the low-density storage option relative to the regulatory baseline ranges from \$3.2 million (3 percent net present value) to \$2.1 million (7 percent net present value) considering consequences within 50 miles from the site. Comment: I believe you mean \$703k to \$460k within 50 miles.	Fred S.	Revised text to agree with the base case values contained in Table 25.		Closed	OD Concurrence	
634	RES	05.20.13	D-34	AJN	Modeling Uncertainties Comment: Consider discussing how 50.54(hh)(2) mitigation and the uncertainty in seismic frequencies can affect the analysis. Ideally, we could have a sensitivity for these uncertainties, but I understand we may not have time.	Fred S.	Agree. Add new section 3.2.3.10 Mitigation Assumptions. I agree that a sensitivity analysis could be performed to address seismic frequency uncertainties and I also agree that we don't have time to incorporate this change into this draft.		Closed	OD Concurrence	
635	RES	05.20.13	D-36	AJN	Comments: I suggest deleting the paragraphs on early fatality and latent cancer fatality conclusions. Do you feel this is necessary here? I imagine this was originally included because it was a standalone report. The reason for "no early fatalities" has been updated. At least one case had dose levels that exceeded the early fatality threshold and emergency response moved people so they did not incur the dose. Also, FSME had some comments about the dose truncation models, which I plan to address.	Fred S.	Revised to include the following text from SFPSS section 7.2.1. "When doses do exceed levels for early fatalities, emergency response as treated in the main report effectively prevents any early fatality risk, at least in part because the modeled accident progression results in releases that are long compared with the time needed for relocation."		Closed	OD Concurrence	
636	RES	05.20.13	D-36	AJN	Tables 30, 33, and others, as appropriate. Comment: Consider identifying (footnote?) the parameters that vary the costs between the high/low estimates. It appears offsite health costs consider different protective action levels (habitability criterion), but other attributes may also vary and it is not clear why.	Fred S.	No change required. The values listed are summarized from previous tables, which provided the rationale for the low and high estimates.		Closed	OD Concurrence	

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637	RES	05.20.13	D-36	AJN	Tables 30, 33, and others, as appropriate. Comment: It appears that some uncertain parameters will vary the high/low estimates, while others are considered separately in sensitivity analyses. This creates two sets of high/low estimates. Consider explaining why these uncertainties are considered differently, or if appropriate perhaps combine them to make one set of high/low estimates.	Fred S.	No change required. The values listed in the base case are summarized from previous base case tables, which provided the rationale for the low and high estimates. Similarly, this also applies to the sensitivity summary tables.		Closed	OD Concurrence	
638	RES	05.20.13	D-36	AJN	Tables 30, 33, and others, as appropriate. Comment: For the operation/implementation costs, I suggest flipping the values for the high and low estimates. The highest "net benefit" is not currently the "high estimate", which does not make sense.	Fred S.	Incorporated. High est is highest net benefit.		Closed	OD Concurrence	
639	RES	05.20.13	D-36	AJN	1. Tables 30, 33, and others, as appropriate. Comment: Offsite property damage does not vary with different protective action levels as offsite health costs do between high/best/low estimates. Less strict protect actions, while allowing for more health effects, will not incur as much offsite property damage costs. Likewise, more strict protective actions will trade less health effects for more property costs.	Fred S.	No change required. Although I agree that different habitability criteria will result in a reduction in offsite property damage cost, it isn't significant. By using the PA PAG habitability criteria it maximizes the offsite property cost offset.	This isn't my understanding. I expect offsite costs to change significantly with protective actions. Although I agree not considering it maximizes the cost offset.	Closed with Ques.	OD Concurrence	
640	RES	05.20.13	D-35	AJN	1. Other Favorable Spent Fuel Loading Configurations Comment: Please consider having Hossein review this in detail. 1x8 pattern can undergo zirc fire/oxidation. A 1x8 pattern does not have more mass than a 1x4. I am confused about the statement "allows for the storage of a total 2,771 assemblies". Is this meant to say in addition to what is already in the pool? The 1x8 pattern was analyzed for a high density loading, and has the same amount of assemblies as the 1x4 (potentially no offloads required to implement).	Fred S.	Resolution provided in comment #465.		Closed	OD Concurrence	
641	RES	05.20.13	D-38	AJN	Comment: I suggest stating "including beyond 50 miles" instead of stating "up to 500 miles". A small portion of the population dose comes from beyond 500 miles.	Fred S.	Incorporated. Revised text to "beyond 50 miles."		Closed	OD Concurrence	
642	RES	05.20.13	D-42	AJN	The frequency of a release of radioactive material to the environment is assumed to be the same as the frequency of spent fuel damage. The underlying assumption is that the spent fuel pool housing (refueling building, auxiliary building or secondary building fails due to either the seismic event, extreme temperature conditions which would accompany a Zirc cladding fire and fuel melting scenario, or hydrogen explosions	Fred S.	See resolution to comment 643		Closed	OD Concurrence	
643	RES	05.20.13	D-42	AJN	Comment: Perhaps consider deleting the second sentence. It is somewhat confusing, and "because the SFP is not in primary containment" is probably sufficient.	Fred S.	Incorporated. Deleted second sentence.		Closed	OD Concurrence	
644	RES	05.20.13	D-42	AJN	1. Therefore, the risk and consequences of a SFP accident at the reference plant appear to meet the Safety Goal Policy Statement public health objectives. Comment: Please delete "and consequences" as the safety goal does not have health objectives for "consequence".	Fred S.	Incorporated.		Closed	OD Concurrence	
645	RES	05.20.13	D-42	AJN	Conclusion Comment: Please consider adding: "While the expedited fuel movement is not cost beneficial, the report has discovered that an alternative 1x8 high density fuel configuration is likely to have significantly lower costs in implementation and potentially similar benefits to the low density configuration. This alternative should also be considered in addition to the low density loading as part of the generic Regulatory Analysis for expedited fuel movement."	Fred S.	Agree Added suggested text.		Closed	OD Concurrence	

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646	RES	05.20.13	Foreword	AJN	The hot fuel is distributed throughout the pool and is surrounded by older, cooler used fuel as well as water. Comment: Under current regulation, the hot fuel is not necessarily distributed throughout the pool. Some restrictions exist, but pools may discharge all the hot fuel in the same area.	Kathy G.	This is the starting point for the low density case in the study.		Closed	OD Concurrence	
647	RES	05.20.13	Foreword	AJN	last paragraph Comment: Consider adding: "However, the report has discovered that an alternative 1x8 high density fuel configuration that is likely to have significantly lower costs and potentially similar benefits to a pool with less spent fuel."	Kathy G.	This was a sensitivity case, and no cost-benefit has been done to substantiate this suggested addition. NRR may look at this in the Tier 3 reg analysis.		Closed	OD Concurrence	
648	RES	05.20.13	Abstract	AJN	The study will inform the question of moving spent fuel from spent fuel pools to dry storage sooner than current practice. Comment: Make present tense.	Kathy G.	Revised sentence based on other comments.		Closed	OD Concurrence	
649	RES	05.20.13	ES	AJN	The analyses show the likelihood of a radiological release from the spent fuel after the severe earthquake at the reference plant to be between about six in a billion and one in 10 million per year. Comment: Consider calling the severe earthquake, the "analyzed" severe earthquake. We talk generically about earthquakes before this, and the reader will not understand that these results are not applicable to all earthquakes.	Kathy G.	addressed		Closed	OD Concurrence	
650	RES	05.20.13	ES	AJN	In addition, the cost benefit analysis included with this study does not support requiring low-density spent fuel pool storage for the reference plant. The risk due to beyond design basis accidents for the spent fuel pool studied, while not negligible, is sufficiently low that the added costs involved with expediting the movement of spent fuel from the pool to achieve low-density fuel pool storage are not warranted. Comment: Consider adding: "However, the report has discovered that an alternative 1x8 high density fuel configuration that is likely to have significantly lower costs and potentially similar benefits to a pool with less spent fuel."	Kathy G.	This was a sensitivity case, and no cost-benefit has been done to substantiate this suggested addition. NRR may look at this in the Tier 3 reg analysis.		Closed	OD Concurrence	
651	RES	05.20.13	ES	AJN	The study evaluated 10 CFR 50.54(hh)(2) mitigation measures by analyzing each scenario twice – assuming successful implementation of mitigation measures and without successful mitigation assumed. Comment: "Successful implementation" implies that mitigation is successful in preventing release, which is not necessarily true. I suggest stating: "with and without credit for mitigation measures."	Kathy G.	addressed		Closed	OD Concurrence	
652	RES	05.20.13	ES	AJN	1. The study also shows even when 10 CFR 50.54 (hh)(2) mitigation measures are unsuccessful; a lower likelihood of a release is predicted than in previous studies. Comment: Upon further review and comparison with past studies, this is not correct, at least when compared to NUREG-1353 and NUREG1738. When you consider the likelihood of bin 4 (and that event's potential effects on cooling during the operating cycle), our frequencies are likely comparable. Consider changing the sentence to: "The study also shows even when 10 CFR 50.54 (hh)(2) mitigation measures are unsuccessful; the likelihood of a release is comparable to previous studies."	Kathy G.	addressed		Closed	OD Concurrence	

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653	RES	05.20.13	ES	AJN	<p>The study examines how an accident proceeds if the pool liner is damaged, concluding that pool leaks are somewhat less likely to release radioactive material to the environment than in previous studies.</p> <p>Comment: It is unclear if this statement is referring to the full release frequency or the conditional release probability in the event of a pool leak. If referring to the conditional probability, this is true, in which case this should be clarified. If referring to the release frequency, this is only true when crediting mitigation. If not crediting mitigation, the release frequencies are comparable.</p>	Kathy G.	<p>This is a conditional probability since at the beginning of the statement, it describes progression of the accident leading to a release considering pool liner damage. The second bullet following the paragraph also repeats this statement followed by numerical values for the fraction of the cycle that releases can occur.</p>		Closed	OD Concurrence	
654	RES	05.20.13	ES	AJN	<p>The study's detailed accident progression modeling differs from earlier work in showing that draining the pool after liner failure is less likely to lead to a release.</p> <p>Comment: Please consider the following edit: "The study's detailed accident progression modeling differs from earlier work in showing that, for the severe earthquake analyzed, draining the pool after liner failure less likely to lead to a release." This conclusion is not applicable to seismic bin 4, which earlier work considered. Previous studies considered the possibility that fuel geometry may not be maintained. We assumed it was because we did not analyze bin 4. Our expectation is that this probability would be higher for bin 4, which is consistent with earlier work</p>	Kathy G.	addressed		Closed	OD Concurrence	
655	RES	05.20.13	ES	AJN	<p>That damage would remove structures that could retain radioactive material, along with allowing more oxygen into the building potentially prolonging a spent fuel pool fire.</p> <p>Comment: "Prolong" means drawn out, which is not the intent of the sentence. I suggest stating "exacerbate" instead.</p>	Kathy G.	addressed		Closed	OD Concurrence	
656	RES	05.20.13	ES	AJN	<p>The study also analyzed a 1x8 loading pattern (hotter fuel surrounded by two cooler assemblies on each side) which also resulted in smaller radioactive releases because the hotter assembly transfers its heat to the cooler assemblies.</p> <p>Comment: This is not the definition of a 1x8 pattern. I suggest stating "(hotter fuel surrounded by 8 of its own cooler assemblies)"</p>	Kathy G.	addressed		Closed	OD Concurrence	
657	RES	05.20.13	ES	AJN	<p>For the severe earthquake analyzed, successful measures reduced the time when the fuel is susceptible to a fire by a factor of about twenty.</p> <p>Comment: The "time" is not reduced by a factor of twenty. I suggest "the severe earthquake analyzed, successful measures reduced the cases that fuel is susceptible to a fire by a factor of about twenty."</p>	Kathy G.	<p>This sentence was removed to avoid confusion. Reference is made to a factor of twenty reduction in the likelihood of release in the second bullet on the same page.</p>		Closed	OD Concurrence	
658	RES	05.20.13	ES	AJN	<p>The results are comparable to or less than those in previous studies, largely because this study's updated modeling demonstrates the releases would generally include less radioactive material compared to past studies.</p> <p>Comment: On further review, while the release fractions are generally smaller, the inventories are larger than in the past. I suggest we change this sentence to say: "The results are comparable to or less than those in previous studies, largely because this study's updated modeling demonstrates the releases of radioactive material are generally comparable to past studies."</p>	Kathy G.	addressed		Closed	OD Concurrence	

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659	RES	05.20.13	ES	AJN	<p>1. It is more difficult for these radioactive materials to lead to radiation doses high enough to result in early fatalities. If any releases were anticipated to occur, the public would be evacuated or otherwise protected to reduce potential health effects.</p> <p>Comments: The intent of the second sentence has changed. I suggest we change the sentence to say: "In cases during release for which we expect there is a potential for early fatalities, the public is expected to be evacuated or otherwise protected to avert this risk."</p>	Kathy G.	addressed		Closed	OD Concurrence	
660	RES	05.20.13	ES	AJN	<p>1. For low-density loading or with successful deployment of 10 CFR 50.54(hh)(2) mitigation measures, protective measures may include up to a few hundred square miles to be temporarily restricted and on the order of 100,000 people within 100 miles of the plant to be temporarily displaced.</p> <p>Comments: "Temporarily restricted" is not the intent of the sentence. We mean "interdiction", which is a specific type of restriction for potentially a much smaller area. Also, I disagree with calling these individuals "temporarily displaced", as temporary in this context would mean for as much as 30 years. An individual who is displaced even more than a year may never return, and may feel forced to establish a new home elsewhere, would not consider his situation temporary. I suggest the following: "For low-density loading or with successful deployment of 10 CFR 50.54(hh)(2) mitigation measures, protective measures may include up to a few hundred square miles to be temporarily restricted from public occupation and on the order of 100,000 people within 100 miles of the plant to be displaced after the accident."</p>	Kathy G.	Whole paragraph was replaced with frequency-weighted results to match 12.1 results.		Closed	OD Concurrence	
661	RES	05.20.13	ES/11.2	AJN	<p>However, the risk due to beyond design basis accidents for the spent fuel pool studied, while not negligible, is sufficiently low that the added costs involved with expediting the movement of spent fuel from the pool to achieve low-density fuel pool storage are not warranted.</p> <p>Comment: Consider adding that the report discovered that a 1x8 pattern is likely to have significantly lower costs and potentially similar benefits to a pool with less spent fuel, and may be a viable alternative.</p>	Kathy G.	This was a sensitivity case, and no cost-benefit has been done to substantiate this suggested addition. NRR may look at this in the Tier 3 reg analysis.		Closed	OD Concurrence	
662	NRO	05.20.13	ES	Charles Ader	The Executive Summary should acknowledge that the analysis does not include the new mitigation required by Orders EA-12-051 and EA-12-049 which should serve to further reduce spent fuel pool accident risk	Kathy G.	addressed		Closed	OD Concurrence	
663	NRO	05.20.13	ES	Charles Ader	The first paragraph on page vi of the Executive Summary does not properly convey the very low likelihood of a release. This paragraph should be revised to provide proper context to the likelihood of a release (i.e., weighted by the frequency of the release), as has been done in conclusion 13 on page 247	Kathy G.	addressed		Closed	OD Concurrence	
664	NRO	05.20.13	ES	Charles Ader	The second to the last sentence of the first paragraph on page vi of the Executive Summary states that "Consistent with past studies . . ." and reports areas that would require interdiction. This statement appears to be inconsistent with Table 62 on page 235, which compares past studies and states that this metric was not reported in previous spent fuel pool analyses	Kathy G.	addressed		Closed	OD Concurrence	
665	NRO	05.20.13	D	Charles Ader	Appendix D (page D-5) states that the new mitigation required by Orders EA-12-051 and EA-12-049 was included in the study. However, the study does not include this new mitigation	Fred S.	Incorporated as discussed in resolution to comment #634.		Closed	OD Concurrence	
666	NRO	05.20.13	D	Charles Ader	Page D-41 states that Table 30 shows that a requirement for low-density spent fuel storage alternative does not achieve a substantial increase in public health and safety. However, Table 30 only contains dollar values	Fred S.	Revised table reference to Table 32, Summary of Total Benefits and Cost Offsets for Low-Density Spent Fuel Pool Storage for All Initiator Events. Also added the following text to section D.4.3: The best estimate of the delta benefit for accident dose averted is approximately 245 person-rem as shown in Tables 20 and 23.		Closed	OD Concurrence	

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667	NRO	05.20.13	Pg 38	Charles Ader	The response spectrum shown in Figure 7 (page 38, section 3.3), which is referred to as the reference GMRS, appears to be the 10-5 uniform hazard response spectrum rather than a performance-based GMRS as defined in RG 1.208. Allowing it to be referenced as a GMRS is inaccurate and could lead to perpetuating an inaccurate definition of GMRS into a regulatory discussion by others, such as stakeholder groups/members of the public. The report should have a description of how this response spectrum was obtained and also refer to it by a different name (e.g. input response spectrum)	Jose P.	Ch. 3 and in particular Section 3.3 was changed to remove all references to GMRS. These changes were discussed with NRO staff and were made to refer to "spectral shapes" or acceleration response spectra. The references to the GMRS were not needed.		Closed	OD Concurrence	
668	NRO	05.20.13	Pg 22	Charles Ader	The discussion in Table 3 (page 22) that refers to the new CEUS SSC model and updated ground motion misstates the NRC-industry collaboration. The discussion needs to be revised to accurately state the NRC and industry efforts. The NRC was a co-sponsor (with DOE and EPRI) in the CEUS SSC model update only. The NRC is not a co-sponsor of the ongoing GMPE update. The report should also include a sentence to state that, "While the USGS (2008) seismic hazard model is not sufficiently detailed for regulatory decisions, it is appropriate to use for this study because it was the most recent and readily available hazard model for the selected site at the start of the study." This additional statement is necessary and important to note because the NRC does not endorse the USGS hazard model in licensing new reactors	Jose P.	This paragraph was modified and now reads: "The seismic hazard assessment in this study is the US Geological Survey (USGS, 2008) hazard model. A new probabilistic seismic hazard model is currently being developed and will consist of two parts: (1) a seismic source zone characterization and (2) a ground motion prediction equation (GMPE) model. Although part (1) is now complete (NRC, 2012b), it was not available at the start of this scoping study. In addition, the GMPE update is still in progress. Furthermore, the NRC is currently developing an independent probabilistic seismic hazard assessment (PSHA) computer code to incorporate part (1) and part (2) when complete. While the USGS (2008) hazard model is not sufficiently detailed for regulatory decisions, it is appropriate to use for this study because it was the most recent and readily available hazard model for the selected site at the start of the study." Section 3, was modified accordingly.		Closed	OD Concurrence	
669	NRO	05.20.13	Pg. 23	Charles Ader	The assumption regarding the ratio of vertical to horizontal response spectra (Table 3 [pg 22] and Section 3.3 [page 39]) is based on the conclusion that the site controlling earthquakes are moderate magnitude earthquakes at nearby distances. This conclusion (as-is) is insufficient to support the assumption in the study. A description needs to be added on the controlling earthquakes (magnitude and distances) and the associated annual exceedance frequencies to support this conclusion	Jose P.	Following discussion with NRO/DSEA staff, this part now reads: "Vertical shaking: vertical spectral accelerations and the vertical PGA (0.7 g) are assumed to be the same as the horizontal spectral accelerations and PGA. A few studies (e.g., McGuire, Silva, and Costantino, 2001; ASCE, 1999) indicate that for rock sites and frequencies near and above 10 Hz, and especially nearby seismic sources, vertical spectral accelerations may be as high as or exceed horizontal spectral accelerations. For this study, the frequencies of interest are, for the most part, frequencies near or above 10 Hz. Therefore, the assumption of equal vertical and horizontal spectral accelerations was deemed to be a reasonable starting assumption. This assumption is also supported by seismic hazard de-aggregation with the USGS 2008 model which indicates that for the seismic bins of interest (high PGA, low likelihood events) the contributors to the hazard would be earthquakes with magnitudes less than 6 at about 20 km from the site."		Closed	OD Concurrence	
670	NRO	05.20.13	Pg. 23	Charles Ader	The conclusion on Table 3 (page 23) (i.e., in general, aftershocks with damage potential greater than that for the main event is unlikely given that the contributors to the ground motion hazard are already nearby events) may not be accurate from a seismological standpoint. This statement, while an interesting point (especially, when stated with "In general") is not appropriate for this report. It is misleading/inaccurate to discuss aftershocks because aftershocks are not actually included in state-of-the-practice PSHA models (including the USGS (2008) model). Therefore, the reasons for not considering aftershocks should be engineering-based rather than based on assumptions regarding the site controlling earthquakes	Jose P.	Following discussion with NRO/DSEA staff, this part now reads: "The main event would crack the SFP studied, but the SFP's structure would be stable after the earthquake and would crack in a manner that is expected to resist additional loading cycles at this level."		Closed	OD Concurrence	
671	NMSS	05.20.13	D	David Brown	In Section D.3.4.4 (Appendix D), please clarify the offsite property cost offsets for the base case. The text below Table 25 doesn't appear to match the values in Table 25	Fred S.	Revised text to agree with the base case values contained in Table 25. (Same as comment 633)		Closed	OD Concurrence	
672	RES	05.21.13	ES	Brian Sheron	1st Paragraph: Remove: This study aimed to estimate how Reference plant. Replace with: The purpose of this study is to determine if were any significant increases to public health and safety by more rapidly moving older, colder spent fuel to dry storage.	Kathy G.	addressed		Closed	OD Concurrence	
673	RES	05.21.13	ES	Brian Sheron	1st Paragraph: The reference plant used for this study is a GE Type 4...	Kathy G.	addressed		Closed	OD Concurrence	

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674	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: The study results will help inform the Commission's evaluation....	Kathy G.	addressed		Closed	OD Concurrence	
675	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: ...spent fuel pools are robust structures that are highly likely to withstand...	Kathy G.	addressed		Closed	OD Concurrence	
676	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: ...movement of spent fuel from the pool to achieve low-density... Was there a substantial increase in safety?	Kathy G.	addressed		Closed	OD Concurrence	
677	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: The analysis shows the likelihood of a 10 million per year This is a consequence study and not a PRA	Kathy G.	addressed		Closed	OD Concurrence	
678	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: In addition, the cost benefit analysis included... I thought all "P" doing in Phase 1 was the regulatory analysis?	Kathy G.	addressed		Closed	OD Concurrence	
679	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: The risk due to beyond.... This is not a PRA	Kathy G.	addressed		Closed	OD Concurrence	
680	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: The analysis shows the likelihood of a 10 million per year This says the earthquake is a given so of earth probability is 10-5, then the release is 10-5 x 6x10-6 =6x10-11	Kathy G.	addressed		Closed	OD Concurrence	
681	RES	05.21.13	ES	Brian Sheron	2nd Paragraph: The study considered two broad... No. You considered a 1by8 pattern	Kathy G.	addressed		Closed	OD Concurrence	
682	RES	05.21.13	ES	Brian Sheron	5th Paragraph Pg iii: ...a lower likelihood of a release is predicted than in previous studies... Where in previous studies (e.g.: NUREG 1738, PRA?) How do you compare a consequence study for one scenario with a PRA?	Kathy G.	addressed		Closed	OD Concurrence	
683	RES	05.21.13	ES	Brian Sheron	Pg iv 1st Paragraph: The specific conditions...spent fuel pool design. This says that we can only form conclusions for PB. We have no "P" any other pool would behave?	Kathy G.	addressed		Closed	OD Concurrence	
684	RES	05.21.13	ES	Brian Sheron	Pg iv 1st Paragraph: (or conversely, a 10 percent probability of a damaging the liner such that leakage will occur).	Kathy G.	addressed		Closed	OD Concurrence	
685	RES	05.21.13	ES	Brian Sheron	Pg iv 1st Paragraph: NUREG-1738 predicted the likelihood of liner failure from For PB or for all plants?	Kathy G.	addressed		Closed	OD Concurrence	
686	RES	05.21.13	ES	Brian Sheron	Pg iv 2nd Paragraph: The study examines two an accident is expected to proceed...	Kathy G.	addressed		Closed	OD Concurrence	
687	RES	05.21.13	ES	Brian Sheron	Pg iv 2nd bullet: ...and timing and location of the liner leakage... What about the site of the leakage?	Kathy G.	addressed		Closed	OD Concurrence	
688	RES	05.21.13	ES	Brian Sheron	Pg iv 3rd Paragraph: in the unlikely event an earth(-)quake-induced	Kathy G.	addressed		Closed	OD Concurrence	
689	RES	05.21.13	ES	Brian Sheron	Pg iv 3rd Paragraph: heats up and burns, releasing hydrogen gas...	Kathy G.	addressed		Closed	OD Concurrence	
690	RES	05.21.13	ES	Brian Sheron	Pg iv 3rd Paragraph: That damage would remove could breach structures that could would retain...	Kathy G.	addressed		Closed	OD Concurrence	
691	RES	05.21.13	ES	Brian Sheron	Pg iv 3rd Paragraph: This hydrogen could burn or explode, substantially...	Kathy G.	addressed		Closed	OD Concurrence	

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692	RES	05.21.13	ES	Brian Sheron	Pg iv 3rd Paragraph ...along with allowing more oxygen into the building, potentially...	Kathy G.	addressed		Closed	OD Concurrence	
693	RES	05.21.13	ES	Brian Sheron	Pg vi 1st Paragraph: ...100,000 people within 100 miles ...displaced.... The EPZ is only 10 miles. Why are we saying people within 100miles will have to leave?	Kathy G.	addressed		Closed	OD Concurrence	
694	RES	05.21.13	ES	Brian Sheron	Pg vi 3rd Paragraph: Although this analysis does not examine all initiating events...initiating event. Can't we say that the seismic event constitutes ~80% of the risk?	Kathy G.	addressed		Closed	OD Concurrence	
695	RES	05.21.13	ES	Brian Sheron	Where is the discussion that the risk of latent cancer cases from relocating back?	Kathy G.	addressed		Closed	OD Concurrence	
696	RES	05.21.13	ES	Brian Sheron	Pg vii 1st Paragraph: ...high-density configuration is safe and risk is appropriately low of a large release and from a accident is very low. (?)	Kathy G.	addressed		Closed	OD Concurrence	
697	RES	05.21.13	General	Brian W.	The original intent of the term "reference" plant was to emphasize that the plant we modeled was based on Peach Bottom, but had a few difference, namely the 1x4 loading pattern (Peach Bottom currently uses 1x8). However, use of the term "reference plant" has been interpreted to mean that the plant, as modeled, is "representative" of a wide range of plants, which is not true and is a serious misconception. The authors should consider using another phrase, such as "Peach Bottom, as modeled" to avoid this confusion. At the least, we should clearly and repeatedly define what we mean by reference plant.	Brian W.	Added "specific" before reference plant in Foreword, Abstract, and ES.		Closed	OD Concurrence	H
698	RES	05.21.13	InfoSECY	Brian W.	Background, 3rd sentence: The SFPSS did not consider risks, only consequences with probabilistic insights. During the ACRS subcommittee meeting, a member pointed out that this point wasn't made clear by the study. Recommend changing "risks" to "consequences."	Don A.	Text has been updated to remove "risks"		Closed	OD Concurrence	
699	RES	05.21.13	InfoSECY	Brian W.	Discussion, last sentence: "due to the effectiveness of protective actions..." isn't really an explanation for the first part of the sentence "public health effects are generally the same or smaller..." There's lots of reasons health effects are the same or smaller in addition to protective actions.	Don A.	statement has been removed		Closed	OD Concurrence	
700	RES	05.21.13	InfoSECY	Brian W.	4. Discussion, last sentence: The phrase "due to the effectiveness of protective actions" should be changed to "the assumed effectiveness" or "the modeled effectiveness" to clarify that the effectiveness isn't a certainty, but rather a modeling assumption.	Don A.	statement has been removed		Closed	OD Concurrence	
701	RES	05.21.13	Foreword	Brian W.	1st sentence is inaccurate. NPPs are not required to be designed to withstand the most extreme recorded natural disasters.	Kathy G.	Disagree, from GDC 2.		Closed	OD Concurrence	
702	RES	05.21.13	Foreword	Brian W.	3rd paragraph, 1st sentence: To be crystal clear, that this is a consequence study, suggest modifying to read "This report documents a consequence study performed by [RES] to continue our examinations of the risks and consequences..." As it's written, it's not clear that the SFPSS is not considering risks.	Kathy G.	Corrected as suggested by the reviewer. Now reads: This report documents a consequence study performed by the Office of Nuclear Regulatory Research to continue our examination of the risks and consequences of spent		Closed	OD Concurrence	
703	RES	05.21.13	Foreword	Brian W.	4th paragraph, 3rd sentence: consider replacing "reheating" (was it heated before?) with something else, maybe "overheating"?	Kathy G.	Corrected as suggested by the reviewer. Now reads: the accident progression of the spent fuel overheating and potentially releasing		Closed	OD Concurrence	
704	RES	05.21.13	Foreword	Brian W.	5th paragraph, last sentence: Same comment as for the Info SECY. Change to "assumed effectiveness" or "modeled effectiveness."	Kathy G.	Corrected as suggested by the reviewer. Now reads: indicated due to the modelled effectiveness of protective actions		Closed	OD Concurrence	
705	RES	05.21.13	Foreword	Brian W.	Last paragraph, 3rd sentence: This sentence is not supported by the cost benefit that was done. It did not consider all options for moving spent fuel out of the pool (e.g. fuel older than 7 years). It did consider "expedited transfer of all spent fuel cooled for more than 5 years out of the pool" so let's be precise and say something like that. Also, add something to indicate the limitations of the analysis such as "given the current regulatory framework." Some sensitivity cases were cost-beneficial and more may be depending on how comments on the cost benefit analysis are resolved.	Kathy G.	These words were provided by NRR.		Closed	OD Concurrence	H

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706	RES	05.21.13	ES	Brian W.	1st sentence: same comment as above, to be clear that this is a consequence study, change to "This report documents a consequence study"	Kathy G.	addressed		Closed	OD Concurrence	
707	RES	05.21.13	ES	Brian W.	2nd paragraph, 1st sentence: This isn't posed as a question. Consider revising to "The study's results will inform the question of whether moving spent fuel should be moved from spent fuel pools to dry storage sooner than current practice."	Kathy G.	addressed. Brian S. comments override		Closed	OD Concurrence	
708	RES	05.21.13	ES	Brian W.	2nd paragraph, 2nd to last sentence: Again, add something to indicate the limitations of the analysis such as "given the current regulatory framework." This statement will need to be re-evaluated when the cost benefit analysis is updated to respond to comments.	Kathy G.	addressed: What are the limitations?		Closed	OD Concurrence	H
709	RES	05.21.13	ES	Brian W.	3rd paragraph, 2nd bullet: "so the hottest fuel assemblies are surrounded by additional water" should be deleted. This is not an important factor since there are no releases until the water has drained.	Kathy G.	addressed. Completeness for the public, this was not the starting point		Closed with Ques.	OD Concurrence	
710	RES	05.21.13	ES	Brian W.	5th paragraph, 3rd sentence "lower likelihood of release is predicted than in previous studies"; This is not true as written. The qualifier "given a leak" needs to be reinserted to make the statement true.	Kathy G.	addressed		Closed	OD Concurrence	H
711	RES	05.21.13	ES	Brian W.	5th paragraph, 5th sentence: consider changing "removed" to "moved"	Kathy G.	addressed		Closed	OD Concurrence	
712	RES	05.21.13	ES	Brian W.	5th paragraph, last sentence: Two sentence capturing different thoughts seem to have been combined here and significant meaning was lost. Fuel is always coolable by water, steam or air. The significant point is that after a few months, only air is needed to cool the fuel. Consider changing to something like "After that time, the spent fuel is coolable by air."	Kathy G.	This sentence is added at the end of the paragraph.		Closed	OD Concurrence	
713	RES	05.21.13	ES	Brian W.	1st paragraph after figure ES-1, last sentence: "likelihood" should be changed to "frequency" since it's per year. (likelihood mean probability)	Kathy G.	addressed		Closed	OD Concurrence	
714	RES	05.21.13	ES	Brian W.	1st paragraph after figure ES-1: This paragraph is comparing past studies which considered all seismic events, to this study which considered a portion of the seismic hazard. I'm not sure this distinction will be clear to the lay reader unless we specifically state in some way that this does not include bin 4 events.	Kathy G.	addressed. All predicted earthquakes		Closed with Ques.	OD Concurrence	
715	RES	05.21.13	ES	Brian W.	2nd paragraph after figure ES-1: Suggest deleting "assuming 10 CFR 50.54(h)(2) mitigation measures are unsuccessful". The statement will still be true without it.	Kathy G.	addressed. If successful maybe no release		Closed with Ques.	OD Concurrence	
716	RES	05.21.13	ES	Brian W.	3rd paragraph after figure ES-1 "the study also analyzed...1x8...": The description "two cooler assemblies on each side" is a little confusing. Consider changing to "surrounded by 8 cooler assemblies" or more vaguely compare to 1x4 to make this clearer	Kathy G.	addressed		Closed	OD Concurrence	
717	RES	05.21.13	ES	Brian W.	2 paragraphs before figure ES-2: consider changing "spent fuel in the pool can be kept cool" to "mitigation measures can be successful in keeping spent fuel in the pool cool" to be clear that mitigation measures are what we're talking about here."	Kathy G.	addressed		Closed	OD Concurrence	
718	RES	05.21.13	ES	Brian W.	Figure ES-2, 2nd row: NRC order EA-12-051 has nothing to do with power. Also the 84% is likely too low since we didn't consider equipment fragility. Consider removing text about the orders and maybe the entire chevron of the figure.	Kathy G.	addressed		Closed	OD Concurrence	H
719	RES	05.21.13	ES	Brian W.	Figure ES-2: frequencies should all be "per year" rather than just a number.	Kathy G.	Done as the reviewer suggested.		Closed	OD Concurrence	
720	RES	05.21.13	ES	Brian W.	Paragraph after ES-2: paragraph doesn't flow well, Gary has a suggested rewrite.	Kathy G.	Accepted, used Gary's.		Closed	OD Concurrence	
721	RES	05.21.13	ES	Brian W.	2nd paragraph after ES-2, 1st sentence: Sentence isn't clear, consider changing "estimates" to "cost estimates"	Kathy G.	addressed		Closed	OD Concurrence	
722	RES	05.21.13	ES	Brian W.	2nd paragraph after ES-2 "to be temporarily restricted": It's not clear what "restricted" means in this context. Coordinate with AI on whether or not this word is appropriate.	Kathy G.	addressed		Closed	OD Concurrence	
723	RES	05.21.13	ES	Brian W.	3rd paragraph after ES-2: delete "potential" in "potential health risks." By definition, risks are potential consequences so risks are always actual, not potential.	Kathy G.	addressed		Closed	OD Concurrence	
724	RES	05.21.13	ES	Brian W.	Paragraph before figure ES-3: after "Although this analysis does not examine all initiating events" consider adding "(i.e., reactor accidents, spent fuel pool accidents from other initiating events)" and add "site-wide" before "probabilistic risk assessment"	Kathy G.	addressed		Closed	OD Concurrence	
725	RES	05.21.13	ES	Brian W.	Paragraph before figure ES-3: in "PRA has inherent limitations" change "inherent" to "practical."	Kathy G.	addressed		Closed	OD Concurrence	

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726	RES	05.21.13	ES	Brian W.	Safety goal comparison: The safety goal comparison is being used to make the point that SFP risks are way below the safety goal. This is ok, but it needs to be clear that other site risks will be much higher and may challenge the safety goal.	Kathy G.	addressed. Like what SOARCA and Fukushima didn't show this		Closed with Ques.	OD Concurrence	H
727	RES	05.21.13	ES	Brian W.	Figure ES-3 should be removed. A short discussion comparing to the safety goal is tolerable, if presented appropriately, but the figure inappropriately highlights the "good news" of the study while there is no similar figure with the "bad news." To be balanced, a similar figure showing the possible extent of land contamination would be required.	Kathy G.	addressed. Health effects are regulatory framework nothing similar to land contamination and Comm doesn't want any		Closed	OD Concurrence	H
728	RES	05.21.13	General	Gary DeMoss	Series of comments beyond ES, Foreward, Abstract and 11.2. Please see "RES_GaryDeMoss_Comments_052113.doc" for complete list of comments	Brian W.	Addressed changes not in ES, foreward, and abstract.		Closed	OD Concurrence	
729	RES	05.21.13	D	Brian W.	General comment: Now that this has been added into the main SFPSS document, all of the references to other sections need to be fixed.	Fred S.	Incorporated. Figure, section, and table references were checked and modified to use cross-referencing. Appendix D references to pages in the main report were changed to section references using cross-referencing. SFPSS, p. 67 was converted to SFPSS section 5.1 [appeared in §D.3.2.3.9] and SFPSS, p. 7 was changed to SFPSS section 1.3 [appeared in §D.3.4.6]. (Same as comment 457)		Closed	OD Concurrence	
730	RES	05.21.13	D	Brian W.	General comment: Analysis doesn't seem to give credit for mitigation. This is acceptable given the uncertainties and the "maximum benefit" goal of the analysis, but this should clearly be stated somewhere.	Fred S.	Incorporated as discussed in resolution to comment #634.		Closed	OD Concurrence	H
731	RES	05.21.13	D	Brian W.	General comment: rather than having a low estimate that minimizes costs and benefits (and vice versa for the high estimate) consider having 3 estimates. One that maximized the cost benefit by using a low estimate for the cost and high estimate for the benefits, another that does the opposite, and a best estimate. This will provide a better bound for the results.	Fred S.	Resolution provided in response to comment #638.		Closed	OD Concurrence	
732	RES	05.21.13	D	Brian W.	1st page: one of the stated purposes of the regulatory analysis is to help ensure that "no clearly preferable alternative is available to this action." Given this, the analysis should discuss, or at least acknowledge, possible other (non-analyzed) alternatives more prominently. These could include the movement of less fuel to achieve a medium density pool, alternative loading patterns (e.g. 1x8) etc.	Fred S.	Revised conclusion to identify other loading configurations		Closed	OD Concurrence	H
733	RES	05.21.13	D	Brian W.	Section D.1.2 last paragraph 1st sentence: "This backfitting analysis calculated the maximum potential benefit..." Ok but if we're calculating the "maximum" benefit than assumptions need to be clearly bounding.	Fred S.	No change required.		Closed	OD Concurrence	
734	RES	05.21.13	D	Brian W.	Section D.2.1: Compliance with Orders EA-12-051 and EA-12-049 is not assumed in past studies, including SFPSS. Since the reg analysis is using numbers for these past studies, it's not clear how it could be giving credit for these orders as stated in the text.	Fred S.	Agree. The impact of Orders EA-12-049 and EA-12-051 on further mitigating risk from spent fuel pool events is addressed qualitatively in section D.3.4.10.3.		Closed	OD Concurrence	
735	RES	05.21.13	D	Brian W.	Section D.2.2 last paragraph: paragraph refers to dry cask loading costs and risks that are not included. The analysis doesn't include cask risks, but does include cask costs so it's not clear what "costs" this paragraph is referring to.	Fred S.	No change required. Other costs include cost for labor, repacking casks to be compliant with federal storage facility, storage of additional casks in federal storage facility, etc.		Closed	OD Concurrence	
736	RES	05.21.13	D	Brian W.	Section D.3.2.2.1: section considers release frequencies, not "risk." The title should be changed to reflect this.	Fred S.	Agree. Changed section title to Spent Fuel Pool Initiator Release Frequency		Closed	OD Concurrence	
737	RES	05.21.13	D	Brian W.	Section D.3.2.2.1: In the equation " $RS-P = \sum(F_i \times C_{release_i})$ " RSFP- is the total frequency of release, F_i is the initiating event frequency for different initiators i , and $C_{release_i}$ is the conditional probability of release given event i . The variables used make it look like a "risk = frequency x consequence" equation which it is not. Consider using different variables to avoid confusion	Fred S.	Incorporated as resolved for comment #616		Closed	OD Concurrence	

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738	RES	05.21.13	D	Brian W.	43. Table 2: This table contains many unstated assumptions which should be stated more explicitly and a fuller discussion justifying them should be given in the text. Many of the assumptions are suspect. • The “initiating event fuel uncover frequency” column contains both “initiating event frequencies” and “fuel uncover frequencies.” Need to be clear about which the column is attempting to capture. • “uncovery frequencies” from past studies are being multiplied by the SFPSS liner fragility conditional probability to obtain a new uncover frequency. This is double counting. The conditional probability of release for these scenarios should just be the coolability window, 60/700 = 8.57%. • An unstated assumption is that the phenomenology of bin 4 seismic events is the same as for bin 3 events. This is questionable given that the fuel geometry may not be preserved and the refueling building may fail affecting the coolability window the fuel and the release magnitudes. If we truly want a “maximum benefit” calculation, consider changing the coolability window to 1 for this scenario. This would conservatively assume a conditional release probability of 1 for this initiating event. • The mitigated “conditional probability” column for the bin 4 event doesn’t seem to be using the same assumptions.	Fred S.	Incorporated as discussed in resolution to comment #617.		Closed	OD Concurrence	H
739	RES	05.21.13	D	Brian W.	Section D.3.2.2.7 last paragraph: only the high estimate case assumes that replacement power needs to be purchased for both units? Is it reasonable to assume that workers can continue to operate the other unit given such a large release?	Fred S.	No change required. Replacement power is not a significant cost factor.		Closed	OD Concurrence	
740	RES	05.21.13	D	Brian W.	Section D.3.2.2.8, 2nd paragraph, last sentence: instead of “average” dose, do you mean “collective” dose?	Fred S.	No change required. DOE summarized results on the collective dose received by the populace surrounding the Chernobyl accident, which were used to calculate the average dose equivalents.		Closed	OD Concurrence	
741	RES	05.21.13	D	Brian W.	Section D.3.2.2.8, 3rd paragraph, 1st sentence: implies that unit 2 spent fuel rods were exposed, should clarify this is referring to the reactor, not the SFP.	Fred S.	Incorporated as resolved for comment #496		Closed	OD Concurrence	
742	RES	05.21.13	D	Brian W.	Section D.3.2.2.8, 4th paragraph: 10,000 microsieverts is not equal to 10 rem.	Fred S.	Incorporated as resolved for comment #461		Closed	OD Concurrence	
743	RES	05.21.13	D	Brian W.	Table 11: consider changing “spent fuel pool inventory” to “current spent fuel pool inventory.”	Fred S.	Incorporated.		Closed	OD Concurrence	
744	RES	05.21.13	D	Brian W.	Section D.3.2.3.4: Having reviewed the relevant sections of the referenced EPRI reports, it’s unclear that the upfront costs per cask will increase proportionally with an increased number of casks loaded. Some of the costs likely will increase (e.g. multiple ISFSIs may need to be constructed) while others (e.g. licensing costs) are onetime costs. For a site already loading fuel, some portion of this cost is already realized and won’t continue on a per cask basis. This should lower the cost difference between the two alternatives for the discounted cases. Consider using a lower upfront cost, at least for the low estimate case.	Fred S.	No change required.		Closed	OD Concurrence	
745	RES	05.21.13	D	Brian W.	Table 19 seems to assume a lower cask capacity well before newer, hotter fuel is being loaded and doesn’t match table 27 which seems more correct. Table 27 assumes 12 casks are loaded in 2028, a higher number than other years, presumably to keep a low density pool when the reactor is being decommissioned and there is a full core offload. Since this is the last offload, and the casks would likely be loaded after the fuel in the pool is air coolable, there would be little justification for forcing early loading of these extra casks (no benefit would be seen). Consider assuming these casks are loaded later.	Fred S.	Agree. Table 19 was revised.		Closed	OD Concurrence	H
746	RES	05.21.13	D	Brian W.	Section D.3.3.1, last sentence: Implies that current market trends and future predictions are no growth.	Fred S.	No change required. Undiscounted costs and benefits are provided as a sensitivity study.		Closed	OD Concurrence	
747	RES	05.21.13	D	Brian W.	Section D.3.3.3: Is this assuming buying replacement power for two units or just one? From D.3.2.2.7 it sounds like one except for the high estimate case. Consider clarifying.	Fred S.	No change required. These alternative replacement energy costs are applied on a per unit basis as a sensitivity study.		Closed	OD Concurrence	

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748	RES	05.21.13	D	Brian W.	Section D.3.3.3: Maybe I don't understand an assumption here, but by my calculation, \$57.3million for a year of power comes out to about 0.6 cents/kwh if assuming 2 units or 1.2 cents/kwh if assuming 1 unit. Aren't generation costs (even excluding transmissions and distribution costs) much higher than this? Also the frequency of release doesn't change so this cost probably doesn't matter, which should be stated explicitly.	Fred S.	No change required. See response to comment #747.		Closed	OD Concurrence	
749	RES	05.21.13	D	Brian W.	Section D.3.3.4: "For some of the high-density storage cases, this results in public health consequences that extend beyond the postulated accident site." This is not just for the high density cases, delete "for some of the high-density cases" and change "accident site" to "50 miles."	Fred S.	Agree. Incorporated as discussed in resolution to comments #497 and #625.		Closed	OD Concurrence	
750	RES	05.21.13	D	Brian W.	Section D.3.3.4: Delete "The accuracy of the model decreases with distance because of the atmospheric effects that would break up the plume." The accuracy of the model does decrease with distance but not for this reason. Further, the sentence makes it sound like the plume will go away because of these atmospheric effects, which is misleading. The radiation has already been released and has to go somewhere.	Fred S.	Agree. Incorporated as discussed in resolution to comment #625.		Closed	OD Concurrence	
751	RES	05.21.13	D	Brian W.	Section D.3.3.4: "To conservatively capture..." delete "conservative." MACCS2 is a best-estimate code that has benchmarked favorably to other types of offsite consequence codes.	Fred S.	Agree. Incorporated as discussed in resolution to comment #625.		Closed	OD Concurrence	H
752	RES	05.21.13	D	Brian W.	Section D.3.4.1: It looks like it's being assumed that the public health benefits are realized as soon as expedited loading begins, rather than when it is complete. Since we're doing a "maximum" benefit calculation, this is fine, but should be stated explicitly.	Fred S.	No change required. These benefits are calculated over the operating life of the reference plant and discounted back to the present.		Closed	OD Concurrence	
753	RES	05.21.13	D	Brian W.	Section D.3.4.1: It's unclear where the averted dose numbers come from.	Fred S.	No change required. As described in section D.3.4.1, this attribute measures expected changes in radiation exposure to the public due to change in accident frequencies or accident consequences associated with the proposed action. The expected changes in radiation exposure are predicted over a 50-mile radius from the plant site.		Closed	OD Concurrence	
754	RES	05.21.13	D	Brian W.	Tables 20, 21, 22 and 23: For symmetry, consider changing the columns to match that of table 30. Averted dose may need to be in a new row to fit all of the information.	Fred S.	No change required.		Closed	OD Concurrence	
755	RES	05.21.13	D	Brian W.	Section D.3.4.1, 2nd paragraph: It's a little hard to follow which estimate is using which PAG. Consider adding a reference to Table 10 for clarity.	Fred S.	No change required. There is an existing reference in the D.3.4.1 text to section D.3.2.2.9 which contains the table mentioned.		Closed	OD Concurrence	
756	RES	05.21.13	D	Brian W.	Section D.3.4.4, 2nd paragraph, last sentence: "The regulatory baseline assumes that the accident would lead to an uncontrolled radiological plume release." It's not clear what this sentence is referring to since the regulatory analysis is using the numbers from the SFPSS which did not assume this.	Fred S.	Incorporated. Deleted Section D.3.4.4, 2nd paragraph, last sentence		Closed	OD Concurrence	
757	RES	05.21.13	D	Brian W.	Section D.3.4.4: Offsite property costs don't have a low, best and high estimate so I can only assume they're using the Pennsylvania PAGs assumed in the SFPSS. Societal dose and amount of land interdiction are inversely proportional to each other depending on the PAG used. Offsite property costs and societal dose should be matched for each estimate according to the PAG used.	Fred S.	No change required. Offsite property damage is estimated based on the PA PAG used in the main report. Resolution is provided in response to comment #639.		Closed	OD Concurrence	
758	RES	05.21.13	D	Brian W.	Paragraph below Table 25: the text refers to values in the ">50 miles" row but says they are "<50 miles"	Fred S.	Resolution provided in response to comment #633.		Closed	OD Concurrence	
759	RES	05.21.13	D	Brian W.	Section D.3.4.5, "onsite property": It's unclear if these costs are included. The frequency of release doesn't change between the two alternatives so it doesn't seem like they should be.	Fred S.	No change required. The release frequency is different between the two alternatives as shown in Table 2.		Closed	OD Concurrence	
760	RES	05.21.13	D	Brian W.	Section D.3.4.10.2, last sentence: change "cash" movement to "cask" movement.	Fred S.	Agree. Changed cash to cask.		Closed	OD Concurrence	
761	RES	05.21.13	D	Brian W.	Section D.3.4.10.4: 3rd sentence states OCP2 did not have a release when using a 1x8 fuel pattern. This is incorrect, there was a release in OCP2 (but not OCP3 as the text correctly states).	Fred S.	Resolution provided in response to comment #465.		Closed	OD Concurrence	H
762	RES	05.21.13	D	Brian W.	Section D.4.1, 3rd paragraph: "Furthermore, for the Spent Fuel Pool Study analyzed spent fuel pool accident..." consider changing to "Furthermore, for the seismic event analyzed for the Spent Fuel Pool Study..."	Fred S.	Incorporated suggested text changes.		Closed	OD Concurrence	
763	RES	05.21.13	D	Brian W.	Section D.4.3, last sentence: though the property cost was the largest contributor to the benefits, they weren't "dominated" by it. Consider adding "and public health"	Fred S.	Revised the last sentence as follows to eliminate dominated: The offsite property cost offset is the largest contributor to the benefits, of which the majority of these cost offsets occur during the long-term phase.		Closed	OD Concurrence	

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764	RES	05.21.13	D	Brian W.	Section D.4.4: The text doesn't make it clear why our guidance suggests only considering a 50 mile distance from the plant site. Given the large difference in results, if it ends up being cost beneficial for 500 miles, but not 50 miles, it will be hard to justify using the 50 miles results.	Fred S.	No change required. The RA Handbook specifies that the estimation of accident-related health effects should be estimated over a 50-mile radius from the plant site (RA Guidelines section 4.3.1). Other distances can be considered in sensitivity analyses or special cases which was done in Appendix D. Note that consequence analysis for radii up to 1,000 miles was performed in NUREG/CR-6349.		Closed	OD Concurrence	
765	RES	05.21.13	D	Brian W.	Section D.5.1.2.1, 2nd paragraph, 1st sentence: change "sensitivity" to "sensitive"	Fred S.	Agree. Word changed to sensitive.		Closed	OD Concurrence	
766	RES	05.21.13	D	Brian W.	Section D.5.2: CDF and LERF surrogates were developed for reactors and should not be compared to SFP releases. This is a very apples to oranges comparison. The language in the first few paragraphs of the section seems strained in attempt to make this comparison and some of the assumptions aren't consistent with the rest of the cost-benefit analysis (e.g. assuming the spent fuel pool housing fails).	Fred S.	Resolution provided in response to comment #503.		Closed	OD Concurrence	H
767	RES	05.21.13	D	Brian W.	Section D.5.2, 3rd paragraph: "...release does not have the potential for causing any offsite early fatalities..." Actually the release can produce early fatalities, but does not because of our protective action assumptions.	Fred S.	Resolution provided in response to comment #635.		Closed	OD Concurrence	
768	RES	05.21.13	D	Brian W.	Section D.5.2, last sentence: "Therefore, the Regulatory Baseline is justified." Will a statement this strong tie our hands later if we find another alternative to be cost justified? Also need to re-evaluate the veracity of this statement once other comments are addressed and numbers may change.	Fred S.	Agree. Added the following text to the end of the sentence: for the alternative evaluated for the reference plant.		Closed	OD Concurrence	
769	RES	05.21.13	D	Brian W.	Section D.5.3: rather than saying low density loading is not justified, we should be very clear about what we analyzed and say that "expedited transfer of all spent fuel cooled for more than 5 years out of the pool"	Fred S.	Agree. Clarified that the low-density spent fuel pool storage alternative is not justified.		Closed	OD Concurrence	H
770	RES	05.21.13	D	Brian W.	Section D.5.3, last sentence: this is worded as a very general statement from a specific analysis.	Fred S.	Agree. Added the following text to the end of the sentence: for the alternative evaluated for the reference plant.		Closed	OD Concurrence	H
771	RES	05.21.13	ES	Gary DeMoss	This study aimed to estimate how reducing the amount of spent fuel in the pool by more rapidly moving older, colder spent fuel to dry storage could affect accident consequences at a reference plant. The reference plant is a GE Type 4 BWR with a Mark I containment. Peach Bottom is not a reference plant	Kathy G.	Don't understand the comment.		Closed	OD Concurrence	
772	RES	05.21.13	ES	Gary DeMoss	show the likelihood frequency of a radiological release	Kathy G.	addressed		Closed with Ques.	OD Concurrence	
773	RES	05.21.13	ES	Gary DeMoss	. In addition, the cost benefit analysis included with this study does not support requiring low-density spent fuel pool storage for the reference plant Need to check this	Kathy G.	addressed		Closed with Ques.	OD Concurrence	
774	RES	05.21.13	ES	Gary DeMoss	Figure ES-2: Factors Affecting Likelihood of SFP Release from a Severe Seismic Event Units are missing from the figure – all answers are per yr.	Kathy G.	Done as the reviewer suggested. See also response to comment 719.		Closed	OD Concurrence	

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
775	RES	05.21.13	ES	Gary DeMoss	The consequences to the public of a low likelihood spent fuel pool accident release were estimated in the study. The results are comparable to or less than those in previous studies, largely because this study's updated modeling demonstrates the releases would generally include less radioactive material compared to past studies. Despite the fairly large releases for certain predicted accident progressions, Consequence-consequence analysis of all scenarios indicated zero early fatalities from acute radiation effects. Despite the fairly large releases for certain predicted accident progressions , spent fuel contains predominantly longer-lived radioactive materials— it is more which makes it difficult compared to operating reactor releases for these radioactive materials to lead to radiation doses high enough to result in early fatalities. Our analysis indicates that if any releases were anticipated to occur, the public would be evacuated or otherwise protected to reduce potential health effects. The study also showed that the risk of an individual dying from cancer from the radioactive release is very low. When accounting for the very low likelihood of a release occurring, all the scenarios had a probability between about two in a trillion and five in a hundred billion per year of a latent fatal cancer in an individual within 10 miles of the site. The risks are similar between different loading or mitigation scenarios because of modeled offsite protective actions that include evacuation, sheltering, relocation, and decontamination	Kathy G.	addressed		Closed with Ques.	OD Concurrence	
776	RES	05.21.13	ES	Gary DeMoss	Although this analysis does not examine all initiating events (i.e., reactor accidents, spent fuel pool accidents from other initiating events) typically considered in a site-wide probabilistic risk assessment (PRA), it does examine an important initiating event. In fact, any analytical technique, including PRA has inherent practical limitations of scope and method.	Kathy G.	addressed		Closed	OD Concurrence	
777	RES	05.23.13	General	Kevin Coyne	Recommend including scientific notation for frequency numbers. Though the "one in ten million per year" appears to be more "plain language", 1E-07 per year is more readily understood by anyone with a passing familiarity of PRA results. So "one in ten million per year (1E-07/year)" would bridge both worlds. Brian: I believe this comment is directed at the front matter of the report.	Kathy G.	will be addressed as time allows.		Review Comm.	OD Concurrence	
778	RES	05.23.13	General	Kevin Coyne	In several places we use terminology that this study "would inform the question". This needs to be revised since the question is well established – hopefully the study will inform either the issue or the resolution.	Brian W.	changed to "inform the evaluation"		Closed	OD Concurrence	
779	RES	05.23.13	General	Kevin Coyne	In general, great care should be exercised when using words like "severe", "extreme", "unlikely", and "advanced" since these are all understood in context. Therefore, when these words are used, it must be made clear what the context is – e.g., more severe than what? More unlikely than what? More advanced than what?	Kathy G.	will be addressed as time allows.		Review Comm.	OD Concurrence	H

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780	RES	05.23.13	Foreword	Kevin Coyne	First paragraph - the first sentence overstates the licensing basis for US nuclear plants. GDC 2 (which is not applicable to all plants), does not require plants to be "designed to withstand the most extreme recorded natural disasters for their location with an additional margin of safety". Instead, GDC 2 refers to "appropriate consideration" and reflecting the "importance of the safety functions to be performed." Furthermore, in light of GI-199 and NTTF Recommendation 2.1 (both of which call into question the adequacy of plant design and licensing decisions), the sentence as written causes a dissonance between how we actually are treating the external hazards (e.g., by reevaluating the hazard to assure adequate protection) vs. the context for this report. Lastly, we only require that we have reasonable assurance that plants meet regulatory requirements - design errors (which happen periodically) can result in plants not meeting these requirements. For example, plant issues such as Oconee show that the NRC's "traditional" approach has not always resulted plant's being able to withstand design basis external hazards. Given our recent regulatory initiatives in handling external events, the first sentence in the forward will likely undermine the public's confidence in the NRC providing a balanced view of the NRC decision-making process. It would be better to write this sentence along the lines of GDC 2 - that is "NRC regulations require appropriate consideration of external hazards in order to ensure public health and safety following credible external events..."	Kathy G.	See Criterion 2: Design bases for protection against natural phenomena. Structures, systems, and components important to safety shall be designed to withstand the effects....(3) the importance of the safety functions to be performed.		Closed	OD Concurrence	H
781	RES	05.23.13	Foreword	Kevin Coyne	First paragraph - not sure what is meant by "advanced" computer modeling. It would be better to say that we utilized tools that reflect the most current understanding of fuel behavior under severe accident conditions. Additionally, codes such as MACCS rely on relatively simple plume models with some significant limitations and would not be characterized as "advanced" by most experts. The main idea behind the statement can be readily made simply by highlighting that we are using the best tools we have available (but we should also acknowledge that today's tools will hardly seem advanced 25 or 50 years from now...).	Kathy G.	Codes are most advanced available		Closed	OD Concurrence	
782	RES	05.23.13	Foreword	Kevin Coyne	First paragraph - though one reason for studying beyond design basis accidents is to explore and understand safety margins, the main reason we study such beyond design basis events is because this is where the risk to the public comes from. The last several decades have shown that the traditional "design basis approach" is not adequate to protect the public and we have enacted rules such as ATWS and SBO to ensure that certain design basis events were included within plant licensing basis - this wasn't a matter of "exploring safety margins", but one of ensuring public health and safety. So, we study beyond design basis accidents to ensure that we continue to have a high degree of confidence that our regulations adequately protect public health and safety (not just to "explore and ensure safety margins"). This thought should be brought to light since we are not simply confirming what we know; we are actively looking beyond the design basis to make sure the public is adequately protected.	Kathy G.	addressed		Closed	OD Concurrence	
783	RES	05.23.13	Foreword	Kevin Coyne	Fourth paragraph - with regard to the statement "a very severe, highly unlikely" - this really comes across as 'protecting a bit too much' and will erode the NRC's credibility. The event studied is not the most severe seismic event that could have been postulated (it is bin 3 of a 4 bin discretization) and the likelihood of this seismic event is actually larger than at least one design basis event (large break LOCA). So, while the event is severe, I would not say "very" severe; and while unlikely, I would not say "highly unlikely". How about just saying a "severe, though unlikely, seismic event"?	Kathy G.	addressed		Closed	OD Concurrence	H
784	RES	05.23.13	Foreword	Kevin Coyne	Fifth paragraph - with regard to the statement "spent fuel pools are likely to withstand severe earthquakes..." - it needs to be clarified that this study only looked at a single SFP at Peach Bottom for a mid-range seismic bin (i.e., bin 3 of 4). The study did not look at the most severe seismic events (bin 4) and can hardly be concluded that the SFP could withstand this event based on the work done to date. It did not look at more severe events and therefore it is not correct to say that the pool could withstand "severe" seismic events without further qualification as to what is meant.	Kathy G.	addressed		Closed	OD Concurrence	H

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785	RES	05.23.13	Foreword	Kevin Coyne	Sixth paragraph – the sentence “The cost benefit analysis does not support moving spent fuel out of the pool studies in this report” should be revised to add “in an accelerated manner” (or an equivalent statement) to the end. Clearly the cost benefit analysis did not investigate storage of fuel in the pool forever; only the question of accelerated discharge from the pool.	Kathy G.	addressed		Closed	OD Concurrence	
786	RES	05.23.13	Abstract	Kevin Coyne	Add “specific” when referring to the “reference plant” (i.e., “specific reference plant”) so this is not misconstrued by the public to indicate that we used a more generalizable case.	Kathy G.	addressed		Closed	OD Concurrence	H
787	RES	05.23.13	Abstract	Kevin Coyne	Revise the statement “The study will inform the question of moving spent fuel from spent fuel pools” – the study will not inform the question, it will hopefully inform the resolution of the issue. The question is quite well formulated as it is currently stated; it is the answer to the question that the study attempts to inform.	Kathy G.	addressed		Closed	OD Concurrence	
788	RES	05.23.13	ES	Kevin Coyne	Page ii, First paragraph – we are not talking about “more rapidly moving fuel” (which carries a certain hint of recklessness to it since it implies using a really fast SFP crane); we are talking about accelerating the transfer of fuel from the spent fuel pool to dry cask storage	Kathy G.	addressed		Closed	OD Concurrence	
789	RES	05.23.13	ES	Kevin Coyne	Page ii, First paragraph – it is unclear what “reference plant” means – revise to either add “specific reference plant” or otherwise ensure that the public would not misinterpret this statement to mean that we did anything other than picking the plant for which we had information readily available (i.e., it is not ‘generalizable’ nor have we done the work to show it is somehow representative of the industry).	Kathy G.	addressed		Closed	OD Concurrence	H
790	RES	05.23.13	ES	Kevin Coyne	Page ii, Second paragraph – with regard to “The analyses show the likelihood... after the severe earthquake...”. Revise to read “after the severe earthquake analysed for this study”. The overall risk would increase if we also analysed the more severe bin 4 seismic events (which were not included in the scope of the study	Kathy G.	addressed. Not necessarily freq (down arrow) conseq. Based by EP		Closed	OD Concurrence	H
791	RES	05.23.13	ES	Kevin Coyne	Page ii, Third paragraph – delete “modern, scientific validated”. I’m not sure what “modern” refers to, since a study done 50 years ago also would have used “modern methods”. In other words, explain what is meant by modern. Also, not all of the methods used in this study have not been “scientifically validated” – in particular, the probability of leakage from the pool is largely driven by expert judgment and even the techniques used for the MELCOR analysis have not been fully “scientifically validated”. Certainly our best effort at doing the study, but scientifically validated implies that we have experimental data and peer reviews to substantiate the study methods- which we most certainly do not have.	Kathy G.	addressed. Modern: state of the art. Note: “experimental data and peer reviews to substantiate the study methods” we do for MELCOR and benchmarks for MACCS		Closed	OD Concurrence	H
792	RES	05.23.13	ES	Kevin Coyne	Page ii, last sentence (“the study did not consider the post-fukushima...”). Please add “since they have not been implemented at the specific site studied”. As is, the statement carries the implication that these methods can be implemented now (we just choose not to consider them), which is not the case	Kathy G.	addressed		Closed	OD Concurrence	H
793	RES	05.23.13	ES	Kevin Coyne	Page iii, Figure ES-1 – suggest adding a footnote to clarify that the low density case has a lower total inventory of Cs compared to the high density (so in cases where low and high density % Cs releases are comparable, the low density case actually has substantially less cubes of Cs being released. The footnote would also be a good place to explain “early in the operating cycle” since this term is used in a different manner than it is typically used in industry (i.e., normally, early in cycle means early in a power operation run, while in this study, it means early after shutdown.	Kathy G.	Done as the reviewer suggested.		Closed	OD Concurrence	
794	RES	05.23.13	ES	Kevin Coyne	Page iv, Second paragraph, first bullet – suggest adding “for the seismic event studied” to the first sentence since the results of the study are not generically applicable to all seismic events, only the one that was studied (and a bin 4 seismic event may not have the same results).	Kathy G.	addressed		Closed	OD Concurrence	H
795	RES	05.23.13	ES	Kevin Coyne	Page iv, Second Paragraph, second bullet – with regard to the statement “Because spent fuel can be effectively cooled by water, steam, or air...” clarify that this only applies after decay heat has decreased (and not immediately after shutdown).	Kathy G.	If makeup greater than leak, even recently discharged fuel can be kept cool		Closed with Ques.	OD Concurrence	H

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796	RES	05.23.13	ES	Kevin Coyne	Page iv, third paragraph, with regard to the discussion that "damage would remove structures that could retain radioactive...". "Retain" is a strong word in this context given that an intact fuel building would certainly leak and release some amount of radioactivity. "Confine" is the word normally used in this instance.	Kathy G.	plain english		Closed with Ques.	OD Concurrence	H
797	RES	05.23.13	ES	Kevin Coyne	Page v, first sentence ("Assuming no complications from other reactors at a site and available equipment and staff, the study suggest that in many situations spent fuel in the pool can be kept cool..."). This is an egregiously misleading statement given that our best estimate is that both reactors would likely suffer a core damage accident given the earthquake analysed. Additionally, there is not sufficient B.5.b equipment on site to handle more than a single reactor or spent fuel pool and is not assured that the B.5.b equipment would even survive the earthquake since it is not designed to handle this type of event.	Kathy G.	Those were the HRA assumptions		Closed with Ques.	OD Concurrence	H
798	RES	05.23.13	ES	Kevin Coyne	Page v, Figure ES-2 – Remove the "chevron" for station blackout probability. This probability value is speculative and was not examined during the study. The main reason for bringing this information into the report was to substantiate the assumption of loss of normal SFP makeup and cooling, not claim credit for continuity of AC/DC power after this substantial seismic event. To claim credit for this value would require a systematic review of the electrical distribution system and SFP makeup/cooling systems (in addition to station closed cooling water), including detailed models of building structural response and component fragilities, none of which were done for this study. Furthermore, there is no reason to believe that SFP level instrumentation (EA 12-051) would have any impact on AC/DC power, and the other order cited (EA-12-049) would not have an impact on this value (though may increase the likelihood of certain recovery actions – though this was well beyond the scope of this study).	Kathy G.	As stated in Section 5 of the report, this probability (84%) was taken from NUREG-1150 to consider the direct or indirect failure of the onsite emergency diesel generators, and it was not examined as part of this study as pointed out by the reviewer. Nevertheless, it was retained in the analysis (see discussion in section 5.6.2 of the report) in order to treat the various probabilities systematically to highlight the loss of normal SFP makeup and cooling. The overall probability of release is still very low and it would not change the conclusions of the study. References to the EA 12-051 and EA 12-049 have been removed from the figure.		Closed	OD Concurrence	H
799	RES	05.23.13	ES	Kevin Coyne	Page v, Second full paragraph (beginning "The consequences to the public..."). Revise the sentence that begins "If any releases were anticipated to occur, the public would be evacuated or otherwise protected...". This is a very strong statement (particularly when we use phrases like "if any releases...") and ultimately, it is a decision that is outside the NRC's control. Revise to read "If releases were anticipated to occur, it is assumed that the public would be evacuated or otherwise protected ...".	Kathy G.	addressed		Closed	OD Concurrence	H
800	RES	05.23.13	ES	Kevin Coyne	Page v, Second full paragraph, with regard to "probability between about two in a trillion...". Two main comments – (1) do we really want to report numbers like 2E-12/year given the uncertainties present in the study and the dose response model and (2) why are we truncating at 10 miles when the public health effects actually peak well beyond this distance?	Kathy G.	frequency-weighted. Standard regulatory reporting.		Closed with Ques.	OD Concurrence	H
801	RES	05.23.13	ES	Kevin Coyne	Page vi, Second paragraph and page vii, Figure ES-3 – The safety goal comparison is inappropriate for this study. Of particular note, the SFP study did not examine uncertainties, consider the other pool on site (which would double the risk for the seismic event studies), nor consider the impact of both reactors (which would likely experience core damage for the seismic event considered). Furthermore, the public health effects in the SFP study did not reach their maximum within 10 miles, so comparison to the safety goal is inappropriately truncating the public health effects. Finally, this was not a risk study, so comparison to a risk metric is completely inappropriate. Although DSA did this for SOARCA, at least in that case (which also was done against the recommendation of DRA), we were talking about scenarios that accounted for a large part of the public risk – in this case we are leaving substantial contributors to public risk for the seismic event studies completely off the table (i.e., the reactors). This comparison does not provide "context" – it misleads the public.	Kathy G.	limitations of comparison are discussed		Closed with Ques.	OD Concurrence	H
802	OGC	05.23.13	General	Tison Campbell	General Comment: Throughout this study you alternate between metric and BE units. Doesn't NRC policy require both to be listed? At the very least, if you're only going to use one of the two, you should select one and be consistent throughout the document.	Hossein E.	This will done as appropriate when the document is ready for NUREG format in October 2013.		Closed	OD Concurrence	
803	OGC	05.23.13	General	Tison Campbell	General Comment: There are a number of places where the document says "Error! Reference source not found." This needs to be fixed before publication.	Brian W.	These have been fixed.		Closed	OD Concurrence	

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804	OGC	05.23.13	Foreword	Tison Campbell	Although the spent fuel pools and the used fuel assemblies stored in the pools.... The SECY paper uses the term "spent fuel" throughout. Do we intend to use both "spent fuel" and "used fuel" in this document?	Kathy G.	yes		Closed	OD Concurrence	
805	OGC	05.23.13	Foreword	Tison Campbell	The hot fuel is distributed throughout the pool and is surrounded by older, cooler used fuel as well as water. After used fuel has cooled in the spent fuel pool for greater more than five years, it can be moved to dry storage casks for longer term storage.	Kathy G.	Corrected as suggested by the reviewer Now reads: the spent fuel pool for more than five years		Closed	OD Concurrence	
806	OGC	05.23.13	Foreword	Tison Campbell	The cost-benefit analysis was done by staff in the Office of Nuclear Reactor Regulation. The cost benefit analysis does not support moving spent fuel out of the pool studied in this report. Might want to clarify here which spent fuel pool you studied.	Kathy G.	added words referring to reference plant		Closed	OD Concurrence	
807	OGC	05.23.13	Foreword	Tison Campbell	The NRC continues to believe, based on this study and previous studies, that spent fuel pools appropriately protect public health and safety.	Kathy G.	??		Closed	OD Concurrence	
808	OGC	05.23.13	ES	Tison Campbell	Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor ("the study") study. There are a lot of unclear referents below ("the study," "this study," etc.) If you define this here it addresses your problems below. I think it reads better to avoid the problem altogether (see suggestions below), but if you make this change here, you will address most of the problem.	Kathy G.	Don't see the need for the suggested change		Closed	OD Concurrence	
809	OGC	05.23.13	ES	Tison Campbell	This study aimed to estimate how reducing the amount of spent fuel in the pool by more rapidly moving older, colder spent fuel to dry storage could affect accident consequences at a reference plant. Are you talking about the current study? Or NUREG-1738? If this sentence references NUREG-1738, then it's fine. If the sentences is talking about this paper, then it needs to be revised.	Kathy G.	considered		Closed	OD Concurrence	
810	OGC	05.23.13	ES	Tison Campbell	scenario twice — assuming Added the correct character here (sometimes Word doesn't insert it correctly).	Kathy G.	addressed		Closed	OD Concurrence	
811	OGC	05.23.13	iv	Tison Campbell	This study considered an earthquake with ground motion roughly four to eight times stronger than that used in the plant design and predicted a liner failure likelihood of about two in a million per year Are you talking about NUREG-1738?	Kathy G.	No, we are talking about the present study. Change tense to considers.		Closed	OD Concurrence	
812	OGC	05.23.13	iv	Tison Campbell	The study examines how an accident proceeds if the pool liner is damaged, concluding that pool leaks are somewhat less likely to release radioactive material to the environment than in previous studies. Here the tense removes confusion, so "the study" is okay.	Kathy G.	ok		Closed	OD Concurrence	
813	OGC	05.23.13	iv	Tison Campbell	The studyIn this study, the NRC staff finds liner damage is the only way to cause a radiological release in less than 3 days. You could say something like this in this instance the tense of the introductory clause removes the confusion	Kathy G.	ok		Closed	OD Concurrence	
814	OGC	05.23.13	iv	Tison Campbell	The studyIn this study, Okay, I'm not going to make this comment anymore. I think you're fine if you define "the study" as suggested above or if you make changes like this throughout the document.	Kathy G.	ok		Closed	OD Concurrence	
815	OGC	05.23.13	iv	Tison Campbell	In the unlikely event an earth -quake induced liner failure Earthquake is one word, right?	Kathy G.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
816	OGC	05.23.13	v	Tison Campbell	For the severe earthquake analyzed, successful measures reduced the time when the fuel is susceptible to a fire by a factor of about twenty20 NRC style guide.	Kathy G.	Corrected as suggested by the reviewer		Closed	OD Concurrence	

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817	OGC	05.23.13	v	Tison Campbell	...preventing staff from deploying 10 CFR 50.54(hh)(2) mitigation measures Licensee staff?	Kathy G.	addressed		Closed	OD Concurrence	
818	OGC	05.23.13	v	Tison Campbell	The study estimated the consequences to the public of a low likelihood spent fuel pool accident release were estimated in the study. Removed passive voice for clarity.	Kathy G.	Corrected as suggested by the reviewer		Closed	OD Concurrence	
819	OGC	05.23.13	vi	Tison Campbell	For low-density loading or with successful deployment of 10 CFR 50.54(hh)(2) mitigation measures, protective measures may include the temporary restriction of up to a few hundred square miles to be temporarily restricted and on the temporary displacement of around order of 100,000 people within 100 miles of the plant to be temporarily displaced. This sentence is phrased very strangely, I've revised to try to make it read a little better.	Kathy G.	Whole paragraph was replaced with frequency-weighted results to match 12.1 results.		Closed	OD Concurrence	
820	OGC	05.23.13	vi	Tison Campbell	For perspective To put this into perspective, the Commission's safety goal for latent	Kathy G.	Corrected as suggested by the reviewer		Closed	OD Concurrence	
821	OGC	05.23.13	vii	Tison Campbell	Low-density loading reduced the size of potential releases, but did not	Kathy G.	addressed		Closed	OD Concurrence	
822	OGC	05.23.13	3	Tison Campbell	They utilize upright fuel assemblies (usually roughly 12 feet in length)	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
823	OGC	05.23.13	3	Tison Campbell	(which are comprised of numerous fuel rods (typically 80-100 rods for boiling-water reactor fuel and 200-300 rods for pressurized-water reactor fuel)).	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
824	OGC	05.23.13	3	Tison Campbell	Each operating cycle typically lasts 18 to 24 months. At the end of their "life," the assemblies are placed in large pools of water adjacent near to the reactor (how adjacent depends on the plant design) that are roughly 12 meters (m) (40 feet (ft)) deep. For facilities licensed to operate an independent spent fuel storage installation (ISFSI), the fuel assemblies are later loaded into casks and moved to the ISFSI as necessary to accommodate future core offloads. The casks are drained of water and inerted with helium	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
825	OGC	05.23.13	3	Tison Campbell	...1990s to allow for the storage of larger numbers of spent nuclear fuel assemblies (e.g., roughly ...	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
826	OGC	05.23.13	3	Tison Campbell	Throughout this time (including present day), the U.S. Nuclear Regulatory Commission (NRC) has maintained that SFPs provide adequate protection	Don A.	removing this text would change the meaning of this paragraph. Text has not been changed.		Closed	OD Concurrence	
827	OGC	05.23.13	3	Tison Campbell	As also described later in this section, stakeholders have periodically challenged this position the NRC's position that SFPs provide adequate protection of public health and safety. This tension is natural because there are a number of complex considerations when weighing low-density versus high-density spent fuel storage. In understanding this tension To understand the basis for these challenges, it's first necessary to understand, let us first state with two basic facts about spent nuclear fuel tenets:	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
828	OGC	05.23.13	3	Tison Campbell	The list below presents some less-obvious considerations from the perspective of the pros and cons associated with postulated transitioning from the existing use of high-density racking in the United States back to the use of low-density storage racking.	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
829	OGC	05.23.13	4	Tison Campbell	Removal of older fuel from the SFP will decrease the inventory of longer lived radionuclides, such as cesium-137, present in the SFP.	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
830	OGC	05.23.13	4	Tison Campbell	As a result of the above, removal of older fuel will result in less radioactive material would be present in the pool if a radioactive release occurred, which would be expected to reduce potential offsite consequences.	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
831	OGC	05.23.13	4	Tison Campbell	Removal of older fuel will increase the volume available for cooling water (note that this is mathematically a small effect with the older fuel comprising on the order of 5-percent of the total pool volume—recall that because most of the pool is occupied by water, not fuel	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	

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#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
832	OGC	05.23.13	4	Tison Campbell	<ul style="list-style-type: none"> Current licenses for dry cask storage systems limit the ability to transfer fuel that has been out of the reactor for less than 5 years from the SFP to dry storage casks that has been discharged from the reactor less than 5 years. A rulemaking to amend Title 10 of the Code of Federal Regulations (10 CFR) Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste" would be required to modify approved system designs to accommodate fuel with shorter cooling times. 	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
833	OGC	05.23.13	4	Tison Campbell	<ul style="list-style-type: none"> Discharging large amounts of fuel (and thus greatly increasing the amount of fuel contained in the ISFSI) would require a rulemaking under Title 10 of the Code of Federal Regulations (10 CFR) Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste" (e.g., to modify approved system designs to accommodate fuel with shorter cooling times), and would increase the number of casks required to store the existing spent fuel inventory 	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
834	OGC	05.23.13	4	Tison Campbell	<ul style="list-style-type: none"> Expedited discharging of fuel from the SFP to dry storage increases the frequency of postulated cask drops, which in turn increases the frequency probability of causing damage to the pool or cask that could lead to a radioactive release 	Brian W.	May not increase the probability since casks have to be loaded anyway. Does increase the frequency while expedited transfer is occurring.		Closed	OD Concurrence	
835	OGC	05.23.13	5	Tison Campbell	<ul style="list-style-type: none"> Earlier movement of fuel into casks that are not currently approved for shipping or long-term storage may require that fuel to be repackaged later for shipment to the eventual long-term repository or interim storage site <p>But isn't this true for existing fuel under current practices. Is this really relevant to the report?</p>	Brian W.	But more may have to be repackaged if they have already been loaded into nonconforming casks. This is only tangentially related to the report and is therefore listed under the heading "these are not explicitly addressed in the report...."		Closed	OD Concurrence	
836	OGC	05.23.13	5	Tison Campbell	<p>Issues related to design-basis accidents and risk posed by dry cask storage have received, and continue to receive, attention .</p> <p>From whom? The NRC? Industry? Public Interest groups?</p>	Brian W.	Added "from various stakeholders"		Closed	OD Concurrence	
837	OGC	05.23.13	5	Tison Campbell	<p>The first set of considerations is generally pros associated with expedited fuel movement to casks, while the latter considerations are generally cons. The agency's position—</p>	Brian W.	This is important to describe the purpose of the study.		Closed	OD Concurrence	
838	OGC	05.23.13	5	Tison Campbell	<p>One of the objectives of this study is to inform the NRC's Fukushima lesson learned Tier 3 activity .</p> <p>Activities?</p>	Brian W.	Added " on whether regulatory action needs to be taken to require expedited transfer of spent fuel"		Closed	OD Concurrence	
839	OGC	05.23.13	5	Tison Campbell	<p>In order To determine whether regulatory action needs to be taken in this area, the NRC has prepared a regulatory analysis to evaluate this issue (see APPENDIX D:).</p>	Brian W.	changed to "to help inform whether...."		Closed	OD Concurrence	
840	OGC	05.23.13	6	Tison Campbell	<p>analytical tool used by NRC decision-makers to assist in determining help determine whether the NRC should implement a proposed regulatory action</p>	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
841	OGC	05.23.13	6	Tison Campbell	<p>The site characterization (e.g., seismic response, decay heat, radionuclide inventory) has been based on readily</p>	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
842	OGC	05.23.13	7	Tison Campbell	<p>developed by the U.S. Geological Survey (USGS) and the post-9/11 security assessments. Later in the project, the licensee provided additional information was provided by the licensee that generally corroborates the assumptions made in this study</p>	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
843	OGC	05.23.13	7	Tison Campbell	<p>In reality, there are differences between the major design types (PWRs versus BWRs) that which make each</p>	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
844	OGC	05.23.13	7	Tison Campbell	<p>Nevertheless, there are situations where assumptions are made the SFPSS makes some assumptions that are not representative</p>	Brian W.	Changes are made as suggested by the reviewer		Closed	OD Concurrence	
845	OGC	05.23.13	8	Tison Campbell	<p>Finally, with respect to emergency preparedness, the site is located in a State (i.e., Pennsylvania) that which</p>	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
846	OGC	05.23.13	10	Tison Campbell	<p>In terms of assessing the results, the consideration of probabilistic insights uses the above inputs (and simple algebraic combination) to quantify different figures of merit in order to place context on the results in context.</p>	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	

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847	OGC	05.23.13	10	Tison Campbell	The inclusion of probabilistic aspects within the current study allows for consideration of some aspects of likelihood, but will not support definitive statements on risk. Readers to consider? The NRC to consider? Please clarify.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
848	OGC	05.23.13	10	Tison Campbell	seismic events between 0.5 te and 1g	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
849	OGC	05.23.13	10	Tison Campbell	Using this approach we can draw supportable, but not definitive, conclusions about overall consequences and risk NRC?	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
850	OGC	05.23.13	10	Tison Campbell	(2) events that might preclude operator action to inject water into the pool for an extended period of time (e.g., i.e., days)	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
851	OGC	05.23.13	10	Tison Campbell	Tin addition to these, the second criterion also points to the following	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
852	OGC	05.23.13	11	Tison Campbell	Past studies have reached had different conclusions about the relative contribution to risk f and consequences from the various initiating events considered	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
853	OGC	05.23.13	11	Tison Campbell	Table 1 below summarizes fuel uncover frequencies from NUREG-1353,	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
854	OGC	05.23.13	11	Tison Campbell	This range of ground motions represents a good compromise between more likely events that would not be expected to lead to any consequences versus and less likely events that would lead to greater consequences (recall that risk is the product of the likelihood times the consequences). Your readers might not know this to begin with. I'd suggest defining risk earlier in this document.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
855	OGC	05.23.13	11	Tison Campbell	<ul style="list-style-type: none"> will change configurations from being an isolated pool to being a pool that's hydraulically connected to the reactor vessel (and back again)—these configurations will be referred to as pool-reactor configurations to distinguish from the different spent fuel loading configurations; may have spent fuel temporarily offloaded temporarily from the reactor; will have spent fuel permanently offloaded permanently from the reactor; 	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
856	OGC	05.23.13	12	Tison Campbell	<ul style="list-style-type: none"> will experience changes in the peak assembly fission product decay power (of interest for draindown events and spray mitigation) because of the above as well as radioactive decay; and Need to be more specific	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
857	OGC	05.23.13	12	Tison Campbell	<ul style="list-style-type: none"> will experience changes in the total decay power of all assemblies (of interest for pool heatup/boiling and makeup mitigation) because of the above as well as radioactive decay. Need to be more specific	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
858	OGC	05.23.13	12	Tison Campbell	To faithfully represent these changing conditions, one would need to break the study breaks up the operating cycle into numerous small periods of time or operating cycle phases (OCPs).	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
859	OGC	05.23.13	12	Tison Campbell	This approach allows for more faithful representation of the annualized frequencies of on-site consequences	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
860	OGC	05.23.13	13	Tison Campbell	A number of past studies have been performed to look at various aspects of spent fuel and SFP safety, security, and for risk. The major regulatory activities are shown pictorially in	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
861	OGC	05.23.13	14	Tison Campbell	The conditional probability of a Zircaloy cladding fire given a complete loss of water in low-density storage racks is estimated to be at least a factor of five 5 less than f	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
862	OGC	05.23.13	14	Tison Campbell	In 1996, an NRC-sponsored and issued an Idaho National Laboratories (INL) study entitled, "Loss of Spent Fuel Pool Cooling PRA: Model and Results," was issued (INL, 1996). This study considered a dual unit plant and the following initiators:	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	

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863	OGC	05.23.13	14	Tison Campbell	It is also shown The INL study also showed that, depending on the design characteristics of a given plant,	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
864	OGC	05.23.13	15	Tison Campbell	To understand the The following conclusions, it's important to point out are based on an assumption that for the second configuration (cold fuel in the SFP) the report assumes that a zirconium fire would not occur	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
865	OGC	05.23.13	15	Tison Campbell	Several years later, the agency NRC re-visited these	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
866	OGC	05.23.13	16	Tison Campbell	The NRC concluded that the fundamental recommendation of the 2003 Alvarez paper, namely that all spent fuel more than 5 years old be placed in dry casks through an expedited 10-year program costing many billions of dollars, was not justified.	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
867	OGC	05.23.13	17	Tison Campbell	Academies study, including the finding that the NRC might determine that the earlier movement of spent fuel from pools to dry cask storage would be prudent, depending	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
868	OGC	05.23.13	17	Tison Campbell	The NRC will continue to evaluate the results of the ongoing plant-specific assessments and, based upon new information, would evaluate whether any change to its spent fuel storage policy is warranted." The NRC's position on each finding or recommendation that it disagreed with is contained in the report to Congress that accompanied the March 2005 letter. Need to add a citation to the letter here.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
869	OGC	05.23.13	17	Tison Campbell	In parallel to the National Academies study, the NRC continued performing the aforementioned security assessments, which were completed in the 2006 2008 timeframe	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
870	OGC	05.23.13	17	Tison Campbell	The results of the report's analysis indicates that dry cask storage risk is solely from latent cancer fatalities, and no prompt fatalities are expected	Don A.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
871	OGC	05.23.13	18	Tison Campbell	The last two reports are of particular interest for the present effort. The former report EPRI TR-1021049 assesses the cost and risk impacts (from a worker dose perspective) associated with transfer of spent nuclear fuel from SFPs to dry storage after 5 years of cooling	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
872	OGC	05.23.13	19	Tison Campbell	one in which where the campaign takes 10 years and one where it takes 15 years	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
873	OGC	05.23.13	19	Tison Campbell	Regarding the amount of fuel older than five years, and its associated decay heat, the table below compares industry averages reported in the NAC study with those from the study presented in this report	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
874	OGC	05.23.13	23	Tison Campbell	The current seismic assessment uses a model and code generated by the US Geological Survey (USGS, 2008). A group of stakeholders, which includes the NRC, is developing a new probabilistic seismic hazard model in a collaborative study that which comprises has two parts	Jose P.	To answer a NRO comment this paragraph was modified and now reads: "The seismic hazard assessment in this study is the US Geological Survey (USGS, 2008) hazared model. A new probabilistic seismic hazard model is currently being developed and will consist of two parts: (1) a seismic source zone characterization and (2) a ground motion prediction equation (GMPE) model. Although part (1) is now complete (NRC, 2012b), it was not available at the start of this scoping study. In addition, the GMPE update is still in progress. Furthermore, the NRC is currently developing an independent probabilistic seismic hazard assessment (PSHA) computer code to incorporate part (1) and part (2) when complete. While the USGS (2008) hazard model is not sufficiently detailed for regulatory decisions, it is appropriate to use for this study because it was the most recent and readily available hazard model for the selected site at the start of the study. " Section 3, was modified accordingly.		Closed	OD Concurrence	
875	OGC	05.23.13	24	Tison Campbell	For the ground motions considered in this study, lower frequencies of vibration tends to	Jose P.	Suggested edits made.		Closed	OD Concurrence	
876	OGC	05.23.13	24	Tison Campbell	outside the nature of the study Scope?	Jose P.	Replaced "nature" with "scope".		Closed	OD Concurrence	
877	OGC	05.23.13	25	Tison Campbell	The main event would crack the SFP studied, but the SFP's structure would be stable after the	Jose P.	Suggested edits made.		Closed	OD Concurrence	
878	OGC	05.23.13	27	Tison Campbell	This fuel would be placed in to the spent fuel pool just prior to the outage (the	Jose P.	Suggested edits made.		Closed	OD Concurrence	

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879	OGC	05.23.13	28	Tison Campbell	Radionuclide releases occur only if the fuel has become uncovered by 48 hours. Does this mean "48 hours after the earthquake"?	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
880	OGC	05.23.13	29	Tison Campbell	radiological release has commenced before 72 hours After the earthquake?	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
881	OGC	05.23.13	30	Tison Campbell	Health effect risk estimates (e.g. latent cancer fatality risk and early fatality risk) are with respect to distance. There's a word or two missing here.	AJ N.	Incorporated.		Closed	OD Concurrence	
882	OGC	05.23.13	31	Tison Campbell	The seismic event has a limited effect on emergency response	Jose P.	Suggested edits made.		Closed	OD Concurrence	
883	OGC	05.23.13	31	Tison Campbell	A long-term cleanup policy for severe accidents does not currently exist, although such guidance is currently being drafted. In addition, such guidance could likely allow for recommend the development Guidance can't allow anything, it doesn't impose requirements.	AJ N.	Incorporated.		Closed	OD Concurrence	
884	OGC	05.23.13	31	Tison Campbell	after an accident, to account for a number of factors that include sociopolitical, technical, and economic considerations	AJ N.	Incorporated.		Closed	OD Concurrence	
885	OGC	05.23.13	31	Tison Campbell	Given that such a policy for long-term cleanup does not currently exist (and because a developed policy may not contain explicit cleanup goals), the project instead uses dose levels associated with habitability as the point in deciding to decide when	AJ N.	Incorporated.		Closed	OD Concurrence	
886	OGC	05.23.13	32	Tison Campbell	There are four broad interplays that can be defined between the SFP and the reactor: (1) an initiating event thatwhich directly affects both the reactor and the SFP (2) a reactor accident which that prevents accessibility to the SFP for a prolonged period of time (e.g., due to high radiation fields), leading to a SFP accident (3) a reactor accident that includes ex-containment energetic events (e.g., a hydrogen combustion event) or other ex-containment interplays (e.g., steaming through the drywell head that affects refuel floor combustible gas mixtures) which and creates a hazard to the SFP (e.g., by causing debris to fall in to the pool) or otherwise changes the SFP event progression (4) a SFP accident thatwhich prevents accessibility to key reactor systems and components for a prolonged period of time or thatwhich creates a hazard for equipment used to cool the reactor (e.g., the flooding of low elevations of the reactor building due to a leak in the pool or excessive condensation from continuous boiling of SFP water), leading to a reactor accident For each of these interplays, large	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
887	OGC	05.23.13	32	Tison Campbell	For instance, a hydrogen combustion event caused by a reactor accident thatwhich affects the refuel floor superstructure	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
888	OGC	05.23.13	33	Tison Campbell	Even if such this symmetry did exist, the offsite consequences would not follow a linear scaling because of a number of nonlinearities associated with that portion of the analysis. Again, capturing such these effects was not a focus of this study, and future work (the SECY 11 0089 Level 3 PRA) will attempt to more rigorously treat these effects	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
889	OGC	05.23.13	33	Tison Campbell	there are several "advantageous" considerations that should-to-be-kept-in-mind, including the following	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
890	OGC	05.23.13	34	Tison Campbell	Having said this, thereThere are also a few counter considerations that should-also-be-kept-in-mind	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	

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891	OGC	05.23.13	35	Tison Campbell	A group of stakeholders, which includes the NRC, is developing a new probabilistic seismic hazard model in a collaborative study, which includes comprises two parts	Jose P.	To answer a NRO comment this paragraph was modified and now reads: "The seismic hazard assessment in this study is the US Geological Survey (USGS, 2008) hazared model. A new probabilistic seismic hazard model is currently being developed and will consist of two parts: (1) a seismic source zone characterization and (2) a ground motion prediction equation (GMPE) model. Although part (1) is now complete (NRC, 2012b), it was not available at the start of this scoping study. In addition, the GMPE update is still in progress. Furthermore, the NRC is currently developing an independent probabilistic seismic hazard assessment (PSHA) computer code to incorporate part (1) and part (2) when complete. While the USGS (2008) hazard model is not sufficiently detailed for regulatory decisions, it is appropriate to use for this study because it was the most recent and readily available hazard model for the selected site at the start of the study." Section 3, was modified accordingly.		Closed	OD Concurrence	
892	OGC	05.23.13	37	Tison Campbell	Figure 4 Comparison of annual PGA exceedance frequencies for U.S. Suggest updating the figure to identify the reference site as a reminder to readers	Jose P.	Figure was updated and the legend now says "Reference Plant" instead of Peach Bottom.		Closed	OD Concurrence	
893	OGC	05.23.13	37	Tison Campbell	Figure 5 Comparison of annual exceedance frequencies for 1 Hz spectral accelerations for U.S. Mark I reactors (USGS 2008 model) (rock hazard curves) Suggest updating the figure to identify the reference site to readers	Jose P.	Figure was updated and the legend now says "Reference Plant" instead of Peach Bottom.		Closed	OD Concurrence	
894	OGC	05.23.13	39	Tison Campbell	bin 3, with initiating annual frequencies on the order of 1×10^{-5} to 2×10^{-5} , have the potential of challenging the structural integrity Why not just say "could challenge"?	Jose P.	Suggested edits made.		Closed	OD Concurrence	
895	OGC	05.23.13	39	Tison Campbell	was that the ground motions associated with the SSE (bin 1 (the least severe bin) event) would not be large enough to damage the SFP at the reference plant.	Jose P.	Suggested edits made.		Closed	OD Concurrence	
896	OGC	05.23.13	39	Tison Campbell	The information above coupled with the review of previous studies (NRC, 2001) suggests that the frequency of a seismic event that has the potential for challenging to challenge	Jose P.	Suggested edits made.		Closed	OD Concurrence	
897	OGC	05.23.13	39	Tison Campbell	This frequency places the Mineral, VA, event in seismic bin 1.	Jose P.	Suggested edits made.		Closed	OD Concurrence	
898	OGC	05.23.13	ALL	Tison Campbell	Editorial Comments. Please review original OGC comments in report. Please look for editorial comments after Pg 40 of the report and ignore comments boxes as they have been individually assigned	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
899	OGC	05.23.13	43	Tison Campbell	(1) structural damage to the spent fuel structure with potential locations of leakage from concrete cracking and related liner tearing SFP?	Jose P.	Suggested edits made.		Closed	OD Concurrence	
900	OGC	05.23.13	43	Tison Campbell	Most of the analytical effort focused on assessing potential structural damage to the spent fuel structure, namely concrete distortions, concrete SFP?	Jose P.	Suggested edits made.		Closed	OD Concurrence	
901	OGC	05.23.13	43	Tison Campbell	This is based on the review of past studies, which indicates that damage to the SFP in those locations, if it were to occur, would be the more significant damage state in terms of loss of coolant Analysis? Effort?	Jose P.	Used: The focus on this analysis was based on the review of past studies which indicates that damage to the SFP in those locations, if it were to occur, would be the more significant damage state in terms of loss of coolant."		Closed	OD Concurrence	
902	OGC	05.23.13	65	Tison Campbell	Damage States and Relative Likelihoods If you have time, I'd recommend revising this section to remove the passive voice. The excessive use of passive voice can cause unnecessary confusion for readers.	Jose P.	Did this in part but not for the entire section.		Closed	OD Concurrence	

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903	OGC	05.23.13	69	Tison Campbell	The resulting crack width for a liner tear localized at the location of the backup bar is then estimated at $3.7 \times 0.10 = 0.37$ mm (0.015 in.). The crack length at each location is taken to be equal to the width of a backup bar which is equal to 4.0 in. (101.6 mm). Given that the spacing of the backup bars is 2 ft, a total of 40 backup bars (20 on each wall) are used to estimate the sum of all localized cracks at $4 \times 40 = 160$ in. The estimated width for each crack, if it were to occur, is then 0.015 in and the depth of the crack is the depth of the liner which is equal to 0.25 in. See general comment re. units. Switching back and forth like this can be really confusing. You need to be consistent and, if possible, follow current NRC policy, which I believe has metric first followed by BE units in parentheses.	Jose P.	Corrected the text for consistency. US standard units used first with SI units in parentheses. This was done for all following sections in Ch. 4.		Closed	OD Concurrence	
904	OGC	05.23.13	69	Tison Campbell	It is important to reemphasize that Considerable uncertainty continues to exist in the calculation of the reported leakage rate This seems really informal. I've tried to rephrase, but might have unintentionally changed the meaning. If you can revise to remove the phrase "it is important to reemphasize..." then you'll address my concern.	Jose P.	Text now reads: Considerable uncertainty continues to exist in the estimation of leakage flow rates for these localized liner tears. Subsequent text also was somewhat edited for clarity.		Closed	OD Concurrence	
905	OGC	05.23.13	71	Tison Campbell	Based on the above, it is concluded that the refueling gate will not fail under the earthquake and will continue to maintain its intended function during the accident progression The NRC? The NRC Staff? Who made this conclusion?	Jose P.	Text now says: Based on the above, the study assumes that the refueling gate will not fail for the seismic event considered and will continue to maintain its intended function during the accident progression.		Closed	OD Concurrence	
906	OGC	05.23.13	73	Tison Campbell	Specifically, a water level reduction of about 1.6 feet (0.5 m) was assumed for Unit 2 as a result of sloshing induced by the ground motion while reductions of about 5 ft (1.5 m) were assumed for Units 1, 3 and 4 from sloshing associated with ground motions and explosions. Need to be consistent. Are you going to write out feet each time or use ft? I think that the NRC Style Guide recommends ft. In any event, you should be consistent.	Jose P.	Suggested edits made.		Closed	OD Concurrence	
907	OGC	05.23.13	73	Tison Campbell	However, seismic design basis loads for this reactor were subsequently revised upwards (those are the design loads reported in this comparison). Differences in the seismic design-basis loads and uncertainties on the knowledge, at the time of the writing of this report, of regarding the construction details "uncertainties on the knowledge" is unidiomatic and could confuse readers.	Jose P.	Suggested edits made.		Closed	OD Concurrence	
908	OGC	05.23.13	74	Tison Campbell	• Vertical PGAs at the foundation slabs of all reactors are for the most part less than horizontal PGAs with the exception of Unit 1 at Fukushima Daiini Unit 1 and Units 6 and 7 of Kashiwazaki-Kariwa Units 6 and 7. These are just suggestions to make this read better. If you don't take these suggestions, then you should make sure that you're consistent in how you describe these sites. For example, you could use Unit X at Plant or Unit Y of Plant, but you should be consistent and only use one of these constructions.	Jose P.	Suggested edits made.		Closed	OD Concurrence	
909	OGC	05.23.13	74	Tison Campbell	study assumes that the vertical PGA is Not sure that "assumes" is the right word here, but I'm trying to get away from the "it is noted that" construction, which doesn't seem appropriate for this type of paper.	Jose P.	Bullet now reads: - The study assumes that the vertical PGA is approximately equal to the horizontal PGA (see Section 3.3).		Closed	OD Concurrence	
910	OGC	05.23.13	83	Tison Campbell	• The study does not treat new fuel Consider?	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
911	OGC	05.23.13	84	Tison Campbell	• The calendar time at which the snapshots are evaluated Not sure what you mean by this.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	

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912	OGC	05.23.13	84	Tison Campbell	It is expected that the licensee's emergency response organization would implement these measures in accordance with approved emergency plans, procedures, and guidelines The NRC expects? The study assumes?	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
913	OGC	05.23.13	85	Tison Campbell	The NRF is exercised periodically conducts periodic exercises and provides access to the full resources	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
914	OGC	05.23.13	85	Tison Campbell	The NRC has an extensive, well-trained, and exercised emergency response capability and has onsite resident inspectors. The NRC would activate the incident response team at the NRC What is exercised emergency response capability? I'd suggest deleting ", and exercised" from this sentence.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
915	OGC	05.23.13	95	Tison Campbell	See later sections of the report for results. I'd suggest deleting this column and just indicated after the table that the results for high-density and low-density loading are discussed later in the report.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
916	OGC	05.23.13	95	Tison Campbell	5.6.3 Refresher-on-Summary of Event Split Fractions	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
917	OGC	05.23.13	97	Tison Campbell	The new upgraded version of the code architecture supports advancements in computer hardware and software, and the code numerics improvements are underway to carry out reasonable execution times Not sure what this means. Would it be more accurate to start a new sentence after "software" and say "Code numeric improvements are underway, which would improve execution times."? As written, this implies that current execution times are not reasonable, and it's unclear which code numeric improvements you're referring to when you talk about "the code numerics improvements". . .	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
918	OGC	05.23.13	97	Tison Campbell	The input structure for MELCOR 2.1 differs completely from that of MELCOR 1.8.6. MELCOR is an ideal 2.1?	Hossein E.	This was meant to convey the message that the code itself is an ideal tool. SFP models have been incorporated in both versions of the code (1.8.6 and 2.1), and they are functionally the same. For this study, MELCOR 1.8.6 was used.		Closed	OD Concurrence	
919	OGC	05.23.13	98	Tison Campbell	The analyses were performed for a reference BWR, with additional supporting analyses for separate effects and fluid flow modeling. The MELCOR analyses were performed using an earlier version of the code (MELCOR 1.8.5 Version RP) which is no longer maintained. Some of the modeling improvements in MELCOR 1.8.6 include revised modeling of the lower plenum to account for the curvature of the lower head (not relevant for an SFP) and formation and convection of stratified molten pools. Consider revising to make this active voice, it's kind of confusing right now	H			Review Comm.	OD Concurrence	
920	OGC	05.23.13	98	Tison Campbell	MELCOR 1.8.5 Version RP included added, and MELCOR 1.8.6 and 2.1 include, two modeling	Hossein E.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
921	OGC	05.23.13	100	Tison Campbell	The MELCOR core models calculate the thermal response of the core . Are you talking about the reactor core or the inventory of spent fuel in the pool? If you're discussing the reactor core, you should clarify why that's relevant here.	Hossein E.	MELCOR core models were originally designed for the reactor core assemblies. Because of the code flexibility the same modeling approach can be used for the spent fuel assemblies in the pool (with the addition of the rack as a separate component as stated in the report). Therefore, as far as code models are concerned (e.g., heat transfer between groups of assemblies and with the fluid, and radionuclide release, transport and deposition), there is no difference between reactor assemblies and spent fuel assemblies. It is up to the user to define these in the input deck.		Closed	OD Concurrence	
922	OGC	05.23.13	104	Tison Campbell	It should be noted that However, NUREG-1465 states that, for accidents in which long-term cooling is maintained (e.g., postulated spent fuel handling accident), the gap release could be as low as 3 percent; and . However, in the unmitigated scenarios	Hossein E.	Changed as suggested by the reviewer.		Closed	OD Concurrence	

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923	OGC	05.23.13	105	Tison Campbell	Based on the effective operating power, MELCOR calculates the specific element, time-dependent decay heat tables, and mass inventories Based on the rest of this paragraph, I think you're talking about three things: (1) element dependent decay heat tables, (2) time-dependent decay heat tables, and (3) mass inventories. If this is correct, then you need this comma to avoid confusion. If it's not correct, then this sentence needs to be clarified.	Hossein E.	MELCOR uses the specific decay heat and mass inventories for each element. The specific element decay heat (watts per kilogram) and the mass inventories (kg) are used to match the SFP decay power from Table 25. This sentence is modified as "Based on the effective operating power, MELCOR calculates the specific time-dependent decay heat and mass inventory for each element."		Closed	OD Concurrence	
924	OGC	05.23.13	108	Tison Campbell	. A comparison of the present decay heat results with values calculated by the utility in 2001 show agreement to be better than 3 percent over all cooling times, with present results being slightly larger than utility values, most likely because of the increase in discharge burnup since 2001	Hossein E.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
925	OGC	05.23.13	126	Tison Campbell	air natural circulation Isn't this more commonly called "natural air circulation"? This phrasing seems odd.	Hossein E.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
926	OGC	05.23.13	126	Tison Campbell	If there was not air natural circulation through the racks, the cooling of the fuel by the spray flow (i.e., modeled with the simple flow regime map) would be very important to the coolability of the fuel How so? What do we mean by "very important"?	Hossein E.	This is to show the importance of natural circulation of air combined with the spray cooling for the two different modeling of spray. In all cases studied here, the spray does not impede the natural air circulation, but it is believed that without natural circulation of air (and other heat transfer mechanisms), direct cooling of the fuel rods becomes very important.		Closed	OD Concurrence	
927	OGC	05.23.13	131	Tison Campbell	The DF is a dynamic quantity as the outer rings start to release (see the fluctuations in Figure 71); therefore, care is taken to allow the earlier releases from inner rings preserve their release history. This statement is unclear. Please revise.	Hossein E.	The sentence is revised as "The DF is a dynamic quantity as the outer rings start to release (see the fluctuations in Figure 71); therefore, care is taken to allow the earlier releases from inner rings preserve their release history so that the total release fraction does not decrease at any time as the release progresses."		Closed	OD Concurrence	
928	OGC	05.23.13	150	Tison Campbell	As shown above, clearly the inventories in the low density configuration are lower and, for the same release fractions	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
929	OGC	05.23.13	154	Tison Campbell	MACCS2 rev. 3.7.0 was used for the offsite consequence analysis in the SFP Study This is the first place you refer to this as the SFP Study. You should be consistent throughout the document.	Brian W.	will be addressed as time allows.		Review Comm.	OD Concurrence	
930	OGC	05.23.13	155	Tison Campbell	The decision of which sequence to represent the binThe study considered a number of different factors to determine which sequence should represent each bin, including the release frequency, the relative Cs-137	AJ N.	Incorporated.		Closed	OD Concurrence	
931	OGC	05.23.13	155	Tison Campbell	because of the significant differences in release category 33 relative to the other bins, both of these sequences were analyzed Which sequences?	AJ N.	Incorporated.		Closed	OD Concurrence	
932	OGC	05.23.13	160	Tison Campbell	They were established with the intent of relocation being assumption that relocation begins implemented beginning after the evacuation is substantially complete	AJ N.	Incorporated.		Closed	OD Concurrence	
933	OGC	05.23.13	160	Tison Campbell	normal relocation time was established to be 12 hours after the hotspot relocation time Assumed?	AJ N.	Incorporated.		Closed	OD Concurrence	
934	OGC	05.23.13	161	Tison Campbell	This time period helps assumption allows for the processes of plume passageto pass and deposit and deposition of contamination onto surfaces, which means to complete so that all the calculated acute exposures are captured	AJ N.	Incorporated.		Closed	OD Concurrence	
935	OGC	05.23.13	177	Tison Campbell	Their statuses are not within the constitution of the success criterion . The effective SFP mitigation strategies to prevent fuel overheating and releasing radioactive from Not sure what this means. Could we say: The status of these components was not considered in the development of the success criterion?	James C.	Reworded as "Statuses of the Unit 3 reactor, Unit 2 reactor, Unit 2 SFP, and the other plant SSCs would affect Unit 3 SFP mitigation, but the mitigation success criterion defined in this HRA study is only determined by the Unit 3 SFP fuel status.		Closed	OD Concurrence	
936	OGC	05.23.13	178	Tison Campbell	The SFP mitigation uses the minimum flow rate endorsed by 10 CFR 50.54(hh)(2) There is no flow rate in this section.	James C.	Reworded as "NEI guidance for complying with 10CFR50.54(hh)(2)"		Closed	OD Concurrence	

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937	OGC	05.23.13	178	Tison Campbell	For a SFP event, the primary function of off-site supports is to keep radioactive There's a word missing here. Or is this supposed to say "radioactivity"?	James C.	addressed		Closed	OD Concurrence	
938	OGC	05.23.13	178	Tison Campbell	(1) Boil-off Scenario This is not hyphenated above. Need to be consistent.	James C.	addressed: use "Boil off"		Closed	OD Concurrence	
939	OGC	05.23.13	179	Tison Campbell	the 10 CFR 50.54(hh)(2) endorsed minimum SFP makeup flow is deployed in time. The red cell represents conditions where gap release cannot be prevented because the 10 CFR 50.54(hh)(2) endorsed minimum makeup flow is insufficient to remove the high decay heat to prevent fuel damage (or gap release) because of overheating There is no minimum makeup flow specified in this paragraph of the 10 CFR. Need to clarify what you mean by 10 CFR 50.54(hh)(2) endorsed minimum makeup flow.	James C.	addressed; see comment #178 in Rwo 939		Closed	OD Concurrence	
940	OGC	05.23.13	180	Tison Campbell	10 CFR 50.54(hh) requirements, which endorses providing at least 500 gpm I'm not sure "endorses" is the correct term here. Maybe "recommends" would be better.	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
941	OGC	05.23.13	180	Tison Campbell	(b)(5)	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
942	OGC	05.23.13	181	Tison Campbell	Figure 99 shows the time history of the refueling floor temperature of the OCP for small leak scenarios. The temperature reaches 140 °F in about 13.5 hours. Figure 100 shows the time history of the refueling floor temperature of the OCP for small leak scenarios. The temperature reaches 140 °F in about 26 hours. There's an inconsistency here. Should the discussion of Figure 100 reference OCP 2?	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
943	OGC	05.23.13	186	Tison Campbell	10 CFR 50.54(hh)(2) endorsed minimum flow rate, the plant staff See previous comments on this phrase.	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
944	OGC	05.23.13	195	Tison Campbell	the 10 CFR 50.54(hh)(2) endorsed flow rates (i.e., 500 gpm of injection See other comments on this phrase.	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
945	OGC	05.23.13	195	Tison Campbell	, the high likelihood is because the 10 CFR 50.54(hh)(2) endorsed flow rates (i.e., 500 gpm of See other comments on this phrase	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
946	OGC	05.23.13	198	Tison Campbell	2The 10 CFR 50.54(hh)(2) endorsed minimum makeup flow is insufficient to prevent gap release. 3The 10 CFR 50.54(hh)(2) endorsed minimum makeup flow is sufficient See other comments on this phrase and revise as necessary.	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
947	OGC	05.23.13	198	Tison Campbell	. In combination, the two portable diesel pumps can deliver three times the 10 CFR 50.54(hh)(2) endorsed flow rate See other comments on this phrase.	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	

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948	OGC	05.23.13	200	Tison Campbell	<p>**The 10CFR50.54(hh)(2) endorsed minimum flow rate is not sufficient to prevent gap release. The procedure (i.e., TSG-4.1) does not instruct operators to establish an additional SFP makeup flow path to significantly increase the SFP makeup flow rate greater the minimum flow rate endorsed by 10CFR50.54(hh)(2).</p> <p>See previous comments on 10CFR50.54(hh) endorsed. . .and revise accordingly</p>	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
949	OGC	05.23.13	201	Tison Campbell	<p>• The 500 gpm of injection as required by 10CFR50.54(hh)(2) is not sufficient to prevent gap release in the OCP1 moderate leak scenarios</p> <p>This is not required by 50.54(hh), it's from NEI guidance. Need to revise this discussion.</p>	James C.	addressed: see comment #178 in Rwo 939		Closed	OD Concurrence	
950	OGC	05.23.13	201	Tison Campbell	leakage scenarios but not other scenarios because these scenarios have more longer available time to initial mitigation s. However, instructions	James C.	addressed		Closed	OD Concurrence	
951	OGC	05.23.13	202	Tison Campbell	<p>. A rigor analysis would require performing a combination of probabilistic risk assessment and HRA</p> <p>Words missing? What's a rigor analysis?</p>	James C.	addressed		Closed	OD Concurrence	
952	OGC	05.23.13	203	Tison Campbell	<p>This section catalogues a set of sensitivity analyses to better understand the potential effect of certain assumptions on the results.</p> <p>The results of the study?</p>	Hossein E.	Changed as suggested by the reviewer.		Closed	OD Concurrence	
953	OGC	05.23.13	213	Tison Campbell	<p>The reference plant studied has prearranged the SFP such that discharged assemblies can be placed directly into a 1x4 (actually 1x8 in the case of this plant) arrangement for the last two outages for both operating units. This approach is consistent with the relevant regulatory requirements. However, those regulatory requirements do allow for the fuel to be stored in a less favorable configuration for some time following discharge if other considerations prevent prearrangement.</p> <p>A regulatory requirement is associated with the time window by which the 1x4 arrangement must be achieved; however, the specific time requirement is not publicly available information (because it could be potentially useful to an adversary). This section posits a situation in which the fuel is unfavorably arranged during the outage to demonstrate the effect of this aspect on the results</p> <p>Which regulatory requirements are you talking about here? Please provide citations.</p>	Hossein E.	<p>The last paragraph in Section 5.1 is revised to cite the requirements as</p> <p>"The above table depicts a 1x4 storage pattern for the recently discharged fuel, based on the approach PBAPS has taken to meet the requirements associated with license condition 2.C.(11) and 10 CFR 50.54(hh)(2)."</p> <p>The two paragraphs cited by the reviewer are modified as follows to refer back to Secion 5.1 of the report</p> <p>"The reference plant studied has prearranged the SFP such that discharged assemblies can be placed directly into a 1x4 (actually 1x8 in the case of PBAPS) arrangement for the last two outages for both operating units. This approach is consistent with the requirements previously discussed in Section 5.1. However, those requirements do allow for the fuel to be stored in a less favorable configuration for some time following discharge if other considerations prevent prearrangement. A requirement is associated with the time window by which the 1x4 arrangement must be achieved; however, the specific time requirement is not publicly available information (because it could be potentially useful to an adversary). This section posits a situation in which the fuel is unfavorably arranged during the outage to demonstrate the effect of this aspect on the results"</p>		Closed	OD Concurrence	
954	OGC	05.23.13	219	Tison Campbell	<p>Since licensees are required to move their recently discharged fuel to a more favorable configuration after a certain amount of time, this sensitivity assumes that the high density uniform case becomes identical to the high-density (1x4) case after OCP2.</p> <p>Cite to source for this requirement?</p>	Hossein E.	<p>The paragraph cited by the reviewer is modified to refer back to Secion 5.1 of the report that cites the requirements (see also response to comment 953).</p> <p>"Since the licensee must either preconfigure the SFP to allow direct placement of discharged fuel in or move their recently discharged fuel to a more favorable configuration after a certain amount of time, this sensitivity simply assumes that the high density uniform case becomes identical to the high-density (1x4) case after OCP2 (i.e., that the actions to meet the requirements on fuel pattern discussed in Section 5.1 are taken at the end of OCP2)."</p>		Closed	OD Concurrence	

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955	OGC	05.23.13	249	Tison Campbell	The exceptions are when (1) the 10 CFR 50.54(hh)(2) required makeup flow rate is insufficient to prevent release, (2) the time No specific level of makeup flow is required by this paragraph.	Hossein E.	The sentenced will be reworded as (1) the NEI recommened minimum flow rate for SFP mitigation is insufficient to prevent release. This is consistent with the discussion in Section 8 of the report.		Closed	OD Concurrence	
956	OGC	05.23.13	A-3	Tison Campbell	As these distances expand and the populations increase, it is important to better understand the more likely directions that the plume would take. This is awkward. Please rephrase.	AJ N.	Incorporated.		Closed	OD Concurrence	
957	OGC	05.23.13	A-3	Tison Campbell	Thus, if a release were to occur, it is more likely that a relatively small population would be affected that a large one affecting a major city. Not sure what this means.	AJ N.	Incorporated.		Closed	OD Concurrence	
958	OGC	05.23.13	D-6	Tison Campbell	Furthermore, the nuclear industry, NRC, and DOE are considering the technical and regulatory issues associated with storage of spent fuel at reactor sites for an indefinite period after the reference The NRC is doing this? How so? This isn't part of the Waste Confidence analysis?	Fred S.	Revised the sentence to read as follows: Furthermore, the NRC, as part of its Waste Confidence Decision and Rule, is considering the technical and regulatory issues associated with storage of spent fuel at reactor sites for a period of time after the end of the licensed life of a nuclear power plant.		Closed	OD Concurrence	
959	OGC	05.23.13	D	Tison Campbell	(b)(5)	Fred S.	Section rewritten to address OGC comments		Closed	OD Concurrence	
960	OGC	05.23.13	InfoSECY	Tison Campbell	The current schedule for issuing the report is based in part on ensuring the report's availability to the public during the public comment period for the Waste Confidence Decision—Draft Generic Environmental Impact Statement and proposed rule	Don A.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	
961	OGC	05.23.13	InfoSECY	Tison Campbell	This Commission paper was reviewed by OGC and they have no legal objectionThe Office of the General Counsel has reviewed the draft report and has no legal objection to its publication for public comment. The	Don A.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	

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962	NMSS	05.24.13	Foreword	Norma Santos	3rd para., last sentence: "After used fuel has cooled in the spent fuel pool for greater than five years, it can be moved to dry storage casks for longer term storage." This statement is not entirely correct. Recommend removing this sentence, as this study only considers that the fuel has been removed from the pool, and does not make a judgment on where the fuel has been moved.	Kathy G.	Disagree, it says it 'can' be moved to dry storage which is the question under consideration.		Closed	OD Concurrence	H
963	NMSS	05.24.13	Abstract	Norma Santos	Last sentence: Replace this sentence with the following: "The study will provide input to the evaluation of expedited transfer of spent fuel from pools to dry storage."	Kathy G.	ok, used Brian S. words.		Closed	OD Concurrence	H
964	NMSS	05.24.13	ES	Norma Santos	1st paragraph, 2nd to last sentence: Revise the sentence as follows: "This study aimed to estimate how reducing the amount of spent fuel in the pool (e.g., by more rapidly moving older, colder spent fuel to dry storage), could affect accident consequences at a reference plant."	Kathy G.	Revised sentence based on other comments.		Closed	OD Concurrence	H
965	NMSS	05.24.13	ES	Norma Santos	2nd para., 1st sentence: Revise the sentence as follows: "The study's results will inform the question of moving spent fuel provide input into the consideration of expedited transfer of spent fuel from spent fuel pools to dry storage sooner than current practice."	Kathy G.	Revised sentence based on other comments.		Closed	OD Concurrence	H
966	NMSS	05.24.13	Introduction	Norma Santos	Page 4, 2nd paragraph: Revise as follows: "This study does not explicitly address the following considerations, though some are discussed further in APPENDIX B Chapter 10:	Don A.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	H
967	NMSS	05.24.13	Introduction	Norma Santos	• Current licenses for dry cask storage systems typically limit the ability to transfer fuel from the SFP to dry storage casks-cask payload to fuel that has been discharged from the reactor less for more than 5 years."	Don A.	Corrected as suggested by the reviewer.		Closed	OD Concurrence	H
968	NMSS	05.24.13	D	Norma Santos	Section D.1.2, Page D-3, 1st para., 1st sentence: This sentence refers to the March 2011 accident at Fukushima as resulting from the "Great East Japan Earthquake." The forward refers to this event as the "Tohoku" earthquake. Revise this sentence to be consistent with the forward.	Fred S.	Incorporated		Closed	OD Concurrence	H
969	NMSS	05.24.13	D	Norma Santos	Section D.2.2, Page D-6, Note 47: The last sentence of this footnote states: "The report goes on to conclude that early movement of spent fuel into dry storage would have 'significant radiological impacts.'" This statement is not supported in this Appendix. Also, whatever the radiological impacts determined in the EPRI report, they are insignificant compared to some of the most severe consequences determined in this current study. Recommend removing this statement.	Fred S.	Deleted statement.		Closed	OD Concurrence	H
970	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.2, 1st sentence: This sentence states that "Three companies supply dry storage technologies ..." There is actually a fourth (BNG Fuel Solutions). Recommend revising to state that three companies provide "most" of the dry storage technologies in service.	Fred S.	Agree. Comment incorporated.		Closed	OD Concurrence	H

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971	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.2, 3rd sentence: This sentence implies that high burnup fuel can be stored in a uniform loading pattern, which is only true for cooling times much longer than those of interest for this study (i.e., greater than 30 years). Recommend removing this sentence, as whether or not the fuel is categorized as "high-burnup" for storage is irrelevant to this evaluation.	Fred S.	Agree. Sentence removed.		Closed	OD Concurrence	H
972	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.2, Table 12: This table implies that these are the only commercially available cask systems, which is not true. For example, the TN NUHOMS System also has a 61BT canister, which is similar to the 61BTH, but with a lower decay heat limit. Revise this table to indicate that this is a representative sampling of available cask systems. Also, revise the title to indicate that these are commercially available BWR systems. Additionally, the 2nd sentence of Note 1 for this table states that regional loading schemes allow for a higher decay heat per assembly. While this is true, it is only so for a smaller number of assemblies. The sentence implies that the decay heat limit is higher for every assembly in the canister.	Fred S.	Agree. Added suggested title and suggested wording to 2nd sentence.		Closed	OD Concurrence	H
973	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.3, 2nd sentence: This sentence states that average discharge burnups for BWR assemblies are 43 GWd/MTU. This may be true when averaged over all discharged fuel assemblies; however, fuel being discharged today has a average burnup of between 50 and 55 GWd/MTU. Revise this sentence to clarify the average assembly discharge values and provide a reference for these numbers.	Fred S.	Clarify these are avg estimates. Reference source is EPRI study.		Closed	OD Concurrence	H
974	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.3, 3rd and 4th sentences: These sentences provide decay heat values for difference assembly burnups and cool times. Decay heat can also vary significantly with initial enrichment and assembly irradiation parameters. Revise these sentences to state whether these values are average or upper bound estimates of decay heat.	Fred S.	Revised to state these are avg estimates.		Closed	OD Concurrence	H
975	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.3, 2nd para., 2nd sentence: Revise this sentence as follows: "Table 13 shows that all of the dry storage canisters can be filled to capacity without exceeding the maximum decay heat per package rating, <u>subject to restrictions on loading pattern</u> ."	Fred S.	Added suggested wording		Closed	OD Concurrence	H
976	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.3, 2nd para., last sentence: This sentence states that the TN-68 casks were used in this evaluation. Revise this paragraph to note that the currently approved minimum cooling time for fuel stored in the TN-68 is seven years (ten years for some fuel types), and would need to be amended to allow storage of shorter cooled fuel.	Fred S.	Added suggested wording		Closed	OD Concurrence	H
977	NMSS	05.24.13	D	Norma Santos	Section 3.2.3.7: Recommend removal of this entire section, as well as any consideration of transportation costs in this analysis. This study should focus on dry storage versus pool storage, as those are the two options being considered. Additionally, large dry spent fuel storage canisters have not yet been shipped anywhere, so that there is little basis for the cost estimates provided here.	Fred S.	Section deleted.		Closed	OD Concurrence	H

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978	NMSS	05.24.13	D	Norma Santos	Section D.3.2.3.8, Table 17: The dose estimate for loading a transportation cask is too high. This activity consists of moving a sealed dry storage canister from a storage overpack to a transport overpack, or in the case of the TN-68, loading the entire sealed storage cask onto a transport trailer. These activities are expected to be similar in dose to "Loading a DSC at an ISFSI," except that the fuel will have cooled much longer, and external dose rates should be less. Also, per the above comment, recommend removing any consideration of transportation from this analysis.	Fred S.	Deleted any mention of transportation.		Closed	OD Concurrence	H
979	NSIR	05.24.13	Foreword	Randy Sullivan	The staff then analyzed what the public health and environmental effects of a radiological release would be in the area surrounding the plant. <i>In order to estimate the hypothetical consequences, the staff analyzed scenarios wherein preplanned and ad hoc mitigative actions by the emergency response organization were either not successful or not implemented.</i>	Kathy G.	Incorporated as suggested by reviewer		Closed	OD Concurrence	
980	NSIR	05.24.13	Foreword	Randy Sullivan	the study shows public health effects are generally the same or smaller than earlier studies indicated due to the effectiveness of <i>radiological emergency response program implementation of protective actions including evacuating and relocating people, and decontamination.</i>	Kathy G.	Incorporated as suggested by reviewer		Closed	OD Concurrence	
981	NSIR	05.24.13	Abstract	Randy Sullivan	The U.S. Nuclear Regulatory Commission performed this study to continue its examination of the risks and consequences of spent fuel pool accidents. The study's primary objective is to provide publicly available consequence estimates of a <i>postulated hypothetical</i> spent fuel pool accident initiated by a low likelihood	Kathy G.	Incorporated as suggested by reviewer		Closed	OD Concurrence	
982	NSIR	05.24.13	ES	Randy Sullivan	After that time, the spent fuel is coolable by water, steam or air. <i>In addition to the 10 CFR 50.54(hh)(2) mitigation measures, the site emergency response organization would request support from the offsite response organizations to implement ad hoc mitigative measures. These additional mitigative measures could include pumping water into the spent fuel pool using a fire truck. Analysis of these additional mitigative measures was beyond the scope of this study. In order for the study to inform regulatory decision making on relocation of spent fuel from pools, it was necessary to calculate the impact of unlikely and unmitigated accident scenarios.</i> Figure ES-1 illustrates the study results in terms of the likelihood of a leak and magnitude of release from the spent fuel pool (SFP) for the severe, low likelihood earthquake considered in this study	Kathy G.	Incorporated as suggested by reviewer		Closed	OD Concurrence	

Compiled Comments on Frozen SFPSS Documents

(Comments in black, helpful info in blue)

#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Reviewer Comments	Status	Review/Concurrence Phase	Priority
983	RES	05.24.13	ES	Doug Coe	<p>Paraphrasing what was included in the NUREG-1935 SOARCA report Executive Summary, modified for the present case, please add the following:</p> <p>Comparisons of the calculated LCF risks to the NRC Safety Goal and the average annual US cancer fatality risk from all causes are provided to give context that may help the reader to understand the contribution to cancer risks from the accident scenarios that were studied. However, such comparisons have limitations for which the reader should be aware. First, the safety goal is intended to encompass all accident scenarios on a nuclear power plant site, including both reactors and spent fuel. This study does not examine all scenarios that would need to be considered in a PRA for a spent fuel pool, although seismic contributors are considered the most important contributors to spent fuel pool risk. Also, this study represents a mix of limited probabilistic considerations with a deterministic treatment of mitigating features. All analytical techniques, both deterministic and probabilistic, have inherent limitations of scope and method and also have uncertainty of varying degrees and types. As a result, comparison of the scenario-specific calculated LCF risks to the NRC Safety Goal is necessarily incomplete. However, it is intended to show how multiple spent fuel pool scenarios' risk results (in the 10-12 to the 10-10 per reactor-year LCF range) are low relative to reactor risk even if the total risk at a particular site were estimated to be just under the NRC Safety Goal of 2x10-6 or two in one million. Note that a reactor risk estimation for long-term station blackout, for the specific scenarios studied on one reactor at the Peach Bottom plant, was between 10-10 and 10-9 per reactor-year LCF (reference: Figure ES-3, pg xix, NUREG-1935 "State-of-the-Art Reactor Consequence Analyses (SOARCA) Report").</p>	Kathy G.	<p>Replaced:</p> <p>"For perspective, the Commission's quantitative health objective for latent cancer fatality risk from all accident scenarios associated with nuclear power plant operation is two in one million per year, 1,000 times lower than the sum of cancer fatalities resulting from all other causes (two in one thousand per year). Although this analysis does not examine all initiating events (i.e., reactor accidents, spent fuel pool accidents from other initiating events) typically considered in a sitewide probabilistic risk assessment (PRA), it does examine an important initiating event. In fact, any analytical technique, including PRA has practical limitations of scope and method. As a result, comparison of the calculated latent cancer fatality risks in this study to the NRC safety goal is incomplete. While the results of this study are scenario-specific and related to a single spent fuel pool, NRC staff concludes that since these risks are many orders of magnitude smaller than the NRC quantitative health objective for latent cancer fatalities (shown in Figure ES-3), it is unlikely that the results here would contribute significantly to a risk that would challenge the Commission's safety goal policy (NRC, 1986)."</p> <p>With provided text.</p>		Closed	OD Concurrence	
984	NRR	05.28.13	General	Jennifer Uhle	Please refer to the PDF file with comments.	Team	Comments will be incorporated as appropriate before June 10th		Review Comm.	OD Concurrence	

**Inter-Office Working Group Compiled With Balanced Dispositioned
(Based on May 2012 Version of the SFPSS Report)**

#	Office	Received	Affected Chapter	Name	Comment	SFPSS Ch. Lead	Disposition	Status
Comments 1-8 captures the gist of Randy's concerns and our responses. A slightly more expansive Word version of these comments/responses also exists.								
1	NSIR	n/a	n/a	Randy Sullivan	The study is a bounding analysis of worst case accidents. Bounding analyses been performed in the past and have proved not useful for regulatory purposes. Rather they are often widely misinterpreted by the public and used to show that NRC is not protecting public health and safety.	n/a	It is true that past studies have been mis-interpreted by intervenor groups, but it is not true to say that they have not proved useful for regulatory purposes. To the contrary, NUREG-1353 was effective in closing GI 82, while NUREG-1738 was effective for establishing what requirements should or should not be relaxed for decommissioning. SFPSS is not a bounding analysis of worst case accidents. SFPSS focuses on the area that previous risk studies have stated contribute the most to risk; SFPSS is not bounding and is not meant to be (for example, larger seismic hazards are not considered, all scenarios model effective EP, and we optimistically assume mitigation can truncate an ongoing release). How the public will use the report is beyond our control; we can only work to report our results with proper context and good risk communication. Protecting the public does not mean zero risk.	Closed with Ques.
2	NSIR	n/a	n/a	Randy Sullivan	The study assumption of no mitigation for 72 hours is not credible, nor appropriate. Mitigation for many accident scenarios is simply getting a water hose up 5 flights of stairs to the refuel floor and pumping water at a modest rate within one day.	n/a	The report acknowledges the lack of a reliability assessment, and describes the rationale for including mitigated and unmitigated scenarios. The commenter does not consider the radiological (shine dose on refuel floor), seismic damage (firewater system is not seismically qualified), event progression damage (hydrogen deflagration) and competing priority (2 other reactors, 1 other SFP) aspects that could (and would) hamper response. Also, for clarity, the study assumes that if the fuel is not uncovered by 48 hours, that the accident is terminated at that time. It only proceeds to 72 hours if the fuel is uncovered by 48 hours. The above notwithstanding, we recognize that the commenter has not been satisfied with past arguments of this type, and this comment will be added to the unresolved comments list. Note that some of the above considerations have been expanded upon by virtue of the conduct of the HRA.	Closed with Ques.

3	NSIR	n/a	n/a	Randy Sullivan	The report does not analyze the Peach Bottom fuel configuration of 1X8. But rather represents the regulatory required 1x4. While such a calculation would have value as a sensitivity analysis, this is supposed to be a site specific study and should use site parameters.	n/a	The report clearly articulates this difference. The 1x8 arrangement is believed to be unique to Peach Bottom, and while we generally strive to use site-specific values, this was an area where modeling convenience, a-prototypicality, and the time at which licensee-provided information became available, led to a modeling assumption. Based on past analyses that looked at 1x4 vs. 1x4x8 configurations, the difference between the two configurations is expected to have a modest effect on the results, commensurate with the other uncertainties in the analysis. That notwithstanding, the item has been added to the unresolved items list. Note that subsequent to this comment and response, further steps were taken to deemphasize the focus on Peach Bottom, specifically in light of this concern (see discussion in the Site Familiarization section of Chapter 1).	Closed with Ques.
4	NSIR	n/a	n/a	Randy Sullivan	The conclusion that the study shows that SFPs are safe is not borne out by the offsite consequence analyses. Evacuation out to 30+ miles will not send a message of adequate safety to anyone.	n/a	This comment does not reflect the role of likelihood in agency's posture on safety. Reasonable assurance of adequate protection stems from prevention, mitigation, and emergency preparedness. The fact that a large release could occur from an SFP is a point the agency has always conceded, and in fact, past agency analyses have demonstrated this possibility. The agency does not strive for zero-risk, and the events studied in SFPSS further demonstrate the unlikely nature of those events that could lead to this situation. This is the reason that GI-82 was closed with no recommendation for regulatory action, and it is the reason that other potential actions (e.g., PRM-51-10 and PRM-51-12) were not taken. The commenter's point is really that these results will be mis-understood, and will challenge our ability to rely on effective risk communication to promote public confidence. We agree with that concern. The above item has been added to the unresolved items list.	Closed with Ques.
5	NSIR	n/a	n/a	Randy Sullivan	NRC Chairman responded to the Senate (3/14/05) that mitigative capability was adequate to protect public H&S in the event of a SFP accident (in response to the N&S study, etc.) This study will show that NRC staff best estimate is that mitigation will not be effective.	n/a	To the contrary, the study shows that when successfully deployed, mitigation is highly effective. The commenter intends to say that the study will infer that mitigation may not be effectively deployed by presenting protracted accident progressions where no mitigation is credited. This is likely true, but is part of the original design (for better or worse) of a limited-scope consequence assessment, and was known and highlighted from the beginning.	Closed with Ques.

6	NSIR	n/a	n/a	Randy Sullivan	NRC and FEMA have worked with OROs for 30 years in preparing for emergency within the EPZ. This report will show the lack of protection provided by the EPZ, detract from discussions of EPZ expansion and undermine ORO confidence. Political support at the local level will disappear.	n/a	To the contrary, the study assumes that EP actions are very effective, per the direction of the EP modeling input provided by NSIR. In addition, the report results show that the vast majority of risk lies in the long-term phase, not in the emergency phase actions referred to by the commenter.	Closed with Ques.
7	NSIR	n/a	n/a	Randy Sullivan	The SFPSS report, unlike SOARCA that reports distances to 50 miles, sometimes reports consequences to farther distances	n/a	The SFPSS has more significant releases than SOARCA. A high density loading configuration has about 6 times the Cs-137 inventory, and sometimes 2 orders of magnitude larger releases. Consequences that are shown as a function of distance are only reported out as far as uninhabitable land extends, or 50 miles, whichever is greater. Reporting of consequences at various distances is limited for risk communication purposes. However, if a severe accident is expected to render a distant area uninhabitable, it is reasonable to report the consequences to those areas.	Closed with Ques.
8	NSIR	n/a	n/a	Eric Schrader	Unmitigated scenarios should be described as scenarios performed to show / document the effectiveness of current mitigative actions, the potential dose savings to the public that these mitigative actions would account for. Not that we believe, however remote the chance, that there is/are scenario(s) in which a licensee would do nothing or may be unable to do anything. I think our Agency mission to protect the environment and public could be seriously questioned if we believe and allow scenarios to exist in which a licensee may take no action to mitigate an accident or, could somehow be unable to take mitigative actions and we have taken no regulatory improvement, change, or correction action to address this / these scenario(s), then we are not doing the job we have been assigned.	n/a	I agree (and I think I speak for the team) that there is no likelihood that the licensee would do nothing. The question is whether they would be successful at taking actions, given the conditions (which may include radiological hazards and a leakage rate that cannot be overcome by 50.54(hh)(2) makeup rates. With respect to how scenarios could exist where mitigative actions would be ineffective, and how that relates to us doing our job, PRAs and consequence assessments routinely "prioritize" contributors to risk/consequences such that the agency (and licensees) can focus attention on the larger contributors to risk. We routinely make decisions in licensing and enforcement space that acknowledge that risk exists (the CDF and LERF of a reactor has never been, and will never be, zero; and in fact reactor CDFs/LERFs are routinely much larger than the corresponding values from this study).	Closed with Ques.

9	NSIR	n/a	n/a	Eric Schrader	"5.3.2. Rationale for Producing Unmitigated Results - Even so, there are uncertainties associated with the response to a well-beyond-design-basis seismic event, and its associated effects on the spent fuel pool, which make consideration	n/a	The concern is acknowledged, but the team believes the wording appropriate. Responses to other comments provide the rationale for this position.	Closed with Ques.
10	NSIR	n/a	n/a	Eric Schrader	3 rd bullet under " 5.3.2 Rationale for Producing Unmitigated Results" ----> This describes a situation where we, the NRC, required licensees to take actions we don't believe to be sufficient/effective. How do we justify the expense we cost them by directing actions that we feel in this scenario can not be taken?	n/a	The intent is to describe the difficulty in taking this action. The NRC required licensees to take actions that would result in reasonable assurance of adequate protection. That is not the same as saying that the actions comprehensively preclude the possibility of unsuccessful mitigation. For instance, 200 gpm spray was not chosen because it was sufficient for mitigating all accident, but rather because it provided sufficient benefit. The NRR staff lead for 50.54(hh)(2) has reviewed the paragraph, and to date has not raised any concerns on the wording.	Closed with Ques.
11	NSIR	n/a	n/a	Eric Schrader	4 th bullet under "5.3.2 Rationale for Producing Unmitigated Results" ---> Earlier in this document we state multiple unit effects are not going to be considered in this study. Why add the effects here?	n/a	Actually, earlier in the document we state that we don't rigorously account for multi-unit effects, but that we try to qualitatively (or in a rare case, quantitatively) account for them. This is an example. Another example is our assumption of early GE declaration during OCP #1/#2 based on the opposite, operating unit.	Closed with Ques.
12	NSIR	n/a	n/a	Eric Schrader	5 th bullet under "5.3.2 Rationale for Producing Unmitigated Results" ---> Earlier in this document we state an inadvertent criticality event in the SFP was not going to be considered in this study. Why add the effects here?	n/a	Earlier in the document it states that inadvertent criticality will not be treated. Here we are highlighting one of the effects of this assumption. This seems consistent with our overall intent to be forthright about the limitations of the study, and their impacts.	Closed with Ques.
13	RES	n/a	n/a	Jason Shaperow	Seismic initiator - The analysis does not include a concurrent reactor accident.	n/a	This is clearly articulated in the report assumptions, and is consistent with the state-of-practice.	Closed with Ques.
14	NRO	n/a	n/a	Jason Shaperow	Arrangement of fuel - Peach Bottom uses a 1x8 arrangement of fuel, not the 1x4 arrangement assumed in the study.	n/a	The 1x8 arrangement currently in use at Peach Bottom is believed to be highly atypical, is not required by regulation, and is not expected to have a large effect on the study results (i.e., the 1x4 configuration achieves much of the benefit of dispersing fuel). In addition, the timing of obtaining the actual pool configuration, along with conveniences associated with how the MELCOR SFP model is currently designed, also played a role in the decision to use the 1x4 configuration. In cases where the 1x8 might affect conclusions, this is identified. Note that since the time of the comment and response, a sensitivity study has been added to quantify the effects of a 1x4 vs. 1x8 pattern. Also, the report has been modified to deemphasize its representativeness for Peach Bottom (see Site Familiarization section in Chapter 1). Nevertheless, the report retains 1x4 as the base case	Closed with Ques.

15	NRO	n/a	n/a	Jason Shaperow	Pool damage - Fukushima shows that an earthquake would not make a hole in a spent fuel pool.	n/a	Along with being a different hazard characterization, and being a different site (propagation of the seismic hazard), it is important to recall that our study shows it is unlikely that damage to the pool would occur. The report discusses the relationship between this study and the Japanese earthquakes.	Closed with Ques.
16	NRO	n/a	n/a	Jason Shaperow	Mitigation - Peach Bottom-specific mitigation measures are not credited.	n/a	That is not true. In a few cases, PB-specific capacities are not credited, based on discussions with NRR.	Closed with Ques.
17	NRO	n/a	n/a	Jason Shaperow	Mitigation - Makeup and spray are likely, because the spent fuel pool is an open system and there is a long time available until draindown and fuel damage. Also, offsite equipment began arriving at Fukushima within about 8 hours (INPO report of November 2011).	n/a	The Japanese reference is a bit misleading, given that they were still frantically trying to add water to the pool many days in to the event. Regardless, the approach of doing mitigated versus unmitigated was established as part of the project's original design. Note that the report now contains an HRA chapter.	Closed with Ques.
18	NRO	n/a	n/a	Jason Shaperow	Mitigation - The operators are likely to make openings in the reactor building to aid in spent fuel pool cooling and to prevent a buildup of hydrogen from a concurrent reactor accident.	n/a	To my understanding, and having been involved in the most recent inspection at PB on these strategies, I do not believe their procedures would direct this. Also note that industry was very reluctant to implement such actions (which to my understanding are not generally required) because of the loss of secondary containment (holdup)..	Closed with Ques.
19	NRO	n/a	n/a	Jason Shaperow	Mitigation - For one of the "mitigated" cases, the analysis assumes makeup when spray is needed (and available) to prevent fuel overheating.	n/a	The report discusses this, and deployment mode reflects the lack of instrumentation and clear guidance to drive this decision. Note that, in some cases, the mode selection did not affect the results.	Closed with Ques.
20	NRO	n/a	n/a	Jason Shaperow	Mitigation - The "unmitigated" cases include some B.5.b mitigation, namely, arranging the fuel in a favorable pattern for cooling.	n/a	While use of favorable fuel patterns was an outcome of B.5.b, it is not an example of deployed mitigation. The report is very clear in linking deployed mitigation to 50.54(hh)(2). That part of the regulation is not what requires the use of a favorable fuel pattern (that is accomplished through a license condition)	Closed with Ques.

21	NRO	n/a	n/a	Jason Shaperow	Release from clad-pellet gap - The assumed release of cesium (magnitude of 0.05, chemical form CsOH) is conservative.	n/a	In the report, it mentions the following – “The gap inventory is specified in Table 25 based on NUREG-1465 [NRC,1995]. It should be noted that in NUREG-1465, it is stated that for accidents where long term cooling is maintained (e.g., postulated spent fuel handling accident), the gap release could be as low as 3%. However, in the unmitigated scenarios in this work, the fuel experiences prolonged high temperatures (and even failure in some instances). Therefore, in the present work, it is conservatively assumed that 5% applies to all scenarios.” --- Additional thought from KC - I think your approach is fine. It allows some room for uncertainty in inventory. Actually, I think that the gap Cs is split between CsI and CsOH. There is no I-131 for the older fuel but there can be other stable Iodine isotopes.	Closed with Ques.
22	NRO	n/a	n/a	Jason Shaperow	Release from fuel pellet - The modeling was validated using in-pile tests for reactor accidents, which is not prototypical of spent fuel pool accidents which progress more slowly and have lower fuel temperatures.	n/a	The release models are time-at-temperature models, so they inherently include the effect of lower temperatures. As for the lack of validation of the release models for spent fuel pool accidents, that is an unavoidable situation when using the tool "as is," and at best could be addressed using sensitivity studies that would likely show that this particular item has no more uncertainty on the overall results than do any number of modeling assumptions. ----- Additional thoughts from KC - I think that I could make an argument that the in-pile tests are not characteristic of reactor accidents and better represent SFP accidents. At the start of the (reactor) MOX project, it was expected that MOX releases would be much higher because the VERCOS (I think) tests showed higher MOX releases at intermediate temperatures. When we ran characteristic reactor severe accident scenarios, the fuel temperatures shot past those carefully controlled temperatures to very high values. At that point, the MOX releases were really, really, really fast and the LEU was just releasing really, really fast. It did not matter. All the volatile fission products came out at about the same rate. I think the test data is much better for long sustained heat-ups. But I might add, once SFP fuel gets to breakaway air of accelerated steam oxidation, the decay power is huge and the response can be relatively similar (i.e., driven by oxidation energy rather than decay power during the high release phase).	Closed with Ques.
23	NRO	n/a	n/a	Jason Shaperow	Hydrogen combustion - A single node is used for the area between the refueling floor the reactor building roof. Simple parametric modeling is used for determining whether there will be a burn.	n/a	Again, this is an uncertainty associated with using the code "as is." Some sensitivity studies have been carried out and the report will acknowledge this as an important assumption. In addition, CFD analysis showed very strong mixing currents in the refueling bay and uniform mixing would be expected.	Closed with Ques.

24	NRO	n/a	n/a	Jason Shaperow	Public evacuation - Assuming that we can evacuate tens and even hundreds of thousands of people but we cannot get a couple of people up to the spent fuel pool with a fire hose seems illogical.	n/a	You need equipment, you need access, you may have a leak rate that exceeds your pumping capability, you may be trying to use a firewater system that did not survive the event, you may be dealing with the reactor accident. It is more accurate to say that we are able to evacuate tens or hundreds of thousands of people from areas largely unaffected by the seismic event, while we may be unable to ensure adequate inventory in the SFP based on a large leak rate, radiological impediments, seismic damage, etc.	Closed with Ques.
25	NRO	n/a	n/a	Jason Shaperow	Public evacuation - NRC recommended a 50-mile evacuation for Fukushima.	n/a	We agree, but we're not sure what the point is relative to SFPSS.	Closed with Ques.
26	NRO	n/a	n/a	Jason Shaperow	Public evacuation - MELCOR and MACCS analysis was used for developing evacuation and relocation assumptions, instead of RASCAL.	n/a	Yes, that is the nature of a research project rather than a actual event (the approach is the same as SOARCA). We actually thought it would be best to use the SOARCA evacuation models as is, so if your concern is with the modified models, you'll have to take that up with NSIR. Also, it is our understanding that Eric (NSIR) did do some RASCAL analysis.	Closed with Ques.
27	NRO	n/a	n/a	Jason Shaperow	Results - The consequence/risk results presented in the study assume the probability of mitigation is zero.	n/a	The mitigated results assume the failure probability for successful deployment of mitigation is 0. The unmitigated results assume it is 1.	Closed with Ques.
28	NRO	n/a	n/a	Bret Tegeler	With respect to the seismic hazard evaluation, I reviewed this report section from the perspective of having some working-level knowledge. However, a more detailed review by a specialist in this area may be beneficial, if not already done.	n/a	A senior seismologist is part of the SFP scoping study and has already the assumptions made pertaining to the seismic hazard. In addition, input for the seismic hazard and ground motion modeling was provided by another senior seismologist in RES/DE. The information in this chapter is also based in large part on information derived for GI-199 which has been reviewed.	Closed with Ques.
29	NRO	n/a	n/a	Bret Tegeler	Report Section 3.0 describes the basis for the Peach Bottom (PBAPS) hazard characterization. While it is understood that the scoping study is aimed at looking at beyond design basis events, it is not clear if the overall approach for developing the GMRS is consistent with current licensing guidance (e.g., RG 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion." It may helpful to include a brief discussion of how the approach taken differs (if so) from RG 1.208.	n/a	The report already says that the GMRS is a uniform hazard spectrum (average spectrum) in the sense of RG 1.208. Final revision of the report will consider further addressing how the approach for determining the GMRS (for the rock site studied) is or is not consistent with the approach in RG 1.208.	Closed with Ques.

30	NRO	n/a	n/a	Bret Tegeler	Figure 26 is helpful, but it would seem that a section view, which magnifies the SFP wall-to-floor connection, may be helpful in understanding the discussion of the cracking behavior (page 47).	n/a	This request has not been included in the current draft. Editing the report to include such illustrative figure will be considered in the final revision of the report.	Closed with Ques.
31	NRR	n/a	n/a	Rick Ennis	# of assemblies in the SFPs (not the # of rack cells)	n/a	The following are thoughts from reviewers about information in the report that they believe might be sensitive, which is currently not flagged as such: Note that Mark Caruso (NRO) scanned the report for things that might be SGI and confirmed that none are present.	Closed with Ques.
32	NRR	n/a	n/a	Rick Ennis	Pressure necessary to fail the blowout panels	n/a	The following are thoughts from reviewers about information in the report that they believe might be sensitive, which is currently not flagged as such: Note that Mark Caruso (NRO) scanned the report for things that might be SGI and confirmed that none are present.	Closed with Ques.

	Office	Status
NRR		Open
NRO		Review Response to Disposition.
NMSS		Closed with Ques.
NSIR		Closed
OPA		
R I		
R II		
R III		
R IV		
Resident Inspector		

NOT FOR PUBLIC DISCLOSURE

June 30, 2017

Eugene Dacus
Director, Office of Congressional Affairs
Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Dacus:

Enclosed please find correspondence I received from a constituent. They reached out to your office about resolution of an export license application filed in 2014.

I would greatly appreciate your addressing my constituent's concerns and responding directly to him. Please also send a copy to my Washington D.C. office, attention Micki Ream, as I am interested in your response. Thank you in advance for your assistance.

Sincerely,

A handwritten signature in black ink that reads "Ron Wyden". The signature is fluid and cursive, with the first name "Ron" and last name "Wyden" clearly distinguishable.

Ron Wyden
United States Senator

**Correspondence Tracking Sheet**

Tracking # 1373404-1DCc_

Constituent

Pershall, Sheila
1600 Old Salem Rd
Albany OR 97321
Linn County

Phone: 541-917-6712
Email: sheila.pershall@atimetals.com

Web Mail Message

Web Mail Subject: Trade

Dear Senator Wyden

This letter was sent to Senator Merkley but as an Oregon business viable in producing metal components for foreign energy with approval by the Nuclear Regulatory Commission. We also respectfully request your support in advocating for results to a 3 year pending application with the NRC. Please find the letter to Senator Merkley as follows

Friday, May 12, 2017

Jeff Merkley
United States Senator
PO Box 14172
Portland, OR 97293

Dear Senator Merkley

As the export administrator at ATI Specialty Alloys & Components, I am writing this letter to seek your assistance regarding an export license that has been stalled for approval through the Nuclear Regulatory Commission (NRC).

Application reference is: XCOM1284 - Initial application May 2014 - Amendment in Jan 2016.

ATI Specialty Alloys & Components is a business unit of Allegheny Technologies Inc. At this Albany, Oregon headquartered business unit we specialize in manufacturing a variety of specialty metals such as zirconium, hafnium, titanium and niobium. These metals are also produced into a variety of intermediate wrought products and final components sold into a variety of applications both domestically and to international markets.

This license is for an order initially placed in 2014. The material was promptly produced to the unique specification of this customer. The material has no practical use for any other customer. In 2014, the application was held awaiting assurances from the China Atomic Energy Authority (CAEA). Working with our Chinese customer, the contract was amended in an effort that was believed to aid in the approval of the export license and completion of the sale. The amended contract and application was filed in January, 2016. Value of the export license: 36,300 kgs - \$3,362,662.00 USD.

The current situation as explained by NRC, is that the assurances required for license approval have been received from the China Atomic Energy Authority (CAEA) and submitted to the NRC. We have been told by NRC that the approval has been delayed due to direct communication between the Executive Branch (EB) affiliated with the NRC and the Chinese Foreign Ministry (CFM). ATI has been advised that

the CFM typically does not get involved, but given the large volume of material for this application the EB may have reached out to CFM for more information.

After several phone calls and inquiries to the NRC, we have not been able to get any additional information and the situation simply drags on. Oregon jobs and tax revenue are at risk as this material ages on our shipping dock as it has since 2014. Our contract customer is now threatening to source the material elsewhere - likely Russia or France.

ATI respectfully requests your involvement and inquiry into the status and reason for delay of the export license application and the expected decision and/or approval. Thank you for your kind consideration in advocating for results.

Sincerely,

Sheila Pershall

cc: Ron Wyden, U.S. Senator
Lee Weber, President, ATI SAC
Greg Bartley, V.P. Marketing and Sales, ATI SAC

UNITED STATES DEPARTMENT OF COMMERCE

WASHINGTON, D. C. 20555

OFFICIAL BUSINESS

Ron Wyden
U.S.S.

Eugene Dacus
Director, Office of Congressional Affairs
Nuclear Regulatory Commission
Washington, D. C. 20555-0001

CONFIDENTIAL



UNITED STATES
HOUSE OF REPRESENTATIVES

THIS IS A FAX TRANSMISSION FROM:

REP. LOUIS J. BARLETTA, 11TH DISTRICT OF PENNSYLVANIA
1 SOUTH CHURCH STREET
HAZLETON, PA 18201
TEL: (570) 751-0050
FAX: (570) 751-0054

TO: NRC

RE: JIM Shepler

FROM: Vincent J. Kundrik - Constituent Services Rep.

DATE: 5-2-16

FAX NUMBER: 301-415-8571

PAGES: (inc. cover sheet)

ADDITIONAL COMMENTS

Please review & contact me

THANK YOU

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May. 2. 2010 9:41AM

LOU BARLETTA

11TH DISTRICT, PENNSYLVANIA

TRANSPORTATION AND
INFRASTRUCTURE COMMITTEE

Chairman
SUBCOMMITTEE ON
ECONOMIC DEVELOPMENT, PUBLIC BUILDINGS,
AND EMERGENCY MANAGEMENT

EDUCATION AND THE WORKFORCE
COMMITTEE

HOME LAND SECURITY COMMITTEE



**Congress of the United States
House of Representatives**

115 Cannon House Office Building

Washington, DC 20515-3811

Toll-Free (866) 241-6144
(202) 225-6511

NOV. 2011

DISTRICT OFFICES

1 SOUTH CHURCH STREET, SUITE 100
HAZLETON, PA 18201
(570) 751-0050 PHONE

108 ARCH STREET
SUNBURY, PA 17801
(570) 888-7801 PHONE

88 WEST LOUTHAN STREET
CARLETON, PA 17012
(717) 243-6198 PHONE

4813 JONESTOWN ROAD, SUITE 101
MARKERSBURG, PA 17108
(717) 325-7002 PHONE

May 2, 2016

Ms. Rebecca Schmidt
Director, Office of Congressional Affairs
Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Ms. Schmidt:

The enclosed information concerning my constituent, Ms. Jill S. Shepler, is submitted for your consideration. Ms. Shepler has requested my assistance regarding the storage of nuclear waste.

I would greatly appreciate your assistance in investigating this matter and informing me of your findings and of any action you are able to take on behalf of Ms. Shepler.

Thank you very much for your attention to this matter. Please respond to me at the Hazleton Office: 1 South Church Street, Suite 100, Hazleton, PA 18201, (570) 751-0050.

All my best,

Lou Barletta
Member of Congress

LB/VK



VINCENT KUNDREK
CONSTITUENT SERVICES REPRESENTATIVE

LOUIS J. BARLETTA
Member of Congress
11th District of Pennsylvania
VINCENT.KUNDREK@HILLHOUSE.PA

1 South Oregon Street, Ste. 100
Harrisburg, PA 17101
(717) 751-0050

LOUIS J. BARLETTA
11th District, Pennsylvania



UNITED STATES
HOUSE OF REPRESENTATIVES

CONGRESSIONAL CASEWORK AUTHORIZATION FORM

Name: Mr. / (Mrs.) / Ms. / Miss Jill S. Shepler
Address: (b)(6)
City, State, ZIP Code: (b)(6)
Email: (b)(6)
Telephone: Home: (b)(6) Work: (b)(6)
Social Security Number: (b)(6) Date of Birth: (b)(6)
Passport/Alien Number (if this is an immigration case): NA
Claim, File or Case Number: (b)(6) Filing Date: (b)(6)

Federal Agency involved in your case: Nuclear Regulatory Commission, Federal Aviation Administration

Which other offices have you contacted? Salem Township Zoning, Tarratohill's office

I request the assistance of Congressman Lou Barletta and his staff in the following federal matter:
(Please provide a brief explanation of your problem and attach copies of any relevant document.
Use additional paper if necessary.)

Talen Energy claims Salem Township has no jurisdiction to disapprove storage of nuclear waste on power plant property, which borders our property at Salem Boulevard. They claim the NRC has full jurisdiction over their activities. On April 19, 2016, Salem Township zoning officials approved storage of nuclear waste. Our concerns are 1) safety, 2) lowering of property value, and 3) commercial airlines flying over the power plant on regular flight patterns.

In accordance with the Privacy Act of 1974, I hereby authorize Congressman Lou Barletta and his staff to make the necessary inquiry on my behalf regarding the problem described above. I give my consent for the information concerning me and this problem to be furnished to Congressman Lou Barletta and his staff.

Signed: Jill S. Shepler

Date: 4/26/16

SALEM TOWNSHIP ZONING NOTICE

The Zoning Hearing Board of Salem Township will conduct a hearing on Tuesday, April 19, 2016, at 7:00 p.m. at the Salem Township Administration Building, 38 Bomboy Lane, Berwick, Pennsylvania, to consider and take action on the appeal filed by Talen Generation, LLC and Susquehanna Nuclear, LLC. Susquehanna Nuclear, LLC filed an Application for a Zoning Permit to construct a 22,000 s.f. Independent Spent Fuel Storage Installation at the Susquehanna Steam Electric Station. The Zoning Officer made a determination the proposed facility was not permitted in the I-3 Special Industrial District and Susquehanna Nuclear LLC has appealed.

As a property owner within 200 feet of this site, you are invited to attend and ask questions and/or offer comments. This hearing is open to the public. If you have any questions, please call me at (570) 732-1100, ext. 12.

Karen J. Karchner
Salem Township Zoning Officer

May 27, 2016

The Honorable Lou Barletta
Unites States Representative
1 South Church Street, Suite 100
Hazleton, PA 18201

Dear Congressman Barletta:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter of May 2, 2016, forwarding correspondence from your constituent, Jill Shepler. Ms. Shepler is concerned that the Salem Township Zoning Hearing Board recently approved a permit necessary to construct an Independent Spent Fuel Storage Installation at the Susquehanna Steam Electric Station. She indicates that this approval was granted based on representations from the licensee, Talen Generation, LLC, that the NRC has sole jurisdiction over this activity, thus the Zoning Hearing Board had no authority to deny the permit.

While the NRC was present at the April 19, 2016, hearing, the agency was not formally consulted by the Township prior to the meeting and has not taken a position on the specific circumstances of this case. Local jurisdictions do retain the right to adopt zoning ordinances, and nuclear facilities have to comply with them. However, if such ordinances are written or enforced in such a manner as to suggest that the underlying motivation is to protect against a radiological safety hazard or otherwise thwart the objectives of the Atomic Energy Act, they are preempted by Federal authority.

At this point, the NRC has not been a party to this action and the Zoning Hearing Board's decision to grant the permit is not contrary to our regulations. I believe your constituent's concern regarding the action of the Zoning Hearing Board needs to be addressed to the Board.

If you have any questions, please contact me or Eugene Dacus, Director of the Office of Congressional Affairs, at (301) 415-1776.

Sincerely,

/RA Daniel H. Dorman Acting for/

Victor M. McCree
Executive Director
for Operations

May 27, 2016

The Honorable Lou Barletta
United States Representative
1 South Church Street, Suite 100
Hazleton, PA 18201

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Sincerely,

/RA Daniel H. Dorman Acting for/

Victor M. McCree
Executive Director
for Operations

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OFFICE	OEDO	OCA	OGC	R-I	EDO
NAME	RRihm	EDacus*	AAverbach*	NMcNamara	VMcCree (DDorman Acting for)
DATE	05/19/16	05/18/16	05/16/16	05/12/16	05/ 27 /16

OFFICIAL RECORD COPY

JOHN MCCAIN
ARIZONA

CHAIRMAN, COMMITTEE ON
ARMED SERVICES
COMMITTEE ON HOMELAND SECURITY
AND GOVERNMENTAL AFFAIRS
COMMITTEE ON INDIAN AFFAIRS

United States Senate

June 15, 2016

Mr. Brad Crowell
Assistant Secretary for Congressional and Intergov
U.S. Department of Energy
Forrestal Building, Room 7B138 1000 Independence Ave, SW
Washington, DC 20585

Dear Brad,

I wish to bring to your attention a matter concerning Mr. Michael Derivan who has encountered a problem with the Nuclear Regulatory Commission.

Because the situation is under your jurisdiction, I am respectfully referring this matter to you for consideration. I do not require a reply in this instance and respectfully request that you or the appropriate entity within your agency respond directly to Mr. Michael Derivan.

Thank you.

Sincerely,



John McCain
United States Senator

JM/tbh

218 RUSSELL SENATE OFFICE BUILDING
WASHINGTON, DC 20510-0303
(202) 224-2235

2201 EAST CAMELBACK ROAD
SUITE 116
PHOENIX, AZ 85016
(602) 952-2410

122 NORTH CORTIZ STREET
SUITE 108
PHOENIX, AZ 85001
(602) 445-0833

407 WEST CONGRESS STREET
SUITE 103
TUCSON, AZ 85701
(520) 670-8334

TELEPHONE FOR HEARING IMPAIRED
(602) 952-0170

(b)(6)

Incoming Message:

Date: 5/16/2016

Dear Senator McCain,

I am having trouble getting a straight forward timely answer to a question I asked of the Nuclear Regulatory Commission in response to an issue they posted on the NRC Blog web page. Quite frankly I feel they are stonewalling me. They have made a technical statement on a minor issue that I feel is not only wrong because it is technically impossible in our current fleet of Nuclear Power plants, but extremely alarming. These alarmist statements not only fed the hysteria of the anti-nuclear activists, but also in my opinion threaten national security because they undermine public confidence in nuclear power technology in general, which includes both the commercial fleet and the US Navy Nuclear Powered Submarine fleet. I am prepared to discuss the technical details of this issue, and also my communication attempts with the NRC with any of your staff. I also know NRC Commissioner Kristine L. Svinicki formerly worked on your staff. Perhaps you can ask her assistance in getting this issue resolved.

Thank You For Your Consideration,

Mike Derivan

Plank Owner USS Sunfish

Senior Reactor Operator (Retired)

WASHINGTON, DC 20510-0303

Office of Senator John McCain
407 West Congress St.
Suite 103
Tucson, AZ 85701

16 John McCain
U.S.S.
JUL 11 2016

JUL 11 2016

MAIL SANITIZED

Mr. Brad Crowell
Assistant Secretary for Congressional and Intergov
U.S. Department of Energy
Forrestal Building, Room 7B138 1000 Independence Ave, SW
Washington, DC 20585

THE NEW YORK TIMES

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