Mitman, Jeffrey

From: Mitman, Jeffrey
Sent: Wednesday, December 16, 2009 7:24 PM
To: Galloway, Melanie
Cc: James, Lois
Subject: RE: Oconee

1) The four events are our number of events, not Duke's. To the best of my knowledge Duke has never given us what they think is the correct number of events or the right frequency. If you recall the phone call APOB had with Duke in January 2009, Duke refused to answer this question. Instead, they claimed that a single initiating event frequency based on failure data was too conservative.

2) Jim, must have miss-remembered. The data that APOB believes is as stated in my original email.

3) As I will layout in my response to your directions, events with frequencies below 1E-7 do not have to be designed for. Between 1E-6 and 1E-7 is a gray area. Events above 1E-6 must clearly be designed against. My recollection is that G. Mizuno indicated that previously the Commissioners attempted to place a probabilistic value on adequate protection, but they were unsuccessful. Thus, AP remains undefined probabilistically and deterministically.

Jeff

From: Galloway, Melanie
Sent: Wednesday, December 16, 2009 4:58 PM
To: Mitman, Jeffrey
Cc: James, Lois
Subject: RE: Oconee

Thanks, Jeff. I appreciate what you have outlined below.

Couple followups: 1. Is the 4 our number or Duke's? I think ours, right?
2. Jim told me yesterday that overtopping was about half of the initiating event frequency. That doesn't seem to coincide with what you have below.
3. The below regulatory concern number (less than 10-7) is lower than the adequate protection number (arguable what this number is but I would say easily with a CCDF of 10-4, likely justifiable at 10-5, possible at 10-6).

Observation: our strong case for supporting 10-4 will serve us well in the adequate protection case (I haven't read for a while so will have to revisit) and thus in supporting the Order (which by the way I agree with rather than the letter that DE was suggesting so Jack's direction in this regard I think is right on--but this is only valuable if we get it out quickly)

If per Lois, Fernando is available, I have no problem with him attending. It may then be best to see if Mary can get us a conference room--I will make the request.

From: Mitman, Jeffrey
Sent: Wednesday, December 16, 2009 3:46 PM
To: Galloway, Melanie
Cc: James, Lois
Subject: Oconee

Melanie, I understand the task and will work to put together detailed answers to your questions by tomorrow.

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However, the bottom line is that if we exclude overtopping and seismic failures (which DE believes are not a concern), it changes the numeric frequency only a little. Our ~2E-4 per year frequency point estimate (the precise number is 2.9E-4 per dam-year) is calculated as follows:

IEF = Number of events / number of dam years

Where:

number of events = 4, between 1940 and 2008

number of dam years = 13,889 years, between 1940 and 2008

If we use Bayesian statistics instead of point estimates, the numbers change a little. But more significantly Bayes tells us the uncertainty in our estimate. The Bayesian results are (based on data from 1900 to 2008):

5th = 1.4E-4 per dam-year
median = 2.6E-4 per dam-year
mean = 2.7E-4 per dam-year
95th = 4.3E-4 per dam-year

A result with this little uncertainty tells us that the statistics are good. As a point of comparison, in PRAs we often see results with +/- an order of magnitude.

One of the four failure events used in the calculation is an overtopping event, none are seismically induced. If we recalculate using 3 events instead of 4 the answer is: 2.2E-4 per dam-year. If we eliminate all of the failures, which is what many non-PRA engineers tend to want to do because the precise event that did occur could not happen precisely that way at Jocassee (or some other dam of interest), then using simple Bayesian methods we must assume one half of one failure in the next operating year. This gives the following calculate value:

IEF = 0.5 failures / (13,889 + 1) dam-years

= 3.6E-5 per dam-year

Even though this calculation does not yield a frequency that is below regulatory concern (it is still significantly greater than 1E-6 per year) it is wrong! It ignores all of the available information. We know that dams fail and this calculation assumes that there have been no past failures that are applicable to Jocassee. There is no reason to believe that Jocassee is a perfect dam.

We (APOB) have tried to analyze the data in a way that gets a lower number, RES has also looked hard at this number. If Duke had an easy way to calculate this number so that it was lower than regulatory concern they would have shown us our error. There simply is no way to take the available data and get numbers significantly less than what we have caluculated.

I would like to invite Fernando to our meeting tomorrow. He has done a lot of the hard looking at the data and the failures in the data and will thus add significantly to our discussions.

Jeff
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When: Thursday, December 17, 2009 8:30 AM-9:30 AM (GMT-05:00) Eastern Time (US & Canada).
Where: 010E4

Note: The GMT offset above does not reflect daylight saving time adjustments.

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I attended a meeting yesterday in Jack's office along with Dave Skeen, Allen Howe, Meena and George to discuss path forward with Duke on Oconee flooding. Bottom line is that Jack wants an Order to them sent by Jan. 31 which defines their committed dates to us so that the issue would be part of their design basis and will prevent issue resolution from extending well into the future.

To support this, DE will need DRA's assistance in completing the adequate protection documentation to support the Order. In discussions with DE folks after the above meeting, DE indicated a need to better understand probability and adequate protection. Dave has stated that the PMP event is a 10-5 event and that overtopping can't occur (Duke and DE views). DE then has raised the question as to whether overtopping should be considered probabilistically as an initiating event. They think Duke will try to make the case that Oconee dam failure is a 10-6 event and that part of that reason is because overtopping is not credible and therefore not part of the probabilistic consideration.

This topic is what I want to discuss. Specifically, the following starting points are what we need to understand to develop DRA input further on adequate protection. (Remember from Geary Mizuno that an adequate protection issue needs to include a significant risk and NRR agrees that a 10-4 event with a CDF of 1 is an adequate protection issue so the agency needs to either (1) clearly demonstrate that we are at 10-4 or (2) demonstrate that even is overtopping (or other initiating events) is not credible that the resulting probability of flooding is still of significant enough risk to put it in adequate protection space.)

1. Verify (with Ken See or the RG 1.59 workshop notes) the frequency of PMP events--can this be narrowed to the SE US?
2. Deterministically PMPs need to be considered per our regs. So even if a PMP event is a 10-6 event, a licensee still needs to consider it. True or false?
3. How does any dependency between a PMP event and overtopping come into play in determining probability of overtopping?
4. How can overtopping be eliminated from consideration as a source of dam failure? Does the probability of PMP plus the probability of overtopping matter here (see question 3)?
5. Does the fact that a PMP event gets to within 1-2 feet of the top of the dam come into play in our view that deterministically we can't say overtopping is incredible? That is, how does uncertainty in the calculations come into play? Or said yet another way, if the licensee's and Rex's PMP calculations showed the reservoir level raising only to say 1115', would we be able to agree that overtopping is not credible?
6. If overtopping is not credible for Jocassee, how does that affect the initiating event frequency? Would we still be in adequate protection space? (See parenthetical before list above.)

Etc. What other issues do you all think need to be discussed?

DE is anxious to get this issue addressed and move forward and we will do our part to support them. I request that you not engage DE folks individually on these issues but assure them that we will get back to them after we have considered the probabilistic aspects involved. Knowing that there is a Jan. deadline (ambitious but trying to be reached none the same), we will need to move expeditiously. As such, I am also trying to schedule a meeting with Mark for the afternoon of this day.