



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

July 20, 2011

MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

FROM: Edwin M. Hackett, Executive Director /RA/
Advisory Committee on Reactor Safeguards

SUBJECT: INFORMATION REQUESTED DURING THE APRIL 7, 2011,
ACRS MEETING

On April 7, 2011, the NRC staff briefed the Advisory Committee on Reactor Safeguards (ACRS) on the recent events at the Fukushima reactor site in Japan. In response to questions raised by ACRS members during this meeting, the staff committed to provide the Committee with additional information regarding the 50-mile evacuation zone recommendation. We are aware that the June 17, 2011, letter from Chairman Jaczko to Senator Webb addressed some of the questions. The ACRS requests that the staff identify any information from the June 17, 2011, letter that is responsive to questions raised by the members during the April 7, 2011, ACRS meeting and provide these responses to the ACRS in writing. In addition, the ACRS requests a written response to questions raised at the April 7, 2011, meeting that were not addressed in the June 17 letter.

We have reviewed the April 7, 2011, meeting transcripts for questions related to the 50-mile evacuation zone and compared these questions with the responses provided in the June 17 letter. We have attached our evaluation for your information.

Attachment: As stated

cc: A. Vietti-Cook, SECY
N. Mamish, OEDO
A. Frazier, OEDO
M. Virgilio, OEDO
W. Ruland, NRR
N. Valentine, NRR
A. Snyder, NRO
B. Rini, RES

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301-415-7360

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Accession No: **ML11199A134** Publicly Available Y Sensitive N
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DATE	07/20/11	07/20/11	07/20/11	

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Table 1: Questions Asked and Information Requested during the ACRS Full Committee Meeting held on April 7, 2011 – Table Augmented to Provide the Status of Answers to Questions on the 50 Mile EPZ (6/28/11)

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P8 Line 9 Line 21 P9 Line 1	Powers Corradini	Do we have a seismic hazard curve for this part of Japan comparable to what we use for the eastern United States?	I don't have an answer for you on that, but I believe that some of our staff will be addressing seismic issues a little bit later in the presentation	NA
P12 Line 6 P12 Line 14 P13 Line 3	Abdel-Khalik Corradini	Did the operators take manual control of RCIC (Reactor Core Isolation Cooling) and prolong the RCIC operation? Timing of the loss of RCIC?	We don't have specific facts ... That is something we will look into as part of our evaluations	NA
P13 Line 14	Armijo	Were batteries used for controlling of the cooling of Daiichi Unit 4 spent fuel pool?	We don't have information on	NA
P13 Line 23 P29 Line 13	Armijo	Why did Daiichi Units 5 and 6 survive in a better state with ...?	I have a couple of comments on Units 5 and 6 as we move through that hopefully will answer your question there	NA
P14 Line 18	Banerjee	How long was this period (fuel/cladding interaction to produce hydrogen) from the initiation of the accident?	I don't know exactly the timeframe of the explosion	NA
P15 Line 7	Sieber	How certain are we that the hydrogen came from zirc/water (reaction) as opposed to a couple of other the report from the regulator and their assessment that it was generation based on zirc water reaction	NA

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P16 Line 1 Line 5	Corradini	Unit 2 explosion may have occurred in the suppression pool was it confirmed or speculation? Where did it occur?	It's a report from the utility The Unit 2 explosion may have occurred within the suppression chamber	NA
P16 Line 12	Shack	Do we know how they tried to do the venting?	We don't have specific details	NA
P16 Line 16	Shack	So we don't know whether they have hardened vents?	It's not clear	NA
P17 Line 1	Corradini	Congressman Markey claims he has an NRC report that they (the Fukushima Daiichi Units) had hardened vents?	We don't know the answer	NA
P18 Line 15 Line 21	Sieber	Was the Unit 2 explosion from inside the torus? The inside of the torus ordinarily would be under a nitrogen blanket in that type of reactor, right?	It's not clear Until it's vented, yes.	NA
P20 Line 1	Bley	We don't know what that means, right? (referring to TEPCO estimates of core damage)	I certainly don't know what that means	NA
P20 Line 11	Corradini	Is it a zirc/water reaction analysis? Is it a radioisotope analysis? What is it? (referring to the methods used to infer core damage)	We don't really know	NA
P21 Line 3	Rempe	What date did they claim it (the Unit 1 safety relief valve) had started to be stuck open?	April 5 th	NA

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P21 Line 11	Corradini	... do they have instrumentation that they can actually see a pressure change with this injection? (referring to the use of Nitrogen to inert the Unit 1 containment). The public reason given for this injection is?	It's not clear what instrumentation they have inert the containment so that if they have to vent they will minimize the possibility of hydrogen explosion	NA
P22 Line 3	Banerjee	Can you explain that to me? (referring to why Nitrogen injection helps in the mitigation of potential hydrogen explosions)	It's not clear to me Answer provided by ACRS Member Dr. Powers on P22, Line 13	NA
P24 Line 3	Corradini	Is there still venting going on, or is that unclear also?	That's also unclear	NA
P24 Line 19	Armijo	Do we have the Japanese plant drawings?	We have been working to obtain materials	NA
P29 Line 13 P29 Line 25	Armijo Sieber	Why did Units 5 and 6 fare better? Are they at the same elevation? How much higher? (referring to the elevation of Units 5 and 6 relative to Units 1-4)	... they appear to be on somewhat higher ground than the other four units. We don't know	NA
P32 Line 18	Abdel-Khalik	The EOPs (Emergency Operating Procedures) do not ask the operators to check the status of the spent fuel pool, should that be asked in the EOP procedures?	EOPs and SAMGs (Severe Accident Management Guidelines) are going to be one of the things that the Task Force is going to look at	NA

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P34 Line 7	Corradini	... has the NRC done a calculation on ... how many days would this pool (Unit 4) have been able (referring to time to boil off the spent fuel pool inventory)	We have been working ... to conduct some calculations, but I don't know if the calculations are finalized or not.	NA
P35 Line 10	Sieber	Do we know the spent fuel loading Pattern?	Different from the U.S. loading patterns. Results will come later	NA
P36 Line 10 Line 23	Rempe	Would you elaborate a little more about the geometry being different? And, in particular, in Unit 4? I'm talking about just the ... structure	We don't know structurally what their condition was	NA
P37 Line 12	Abdel-Khalik	... was the full core offload for Unit 4 placed in the shallow part of the pool?	I have no idea	NA
P37 Line 24	Rempe	But building geometry, anything different that you know about?	No, sorry	NA
P38 Line 4	Bley	SAMGs (Severe Accident Management Guidelines) – does the staff review or audit them?	The information will come out in the weeks and months ahead	NA
P39 Line 10	Sieber	How do we treat various phenomena at various sites?	This will be one of the focuses of the NRC Task Force	NA
P42 Line 19	Abdel-Khalik	The equipment staged by the licensees in response to Section B.5.b is based on an event at a single Unit. Are licensees being asked to also evaluate the adequacy of the staged equipment if more than one Unit is involved?	Yes, the B.5.b equipment was there for an event. It wasn't for a single Unit. It could apply for multiple Units. The NRC Task Force will address this.	NA
P49 Line 2	Corradini	What I was looking for is some sort of discussion about natural events that may affect spent fuel pool cooling?	Licensees will be looking at this	NA

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P51 Line 6	Powers	What is it you are looking for? Their ability to respond to beyond design basis events? (referring to the staff's Temporary Instruction)	... to look at the things they have put into place for 50.54(hh) (2), station blackout, etc.	NA
P57 Line 23	Corradini	... is there a to do list and schedule that goes along with three months ... that is out there (referring to the NRC Task Force activities)	... a charter has been developed	NA
P58 Line 12	Abdel-Khalik	The estimated risks are done on an individual unit basis rather than site-wide basis. Given what happened, should we change our paradigm and address issues based on site-specific evaluations, general site evaluations rather than unit-specific evaluations?	These are good issues that the Task Force will look at.	NA
P60 Line 3	Shack	How about their procedure for developing a design earthquake? Does it sort of go through a seismic hazard analysis somewhat akin to what we do, or do they go strictly on historical record?	Previously, they were more deterministic, and now they are trying to do more of a hazard assessment. But for this particular plant, from what we know it was, you know, a deterministic basis	NA
P61 Line 20	Stetkar	... the switchgear was located relatively low in the plant, though, wasn't it?	That I don't know	NA
P63 Line 13	Sieber	Now, your observed numbers come from seismic instrumentation?	Right	NA
P65 Line 10	Brown	What was the specified duration that you listed ... I just don't remember	4 hours (referring to station blackout coping time)	NA
P68 Line 3	Stetkar	Do we know whether the Japanese had similar station blackout coping procedures?	I do not know	NA

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P68 Line 8	Sieber	I think the more important question is -- Fukushima had the event. At the time of the flooding, that was the start of the station blackout. How long did they last until they got core damage? Was it four hours? Eight hours? ... If you could answer that, that will tell you the validity Does anybody know the answer to that timing question?	We don't know specifically what the answer is	NA
P69 Line 3	Sieber	I think it would be important to look at this event to see it as another way to validate what we believe station blackout or duration time really is. And I would like to know the answer, if I could find out somehow.	Yes, sir. That will be on our plate.	NA

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P73 Line 2 Line 6	Powers	Question on the dispersal. You said you were working on the dispersal of radiation. What computational tool are you using to estimate the amount of dispersal that you get?	The short answer is that NRC has the RASCAL (Radiological Assessment for Consequence Analysis) code, which we use to generate source terms. However, dose projections in terms of plume for RASCAL only go out 50 miles. That is our quick-look tool in the Operations Center. For the official U.S. Government position on plume modeling, we coordinate with NARAC (National Atmospheric Release Advisory Center), and we do that -- practice that during our exercises. And they have the capability to model over a greater distance.	Responsive – question answered at the meeting
P74 Line 8 Line 14	Corradini	Are NARAC calculations being done simultaneously so there is more refined analysis that is available to you? ... you are doing the RASCAL calculations very quick. ...the NARAC calculations I thought were also available.	They are not simultaneous. They take many hours to do.	Responsive – question answered at the meeting

Transcript Page No. Line No.	ACRS Member	Requested Information/Description	Staff Response	Question pertains to 50 Mile EPZ?
P75 Line 1	Powers	Let me ask you one other question. We have this team that has been set up to learn all sorts of things about licensees and accidents and ... Will you be looking at the tools that you have within the Operations Center to see if there are tools that could be refined, improved, created, ... I mean, this is a wonderful exercise for you in the sense that you can have a certain detachment from it And will you be coming forth with a set of recommendations ... maybe it's in the longer term, but ...	It will be. We are going to do the lessons learned relative to the functions within the Operations Center.	NA
P78 Line 3 P78 Line 17 P78 Line 20 P78 Line 23	Corradini Banerjee Sieber Banerjee	Where is the complete calculation, so I can see the source, the assumed source, and the assumptions? Do we have this written down somewhere? That would be a better way to give it to us. But weather conditions, wind velocity, everything?	Well, that's available. I think so, yes Okay Sure	Responsive – Answers provided in the Chairman Jaczko letter to Senator Webb
P79 Line 1 Line 8	Sieber	Well, and the other factor that I think is important is, do you have more than one reactor? So you had a bunch of different source terms.	Unfortunately, RASCAL doesn't handle a bunch of different source terms.	Responsive – Answers provided in the Chairman Jaczko letter to Senator Webb

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P79 Line 17	Sieber	As far as I could tell, neither the licensee nor the officials in Japan knew exactly what the source term strength was and what its composition was. So it becomes very difficult to make an evacuation recommendation under those circumstances.	Not applicable	Applicable but not a question
P79 Line 23	Abdel-Khalik	I understand that a request has been made to provide that information in written form.	Not applicable	Applicable but previously answered
P82 Line 2	Corradini	So it was 100 percent release bypass. As you use RASCAL, it asks you whether or not you have containment bypass. You assume containment bypass.	I think we did not. I think we assumed failed containment. But I could be wrong on that, so we'll have to get back to you on that.	Responsive – Answers provided in the Chairman Jaczko letter to Senator Webb
P83 Line 2	Armijo	I want to make sure that we get the analysis and the numbers that were actually used in coming up with this decision, because, clearly, there were -- a number of conservatisms were made, and as time goes on we will find out how conservative they were, and we can look back and -- on this decision. But I would like to see the actual analysis as it was done at the time.	We understand, and we will be responsive to the Committee.	Responsive – Answers provided in the Chairman Jaczko letter to Senator Webb

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P84 Line 1	Corradini	So you're saying that there was a lack of data, or you're saying that there was data and you weren't getting it?	We were trying to make a recommendation	Responsive – Answers provided in the Chairman Jaczko letter to Senator Webb
P84 Line 11	Corradini	How many U.S. citizens are we talking about in that zone?	I don't know the answer to that question.	Answer remains outstanding
P85 Line 4 P85 Line 12 P85 Line 18 P86 Line 9	Corradini	I guess I'm trying to understand whether it was a lack of data or there was data there and you were concerned that it was not being shared. The other part of this technically is that if you look at the two calculations, the four-unit calculation ... doses are smaller doses than the one unit calculation, which confused me. As a function of distance, they are different, which means you're assuming something on some refinement on four units that you're not assuming on the one unit calculation. So that also confuses me.	I thought we agreed that some sort of written summary ... (would be provided) yes	Responsive – Answers provided in the Chairman Jaczko letter to Senator Webb

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P86 Line 24 P87 Line 21 P88 Line 17	Corradini	<p>It's just if you have a calculation that is very quick to do, I would think I would have the monitoring data that -- the airborne monitors that a lot of us were looking at every day every hour of every day and asking, "How can I get a calculation that maps up with what I see there to at least benchmark what I'm calculating?"</p> <p>So to better understand what you're saying is that you were doing a what-if calculation.</p>	<p>That's right</p> <p>In writing we will provide something to the Committee on this matter.</p>	<p>Answer remains outstanding</p>

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<p>P88 Line 23</p> <p>P89 Line 13</p> <p>P89 Line 24</p>	<p>Armijo</p>	<p>Well, can you tell us something at least qualitatively on statements that we read in the media that we knew that the spent fuel pool in Unit 4 was dry? That was the Chairman's testimony on this. And so, you know, was that in your assumption, that the spent fuel pools were empty? I'd like to know as much as -- whatever you can tell us about that.</p> <p>So your assessment was that the Unit 4 fuel was the source of that explosion?</p>	<p>There were limited and uncertain data, and although our assumptions here don't necessarily track, we, the staff, were worried about all the spent fuel pools.</p> <p>Although we didn't model four spent fuel pools in trouble, it was part of the limited and uncertain data that forced this conservative and prudent recommendation.</p>	<p>Answer remains outstanding</p>

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<p>P90 Line 3</p> <p>P90 Line 13</p> <p>P90 Line 18</p> <p>P90 Line 25</p> <p>P91 Line 3</p>	<p>Armijo</p> <p>Banerjee</p> <p>Corradini:</p> <p>Banerjee</p>	<p>The reason I'm pressing on this is this was a very, very important decision. And I would have expected there would have been high-level conversations between our regulatory bodies and our government with equivalent people in the Japanese government on the worst-case analysis that we were doing. Was there anything like that going on?</p> <p>So these calculations were done, and they went where after that?</p> <p>So it went to who in the executive team?</p> <p>But I guess Sanjoy asked the question I think he wanted to get an answer to. Who reviewed it?</p> <p>Yes, I want an answer on this. Who reviewed it?</p>	<p>I'm not aware of what took place at a high level. I'm more of a staff guy.</p> <p>They were assessed by the executive team and discussed with the Chairman.</p> <p>Typically, the executive team is deputy office directors and office directors. I do not recall who specifically was the executive, the ET director at the time that this recommendation was made.</p>	<p>Partially answered at the meeting</p> <p>Answer remains outstanding for the question on high level interactions</p>

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P91 Line 9	Corradini	We're a bit concerned about the fact clearly you did a what-if calculation, but I'm assuming the Japanese did a what-if calculation. Before you started publicizing our what-if, I'd like to have done some sort of comparison, because it creates a ... it potentially can create a misimpression.	As everybody here I know is well aware, under normal circumstances in the United States -- in the United States, there is no such thing as conservative or non-conservative in EP, in emergency planning. It's you try to get it right, what the recommendation is, right? I mean, that's kind of our operating -- that's kind of the operating presumption.	Answer provided at the meeting
P91 Line 24	Corradini	But let me reverse this. Thirty-two years ago, if Japan would have done a what-if calculation about Three Mile Island, and said all the Japanese within 50 miles of Harrisburg should get out, what would be our response to that, from a policy standpoint?	I can't answer that question	Question is not answerable

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P92 Line 8	Armijo	What was your assumption, and how did you coordinate with the Japanese regulators? And this is a very high-level decision, I would think, and it would have -- you know, the Chairman of the NRC called up his counterpart or the Embassy and they say, "Hey, look, we're getting some very, very different numbers, and what do you think? And we're thinking of getting our people out, and what do you guys think?"	We are going to examine how this recommendation was made and/or whatever. You know, this will be part of our overall review of our agency response to this matter.	Answer remains outstanding
P93 Line 13	Abdel-Khalik	I think the point has been made, and you promised to give us the detailed information to support that calculation.	Yes, sir	Applicable but previously answered
P93 Line 22	Sieber	But had the accident occurred in the United States, would your calculation and your recommendation, which would differ from state, local, and utility recommendations be similar, or would you have -- would you say, "This is the ... I think the whole reactor went, and I got all of these spent fuel pools, and this reactor went, and that reactor went, so we'll take 100 percent of all of it."	Our response in the U.S. we would have better data, a very different response, and we would have much better plume measurements. And maybe the Japanese had some of that, but we didn't.	Answer provided at the meeting

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P97 Line 15	Armijo	I think it's very important to get down to the root cause of the things that failed, because before we start saying, "This is what we've got to do to improve our plants here in the United States," and not limit ourselves to a tsunami, because most of our plants aren't subject to a tsunami, but we may be subject to other things that are worse than what we thought we had to deal with. But I think it's very important to get to the root cause of why some units survived well, and why others didn't.	I would agree with you 100 percent. I think understanding this event will be very important for NRC, but, as I mentioned earlier, this is an ongoing event.	NA

Notes: Information for this Table was taken from the transcripts of the April 7, 2011 ACRS meeting. Typographical errors in the transcript were corrected, acronyms have been defined and some clarifications were added as appropriate.

NA – Not applicable