

Group CH

(Records Withheld
In Part)

****NOTICE****

This package contains both Japan and Non-Japan related records. The non-Japan records pertain to the specific request made by FOIA/PA-2011-0140, FOIA/PA-2011-0148, and FOIA/PA-2011-0191.

From: Sheron, Brian
To: Johnson, Michael; Rini, Brett
Cc: Uhle, Jennifer
Subject: RE: Draft Scheduling Note for DOE Commission Briefing
Date: Friday, March 11, 2011 7:13:00 AM

You can thank me later.....

From: Johnson, Michael
Sent: Thursday, March 10, 2011 6:00 PM
To: Sheron, Brian; Rini, Brett
Cc: Uhle, Jennifer
Subject: Re: Draft Scheduling Note for DOE Commission Briefing

What!?!
From my blackberry.

From: Sheron, Brian
To: Rini, Brett
Cc: Uhle, Jennifer; Johnson, Michael
Sent: Thu Mar 10 17:31:44 2011
Subject: RE: Draft Scheduling Note for DOE Commission Briefing

Looks OK. Add Mike Johnson to the list of presenters.

From: Rini, Brett
Sent: Thursday, March 10, 2011 5:29 PM
To: Sheron, Brian
Cc: Uhle, Jennifer
Subject: RE: Draft Scheduling Note for DOE Commission Briefing

Other than that, do you think it's sufficient to send up? I took out references to ORNL.

From: Sheron, Brian
Sent: Thursday, March 10, 2011 5:25 PM
To: Rini, Brett; Uhle, Jennifer
Subject: RE: Draft Scheduling Note for DOE Commission Briefing

I'm not sure I want to commit ORNL to be at the table talking about their simulation work yet. Whatever they are doing, you can be sure DOE is paying for it. Hence, I think it is DOE's call whether they want to talk about the simulation work, or if they want ORNL to do the talking.

From: Rini, Brett
Sent: Thursday, March 10, 2011 5:11 PM
To: Sheron, Brian; Uhle, Jennifer
Subject: RE: Draft Scheduling Note for DOE Commission Briefing

Just testing you.

The new one is attached. It's been a long day I guess.

CA/1

From: Sheron, Brian
Sent: Thursday, March 10, 2011 5:07 PM
To: Rini, Brett; Uhle, Jennifer
Subject: RE: Draft Scheduling Note for DOE Commission Briefing

Your draft scheduling note is one from a year ago.

From: Rini, Brett
Sent: Thursday, March 10, 2011 4:57 PM
To: Sheron, Brian; Uhle, Jennifer
Subject: Draft Scheduling Note for DOE Commission Briefing

Brian/Jennifer,

I put together a rough draft of a scheduling note related to a DOE meeting. In the original e-mail below, it mentions ORNL too, but I wasn't sure if we wanted just DOE. Right now the only presenters I listed are John Kelly, our EDO, and Brian. I also suggested not having a meeting until November or December.

I think we can send this over now as an initial proposal and then work with DOE to set up 2 counterpart meetings prior to the Commission briefing, as we discussed.

Let me know if you have any thoughts on the attached.

Thanks,

Brett

From: Bowman, Gregory
Sent: Wednesday, March 02, 2011 8:28 AM
To: Sheron, Brian; Uhle, Jennifer
Cc: Dion, Jeanne
Subject: RE: Summary/Follow-up to Agenda Planning meeting on 2/28/11

I spoke to Jim Andersen about this. He said that even though it might be too early to have a Commission meeting this year, the Commission will still expect us to provide a draft scheduling note now (although I'm guessing it would be pretty rough). Along with the scheduling note, they're looking for comments from the staff on whether it makes sense to have the meeting, so we would definitely want to let them know that we think it's premature until after we've had at least a couple meetings with DOE. Jim suggested including that in the draft scheduling note in the purpose section, along with a proposed timeframe.

I'm going to be heading up to Region I in a little while. I'll be unavailable for the rest of the day, but I'll be checking e-mail periodically. I'll be back in tomorrow if you or Jeanne want to talk about this some more.

Greg

From: Sheron, Brian
Sent: Tuesday, March 01, 2011 4:56 PM
To: Bowman, Gregory; Uhle, Jennifer

Cc: Dion, Jeanne

Subject: RE: Summary/Follow-up to Agenda Planning meeting on 2/28/11

(b)(5)

From: Bowman, Gregory

Sent: Tuesday, March 01, 2011 4:44 PM

To: Sheron, Brian; Uhle, Jennifer

Cc: Dion, Jeanne

Subject: FW: Summary/Follow-up to Agenda Planning meeting on 2/28/11

Brian and Jennifer,

(b)(5)

Greg

From: Andersen, James

Sent: Tuesday, March 01, 2011 4:26 PM

To: EDO_TBPM Distribution

Cc: Muessle, Mary; Ash, Darren; Virgilio, Martin; Weber, Michael; Borchardt, Bill; Landau, Mindy

Subject: FW: Summary/Follow-up to Agenda Planning meeting on 2/28/11

(b)(5)

Jim A.

From: Baval, Rochelle

Sent: Tuesday, March 01, 2011 4:03 PM

To: Vietti-Cook, Annette; Bates, Andrew; Burns, Stephen; Muesle, Mary; Andersen, James; Landau, Mindy; Doane, Margaret; Mamish, Nader; Henderson, Karen; Dyer, Jim; Brown, Milton

Cc: Laufer, Richard; Hart, Ken; Shea, Pamela; Batkin, Joshua; Coggins, Angela; Sharkey, Jeffry; Sosa, Belkys; Bubar, Patrice; Nieh, Ho; Baval, Rochelle

Subject: Summary/Follow-up to Agenda Planning meeting on 2/28/11

Following is a summary/follow-up to Yesterday's (2/28) agenda planning session.

Papers:

- The due date for the OGC paper on redaction and early release of SUNSI has been extended to 3/18/11, so the paper will be moved to April priority (from March).
- The COMSECY on NFPA 805 that is expected this week will be for priority in March.
- New OCAA paper on a certified question to the Board on the Areva – Eagle Rock case is expected soon for priority in March.
- The OGC paper on jurisdiction over Shieldalloy will be delayed and moved to June priority (from April)
- New OCAA paper on Energy Solutions import application coming by the end of March, for priority in April.
- Since ACRS will write a letter in June on the 50.46b final rule, the Commission agreed to move the proposed rule to June priority (from May).
- Chairman indicated he will be issuing a COM in mid-April, for May priority, on patient release criteria

Scheduled Meetings:

- March 24 – 50.46a ECCS Rule – The Commission approved switching the order to have the NRC staff give their presentation first.
- April 19 – Source Security – Part 37 Rulemaking – The Commission approved the proposed stakeholders listed on the Scheduling Note.
- May 12 – Cumulative Effects of Reactor Regulation – At last agenda planning, the Commission approved having this meeting and adding a reactor industry representative at the Plant Manager/Site Vice President level to participate in addition to NEI. The site VP was added to the scheduling note, and NEI changed their representative. The Commission approved the scheduling note, including making the Commission Q&A time 50 minutes (10 minutes for each Commissioner).
- June 2 – Final EP Rule – The Commission approved the proposed meeting and its associated Scheduling Note.
- The Commission agreed not to have a meeting on Fire Protection in June and preferred to have a meeting with the ACRS in lieu of the Fire Protection meeting.
*****ACTION: SECY will check with the ACRS on their availability to meet with the Commission in June (Options are June 6th am, June 15-17, June 1-3).**

- June Agenda Planning Session – The Commission agreed to try to move the agenda planning session to June 27th, but if a time could not be worked out, then the next agenda planning session would be in July. *****ACTION: SECY checked with the Commission offices and has moved agenda planning to June 27th at 9:30am.**
- June 6 or 16 – Briefing on International Activities - The Commission approved the proposed meeting and its associated Scheduling Note.
- June 6 or 16 – Non-Sunshine Act Meeting to Discuss International Experience - The Commission approved the proposed meeting and its associated Scheduling Note, with the last word in the title to be changed from “Travel” to “Experience,” and Margie Doane would also provide a brief update on significant relationships with other countries

(b)(5)

The next agenda planning is on March 31, 2011.

Thank you,
Rochelle

From: [Rini, Brett](#)
To: [Bowman, Gregory](#)
Cc: [Sheron, Brian](#); [Uhle, Jennifer](#); [Johnson, Michael](#)
Subject: REPLY: Draft Scheduling Note for Commission Meeting with DOE
Date: Friday, March 11, 2011 8:59:58 AM
Attachments: [DRAFT DOE Scheduling Note.docx](#)

Greg,

Please find attached our rough draft of a scheduling note for the potential Commission meeting with DOE.

Let me know if you need any additional information at this time.

Thanks,

Brett

Brett A. Rini

Technical Assistant
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
(301)251-7615
Brett.Rini@nrc.gov

From: Bowman, Gregory
Sent: Wednesday, March 02, 2011 8:28 AM
To: Sheron, Brian; Uhle, Jennifer
Cc: Dion, Jeanne
Subject: RE: Summary/Follow-up to Agenda Planning meeting on 2/28/11

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Greg

From: Sheron, Brian
Sent: Tuesday, March 01, 2011 4:56 PM
To: Bowman, Gregory; Uhle, Jennifer
Cc: Dion, Jeanne
Subject: RE: Summary/Follow-up to Agenda Planning meeting on 2/28/11

CH/2

(b)(5)

From: Bowman, Gregory
Sent: Tuesday, March 01, 2011 4:44 PM
To: Sheron, Brian; Uhle, Jennifer
Cc: Dion, Jeanne
Subject: FW: Summary/Follow-up to Agenda Planning meeting on 2/28/11

Brian and Jennifer,

(b)(5)

Please let me know if you have any questions. If this is something that you think should go to one of the other offices, please let me know.

Greg

From: Andersen, James
Sent: Tuesday, March 01, 2011 4:26 PM
To: EDO_TBPM Distribution
Cc: Muessle, Mary; Ash, Darren; Virgilio, Martin; Weber, Michael; Borchardt, Bill; Landau, Mindy
Subject: FW: Summary/Follow-up to Agenda Planning meeting on 2/28/11

(b)(5)

Please see me if you have any questions.

Jim A.

From: Baval, Rochelle

Sent: Tuesday, March 01, 2011 4:03 PM

To: Vietti-Cook, Annette; Bates, Andrew; Burns, Stephen; Muessle, Mary; Andersen, James; Landau, Mindy; Doane, Margaret; Mamish, Nader; Henderson, Karen; Dyer, Jim; Brown, Milton

Cc: Laufer, Richard; Hart, Ken; Shea, Pamela; Batkin, Joshua; Coggins, Angela; Sharkey, Jeffrey; Sosa, Belkys; Bubar, Patrice; Nieh, Ho; Baval, Rochelle

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the next agenda planning session would be in July. *****ACTION: SECY checked with the Commission offices and has moved agenda planning to June 27th at 9:30am.**

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(b)(5)



The next agenda planning is on March 31, 2011.

Thank you,
Rochelle

Draft: 3/10/11

SCHEDULING NOTE

Title: **BRIEFING ON RESEARCH ACTIVITIES AT DOE AND RELEVANT NRC COLLABORATION (Public Meeting)**

Purpose: To provide the Commission an opportunity to hear about selected work being done at the Department of Energy (DOE) and to hear about collaboration between the Office of Nuclear Regulatory Research and DOE.

Scheduled: RES proposes a date in November or December 2011 to allow sufficient time for coordination with DOE on the briefing

Duration: Approx. 2 hours

Location: Commissioners' Conference Room, 1st fl OWFN

External Stakeholders

**Presentation
40 mins.***

John Kelly, Deputy Assistant Secretary for Nuclear Reactor Technologies, Office of Nuclear Energy, Department of Energy

Other Presenters TBD

Topic:

- Discussion of Current Research Activities at DOE Relevant to NRC Including Modeling and Simulation Efforts

Commission Q & A

15 mins.

NRC Staff

40 mins.*

Bill Borchardt, Executive Director for Operations
Brian Sheron, Director, Office of Nuclear Regulatory Research
Michael Johnson, Director, Office of New Reactors

Other Presenters TBD

Topic:

- Discussion of Research Activities at NRC and Areas Where NRC is Collaborating with DOE

Commission Q & A

20 mins.

Discussion – Wrap-up

5 mins.

*For presentation only and does not include time for Commission Q & A's
Documents:

From: Chin, Allison
To: Burns, Stephen; Dyer, Jim; Doane, Margaret; Virgilio, Martin; Weber, Michael; Ash, Darren; Greene, Kathryn; Boyce, Thomas (OIS); Wiggins, Jim; Johnson, Michael; Leeds, Eric; Haney, Catherine; Miller, Charles; Sharon, Brian; Dean, Bill; McCree, Victor; Satorius, Mark; Collins, Elmo
Cc: Cohen, Miriam; Gallagher, Johanna; Johns, Nancy; Tallarico, Alison
Subject: LPP Extension
Date: Friday, March 11, 2011 10:10:30 AM

Hello All:

The deadline for reviewing your LPP packages and turning in your quartile rankings and vote sheets has been extended to April 8, 2011.

The expanded ERB meeting will take place on April 22, 2011.

Thanks,

ALLISON CHIN, HR SPECIALIST

REACTOR PROGRAM SUPPORT BRANCH, OHR

[PHONE] **301-415-2944**

[FAX] **301-415-3818**

[MAIL STOP] **O3-E17A**

U.S. Nuclear Regulatory Commission

CH/3

From: [Sheron, Brian](#)
To: [Flory, Shirley](#)
Subject: FW: LPP Extension
Date: Friday, March 11, 2011 10:11:00 AM

From: Chin, Allison
Sent: Friday, March 11, 2011 10:11 AM
To: Burns, Stephen; Dyer, Jim; Doane, Margaret; Virgilio, Martin; Weber, Michael; Ash, Darren; Greene, Kathryn; Boyce, Thomas (OIS); Wiggins, Jim; Johnson, Michael; Leeds, Eric; Haney, Catherine; Miller, Charles; Sheron, Brian; Dean, Bill; McCree, Victor; Satorius, Mark; Collins, Elmo
Cc: Cohen, Miriam; Gallagher, Johanna; Johns, Nancy; Tallarico, Alison
Subject: LPP Extension

Hello All:

The deadline for reviewing your LPP packages and turning in your quartile rankings and vote sheets has been extended to April 8, 2011.

The expanded ERB meeting will take place on April 22, 2011.

Thanks,

ALLISON CHIN, HR SPECIALIST
REACTOR PROGRAM SUPPORT BRANCH, OHR
[PHONE] **301-415-2944**
[FAX] **301-415-3818**
[MAIL STOP] **O3-E17A**
U.S. Nuclear Regulatory Commission

CA/4

From: Sheron, Brian
To: Warnick, Greg
Cc: Coe, Doug
Subject: PRA Communications Brochure
Date: Friday, March 11, 2011 3:12:00 PM

I spoke with Doug Coe, who is the acting DRA Division Director. He said the brochure on risk communication is on the web. He will be contacting you with the link.

CH/5

From: Sheron, Brian
To: Dyer, Jim
Subject: RE: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule
Date: Friday, March 11, 2011 3:14:00 PM

WooHoo!

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

From: Dyer, Jim
Sent: Friday, March 11, 2011 3:12 PM
To: Sheron, Brian
Subject: Re: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

(b)(5)

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

From: Sheron, Brian
To: Dyer, Jim; Scott, Michael
Sent: Fri Mar 11 14:55:50 2011
Subject: RE: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

(b)(5)

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

From: Dyer, Jim
Sent: Friday, March 11, 2011 12:17 PM
To: Sheron, Brian; Scott, Michael
Subject: RE: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

(b)(5)

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

From: Hudson, Sharon
Sent: Tuesday, March 08, 2011 7:55 AM
To: Suri, Renu; Mitchell, Reggie
Cc: Dyer, Jim; Brown, Milton
Subject: FW: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

See comments from Mike Scott below on the "Communication Plan". DOC should respond to his concerns.

Thank you,
Sharon

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

From: Valentin, Andrea
Sent: Tuesday, March 08, 2011 7:43 AM
To: Hudson, Sharon
Cc: Scott, Michael
Subject: FW: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

Good Morning Sharon,

Brian Sheron asked me to forward this message to you (see below) with regard to the Communication Plan for the Fiscal Year 2011 Proposed Fee Rule. One of our Acting Deputies in RES (Mike Scott) makes some valid point regarding the communication plan. I have cc'ed him on this e-mail in case the CFO' office has questions or wants to contact him directly.

CA/6

Thanks,

Andrea Valentin, Acting Director
Program Management, Policy Development and Analysis Staff
Office of Nuclear Regulatory Research
301-251-7497

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

From: Sheron, Brian
Sent: Monday, March 07, 2011 9:50 PM
To: Valentin, Andrea
Subject: FW: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

Andrea, Mike makes a good point. Can you forward this to OCFO (Sharon Hudson).

From: Scott, Michael
Sent: Monday, March 07, 2011 5:31 PM
To: Sheron, Brian; Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Richards, Stuart; Sangimino, Donna-Marie; Uhle, Jennifer; Valentin, Andrea
Subject: RE: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

(b)(5)

Just seems like the message could be made more palatable to the bill payers.

Mike

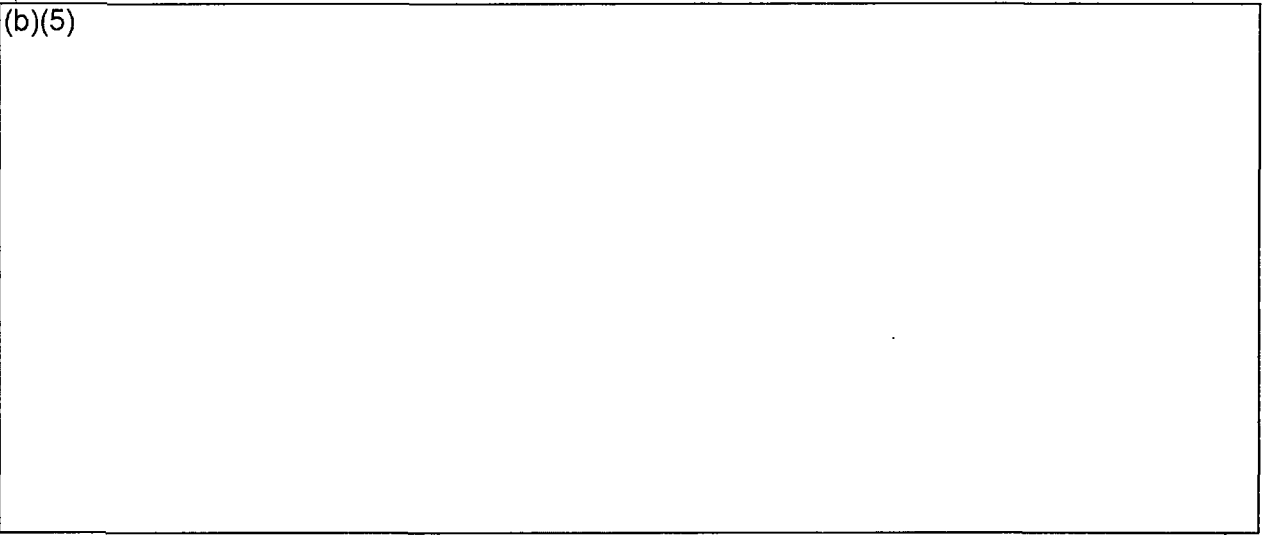
From: Sheron, Brian
Sent: Monday, March 07, 2011 7:57 AM
To: Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Subject: FW: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

FYI.

From: Hudson, Sharon On Behalf Of Dyer, Jim
Sent: Friday, March 04, 2011 11:23 AM
To: Hackett, Edwin; Hawkens, Roy; Burns, Stephen; Poole, Brooke; Bell, Hubert; Doane, Margaret; Schmidt, Rebecca; Brenner, Eliot; Vietti-Cook, Annette; Borchardt, Bill; Weber, Michael; Ash, Darren; Virgilio, Martin; Muessle, Mary; Greene, Kathryn; Howard, Patrick; Zimmerman, Roy; Miller, Charles; McCrary, Cheryl; Boyce, Thomas (OIS); Cohen, Miriam; Johnson, Michael; Haney, Catherine; Leeds, Eric; Sheron, Brian; Kelley, Corenthis; Wiggins, Jim; Dean, Bill; McCree, Victor; Satorius, Mark; Collins, Elmo
Subject: The Communication Plan - Fiscal Year 2011 Proposed Fee Rule

On March 2, 2011, I signed a proposed rule to establish the FY 2011 fees. The proposed rule will shortly be published in the Federal Register with a 30-day public comment period. The attached Communication Plan is provided to assist you with your communications with our licensees. It can also be found on the internal communications website.

(b)(5)



Jim Dyer

From: Sheron, Brian
To: Spencer, Ruth; Uhle, Jennifer
Cc: Stout, Kathleen; Grancorvitz, Teresa; Valentin, Andrea; Sangimino, Donna-Marie
Subject: RE: Short turnaround action from NRR -- ACTION: Review Scenario A Prioritization
Date: Friday, March 11, 2011 3:34:00 PM

I would like to see what the divisions are concluding.

From: Spencer, Ruth
Sent: Friday, March 11, 2011 1:20 PM
To: Sheron, Brian; Uhle, Jennifer
Cc: Stout, Kathleen; Grancorvitz, Teresa; Valentin, Andrea; Sangimino, Donna-Marie
Subject: Short turnaround action from NRR -- ACTION: Review Scenario A Prioritization

Brian/Jennifer,

(b)(5)

If you have any feedback you would like us to provide, please let me know.

Ruth Spencer

Ruth Spencer, NRC/RES, 301 251 7921

From: Nguyen, Caroline
Sent: Friday, March 11, 2011 12:16 PM
To: Le, Hong; Ma, May; Harvey, Sue; Spencer, Ruth; Stout, Kathleen; Grancorvitz, Teresa
Cc: Newell, Karenina; Ferrell, Kimberly; Ruland, William; Givvines, Mary
Subject: RE: ACTION: Review Scenario A Prioritization

All,

Please use the revised Scenario A attached. The updated document deleted "NRR-1, Digital Control Room Modification Inspections," and replaced with "NRR-1A, 1B for CDBI Inspections and Event Evaluation."

Thanks,
Caroline

CA/7

From: Le, Hong

Sent: Friday, March 11, 2011 11:55 AM

To: Ma, May; Harvey, Sue; Spencer, Ruth; Stout, Kathleen; Grancorvitz, Teresa

Cc: Newell, Karenina; Nguyen, Caroline; Ferrell, Kimberly; Ruland, William; Givvines, Mary

Subject: ACTION: Review Scenario A Prioritization

(b)(5)



Hong

415-2294

From: Sheron, Brian
To: Rini, Brett; Uhle, Jennifer
Subject: RE: Schedule Update
Date: Monday, March 14, 2011 10:00:00 AM

(b)(6)

From: Rini, Brett
Sent: Monday, March 14, 2011 5:14 AM
To: Sheron, Brian; Uhle, Jennifer
Subject: Schedule Update

Brian, Jennifer

(b)(6)

Let me know if you have any questions.

thanks,

Brett

CH/8

From: Sheron, Brian
To: Uhle, Jennifer
Subject: FW: Neutron Absorber Testing Issues
Date: Monday, March 14, 2011 11:20:00 AM

FYI.

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

From: Case, Michael
Sent: Monday, March 14, 2011 7:34 AM
To: Sheron, Brian
Subject: FW: Neutron Absorber Testing Issues

FYI

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

From: Case, Michael
Sent: Monday, March 14, 2011 7:33 AM
To: Harris, Charles; Richards, Stuart
Subject: RE: Neutron Absorber Testing Issues

Thanks for the feedback Charlie. As you know, Stu is out this week. Mirela has some great insights in doing research work and shares the same high safety ethic that you have. Our short term objective is to get NRR a focused (and reasonably high quality for this stage) document on this issue.

I'll be a little crazy this week with all the Japanese earthquake items, but let's set a target for a progress update at the end of this week.

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

From: Harris, Charles
Sent: Friday, March 11, 2011 9:24 PM
To: Richards, Stuart
Cc: Case, Michael
Subject: RE: Neutron Absorber Testing Issues

Stu,

(b)(5)



Charles

CH/9

From: Richards, Stuart
Sent: Friday, March 11, 2011 4:48 PM
To: Harris, Charles
Cc: Case, Michael
Subject: Neutron Absorber Testing Issues

Charles

I came by to talk with you, however it appears that you are out of the office today. I'm on annual leave next week, so I want to update you on the neutron absorber testing issues which we discussed this week. First, I appreciate the open discussion we had on the issues, and the information you provided me. I read the draft evaluation which you gave me, and the other materials. I agree that you raise technical issues that need to be resolved.

I spoke with Mirela and my understanding is that your draft evaluation, along with other related information, will be provided to Rob Taylor by e-mail before a meeting scheduled to occur on Wednesday, March 16th. The status of our work will be discussed at the Wednesday meeting. Of course you are invited to attend and participate in the discussion, if your duties with your rotation allow.

I am comfortable with the pace with which the work is proceeding. I understand that the issues were discussed with NRR during the training session in mid-February, so they are aware of the concerns. I believe NRR plans to conduct a "mini-PIRT" after they receive our input.

I'll be glad to discuss this in more detail with you when I return.

Thanks
Stu

From: Sheron, Brian
To: Bonaccorso, Amy; Case, Michael
Cc: Richards, Stuart; Donaldson, Leslie; Valentin, Andrea; Kardaras, Tom; Uhle, Jennifer
Subject: RE: 9-11 Commemoration Panel - NSIR - Need Speaker/Presentation Description
Date: Monday, March 14, 2011 11:30:00 AM

Don't restrict it to non-supervisory experts. The presenters should just be the best experts on the subject.

I thought the areas we might somehow discuss are the aircraft impact analyses that RES did. I'm not sure to what extent we were involved in the development of the B5B measures. However, our SOARCA analyses have shown the benefits of the B5B actions, so maybe someone like Charlie could speak to those.

From: Bonaccorso, Amy
Sent: Monday, March 14, 2011 9:30 AM
To: Case, Michael
Cc: Richards, Stuart; Donaldson, Leslie; Valentin, Andrea; Kardaras, Tom; Sheron, Brian; Uhle, Jennifer
Subject: 9-11 Commemoration Panel - NSIR - Need Speaker/Presentation Description

Good morning Mike:

NSIR is ready to establish a list of speakers and topics for their 9-11 seminar. I just got a tasker to reach out within RES and get a name of a potential speaker and also a sentence or two on what the presentation would be about.

So far, it sounded like NRR would probably focus on B5B, and NRO would focus on the Aircraft Impact Rule. This is not official yet - but this is the discussion I heard at the meeting this morning.

They seemed confident that RES would have something to contribute and I remember you having some ideas many months ago when this first came up. Charlie Tinkler's name came up in this meeting too. Do you have anything in mind? The first 9-11 planning meeting happened so long ago that I can't remember exactly what you (or Stu) proposed.

The tricky part is that the leads for this seminar specifically said that they'd like speakers who are senior level experts/non-supervisory. I expressed some concern over that because we can't always be sure that the person with the most expertise will be non-supervisory. For example, at the TMI Seminar, we had Brian and Gary speak.

They'd like a name and topic by early next week.

I'm cc'ing Brian because he was on a lot of the email traffic leading up to the seminar and may also have some ideas on this.

Thanks,

Amy

Amy Bonaccorso

CAH/10

Senior Communications Specialist
U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
301-251-7681
amy.bonaccorso@nrc.gov



From: [Sheron, Brian](#)
To: [Bonaccorso, Amy](#)
Cc: [Oklesson, Edward](#); [Donaldson, Leslie](#); [Kardaras, Tom](#); [Valentin, Andrea](#)
Subject: RE: Task: RIC Lessons-Learned
Date: Monday, March 14, 2011 11:35:00 AM

Just an RES list.

From: Bonaccorso, Amy
Sent: Monday, March 14, 2011 10:47 AM
To: Sheron, Brian
Cc: Oklesson, Edward; Donaldson, Leslie; Kardaras, Tom; Valentin, Andrea
Subject: FW: Task: RIC Lessons-Learned

Brian:

Ed just talked to me about this tasker and being that I have questions on it, he encouraged me to reach out to you for clarification.

Are you asking for a lessons learned list like I did last year? From our Office's perspective? We did a list like that last year and it was shared with NRR after we discussed it internally. I have started that list and could have it done quickly.

Or, do you want a list that is coordinated with NRR? If that's the case, it will take longer because Lorna, for example, took some leave this week to recover from the RIC. We also may not always come from the same perspective, so it may take longer to iron out and discuss.

Either way is fine – I just need to make sure I understand what type of list you want. A RES list or RES/NRR joint list.

Thanks,

Amy

From: Bonaccorso, Amy
Sent: Monday, March 14, 2011 9:16 AM
To: Donaldson, Leslie
Cc: Kardaras, Tom
Subject: RE: Task: RIC Lessons-Learned

Hi Leslie:

I started my list as I did last year, but saw something different in this tasker. Did NRR ask for a joint list? Did Brian say that I should work with Lorna on this? If that's the case, I will need some time to work with Lorna, who isn't in for a few days....and she may need to work with other folks in NRR to reach agreement. One concern is that Lorna and I may have different perspectives on what went well and poorly....but we could try to work it out. I'll wait for a confirmation.

Last year, RES made up their own listand it was presented to NRR as a "Here is what

CHA / 11

RES experienced." Part of the reason for that was because RES had separate concerns.

Mary Givvines asked me for documentation on Graphics and OIS support, so now I'm not sure how that fits in – I guess it will fall into place.

Thanks,

Amy

From: Donaldson, Leslie
Sent: Friday, March 11, 2011 11:52 AM
To: Bonaccorso, Amy
Cc: Kardaras, Tom
Subject: Task: RIC Lessons-Learned
Importance: High

Hi Amy –

At today's 8:45, Brian requested we do a quick RIC Lessons-Learned, in coordination w/NRR. You would work this at your level, conferring with Lorna, etc. and any other individuals involved at the planning level. Brian is looking for a list of items that:

- Went well;*
- Went poorly; and,*
- Could improve upon for next year*

For example, Brian feels the Head Regulator Chart that OIP developed should include Chiefs, TSOs (Technical Support Organizations) as not all countries have a Head Regulator, but instead a Chief TSO (e.g., France, Germany...). Another item Brian wants to list as something to improve for next year, would be the Head Regulator Dinner on Wed. nite. Brian recommends we either shorten the dinner or change the venue. The final item he noted is that we do more prep leading up to the RIC.

So, once you have a working list next week, please run this by Tom and myself (Tom commences as Acting PMDA Deputy DD on Monday for a 4-week period) for our review and then we will pass it up to Brian. I understand Brian is looking for this list next week as he will then, most probably, meet w/Eric to discuss, etc.

Thanks, Leslie

Leslie A. Donaldson, Chief
Human Capital and Communications Branch
Program Management, Policy Development and Analysis Staff
Office of Nuclear Regulatory Research
301.251.7964

From: [Sheron, Brian](#)
To: [Sangimino, Donna-Marie](#)
Subject: FW: SORRTG Questionnaire and CSNI Position Paper
Date: Monday, March 14, 2011 11:53:00 AM
Attachments: [Position Paper on Safety of Research Reactors jan 2011.doc](#)
[2010 Questionnaire SORRTG.doc](#)

Did I already assign this to you? We should send back agency comments, so we need to coordinate our response with NRR.

From: Greg.LAMARRE@oecd.org [mailto:Greg.LAMARRE@oecd.org]
Sent: Wednesday, March 09, 2011 5:38 AM
Subject: FW: SORRTG Questionnaire and CSNI Position Paper

Dear CSNI Members,

As many of you are aware, CNRA at its December 2010 meeting decided to establish a scoping task group on the safety of research reactors (SORRTG) to assess the current state of safety-related regulatory activities and support for research reactors with the aim to identify areas or topics that CNRA could pursue. At its first meeting in February, SORRTG members decided that a questionnaire should be developed and sent out to interested CNRA member countries to complete in order to further the group's understanding about the current state of research reactor safety and regulation. The questionnaire and CSNI position paper is attached.

At the CSNI Bureau meeting earlier this week, Bureau members requested that the questionnaire also be sent out to CSNI member for their consideration and input. You are therefore invited to provide input, in coordination with your CNRA counterpart (i.e., one input per country would be appreciated). SORRTG membership includes representatives from Australia, Belgium, Canada, France, India, Japan, Russia, the US, and the IAEA.

I thank you in advance for your consideration. Please note the due date of April 15th. This will allow the Secretariat the time to compile results in preparation for the next meeting of the SORRTG at the beginning of May.

Best Regards,
Greg



Greg Lamarre
Nuclear Safety Division
OECD Nuclear Energy Agency (NEA)
Tel.: +33 (0)1 45 24 10 53
greg.lamarre@oecd.org
Update your bookmarks!
On 1 December 2010, the NEA is moving to:
www.oecd-nea.org

CH/12

From: LAMARRE Greg, NEA/SURN
Sent: Friday, February 18, 2011 09:54
To: 'add-cnra-sorrt@nea.fr'
Subject: SORRTG Questionnaire and CSNI Position Paper

Dear SORRTG Members,

Please find attached the questionnaire as discussed and developed during our meeting last week here in Paris. I would ask that you please provide responses to the questions by April 15th. This will allow sufficient time for the Chair and I to compile the results and prepare for our next meeting in early May. As we discussed, we will also invite other CNRA members not participating as members of this TG to also complete the questionnaire.

Also, the Chair has suggested that I also include the CSNI position paper as presented by Jean-Michel Evrard at our meeting. You are invited to provide comments to the content of the paper. Those comments could also form part of the TG's findings and recommendations back to CNRA. I have also included the CSNI position paper in the attachments to this message.

Please note that these documents are also available on the SORRTG members' page which is accessible via the following:

<http://home.oecd-nea.org/download/cnra-sorrt/>

Best Regards,

Greg



Greg Lamarre
Nuclear Safety Division
OECD Nuclear Energy Agency (NEA)
Tel.: +33 (0)1 45 24 10 53
greg.lamarre@oecd.org
Update your bookmarks!
On 1 December 2010, the NEA is moving to:
www.oecd-nea.org

(b)(5)

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From: Sheron, Brian
To: Scott, Michael; Uhle, Jennifer; Gibson, Kathy
Subject: RE: SNL response to NRC request to help Japan
Date: Monday, March 14, 2011 2:02:00 PM

Please don't put anyone on a plane!!!!!!!!!!!!!!!

All we were looking for was names and their potential availability. The agency has already selected the team of 6 they plan to send over.

From: Scott, Michael
Sent: Monday, March 14, 2011 1:53 PM
To: Uhle, Jennifer; Gibson, Kathy; Sheron, Brian
Subject: Fw: SNL response to NRC request to help Japan

Forwarded is over-the-top Sandia support proposal.

Note: Dana Powers is in Rockville. I'm going to attempt to contact him.

Meanwhile, suggest we get Gauntt and Leonard on a plane. Do you know La Chance?

Sent from my NRC blackberry
Michael Scott

(b)(6)

From: Pickering, Susan Y <sypicke@sandia.gov>
To: Scott, Michael
Cc: Orrell, Stanley A <sorrell@sandia.gov>; Gauntt, Randall O <rogaunt@sandia.gov>; Lachance, Jeffrey Lynn <jllacha@sandia.gov>; Ross, Kyle Wayne <kwross@sandia.gov>; Burns, Shawn <spburns@sandia.gov>
Sent: Mon Mar 14 13:04:54 2011
Subject: SNL response to NRC request to help Japan

Mike,

(b)(5),(b)(6)

CH/13

(b)(5),(b)(6)

Admin actions:

(b)(5),(b)(6)

syp

Susan Y. Pickering
Senior Manager, Nuclear Energy Safety Technologies
P.O. Box 5800
Albuquerque, NM 87185-0736
Phone (505) 284-4800
Fax (505) 844-0955
Email: sypicke@sandia.gov

From: Sheron, Brian
To: Johnson, Michael; Holahan, Gary
Cc: Leeds, Eric; Virgilio, Martin; Borchardt, Bill; Grobe, Jack; Boger, Bruce; Williams, Donna; Wiggins, Jim
Subject: RE: Recommendation for proactive action by NRC in light of Japan events
Date: Monday, March 14, 2011 2:07:00 PM

(b)(5)

From: Johnson, Michael
Sent: Monday, March 14, 2011 2:02 PM
To: Holahan, Gary
Cc: Leeds, Eric; Virgilio, Martin; Borchardt, Bill; Grobe, Jack; Boger, Bruce; Sheron, Brian; Williams, Donna; Wiggins, Jim
Subject: RE: Recommendation for proactive action by NRC in light of Japan events

(b)(5)

From: Holahan, Gary
Sent: Monday, March 14, 2011 1:55 PM
To: Johnson, Michael
Cc: Leeds, Eric; Virgilio, Martin; Borchardt, Bill; Grobe, Jack; Boger, Bruce; Sheron, Brian; Williams, Donna; Wiggins, Jim
Subject: Recommendation for proactive action by NRC in light of Japan events

Mike,

(b)(5)

CA/14

Gary

From: [Sheron, Brian](#)
To: [Case, Michael](#); [Richards, Stuart](#)
Cc: [Uhle, Jennifer](#)
Subject: FW: Japanese Earthquake Questions
Date: Monday, March 14, 2011 3:14:00 PM

Andy is an SLS seismic expert. We should be using him.

From: Murphy, Andrew
Sent: Monday, March 14, 2011 3:09 PM
To: Kammerer, Annie; Case, Michael; Skeen, David; Hiland, Patrick
Cc: Pires, Jose; Hogan, Rosemary; Sheron, Brian; Uhle, Jennifer
Subject: RE: Japanese Earthquake Questions

Is there anything that I can do to help the effort?

Andy

From: Kammerer, Annie
Sent: Monday, March 14, 2011 10:49 AM
To: Case, Michael; Skeen, David; Hiland, Patrick
Cc: Murphy, Andrew; Pires, Jose; Hogan, Rosemary; Sheron, Brian; Uhle, Jennifer
Subject: RE: Japanese Earthquake Questions

I have compiled a set of questions from all available sources, which I think are pretty complete. I am organizing them now and I have cliff and jon helping me with some of the answers. I've pulled from the questions we got a kashiwazaki, the questions we have that have come in, the GI-199 com plan, the DCNPP com plan, and other places.

I do have a request from RIV to pull a Q&A list for SONGS. If I brainstorm a list can I get help with answers?

What kind of experts do you have?

From: Case, Michael
Sent: Monday, March 14, 2011 7:51 AM
To: Skeen, David; Hiland, Patrick
Cc: Murphy, Andrew; Pires, Jose; Kammerer, Annie; Hogan, Rosemary; Sheron, Brian; Uhle, Jennifer
Subject: Japanese Earthquake Questions

Hi guys. I don't know where we stand on the seismic related questions after Sunday's day shift activities (I assume Annie was able to continue). Nevertheless, I have access to some more experts here this morning. If there are residual activities, just let me know and we'll get them working.

CH/15

From: Sheron, Brian
To: Uhle, Jennifer; Coyne, Kevin; Case, Michael
Cc: Coe, Doug; Stutzke, Martin; Sancaktar, Selim
Subject: RE: Seismic and Tsunami Hazard in PRA
Date: Monday, March 14, 2011 3:27:00 PM

The question is, did the Japanese also consider an 8.9 magnitude earthquake and resulting tsunami "way too low a probability for consideration"?

Look at GI-199. It shows we didn't know everything about the seismicity of CEUS. And isn't there a prediction that the West coast is likely to get hit with some huge earthquake in the next 30 years or so? Yet we relicense their plants.....

From: Uhle, Jennifer
Sent: Monday, March 14, 2011 3:20 PM
To: Sheron, Brian; Coyne, Kevin; Case, Michael
Cc: Coe, Doug; Stutzke, Martin; Sancaktar, Selim
Subject: RE: Seismic and Tsunami Hazard in PRA

I think this highlights our need to get a better handle on external events hazards—ensure that the tsunami hazard is way too low a probability for consideration. I know we are updating our tsunami hazard for the east coast and gulf coast but did not think we were doing recent work on the west coast. Has industry done anything on tsunami hazards? Also, has anyone done work to look at the effect of numerous cycles of low amplitude acceleration following a larger event. I would expect we would have some information because how do we know a plant would be fit to start back up after an event? We cannot possibly do NDE on everything to determine if flaws have propagated to the point where they need to be replaced.

From: Sheron, Brian
Sent: Monday, March 14, 2011 3:05 PM
To: Coyne, Kevin
Cc: Uhle, Jennifer; Coe, Doug; Stutzke, Martin; Sancaktar, Selim
Subject: RE: Seismic and Tsunami Hazard in PRA

And so the first question is, "Should we make licensees consider a Tsunami coincident with a seismic event that triggers the Tsunami?"

The second question is, How should we consider after-shocks in seismic hazard analyses?

From: Coyne, Kevin
Sent: Monday, March 14, 2011 2:39 PM
To: Sheron, Brian
Cc: Uhle, Jennifer; Coe, Doug; Stutzke, Martin; Sancaktar, Selim
Subject: Seismic and Tsunami Hazard in PRA

Brian –

You raised a question at the standup meeting this morning regarding (1) the treatment of coupled seismic and tsunami events and (2) treatment of seismic

CH/12

aftershocks. I spoke with Marty Stutzke and Selim Sancaktar - the PRA Standard (ASME/ANS-Ra-Sa2009) does address the technical requirements for both seismic events and tsunamis (tsunami hazard under the technical requirements for external flooding analysis). The standard does note that uncertainties associated with probabilistic analysis of tsunami hazard frequency are large and that an engineering analysis can usually be used to screen out tsunamis. Seismic PRAs do not consider the affect of aftershocks since there are not methods to predict equipment fragility after the first main shock. Although the standard does address both these events, there are not specific requirements that require a PRA to assess a tsunami generated by a local seismic event.

Marty also checked on the Diablo Canyon and San Onofre IPEEEs - based on the Technical Evaluation Reports, Diablo did consider a locally induced tsunami in a limited way (the aux service water pumps were assumed to become flooded following a seismic event) while SONGS did not consider a coupled seismic/tsunami event.

-Kevin

From: Sheron, Brian
To: Scott, Michael; Gibson, Kathy; Uhle, Jennifer
Cc: Santiago, Patricia; Tinkler, Charles
Subject: RE: OPCEN SUPPORT - BWR SEVERE ACCIDENT ANALYSTS
Date: Monday, March 14, 2011 5:24:00 PM

Nope. My thanks to both Jason and Charlie for supporting the Op center.

From: Scott, Michael
Sent: Monday, March 14, 2011 5:20 PM
To: Gibson, Kathy; Uhle, Jennifer; Sheron, Brian
Cc: Santiago, Patricia; Tinkler, Charles
Subject: OPCEN SUPPORT - BWR SEVERE ACCIDENT ANALYSTS

Jason Schaperow has been there all day and has not been heavily tasked. We have proposed, and the RST lead agreed, that Charlie Tinkler be on call tonight, so we will not have someone sitting there until the wee hours.

Jason is on the Accident Analyst rotation so will be coming in Wednesday on the back shift.

Please let me know if you have any concerns or questions.

Mike

CTH/17

From: [Sheron, Brian](#)
To: [Brenner, Eliot](#); [Hayden, Elizabeth](#)
Subject: FW: NBC deadline question for NRC on seismic hazard estimates
Date: Tuesday, March 15, 2011 9:46:00 AM

One of you want to handle?

From: Bill Dedman [mailto:Bill.Dedman@msnbc.com]
Sent: Tuesday, March 15, 2011 9:06 AM
To: Manoly, Kamal; Sheron, Brian; Hiland, Patrick; OPA Resource
Subject: NBC deadline question for NRC on seismic hazard estimates

Good morning,

My name is Bill Dedman. I'm a reporter for NBC News and msnbc.com, writing an article today about:

SAFETY/RISK ASSESSMENT RESULTS FOR GENERIC ISSUE 199, "IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES ON EXISTING PLANTS"

I reached out to NRC Public Affairs yesterday but have not heard back, and my deadline is end-of-day today. I'm hoping to get on the phone today with someone from NRC to make sure I'm conveying this information accurately to the public. If nothing else, I'm hoping one of the technical people can help clarify the points below. My telephone number is 203-451-9995.

I've read Director Brian Sheron's memo of Sept. 2, 2010, to Mr. Patrick Hiland; the safety/risk assessment of August 2010; its appendices A through D; NRC Information Notice 2010-18; and the fact sheet from public affairs from November 2010.

I have these questions:

1. I'd like to make sure that I accurately place in layman's terms the seismic hazard estimates. I need to make sure that I'm understanding the nomenclature for expressing the seismic core-damage frequencies. Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-06} , or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct?
2. These documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the Central and Eastern U.S. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the Western U.S.?
3. The documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment."

CH/18

4. What is the timetable now for consideration of any regulatory changes from this research?

Thank you for your help.

Regards,

Bill Dedman

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From: Sheron, Brian
To: Leeds, Eric; Borchardt, Bill
Cc: Taylor, Renee; Weber, Michael; Uhle, Jennifer; Boger, Bruce; Ruland, William
Subject: RE: Charlie Tinkler will support the Chairman.
Date: Tuesday, March 15, 2011 1:36:00 PM

(b)(6)

Jason Shaperow will be going. Jennifer is going with him.

From: Leeds, Eric
Sent: Tuesday, March 15, 2011 11:36 AM
To: Borchardt, Bill
Cc: Taylor, Renee; Weber, Michael; Sheron, Brian; Uhle, Jennifer; Boger, Bruce; Ruland, William
Subject: Charlie Tinkler will support the Chairman

Bill –

RES will supply Charlie Tinkler for this afternoon's activities with the Chairman and tomorrow's briefings on the hill. We'll have him contact Rene to get travel info – so he will travel with you this afternoon. Big thanks to Jennifer for making this happen!

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
301-415-1270

CH/19

From: Sheron, Brian
To: Uhle, Jennifer; Scott, Michael; Spencer, Ruth
Cc: Gibson, Kathy; Grancorvitz, Teresa; Kardaras, Tom; Valentin, Andrea
Subject: FW: FY 2013 New Reactors Business Line Budget Meeting Material
Date: Tuesday, March 15, 2011 2:27:00 PM

From: Murphy, Jerome

Sent: Tuesday, March 15, 2011 2:26 PM

To: Murphy, Jerome; Zimmerman, Roy; Campbell, Andy; McCrary, Cheryl; Krupnick, David; Leeds, Eric; Boger, Bruce; Grobe, Jack; Cohen, Miriam; Tracy, Glenn; Sheron, Brian; Uhle, Jennifer; Burns, Stephen; Hawkens, Roy; Hackett, Edwin; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Arthur; Boyce, Thomas (OIS); Schaeffer, James; Greene, Kathryn; Stewart, Sharon; Wiggins, Jim; Mitchell, Reggie; Doane, Margaret; Mamish, Nader; Valentin, Andrea; Grancorvitz, Teresa; Ma, May; Harvey, Sue; McDevitt, Joan; Tenaglia, Mickey; Powell, Amy; Brenner, Eliot; Poole, Brooke; Joosten, Sandy; Bates, Andrew; Gallo, Jenny; Perry, Jamila; McKoy Moore, Larniece; Whetstine, Jack; Dambly, Jan; Bettis, Ashley; McCrary, Cheryl; Cullison, David; Somerville, Glenda; Horn, James; Baker, Pamela; Walker, Tracy; Rule, David; Zilka, Kathleen; McGill, Clinton; Clarkson, Sharon; Holt, BJ; Sotiropoulos, Dina; Bayliff, Shirley; Hays, Myra; Nute-Blackshear, Lora; Krupnick, David; Gardin, Kathy; Abraham, Susan; Le, Hong; Newell, Karenina; Givvines, Mary; Arrighi, Russell; Ferrell, Kimberly; Rheaume, Cynthia; Lockhart, Michelle; Gulla, Gerald; Nibert, Patty; Campbell, Andy; Krupnick, David; Boyd, Lena; Lockhart, Michelle; Spencer, Ruth; Stout, Kathleen; Kirkwood, Sara; Moulding, Patrick; Shnyder, Yana; Tenaglia, Mickey; Zabler, Marian; Butler, Rodney

Cc: NRO_Division_Directors; NRO_Deputy_Division_Directors; NRO_TA; Lin, Chien-Ting; Flanders, Rhea; Gusack, Barbara

Subject: RE: FY 2013 New Reactors Business Line Budget Meeting Material

New Reactors Business Line Offices, as I stated in today's New Reactors Business Line budget meeting, the attachment (New Rx BL -3-15-11) that was sent out at this morning, budget detail table FY 2013 column is not adding the resources correctly. Please disregard the attachment. We will be sending a revised budget detail report shortly.

Jerome

From: Murphy, Jerome

Sent: Tuesday, March 15, 2011 9:52 AM

To: Zimmerman, Roy; Campbell, Andy; McCrary, Cheryl; Krupnick, David; Leeds, Eric; Boger, Bruce; Grobe, Jack; Cohen, Miriam; Tracy, Glenn; Sheron, Brian; Uhle, Jennifer; Burns, Stephen; Hawkens, Roy; Hackett, Edwin; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Arthur; Boyce, Thomas (OIS); Schaeffer, James; Greene, Kathryn; Stewart, Sharon; Wiggins, Jim; Mitchell, Reggie; Doane, Margaret; Mamish, Nader; Valentin, Andrea; Grancorvitz, Teresa; Ma, May; Harvey, Sue; McDevitt, Joan; Tenaglia, Mickey; Powell, Amy; Brenner, Eliot; Poole, Brooke; Joosten, Sandy; Bates, Andrew; Gallo, Jenny; Perry, Jamila; McKoy Moore, Larniece; Whetstine, Jack; Dambly, Jan; Bettis, Ashley; McCrary, Cheryl; Cullison, David; Somerville, Glenda; Horn, James; Baker, Pamela; Walker, Tracy; Rule, David; Zilka, Kathleen; McGill, Clinton; Clarkson, Sharon; Holt, BJ; Sotiropoulos, Dina; Bayliff, Shirley; Hays, Myra; Nute-Blackshear, Lora; Krupnick, David; Gardin, Kathy; Abraham, Susan; Le, Hong; Newell, Karenina; Givvines, Mary; Arrighi, Russell; Ferrell, Kimberly; Rheaume, Cynthia; Lockhart, Michelle; Gulla, Gerald; Nibert, Patty; Campbell, Andy; Krupnick, David; Boyd, Lena; Lockhart, Michelle; Spencer, Ruth; Stout, Kathleen

Cc: NRO_Division_Directors; NRO_Deputy_Division_Directors; NRO_TA; Lin, Chien-Ting; Flanders, Rhea; Gusack, Barbara

Subject: FY 2013 New Reactors Business Line Budget Meeting Material

New Reactors Business Line Offices, attached are the material for today's budget meeting starting at 10:30am eastern time. Also, below is the dial in number if you did not

CH/20

receive it from Ms. Shannon King. Look forward to our meeting.

Country Toll Numbers Freephone/Toll Free Number

USA 888-677-3792

PASSCODE FOR PARTICIPANTS AND LEADER: (b)(6)

Very Respectfully,

Jerome Murphy

FPMB Branch Chief

NRO/PMDA

Jerome.Murphy@nrc.gov

(301) 415-2288

From: Sheron, Brian
To: Flory, Shirley
Subject: FW: Chairman's Budget Guidance
Date: Tuesday, March 15, 2011 3:10:00 PM
Importance: High

FYI.

From: Ellis, Marv
Sent: Tuesday, March 15, 2011 3:08 PM
To: Taylor, Renee; Smolik, George; Golder, Jennifer; Powell, Marlon; Brown, Milton; Borchardt, Bill; Ash, Darren; Weber, Michael; Muessle, Mary; Virgilio, Martin; Hudson, Sharon; Matakas, Gina; Miles, Patricia; Buckley, Patricia; Owen, Lucy; Collins, Elmo; Satorius, Mark; Reyes, Luis; Casto, Chuck; Dapas, Marc; Kelley, Corenthis; Sheron, Brian; Boyce, Thomas (OIS); McCrary, Cheryl; Zimmerman, Roy; Wiggins, Jim; Leeds, Eric; Johnson, Michael; Haney, Catherine; Cohen, Miriam; Miller, Charles; Howard, Patrick; Greene, Kathryn; Doane, Margaret; Poole, Brooke; Schmidt, Rebecca; Brenner, Eliot; Vietti-Cook, Annette; Burns, Stephen; Hackett, Edwin; Jacobs-Baynard, Elizabeth; Kasputys, Clare; McCree, Victor; Dubose, Sheila
Cc: Administrative ServicesCenter; Telecom Contractor
Subject: Chairman's Budget Guidance
Importance: High

The Chairman's budget guidance meeting scheduled for Thursday 10-11:30 am is postponed until sometime next week. Sharon will coordinate a new time and date.

Thank you.

Marv Ellis
Administrative Assistant
Office of the Chief Financial Officer
U.S. Nuclear Regulatory Commission
T-9F6
301.415.7501
marv.ellis@nrc.gov

CH/21

From: Sheron, Brian
To: Uhle, Jennifer
Subject: Questions
Date: Tuesday, March 15, 2011 3:30:00 PM

Ben will send them to Eliot with a cc to you.

CH/22

From: Sheron, Brian
To: Coyne, Kevin; Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Cc: Dion, Jeanne
Subject: IRC Staffing
Date: Tuesday, March 15, 2011 5:27:00 PM

I participated on a conference call with other ODs and led by Michele Evans, acting deputy OD in NSIR at 4 pm today.

The purpose of the conference call was to discuss staffing for the IRC for the near future. The IRC is currently staffed with members of the Reactor safety team, the Protective Measures team, Liaison Team, etc. There is also an ET member there. None of the teams are at their full compliment. What Michele is looking for is people that can staff the IRC and relieve the staff that are currently there. She said they are currently running 3 shifts (11pm-7am, 7am – 3pm, and 3pm to 11 pm). They would like to find staff that can work shifts for 4 days in a row (I think she wants 4 days on, 3 days off). She said the staff do not have to have had IRC training.

Several of us said we would certainly canvas our staff to see who was qualified to work in the IRC and could work there, but we needed to know what technical disciplines they were looking for. Michele did not have a list of needed disciplines, but said she would generate one and send it out. As of 5:15 pm I have not received a list yet.

However, I am assuming they will be looking for staff with expertise in such areas as systems analysis, severe accidents, radiological dose assessment, etc. In anticipation that these are the technical disciplines of interest, can you please start identifying your staff that you believe have some of the requisite skills needed for the IRC, and start asking if they would be available to work shifts in the IRC if asked to. HR said they would be eligible for normal overtime compensation.

Also, they will be looking for staff to go to Japan and relieve the technical staff that recently went there. There were 2 BWR experts that left over the weekend, and a team of 9 more (6 engineers and 3 OIP staff) left yesterday. The thinking is that the staff that recently went over would come back in 2 weeks, which is when they want to send a replacement team over there. So please check to see if you have any staff with the proper technical credentials, are reasonably good communicators, and would be willing to spend about 2 weeks in Japan as part of the team there.

I will forward the list of desired disciplines as soon as I receive them from Michele. Michele said she will be looking for the list of potential IRC replacements by COB tomorrow (3/16/11), thus, I will need your candidates by mid-afternoon.

For the team that will replace the one that was just sent to Japan, she said she would like us to update the list we previously sent by COB 3/17.

CH/23

From: Coyne, Kevin
To: Andersen, James; Bowman, Gregory
Cc: Armstrong, Kenneth; Hudson, Daniel; Ibarra, Jose; Coe, Doug; Gibson, Kathy; Scott, Michael; Correia, Richard; Ader, Charles; Cheok, Michael; Tinkler, Charles; Stutzke, Martin; Sheron, Brian; Uhle, Jennifer; Santiago, Patricia
Subject: RE: Tracking List Update
Date: Tuesday, March 15, 2011 6:36:17 PM
Attachments: Level 3 PRA-SOARCA Commission Meeting Scheduling Note 03152011 Final.docx

Jim, Greg –

Please see attached scheduling note for the Level 3 PRA/SOARCA commission meeting requested by the Chairman's office. We understand that the meeting, if scheduled, would be held no earlier than approximately two weeks after the Level 3/SOARCA SECY paper is submitted.

Please let me know if you need any additional information at this time –

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: Andersen, James
Sent: Monday, March 14, 2011 11:56 AM
To: Coyne, Kevin
Subject: FW: Tracking List Update

From: Andersen, James
Sent: Monday, March 14, 2011 11:16 AM
To: Santiago, Patricia
Cc: Bowman, Gregory; Scott, Michael; Gibson, Kathy
Subject: RE: Tracking List Update

Pat, I left a message for you on this. The Chairman's office is interested in a possible Commission meeting on SOARCA/Level 3 PRA in July (see below) and would like us to develop a scheduling note on it. Of course they are looking for a quick turnaround. I have provided some guidance on scheduling notes in the attached file. Please give me a call when you get a chance. Thanks.

Jim A.

CH/24

415-1725

From: Baval, Rochelle
Sent: Monday, March 14, 2011 10:42 AM
To: Andersen, James
Subject: FW: Tracking List Update

Jim,

I spoke briefly with Angela this morning about agenda planning for July meetings...

She'd like to know staff's views on the order of priority for July meetings if we can't do them all:

- GEIS for License Renewal
- IRRS Action Plan
- Licensing Medical Isotope Production
- RTR License Renewal
- Level 3 PRA and SOARCA

Since the Level 3 PRA paper coming July 7th will include options on how to proceed with both SOARCA and Level 3 PRA activities, she thought it might be good to have a Commission meeting to inform Commission voting on the paper. We had this on the list for a meeting in July, then moved it to later. Would you please ask staff to put together a scheduling note and ask their thoughts on such a Commission meeting in July.

We're still going to try to meet with Angela this Thursday, 3/17 at 10, since pre-agenda with the Chairman is moved to 3/22.

Rochelle

Draft: 03/15/11

SCHEDULING NOTE

Title: **BRIEFING ON OPTIONS FOR PROCEEDING WITH LEVEL 3 PROBABILISTIC RISK ASSESSMENT AND STATE-OF-THE-ART REACTOR CONSEQUENCE ANALYSIS ACTIVITIES (Public)**

Purpose: To provide the Commission a discussion of options for proceeding with Level 3 probabilistic risk assessment (PRA) and State-of-the-Art Reactor Consequence Analysis (SOARCA) activities and to facilitate Commission voting on the policy paper that will include the staff's recommendation regarding whether and how to proceed with either or both activities.

Scheduled: **Month, Date, Year [SECY will fill in]**
Time [SECY will fill in]

Duration: Two hours

Location: Commissioners' Conference Room, 1st floor OWFN [SECY will change if needed]

Participants: **Presentation**

NRC Staff Panel **55 mins.***

Bill Borchardt, Executive Director for Operations

Brian Sheron, Director, RES **10 mins.***
Topic: Introduction and Overview

Pat Santiago, Chief, Special Projects Branch, RES **15 mins.***
Topic: Discussion on SOARCA Activities

Daniel Hudson, Level 3 PRA Project Manager, RES **25 mins.***
Topic: Discussion on Proposed Level 3 PRA Activities

Jennifer Uhle, Deputy Director, RES **5 mins.***
Topic: Staff Recommendation on Proposed Activities

Additional staff available to answer questions if needed:

- **Charles Tinkler**, Senior Advisor for Severe Accident Phenomenology Code Development and Analysis, RES
- **Martin Stutzke**, Senior Technical Advisor for PRA Technology, RES

Break **5 mins.**

Commission Q & A

55 mins.

Discussion – Wrap-up

5 mins.

*For presentation only and does not include time for Commission Q & A's.

Documents:

Staff background material due to SECY: Ten business days prior to the meeting.
[SECY to fill in date]

Slides due to SECY: Five business days prior to the meeting. [SECY to fill in date]

From: Rini, Brett
To: Sheron, Brian; Uhle, Jennifer; Case, Michael; Richards, Stuart; Gibson, Kathy; Scott, Michael
Cc: Coe, Doug; Coyne, Kevin; Lien, Peter; Rivera-Lugo, Richard; Armstrong, Kenneth; Ibarra, Jose
Subject: FW: ACRS Quality Review of selected Projects
Date: Tuesday, March 15, 2011 7:26:15 PM

FYI, the ACRS has chosen the DSA and DE projects below for their annual quality review of selected research projects. Peter and I will work with the division TAs and MAs to get the specific information to the ACRS over the next few weeks.

Brett

From: Nourbakhsh, Hossein
Sent: Tuesday, March 15, 2011 1:32 PM
To: Rini, Brett
Cc: Lien, Peter; Hackett, Edwin
Subject: ACRS Quality Review of selected Projects

Brett

As you may be aware, the Committee Has selected the following projects for its 2011 annual review of quality of selected NRC research projects:

1. NUREG/CR-6969: Analysis of Experimental Data for High Burnup PWR Spent Fuel Isotopic Validation—ARIANE and REBUS Programs (UO2 Fuel)
2. NUREG/CR-7027: Degradation of LWR Core Internal Materials Due to Neutron Irradiation,

These two projects has been selected from a list of projects proposed by RES in a February 4, 2011, letter from Brian Sharon, RES Director, to Said Abdel-Khalik, ACRS Chairman.

These reports are available on the NRC web. However, the Committee would also like a copy of the Statement of the Work (SOW) for these projects. We would like to have these SOWs before the next ACRS meeting (April 7-9, 2011).

Thanks,
Hossein

Hossein Nourbakhsh, Ph.D.
Senior Technical Advisor
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Tel: (301)415-5622

CH/25

From: Sheron, Brian
To: Baratta, Anthony
Subject: FW: 0630 EDT (March 16, 2011) USNRC Earthquake/Tsunami SitRep
Date: Wednesday, March 16, 2011 7:40:00 AM
Attachments: [NRC Status Update 3-16.11--0630am.pdf](#)

Attached is all the information I have.

From: LIA07 Hoc
Sent: Wednesday, March 16, 2011 6:46 AM
To: Andersen, James; Anderson, Joseph; Ash, Darren; Baggett, Steven; Barker, Allan; Batkin, Joshua; Boger, Bruce; Borchardt, Bill; Bradford, Anna; Brenner, Eliot; Smith, Brooke; Brown, Milton; Bubar, Patrice; Camper, Larry; Carpenter, Cynthia; Castleman, Patrick; Ader, Charles; Casto, Chuck; Coggins, Angela; Collins, Elmo; Correia, Richard; Dapas, Marc; Dean, Bill; Decker, David; Dickman-Disabled-11/14/2010, Paul; Dorman, Dan; Droggitis, Spiros; Dyer, Jim; ET02 Hoc; Evans, Michele; Franovich, Mike; Apostolakis, George; Gibbs, Catina; Giitter, Joseph; Gott, William; Grobe, Jack; Hahn, Matthew; Haney, Catherine; Harrington, Holly; Hipschman, Thomas; Holahan, Gary; Holahan, Patricia; HOO Hoc; Howell, Art; Howell, Linda; Foster, Jack; Jackson, Donald; Jaczko, Gregory; Johnson, Andrea; Johnson, Michael; Kahler, Robert; Foggie, Kirk; Kock, Andrea; Kozal, Jason; Leeds, Eric; LIA01 Hoc; LIA02 Hoc; LIA03 Hoc; LIA06 Hoc; LIA08 Hoc; LIA11 Hoc; Logaras, Herral; Loyd, Susan; Magwood, William; Maier, Bill; Marshall, Jane; Marshall, Michael; McCree, Victor; McDermott, Brian; McNamara, Nancy; Miller, Charles; Miller, Chris; Monninger, John; Morris, Scott; Nieh, Ho; NSIR_DDSP_ILTAB_Distribution; Ordaz, Vonna; Orders, William; Ostendorff, William; Pace, Patti; Pearson, Laura; Pederson, Cynthia; Plisco, Loren; Powell, Amy; R1 IRC; R2 IRC; R3 IRC; R4 IRC; Reddick, Darani; Reyes, Luis; Devercelly, Richard; ROO hoc; Satorius, Mark; Schmidt, Rebecca; Sharkey, Jeffrey; Sheron, Brian; Snodderly, Michael; Sosa, Belkys; Speiser, Herald; Svinicki, Kristine; Thoma, John; Tiff, Doug; Kolb, Timothy; Ulises, Anthony; Nakanishi, Tony; Tracy, Glenn; Trapp; Trapp, James; Trojanowski, Robert; Uhle, Jennifer; Virgilio, Martin; Warnick, Greg; Warren, Roberta; Weber, Michael; Westreich, Barry; Wiggins, Jim; Cook, William; Williams, Kevin; Wittick, Brian; Woodruff, Gena; Zorn, Jason
Subject: 0630 EDT (March 16, 2011) USNRC Earthquake/Tsunami SitRep

Attached, please find a 0630 EDT situation report from the US Nuclear Regulatory Commission's Emergency Operations Center regarding the impacts of the earthquake/tsunami on March 16, 2011. This Update includes information on dose rates near Fukushima Daiichi, Fukushima Daiichi plant parameters, and NRC PMT hypothetical Worst Case Analyses. Please note that this information is "Official Use Only" and is only being shared within the federal family. Please call the Headquarters Operations Officer at 301-816-5100 with questions.

Yen Chen
US Nuclear Regulatory Commission
LIA07.HOC@nrc.gov (Operations Center)

CH/26

From: [Sheron, Brian](#)
To: [Case, Michael](#); [Coe, Doug](#); [Correia, Richard](#); [Gibson, Kathy](#); [Lui, Christiana](#); [Richards, Stuart](#); [Sangimino, Donna-Marie](#); [Scott, Michael](#); [Uhle, Jennifer](#); [Valentin, Andrea](#)
Subject: FW: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing
Date: Wednesday, March 16, 2011 7:41:00 AM
Attachments: [Japan Exercise Position Title March 15.docx](#)
[Japan Support.xlsx](#)

Here is the list of expertise the Op center is looking for.

From: Evans, Michele
Sent: Tuesday, March 15, 2011 5:53 PM
To: Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Muesse, Mary; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
Subject: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing

Everyone,

Please find attached 1) a list of current positions being staffed in the Ops Center and 2) the staff identified as available to support in Japan.

Regarding additional staff available to support in the ops center, the primary needs are for the specialized positions on the PMT and anyone with previous international experience in OIP.

Regarding support in Japan, please provide any updates/changes to the list by COB March 17. The target time frame for sending these staff members is March 27-April 9, so please consider that when considering staff to put on the list.

Thanks for your support.

Michele

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Positions being staffed in the Operations Center as of March 15, 2011

Liaison Team

LT Director
LT Coordinator
LT Federal Liaison (2)
LT Congressional Liaison (2)
LT International Liaison (2)

Protective Measures Team

PMTR Director
PMTR Coordinator
PMTR Protective Actions Assistant Director
PMTR RAAD (Radiological Assessment Assistant Director)
PMTR Dose Assessment (RASCAL)
RASCAL Developer
PMTR GIS Analyst (Geographical Information Systems)
PMTR Meteorologist

Reactor Safety Team

RST Director
RST Coordinator
Severe Accident / PRA
BWR Expert
RST Comm / ERDS Operator
RST Support (Seismology Q&A)

From: Sheron, Brian
To: Coe, Doug; Coyne, Kevin; Correia, Richard; Uhle, Jennifer
Subject: RE: IRC Staffing
Date: Wednesday, March 16, 2011 7:45:00 AM

Thanks.

From: Coe, Doug
Sent: Tuesday, March 15, 2011 8:10 PM
To: Sheron, Brian; Coyne, Kevin; Correia, Richard; Uhle, Jennifer
Subject: RE: IRC Staffing

Brian,
Kevin is canvassing DRA staff per your request, but upon my return on Monday I will be available for duty in any capacity needed. I have RST experience in the IRC and willing to work nights. Also willing to travel.
Doug

From: Sheron, Brian
Sent: Tuesday, March 15, 2011 5:27 PM
To: Coyne, Kevin; Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Cc: Dion, Jeanne
Subject: IRC Staffing

I participated on a conference call with other ODs and led by Michele Evans, acting deputy OD in NSIR at 4 pm today.

The purpose of the conference call was to discuss staffing for the IRC for the near future. The IRC is currently staffed with members of the Reactor safety team, the Protective Measures team, Liaison Team, etc. There is also an ET member there. None of the teams are at their full compliment. What Michele is looking for is people that can staff the IRC and relieve the staff that are currently there. She said they are currently running 3 shifts (11pm-7am, 7am – 3pm, and 3pm to 11 pm). They would like to find staff that can work shifts for 4 days in a row (I think she wants 4 days on, 3 days off). She said the staff do not have to have had IRC training.

Several of us said we would certainly canvas our staff to see who was qualified to work in the IRC and could work there, but we needed to know what technical disciplines they were looking for. Michele did not have a list of needed disciplines, but said she would generate one and send it out. As of 5:15 pm I have not received a list yet.

However, I am assuming they will be looking for staff with expertise in such areas as systems analysis, severe accidents, radiological dose assessment, etc. In anticipation that these are the technical disciplines of interest, can you please start identifying your staff that you believe have some of the requisite skills needed for the IRC, and start asking if they would be available to work shifts in the IRC if asked to. HR said they would be eligible for normal overtime compensation.

Also, they will be looking for staff to go to Japan and relieve the technical staff that recently went there. There were 2 BWR experts that left over the weekend, and a team of 9 more

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(6 engineers and 3 OIP staff) left yesterday. The thinking is that the staff that recently went over would come back in 2 weeks, which is when they want to send a replacement team over there. So please check to see if you have any staff with the proper technical credentials, are reasonably good communicators, and would be willing to spend about 2 weeks in Japan as part of the team there.

I will forward the list of desired disciplines as soon as I receive them from Michele. Michele said she will be looking for the list of potential IRC replacements by COB tomorrow (3/16/11), thus, I will need your candidates by mid-afternoon.

For the team that will replace the one that was just sent to Japan, she said she would like us to update the list we previously sent by COB 3/17.

From: Sheron, Brian
To: Wellock, Thomas
Subject: FW: Commission Action During the Chernobyl Accident
Date: Wednesday, March 16, 2011 7:59:00 AM

Tom, Mike Weber passed your e-mail exchange below to me.

FYI, I was actively involved in the agency's response to Chernobyl. Right after the accident, I spent a couple of weeks in the NRC's IRC, which was at that time located in the basement of the Maryland National Bank building in Bethesda. In August of 1986, when the Russians called a meeting at IAEA HQ in Vienna to announce to the world what actually happened, I was one of 4 technical staff that accompanied Harold Denton as part of the U.S. delegation, which was headed up by Ambassador Richard Kennedy. I authored the NRC sections in NUREG-1250 and participated on a subsequent NEA task group that wrote a report describing why western reactors could not explode like Chernobyl.

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

From: Weber, Michael
Sent: Tuesday, March 15, 2011 8:52 PM
To: Sheron, Brian
Cc: Muessle, Mary; Bowman, Gregory; Wiggins, Jim; Evans, Michele; McDermott, Brian; Virgilio, Martin; Burns, Stephen; Rothschild, Trip
Subject: FYI - Commission Action During the Chernobyl Accident

Thought you might be interested in this. too.

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

From: Vietti-Cook, Annette
To: Jaczko, Gregory; Borhardt, Bill
Cc: Burns, Stephen; Batkin, Joshua; Coggins, Angela; Virgilio, Martin; Weber, Michael
Sent: Tue Mar 15 20:07:22 2011
Subject: FW: Commission Action During the Chernobyl Accident

Commissioner Ostendorffs staff asked Tom Wellock what information may be available about what we did following the Chernobyl Accident. Tom quickly pulled together the information below, scroll down to beginning of the email, and had a brief exchange that may be useful to you in considering future actions. I hope this is helpful.

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

From: Wellock, Thomas
Sent: Tuesday, March 15, 2011 3:50 PM
To: Vietti-Cook, Annette
Subject: FW: Commission Action During the Chernobyl Accident

Annette,

Here is the exchange.

Tom

From: Zorn, Jason
Sent: Tuesday, March 15, 2011 4:48 PM
To: Wellock, Thomas
Subject: RE: Commission Action During the Chernobyl Accident

Tom

Thanks again. I provided this to the Commissioner, and he wanted me to pass on his personal thanks for this information. He has found it extremely helpful.

CH/29

Jason

From: Wellock, Thomas
Sent: Tuesday, March 15, 2011 4:24 PM
To: Zorn, Jason
Subject: RE: Commission Action During the Chernobyl Accident

I'm sure that is correct. By the time the world knew of Chernobyl, the accident was almost three days old. On this one, people can watch all three units explode over and over. But I'd add a couple other elements besides information technology:

(b)(5)

3) This accident goes right to the core of our DBA.

(b)(5)

(b)(5)

Right now CNN's webpage headline says the accident is "nearing the severity of Chernobyl." Hysteria fills the void of uncertainty.

Tom

From: Zorn, Jason
Sent: Tuesday, March 15, 2011 3:54 PM
To: Wellock, Thomas
Subject: RE: Commission Action During the Chernobyl Accident

Tom

This is extremely helpful, and I can't thank you enough for doing the research and putting this together for me. Seems like the response to that incident was significantly different than our current response. I can't help but wonder if the instantaneous availability of information had something to do with a more measured response in 1986. I'll let you know if I have any follow up questions from the Commissioner.

Jason

From: Wellock, Thomas
Sent: Tuesday, March 15, 2011 3:49 PM
To: Zorn, Jason
Subject: Commission Action During the Chernobyl Accident

Hi Jason,

I've scouted around and there is no narrative about what the Commission did right after the Chernobyl accident. But I have pieced it together from a number of documents. I chose to look at Chernobyl over 9/11 because of the similarity of the NRC having to respond to a nuclear event outside its borders, as we are doing in Japan. To summarize my findings, the NRC played a limited, supporting role in the federal response to the accident. Here is a timeline of agency actions over the first couple weeks following the accident on April 26, 1986.

April 26: Accident occurs.

April 28: First indications of airborne contamination outside the USSR found in Sweden.

April 29: Agency requests data from Swedish Nuclear Power Inspectorate. Congressman Edward Markey writes to NRC requesting the agency establish a task force to obtain information on the accident and

evaluate implications for U.S. program. Markey also wrote a letter to Secretary of State George Schultz requesting that the U.S. provide technical and medical assistance when requested by the Soviets. He also called for an international scientific panel to assess the accident.

May 1: The White House announced the formation of an interagency task force to assess the accident's impact on the environment, including the DOE, EPA, NRC, and others. Harold Denton, Director of NRR, represented the NRC. Lee Thomas, Administrator of the EPA, headed the task force. On the same day, the NRC established an Incident Tracking Team to collect information and support the Interagency Task Force. The Soviets refused offers of aid.

May 2: The NRC contacts all licensees requesting that they report anomalous readings in their radiation monitoring to the NRC. Results were to be shared with the task force and INPO.

May 5: Chairman Nunzio Paladino requested the EDO establish another team to perform a longer range study of the accident to determine what reforms might be needed in the U.S. Regulatory program.

May 13: Staff held a briefing of the Commission on the accident. While this is the first mention that I see of Commissioner involvement, there may have been earlier discussion among the Commissioners on this topic. I have requested the transcripts of earlier meetings from the Federal Records Center. They will likely arrive on Thursday.

The NRC issued three reports on the accident over the next six years, NUREGs 1250, 1251, and 1422. From these reports and the earlier actions, I think there are a couple things that are noteworthy given Commissioner Ostendorff's interest in what the Commission did during the accident.

- 1) Because of the delay in notification of the accident by the Soviets, the Soviet refusal of aid, Cold War relations, and the very different technology involved, the NRC played a supporting role to the EPA in the accident and even the State Department for a time. The accident was seen as an environmental threat to the United States, and so the EPA took a greater role. The early focus was on environmental monitoring. As a result, the NRC did not mobilize an emergency response as it is doing now.

- 2) NRC response was low key and largely reactive to requests by Markey and the White House.

- 3) What I find striking in the thrust of all of the reports and early responses is that they were mostly technical, focusing on differences in design, accident initiation, and implications for U.S. vendors, etc. No one seems to have asked the larger question the event raised of how the NRC should organize itself to respond to nuclear accidents outside US borders. This may have been discussed much later, but I think that the comparatively low-key non-controversial response of the federal government and the agency meant no flags were raised on this issue.

If you need me to look at 9/11 or have additional questions, let me know. I will also let you know what the Commission transcripts reveal when they arrive.

Tom

Thomas Wellock
Historian
U.S. Nuclear Regulatory Commission
O16G4
11555 Rockville Pike
Rockville, MD 20852
301-415-1965

From: Sheron, Brian
To: Uhle, Jennifer; Case, Michael; Richards, Stuart; Hogan, Rosemary; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael; Virgilio, Martin; Leeds, Eric; Grobe, Jack; Dean, Bill; Lew, David
Subject: FW: NBC deadline question for NRC on seismic hazard estimates
Date: Wednesday, March 16, 2011 8:09:00 AM

FYI. I imagine this should generate some new interest in IP.

From: Bill Dedman [mailto:Bill.Dedman@msnbc.com]
Sent: Wednesday, March 16, 2011 6:44 AM
To: Manoly, Kamal; Sheron, Brian; Hiland, Patrick; OPA Resource
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

This story is online now. If you see any error, please let me know right away.

Thanks,

Bill

http://www.msnbc.msn.com/id/42103936/ns/world_news-asiapacific/

From: Bill Dedman
Sent: Tuesday, March 15, 2011 9:06 AM
To: 'Kamal.Manoly@nrc.gov'; 'brian.sheron@nrc.gov'; 'patrick.hiland@nrc.gov'; 'OPA.Resource@nrc.gov'
Subject: NBC deadline question for NRC on seismic hazard estimates

Good morning,

My name is Bill Dedman. I'm a reporter for NBC News and msnbc.com, writing an article today about:

SAFETY/RISK ASSESSMENT RESULTS FOR GENERIC ISSUE 199, "IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES ON EXISTING PLANTS"

I reached out to NRC Public Affairs yesterday but have not heard back, and my deadline is end-of-day today. I'm hoping to get on the phone today with someone from NRC to make sure I'm conveying this information accurately to the public. If nothing else, I'm hoping one of the technical people can help clarify the points below. My telephone number is 203-451-9995.

I've read Director Brian Sheron's memo of Sept. 2, 2010, to Mr. Patrick Hiland; the safety/risk assessment of August 2010; its appendices A through D; NRC Information Notice 2010-18; and the fact sheet from public affairs from November 2010.

I have these questions:

1. I'd like to make sure that I accurately place in layman's terms the seismic hazard estimates. I

CH/30

need to make sure that I'm understanding the nomenclature for expressing the seismic core-damage frequencies. Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-06} , or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct?

2. These documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the Central and Eastern U.S. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the Western U.S.?

3. The documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment."

4. What is the timetable now for consideration of any regulatory changes from this research?

Thank you for your help.

Regards,

Bill Dedman

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From: [Sheron, Brian](#)
To: [Case, Michael](#); [Uhle, Jennifer](#)
Cc: [Richards, Stuart](#)
Subject: RE: FYI - Current Status of CR3
Date: Wednesday, March 16, 2011 8:15:00 AM

Then again, I hear those sounds every morning when I get out of bed.....

From: Case, Michael
Sent: Wednesday, March 16, 2011 8:06 AM
To: Sheron, Brian; Uhle, Jennifer
Cc: Richards, Stuart
Subject: RE: FYI - Current Status of CR3

That's for sure. It was pretty early in the information stream, so Herman didn't want to speculate too much other than to note that there is probably some delamination (cracking) going on somewhere...

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 8:03 AM
To: Case, Michael; Uhle, Jennifer
Cc: Richards, Stuart
Subject: RE: FYI - Current Status of CR3

Popping sounds from the containment? My guess is that is not a good thing. Noise from the containment is also probably not a good thing either.....

From: Case, Michael
Sent: Wednesday, March 16, 2011 7:49 AM
To: Sheron, Brian; Uhle, Jennifer
Cc: Richards, Stuart
Subject: FW: FYI - Current Status of CR3

FYI. Update on Crystal River containment.

From: Graves, Herman
Sent: Tuesday, March 15, 2011 11:11 AM
To: Case, Michael
Cc: Hogan, Rosemary
Subject: FW: FYI - Current Status of CR3

Mike,

Here's what we know about CR3 .

<<Herman>>

<<301.251.7625>>

[mail to: Herman.Graves@nrc.gov](mailto:Herman.Graves@nrc.gov)

From: Khanna, Meena
Sent: Tuesday, March 15, 2011 11:05 AM
To: Graves, Herman

CA/31

Cc: Farzam, Farhad; Thomas, George; Manoly, Kamal; Auluck, Rajender; Kuntz, Robert; Pham, Bo; Sheikh, Abdul
Subject: FYI - Current Status of CR3

From Region II PITA regarding Crystal River Unit 3 status:

Current Status: Tensioning is on hold. After completion of the first sequence (sequence 100 of 112) of Pass 11, the acoustic monitors at the upper level of Bay 5-6 began picking up a noise signal. The noise signals transitioned downward to the lower acoustic monitors. The signals from the three embedded strain gages in Bay 5-6 slowly increase then failed. Workers on the containment roof heard popping sounds. Workers outside of Bay 5-6 heard noise coming from the containment. The licensee implemented their contingency plan. Impulse response (IR) testing is ongoing and should be completed later on March 15. Laser scan measurements inside containment were completed last night. Preliminary IR results indicate a delamination in Bay 5-6 of which the extent is not yet determined. Bay 5-6 is adjacent to the spent fuel pool and contains the two transfer tubes. For the current Mode, containment integrity only relies on an intact containment liner. There is currently no impact on the spent fuel pool, however the licensee is still reviewing any potential impacts to the pool. The inspectors walked down the outside of Bay 5-6 and did not see any noticeable cracking. The inspectors will follow-up on the licensee's review with respect to the spent fuel pool.

Thanks,

Meena Khanna, Branch Chief
Mechanical and Civil Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation
(301)415-2150
meena.khanna@nrc.gov

From: Sheron, Brian
To: Muessle, Mary
Subject: FW: iLearn Course Due Date Notification
Date: Wednesday, March 16, 2011 8:30:00 AM

From: do_not_reply@ilearnnrc.plateau.com [mailto:do_not_reply@ilearnnrc.plateau.com]
Sent: Wednesday, March 16, 2011 3:32 AM
To: Sheron, Brian
Subject: iLearn Course Due Date Notification

Name	Course	Due Date	Curriculum
LUI, CHRISTIANA H	Course Ethics Training Required in 2011 for Employees who File SF-278 (Web-Based)	5/31/2011 11:59 PM ET	
MUESSLE, MARY C	Course Ethics Training Required in 2011 for Employees who File SF-278 (Web-Based)	5/31/2011 11:59 PM ET	

Why did you get this message?

Users: You received this message because course(s) with due dates were added to your iLearn Learning Plan. This message is initially sent 90 days prior to the course(s) due date and will continue every 21 days until you complete the above course(s) or the course(s) are removed from your Learning Plan.

For information on how courses are added to or removed from your Learning Plan please contact your training coordinator.

Supervisors: You received this message because the indicated employee(s) have course(s) with due dates on their iLearn Learning Plan. This message is initially sent 90 days prior to the course(s) due date and will continue every 21 days until the above course(s) are completed or removed from the user's Learning Plan.

For information on how you can view your employee's upcoming training in iLearn, please refer to the Supervisor's job aid on using the My Employees Dashboard:
https://ilearnnrc.plateau.com/content/nrc/help_guide/docs/output/supervisor/employees_dashboard.html

For additional information please contact your training coordinator.
The name and contact information for training coordinators may be found at:
<http://papaya.nrc.gov/Training/coordinators.cfm>

Please tell us whether this notification was helpful by clicking on the following link.
<https://www.surveymonkey.com/s/6M25CCR>

Please DO NOT REPLY. This email address is automated and unattended

[Go to Learning Plan](#) | [Go to Current Registrations](#)

CH/32

From: Sheron, Brian
To: Wellock, Thomas
Subject: RE: Commission Action During the Chernobyl Accident
Date: Wednesday, March 16, 2011 8:45:00 AM

Another potential source of information is Carlton Stoiber. I think Carlton was the Director of the Office International programs at the time, and came with us to Vienna in August of 1986. I believe he is still in the area, but have no idea where or how to contact him. Someone in OIP may know.

Jim Asselstine was a Commissioner at the time. I have not spoken with him a long time, but after he left the Commission he went to work for the now-defunct Lehmann Bros. Investment firm up in NYC. I have no idea where he is now, or what he is doing, but he is a potential source of info if you can find him.

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

From: Wellock, Thomas
Sent: Wednesday, March 16, 2011 8:37 AM
To: Sheron, Brian
Subject: RE: Commission Action During the Chernobyl Accident

That's a good idea. I've interviewed Harold on some other issues, so I should probably give him a call on this. What is missing in the record right now is any discussion, I assume, between Palladino and the White House, and whether he talked to the other Commissioners. There was a Commission meeting on May 1, but I won't have those transcripts till Thursday. Harold could probably fill me in more on any informal discussions that were held in setting up a response.

Tom

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 8:28 AM
To: Wellock, Thomas
Subject: RE: Commission Action During the Chernobyl Accident

Only problem is that it was 25 years ago. I don't recall that the Commission did a whole lot, primarily because we really didn't have any information for a long time on what actually caused the accident. Because of this, it was hard to evaluate if the causes had any nexus to U.S. plants. The major contributor that was considered to have some common elements with U.S reactors was the safety culture aspect.

BTW, Harold Denton called me last night. He said he was getting some calls from reporters, and when they asked him questions about NRC's position or opinion on this or that, he referred them to me, since I'm one of the few people left in the agency that he knows and worked with. He lives in Tennessee and I have his phone number. You might want to call him and pick his brain about what he remembers. At the time, I was a deputy division director, and he was the NRR office director, so he had a lot more interaction with the Commission at that time than I did, and he may remember more about what the Commission did than I do. His home phone is (b)(6)

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

From: Wellock, Thomas
Sent: Wednesday, March 16, 2011 8:13 AM
To: Sheron, Brian
Subject: RE: Commission Action During the Chernobyl Accident

Hi Brian,

Yes, and I saw that you gave a presentation on the NRC response to Chernobyl in the fall of 1986, I believe, but I wasn't able to put my hands on a copy of it yesterday. Is it mostly a condensation of the NRC chapters in NUREG-1250? You know, it might be good to get your recollections down on this

CH/33

topic. Commissioner Ostendorff was mostly interested in how the Commission responded, as opposed to staff actions. Perhaps we should do a relatively short interview on the full NRC response at some point?

Tom

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 7:59 AM
To: Wellock, Thomas
Subject: FW: Commission Action During the Chernobyl Accident

Tom, Mike Weber passed your e-mail exchange below to me.

FYI, I was actively involved in the agency's response to Chernobyl. Right after the accident, I spent a couple of weeks in the NRC's IRC, which was at that time located in the basement of the Maryland National Bank building in Bethesda. In August of 1986, when the Russians called a meeting at IAEA HQ in Vienna to announce to the world what actually happened, I was one of 4 technical staff that accompanied Harold Denton as part of the U.S. delegation, which was headed up by Ambassador Richard Kennedy. I authored the NRC sections in NUREG-1250 and participated on a subsequent NEA task group that wrote a report describing why western reactors could not explode like Chernobyl.

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

From: Weber, Michael
Sent: Tuesday, March 15, 2011 8:52 PM
To: Sheron, Brian
Cc: Muessele, Mary; Bowman, Gregory; Wiggins, Jim; Evans, Michele; McDermott, Brian; Virgilio, Martin; Burns, Stephen; Rothschild, Trip
Subject: FYI - Commission Action During the Chernobyl Accident

Thought you might be interested in this. too.

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

From: Vietti-Cook, Annette
To: Jaczko, Gregory; Borchart, Bill
Cc: Burns, Stephen; Batkin, Joshua; Coggins, Angela; Virgilio, Martin; Weber, Michael
Sent: Tue Mar 15 20:07:22 2011
Subject: FW: Commission Action During the Chernobyl Accident

Commissioner Ostendorff's staff asked Tom Wellock what information may be available about what we did following the Chernobyl Accident. Tom quickly pulled together the information below, scroll down to beginning of the email, and had a brief exchange that may be useful to you in considering future actions. I hope this is helpful.

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

From: Wellock, Thomas
Sent: Tuesday, March 15, 2011 3:50 PM
To: Vietti-Cook, Annette
Subject: FW: Commission Action During the Chernobyl Accident

Annette,

Here is the exchange.

Tom

From: Zorn, Jason
Sent: Tuesday, March 15, 2011 4:48 PM
To: Wellock, Thomas
Subject: RE: Commission Action During the Chernobyl Accident

Tom

Thanks again. I provided this to the Commissioner, and he wanted me to pass on his personal thanks for this information. He has found it extremely helpful.

Jason

From: Wellock, Thomas
Sent: Tuesday, March 15, 2011 4:24 PM
To: Zorn, Jason
Subject: RE: Commission Action During the Chernobyl Accident

I'm sure that is correct. By the time the world knew of Chernobyl, the accident was almost three days old. On this one, people can watch all three units explode over and over. But I'd add a couple other elements besides information technology:

- 1) The design connection to US reactors seems obvious. It isn't hard to imagine Daiichi 1 as Oyster Creek sitting on the ocean. In 1986, I think the public accepted quickly that our reactors were different from the Russians.
- 2) The regulatory connection seems obvious, too. Japan is an advanced economy with a mature regulatory system, and it still didn't work.
- 3) This accident goes right to the core of our DBA.
- 4) If the claims are correct that the Japanese regulators have not handled information sharing well, it reminds me all too much of the NRC's poor handling of TMI. Right now CNN's webpage headline says the accident is "nearing the severity of Chernobyl." Hysteria fills the void of uncertainty.

Tom

From: Zorn, Jason
Sent: Tuesday, March 15, 2011 3:54 PM
To: Wellock, Thomas
Subject: RE: Commission Action During the Chernobyl Accident

Tom

This is extremely helpful, and I can't thank you enough for doing the research and putting this together for me. Seems like the response to that incident was significantly different than our current response. I can't help but wonder if the instantaneous availability of information had something to do with a more measured response in 1986. I'll let you know if I have any follow up questions from the Commissioner.

Jason

From: Wellock, Thomas
Sent: Tuesday, March 15, 2011 3:49 PM
To: Zorn, Jason
Subject: Commission Action During the Chernobyl Accident

Hi Jason,

I've scouted around and there is no narrative about what the Commission did right after the Chernobyl accident. But I have pieced it together from a number of documents. I chose to look at Chernobyl over 9/11 because of the similarity of the NRC having to respond to a nuclear event outside its borders, as we are doing in Japan. To summarize my findings, the NRC played a limited, supporting role in the federal response to the accident. Here is a timeline of agency actions over the first couple weeks following the accident on April 26, 1986.

April 26: Accident occurs.

April 28: First indications of airborne contamination outside the USSR found in Sweden.

April 29: Agency requests data from Swedish Nuclear Power Inspectorate. Congressman Edward Markey writes to NRC requesting the agency establish a task force to obtain information on the accident and evaluate implications for U.S. program. Markey also wrote a letter to Secretary of State George Schultz requesting that the U.S. provide technical and medical assistance when requested by the Soviets. He also called for an international scientific panel to assess the accident.

May 1: The White House announced the formation of an interagency task force to assess the accident's impact on the environment, including the DOE, EPA, NRC, and others. Harold Denton, Director of NRR, represented the NRC. Lee Thomas, Administrator of the EPA, headed the task force. On the same day, the NRC established an Incident Tracking Team to collect information and support the Interagency Task Force. The Soviets refused offers of aid.

May 2: The NRC contacts all licensees requesting that they report anomalous readings in their radiation monitoring to the NRC. Results were to be shared with the task force and INPO.

May 5: Chairman Nunzio Paladino requested the EDO establish another team to perform a longer range study of the accident to determine what reforms might be needed in the U.S. Regulatory program.

May 13: Staff held a briefing of the Commission on the accident. While this is the first mention that I see of Commissioner involvement, there may have been earlier discussion among the Commissioners on this topic. I have requested the transcripts of earlier meetings from the Federal Records Center. They will likely arrive on Thursday.

The NRC issued three reports on the accident over the next six years, NUREGs 1250, 1251, and 1422. From these reports and the earlier actions, I think there are a couple things that are noteworthy given Commissioner Ostendorff's interest in what the Commission did during the accident.

- 1) Because of the delay in notification of the accident by the Soviets, the Soviet refusal of aid, Cold War relations, and the very different technology involved, the NRC played a supporting role to the EPA in the accident and even the State Department for a time. The accident was seen as an environmental threat to the United States, and so the EPA took a greater role. The early focus was on environmental monitoring. As a result, the NRC did not mobilize an emergency response as it is doing now.
- 2) NRC response was low key and largely reactive to requests by Markey and the White House.
- 3) What I find striking in the thrust of all of the reports and early responses is that they were mostly technical, focusing on differences in design, accident initiation, and implications for U.S. vendors, etc. No one seems to have asked the larger question the event raised of how the NRC should organize itself to respond to nuclear accidents outside US borders. This may have been discussed much later, but I think that the comparatively low-key non-controversial response of the federal government and the agency meant no flags were raised on this issue.

If you need me to look at 9/11 or have additional questions, let me know. I will also let you know what the Commission transcripts reveal when they arrive.

Tom

Thomas Wellock
Historian
U.S. Nuclear Regulatory Commission
O16G4
11555 Rockville Pike
Rockville, MD 20852
301-415-1965

From: Sheron, Brian
To: Dean, Bill
Subject: RE: NBC deadline question for NRC on seismic hazard estimates
Date: Wednesday, March 16, 2011 10:12:00 AM

Yep. But that's why you're paid the big bucks.....

From: Dean, Bill
Sent: Wednesday, March 16, 2011 8:38 AM
To: Sheron, Brian
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

Thanks Brian. I know this is a fun time for all of us. I know you can imagine the ground swell of interest here in the Northeast

Bill

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 8:37 AM
To: Dean, Bill; Uhle, Jennifer; Case, Michael; Richards, Stuart; Hogan, Rosemary; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael; Virgilio, Martin; Leeds, Eric; Grobe, Jack; Lew, David
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

Yes, seismic folks have been working on Q&As. I need to check and see if they are working on any that will address the stuff in this article.

From: Dean, Bill
Sent: Wednesday, March 16, 2011 8:35 AM
To: Sheron, Brian; Uhle, Jennifer; Case, Michael; Richards, Stuart; Hogan, Rosemary; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael; Virgilio, Martin; Leeds, Eric; Grobe, Jack; Lew, David
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

Brian,

I Assume that our team in HQ is working up proper communications for this that we can leverage. I know there is an existing comm. plan for GSI 199, but my guess it likely needs to be updated in light of current events.

Bill

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 8:10 AM
To: Uhle, Jennifer; Case, Michael; Richards, Stuart; Hogan, Rosemary; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael; Virgilio, Martin; Leeds, Eric; Grobe, Jack; Dean, Bill; Lew, David
Subject: FW: NBC deadline question for NRC on seismic hazard estimates

FYI. I imagine this should generate some new interest in IP.

From: Bill Dedman [mailto:Bill.Dedman@msnbc.com]
Sent: Wednesday, March 16, 2011 6:44 AM

CH/34

To: Manoly, Kamal; Sheron, Brian; Hiland, Patrick; OPA Resource
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

This story is online now. If you see any error, please let me know right away.

Thanks,

Bill

http://www.msnbc.msn.com/id/42103936/ns/world_news-asiapacific/

From: Bill Dedman
Sent: Tuesday, March 15, 2011 9:06 AM
To: 'Kamal.Manoly@nrc.gov'; 'brian.sheron@nrc.gov'; 'patrick.hiland@nrc.gov'; 'OPA.Resource@nrc.gov'
Subject: NBC deadline question for NRC on seismic hazard estimates

Good morning,

My name is Bill Dedman. I'm a reporter for NBC News and msnbc.com, writing an article today about:

SAFETY/RISK ASSESSMENT RESULTS FOR GENERIC ISSUE 199, "IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES ON EXISTING PLANTS"

I reached out to NRC Public Affairs yesterday but have not heard back, and my deadline is end-of-day today. I'm hoping to get on the phone today with someone from NRC to make sure I'm conveying this information accurately to the public. If nothing else, I'm hoping one of the technical people can help clarify the points below. My telephone number is 203-451-9995.

I've read Director Brian Sheron's memo of Sept. 2, 2010, to Mr. Patrick Hiland; the safety/risk assessment of August 2010; its appendices A through D; NRC Information Notice 2010-18; and the fact sheet from public affairs from November 2010.

I have these questions:

1. I'd like to make sure that I accurately place in layman's terms the seismic hazard estimates. I need to make sure that I'm understanding the nomenclature for expressing the seismic core-damage frequencies. Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-06} , or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct?
2. These documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the Central and Eastern U.S. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the Western U.S.?

3. The documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment."

4. What is the timetable now for consideration of any regulatory changes from this research?

Thank you for your help.

Regards,

Bill Dedman

This e-mail message and attached documents are confidential; intended only for the named recipient(s) above and may contain information that is privileged, confidential, proprietary, and/or exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, you are hereby notified that any unauthorized use, dissemination, distribution or copy of this communication is strictly prohibited. No waiver of privilege, confidence or otherwise is intended by virtue of this communication. If you have received this message in error, or are not the named recipient(s), please immediately notify the sender, destroy all copies and delete this e-mail message from your computer. Thank you.

From: [Sheron, Brian](#)
To: Diane.JACKSON@oecd.org; [Borchardt, Bill](#); [Uhle, Jennifer](#)
Cc: Javier.REIG@oecd.org; Janice.DUNNLEE@oecd.org
Subject: RE: GRS request for MELCOR input deck for Mark 1
Date: Wednesday, March 16, 2011 10:20:00 AM

Diane, Kathy Gibson said that we are checking with the Peach Bottom plant to see if we can release the Peach Bottom MELCOR deck, since it is proprietary.

However, we have already completed consequence analyses for Peach Bottom as part of SOARCA. Would GRS be interested in the SOARCA Results, since the severe accident analyses are already done?

From: Diane.JACKSON@oecd.org [mailto:Diane.JACKSON@oecd.org]
Sent: Wednesday, March 16, 2011 8:53 AM
To: [Borchardt, Bill](#); [Sheron, Brian](#); [Uhle, Jennifer](#)
Cc: Javier.REIG@oecd.org; Janice.DUNNLEE@oecd.org
Subject: GRS request for MELCOR input deck for Mark 1

Dear Bill, Brian, and Jennifer –

Dr. Peter Weiss, GRS Director General, is seeking some assistance from the US NRC. As you know, the German government has ordered the shutdown of seven German reactors built before 1980.


Dr. Weiss would like to inject analysis into the argument. He is seeking an input deck for Mark 1 containment for MELCOR.

If NRC would be able to share this with GRS, please let us know. I have included others on cc: for coordination. If the NRC would like to contact GRS directly, here is Dr. Weiss' direct contact information:

frank-peter.weiss@grs.de
+49 221 2068 706 (Cologne office)
+49 893 2004 100 (office number)

Of course, you can always go through NEA if that is more convenient. I know, you also have a full plate dealing with the Japanese event.

Best regards,

 **Diane Jackson**, Nuclear Safety Specialist
Nuclear Safety Division, OECD Nuclear Energy Agency (NEA)
Tel.: +33 (0)1 45 24 10 55, Diane.Jackson@oecd.org
Update your bookmarks! On 1 December 2010, the NEA is moving to: www.oecd-nea.org

CH/35

From: Sheron, Brian
To: Valentin, Andrea; Sangimino, Donna-Marie
Subject: FW: Additional Staff requirements outside Ops Center Long Term Staffing
Date: Wednesday, March 16, 2011 10:28:00 AM
Importance: High

Recommendations?

From: Muessle, Mary
Sent: Wednesday, March 16, 2011 9:32 AM
To: Evans, Michele; Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
Cc: Williams, Shawn; Andersen, James; Ramsey, Jack
Subject: Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

OPA and OIP expect large call volumes today and in the next few weeks given expected news from Japan. OIP is looking for names of people who have desk officer or other OIP or international experience to assist them in the event that current staff cannot meet the work demands for call inquiries as well as ongoing international work. Please provide Shawn Williams and I a list of names that could serve to help OIP in this capacity and their general availability over the next week and month. It is difficult to determine the need level at this time, but as in the Op Center, it is anticipated OIP will have for an additional month. We would like the list of names by COB today.

Thanks

Mary

Mary Muessle
Assistant for Operations - Acting
Office of the Executive Director for Operations
U.S. Nuclear Regulatory Commission
301-415-1703 office
301-415-2700 fax

From: Evans, Michele
Sent: Tuesday, March 15, 2011 5:53 PM
To: Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius,

CH/36

Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Muessle, Mary; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Mary; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald

Subject: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing

Everyone,

Please find attached 1) a list of current positions being staffed in the Ops Center and 2) the staff identified as available to support in Japan.

Regarding additional staff available to support in the ops center, the primary needs are for the specialized positions on the PMT and anyone with previous international experience in OIP.

Regarding support in Japan, please provide any updates/changes to the list by COB March 17. The target time frame for sending these staff members is March 27-April 9, so please consider that when considering staff to put on the list.

Thanks for your support.

Michele

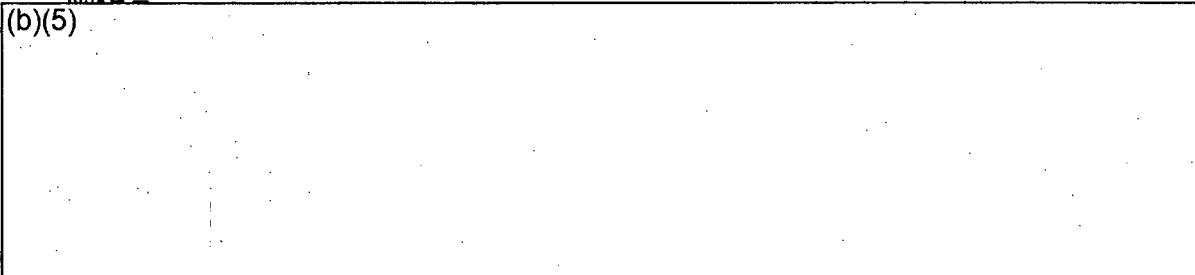
From: Sheron, Brian
To: Dion, Jeanne
Subject: FW: Don Helton's Contact Information
Date: Wednesday, March 16, 2011 10:30:00 AM

Put this info on the list.

From: Coyne, Kevin
Sent: Wednesday, March 16, 2011 9:57 AM
To: Case, Michael
Cc: Sheron, Brian; Uhle, Jennifer; Hasselberg, Rick; Brandon, Lou; Kuritzky, Alan; Marksberry, Don; Gibson, Kathy; Tinkler, Charles; Schaperow, Jason
Subject: Don Helton's Contact Information

Mike

(b)(5)



Kevin

CH/37

From: Sheron, Brian
To: Coyne, Kevin
Subject: FW: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing
Date: Wednesday, March 16, 2011 10:32:00 AM
Attachments: Japan Exercise Position Title March 15.docx
Japan Support.xlsx

From: Evans, Michele
Sent: Tuesday, March 15, 2011 5:53 PM
To: Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Muessle, Mary; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
Subject: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing

Everyone,

Please find attached 1) a list of current positions being staffed in the Ops Center and 2) the staff identified as available to support in Japan.

Regarding additional staff available to support in the ops center, the primary needs are for the specialized positions on the PMT and anyone with previous international experience in OIP.

Regarding support in Japan, please provide any updates/changes to the list by COB March 17. The target time frame for sending these staff members is March 27-April 9, so please consider that when considering staff to put on the list.

Thanks for your support.

Michele

C41/38

Positions being staffed in the Operations Center as of March 15, 2011

Liaison Team

LT Director
LT Coordinator
LT Federal Liaison (2)
LT Congressional Liaison (2)
LT International Liaison (2)

Protective Measures Team

PMTR Director
PMTR Coordinator
PMTR Protective Actions Assistant Director
PMTR RAAD (Radiological Assessment Assistant Director)
PMTR Dose Assessment (RASCAL)
RASCAL Developer
PMTR GIS Analyst (Geographical Information Systems)
PMTR Meteorologist

Reactor Safety Team

RST Director
RST Coordinator
Severe Accident / PRA
BWR Expert
RST Comm / ERDS Operator
RST Support (Seismology Q&A)

From: Sheron, Brian
To: Sangimino, Donna-Marie
Cc: Valentin, Andrea; Dion, Jeanne
Subject: RE: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing
Date: Wednesday, March 16, 2011 10:35:00 AM

Send me the names. We are getting two requests from two different sources, and I'm not sure they are talking to each other.

From: Sangimino, Donna-Marie
Sent: Wednesday, March 16, 2011 9:52 AM
To: Sheron, Brian
Cc: Valentin, Andrea; Dion, Jeanne
Subject: FW: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

Brian,

As discussed at our 845, I'll forward proposed names suitable for assisting OIP and the international liaison position at the Ops Ctr to Jeanne by 3pm today.

Donna-Marie

From: Williams, Shawn
Sent: Wednesday, March 16, 2011 9:34 AM
To: ICWG
Subject: FW: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

fyi

From: Muessle, Mary
Sent: Wednesday, March 16, 2011 9:32 AM
To: Evans, Michele; Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
Cc: Williams, Shawn; Andersen, James; Ramsey, Jack
Subject: Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

CH/39

OPA and OIP expect large call volumes today and in the next few weeks given expected news from Japan. OIP is looking for names of people who have desk officer or other OIP or international experience to assist them in the event that current staff cannot meet the work demands for call inquiries as well as ongoing international work. Please provide Shawn Williams and I a list of names that could serve to help OIP in this capacity and their general availability over the next week and month. It is difficult to determine the need level at this time, but as in the Op Center, it is anticipated OIP will have for an additional month. We would like the list of names by COB today.

Thanks

Mary

Mary Muessle

Assistant for Operations - Acting

Office of the Executive Director for Operations

U.S. Nuclear Regulatory Commission

301-415-1703 office

301-415-2700 fax

From: Evans, Michele

Sent: Tuesday, March 15, 2011 5:53 PM

To: Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Muessle, Mary; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald

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Thanks for your support.

Michele

From: Sheron, Brian
To: Valentin, Andrea; Sangimino, Donna-Marie
Subject: FW: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing
Date: Wednesday, March 16, 2011 10:42:00 AM
Attachments: [Japan Exercise Position Title March 15.docx](#)
[Japan Support.xlsx](#)

FYI.

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 10:41 AM
To: Muessle, Mary
Subject: FW: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing

Mary, you sent out a request asking for people with IP experience who could help out OIP. Attached is a request from NSIR asking us to provide people with IP experience for the IRC. I only have two people-Donna and Jeff. I need at least one here. That leaves just one. Who has priority?

From: Evans, Michele
Sent: Tuesday, March 15, 2011 5:53 PM
To: Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Muessle, Mary; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
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Thanks for your support.

Michele

CAH/40

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LT Coordinator
LT Federal Liaison (2)
LT Congressional Liaison (2)
LT International Liaison (2)

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PMTR Dose Assessment (RASCAL)
RASCAL Developer
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PMTR Meteorologist

Reactor Safety Team

RST Director
RST Coordinator
Severe Accident / PRA
BWR Expert
RST Comm / ERDS Operator
RST Support (Seismology Q&A)

From: [Sheron, Brian](#)
To: [Gibson, Kathy](#); [Scott, Michael](#)
Subject: FW: GRS request for MELCOR input deck for Mark 1
Date: Wednesday, March 16, 2011 11:00:00 AM

From: Weiß, Frank-Peter Prof. Dr. [<mailto:Frank-Peter.Weiss@grs.de>]
Sent: Wednesday, March 16, 2011 10:51 AM
To: Diane.JACKSON@oecd.org; [Sheron, Brian](#); [Uhle, Jennifer](#)
Cc: Axel.BREEST@oecd.org
Subject: AW: GRS request for MELCOR input deck for Mark 1

Thank you all!

Yes, we are interested in the results of the Peach Bottom SOARCA results!

Regards

Frank-Peter

Prof. Dr. rer. nat. Frank-Peter Weiss
Wissenschaftlich-technischer Geschäftsführer / Scientific-technical Director
Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH
Forschungszentrum, Boltzmannstr. 14
85748 Garching bei München / near Munich
Deutschland / Germany
Tel.: +49 89 32004-100
Fax: +49 89 32004-500
E-mail: Frank-Peter.Weiss@grs.de
Internet: <http://www.grs.de>

Vorsitzender des Aufsichtsrates: Parl. Staatssekretärin Ursula Heinen-Esser
Geschäftsführer: Prof. Dr. Frank-Peter Weiß, Hans J. Steinhauer
Registergericht: Amtsgericht Koeln, HRB 7665 Sitz der Gesellschaft: Köln


Disclaimer

Von: Diane.JACKSON@oecd.org [<mailto:Diane.JACKSON@oecd.org>]
Gesendet: Mittwoch, 16. März 2011 15:44
An: Brian.Sheron@nrc.gov; Jennifer.Uhle@nrc.gov
Cc: Weiß, Frank-Peter Prof. Dr.; Axel.BREEST@oecd.org
Betreff: RE: GRS request for MELCOR input deck for Mark 1

Dear Brian –

Thank you for the quick response. Yes, Dr. Weiss would very much appreciate the SOARCA results for Peach Bottom.

Best regards,

 **Diane Jackson**, Nuclear Safety Specialist
Nuclear Safety Division, OECD Nuclear Energy Agency (NEA)
Tel.: +33 (0)1 45 24 10 55, Diane.Jackson@oecd.org

From: Sheron, Brian [<mailto:Brian.Sheron@nrc.gov>]
Sent: Wednesday, March 16, 2011 15:21
To: [JACKSON Diane, NEA/SURN](#); [Borchardt, Bill](#); [Uhle, Jennifer](#)

CA/41

Cc: REIG Javier, NEA/SURN; DUNN LEE Janice, NEA
Subject: RE: GRS request for MELCOR input deck for Mark 1

Diane, Kathy Gibson said that we are checking with the Peach Bottom plant to see if we can release the Peach Bottom MELCOR deck, since it is proprietary.

However, we have already completed consequence analyses for Peach Bottom as part of SOARCA. Would GRS be interested in the SOARCA Results, since the severe accident analyses are already done?

From: [Sheron, Brian](#)
To: [Hudson, Jody](#)
Subject: RE: iLearn Course Due Date Notification
Date: Wednesday, March 16, 2011 11:00:00 AM

OK, thanks. Not sure why she chose me, unless she did it before she moved to NSIR.

From: Hudson, Jody
Sent: Wednesday, March 16, 2011 10:53 AM
To: Sheron, Brian
Subject: RE: iLearn Course Due Date Notification

Hi Brian,

The reason you received the i-Learn email is because Chris Lui selected you as the approver. The approver has a drop down menu for employees to select the appropriate approver.

We will communicate to Chris that going forward he should select his current manager under his detail as the approver. Hopefully that will prevent future occurrences.

Regards

Jody Hudson

Chief Learning Officer
Human Resources Training & Development
U.S. Nuclear Regulatory Commission
Mailstop: GW-4A01
301-492-2215

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 8:31 AM
To: Hudson, Jody
Subject: FW: iLearn Course Due Date Notification

Can you tell your ilearn person that Chris Lui doesn't work for me anymore. She reports to Jim Wiggins, but is currently on detail to Commissioner Apostolakis' office. Thanks.

From: do_not_reply@ilearnnrc.plateau.com [mailto:do_not_reply@ilearnnrc.plateau.com]
Sent: Wednesday, March 16, 2011 3:32 AM
To: Sheron, Brian
Subject: iLearn Course Due Date Notification

Name	Course	Due Date	Curriculum
LUI, CHRISTIANA H	Course Ethics Training Required in 2011 for Employees who File SF-278 (Web-Based)	5/31/2011 11:59 PM ET	
MUESSLE, MARY C	Course Ethics Training Required in 2011 for Employees who File SF-278 (Web-Based)	5/31/2011 11:59 PM ET	

Why did you get this message?

Users: You received this message because course(s) with due dates were added to your iLearn Learning Plan. This message is initially sent 90 days prior to the course(s) due date and will continue every 21 days until you complete the above course(s) or the course(s) are removed from your Learning Plan.

For information on how courses are added to or removed from your Learning Plan please contact your training

CA/42

coordinator.

Supervisors: You received this message because the indicated employee(s) have course(s) with due dates on their iLearn Learning Plan. This message is initially sent 90 days prior to the course(s) due date and will continue every 21 days until the above course(s) are completed or removed from the user's Learning Plan.

For information on how you can view your employee's upcoming training in iLearn, please refer to the Supervisor's job aid on using the My Employees Dashboard:
https://ilearnnrc.plateau.com/content/nrc/help_guide/docs/output/supervisor/employees_dashboard.html

For additional information please contact your training coordinator.
The name and contact information for training coordinators may be found at:
<http://papaya.nrc.gov/Training/coordinators.cfm>

Please tell us whether this notification was helpful by clicking on the following link.
<https://www.surveymonkey.com/s/6M25CCR>

Please DO NOT REPLY. This email address is automated and unattended

[Go to Learning Plan](#) | [Go to Current Registrations](#)

From: [Sheron, Brian](#)
To: [Dion, Jeanne](#)
Subject: RE: MIT course
Date: Wednesday, March 16, 2011 11:25:00 AM

Let's discuss.

From: Dion, Jeanne
Sent: Wednesday, March 16, 2011 11:03 AM
To: Sheron, Brian
Subject: MIT course

Brian,

We have an internal ticket (re-occurring annually) to update the MIT course slides. Are you still providing slides for this course this year? If so are there any topics you want to focus on more? The current slides are very similar to the What it is What it does presentation.

Thanks,

Jeanne

CH/43

From: [Sheron, Brian](#)
To: [Gibson, Kathy](#)
Subject: RE:
Date: Wednesday, March 16, 2011 11:40:00 AM

Mike called and asked me if it was OK to talk to NEI. The issue was that we consider the tests as OUO. If that is the case, then I need a legal basis to discuss the results with just NEI and not with the public. I suggested to Mike that he talk with OGC.

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

From: Gibson, Kathy
Sent: Wednesday, March 16, 2011 11:18 AM
To: Sheron, Brian
Subject: Fw:

This is interesting - recall my mention this morning about NEI quoting DOE experiments saying ignition not possible. I don't have any problem with us and the lab participating in this discussion, do you. There was an email about processing requests through the Ops center. Do we need to do this for the GRS and NEI requests?

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

From: Zigh, Ghani
To: Gibson, Kathy; Scott, Michael
Sent: Wed Mar 16 11:13:07 2011
Subject: FW:

What do you think?

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

From: Lindgren, Eric [<mailto:erlindg@sandia.gov>]
Sent: Wednesday, March 16, 2011 11:11 AM
To: Zigh, Ghani
Subject:

Ghani,

Steve Kraft from NEI called my manager Ken Sorenson to ask if we would call them today to discuss our spent fuel ignition experiments. This is in regards to the ongoing Japanese nuclear disaster. We need to know if we can discuss this with them.

Please let us know.

Thanks

Eric

CH/44

From: [Sheron, Brian](#)
To: [Gibson, Kathy](#)
Cc: [Lee, Richard](#); [Santiago, Patricia](#)
Subject: RE: GRS request for MELCOR input deck for Mark 1
Date: Wednesday, March 16, 2011 11:41:00 AM

Great, thanks.

From: Gibson, Kathy
Sent: Wednesday, March 16, 2011 11:30 AM
To: Sheron, Brian
Cc: Lee, Richard; Santiago, Patricia
Subject: Re: GRS request for MELCOR input deck for Mark 1

Richard is contacting SNL to see if we can provide the MELCOR deck used for NUREG-1465. The one used for SOARCA has proprietary info.

We can send a preliminary draft. This would be an earlier version without the new SRV calculations added because that version has not been reviewed or tech edited - but the results are not much different.

We will work with IPT to follow whatever process is appropriate for transferring the deck and SOARCA reports.

From: Sheron, Brian
To: Gibson, Kathy
Sent: Wed Mar 16 10:45:07 2011
Subject: FW: GRS request for MELCOR input deck for Mark 1

See below. Can we send the Germans the SOARCA results for Peach Bottom?

From: Diane.JACKSON@oecd.org [<mailto:Diane.JACKSON@oecd.org>]
Sent: Wednesday, March 16, 2011 10:44 AM
To: Sheron, Brian; Uhle, Jennifer
Cc: frank-peter.weiss@grs.de; Axel.BREEST@oecd.org
Subject: RE: GRS request for MELCOR input deck for Mark 1

Dear Brian –

Thank you for the quick response. Yes, Dr. Weiss would very much appreciate the SOARCA results for Peach Bottom.

Best regards,



Diane Jackson, Nuclear Safety Specialist
Nuclear Safety Division, OECD Nuclear Energy Agency (NEA)
Tel.: +33 (0)1 45 24 10 55, Diane.Jackson@oecd.org

From: Sheron, Brian [<mailto:Brian.Sheron@nrc.gov>]
Sent: Wednesday, March 16, 2011 15:21
To: JACKSON Diane, NEA/SURN; Borchardt, Bill; Uhle, Jennifer
Cc: REIG Javier, NEA/SURN; DUNN LEE Janice, NEA

CH/45

Subject: RE: GRS request for MELCOR input deck for Mark 1

Diane, Kathy Gibson said that we are checking with the Peach Bottom plant to see if we can release the Peach Bottom MELCOR deck, since it is proprietary.

However, we have already completed consequence analyses for Peach Bottom as part of SOARCA. Would GRS be interested in the SOARCA Results, since the severe accident analyses are already done?

From: Edward.LAZO@oecd.org
Sent: Wednesday, March 16, 2011 12:10 PM
Subject: Information on the Japanese Earthquake
Attachments: Some Background Information on Radiation rev 3.doc

Dear Colleagues,

I am sure that you are all well aware of the details of the terrible event unfolding in Japan, and as such I do not want to over-fill your already overflowing e-mail boxes. However, we have prepared the attached short information file on what we currently understand of the situation, and hope that you find this useful. We fully recognize that the role of the NEA in the early stages of such situations is very small, and as such have provided a few useful web-sites with more complete information provided by the IAEA, WHO, and a few Japanese sites we know to be valuable. However, given the gravity of the situation, we should begin to consider what, if any aspects of the follow-up of this crisis should be studied by the CRPPH. Your thoughts on this would of course be useful.

I wish all of our Japanese colleagues strength during these very trying times!

Sincerely,
Ted

CA/46

Some Background Information on Radiation Protection Limits and Radiation Effects

Radiation Protection Limits (Normal Situations)

The ICRP, the IAEA Basic Safety Standards, and the European Basic Safety Standards Directive all recommend the following dose limits:

- Dose Limit for Members of the Public: 1 mSv/y
- Dose Limit for Occupationally Exposed Workers: 100 mSv/5 years (average 20/yr)
50 mSv max in any single year

These dose limits are applied in all NEA member countries EXCEPT for the United States, where occupationally exposed workers are limited to 50 mSv/y (5 rem/y).

Radiation Protection Limits (Emergency Situations)

In emergency situations it is recognised that under some circumstances the above-mentioned dose limits are too restrictive to allow proper emergency management choices to be made. For such circumstances, informed, trained and volunteer emergency workers may be exposed over the normal dose limits. The latest draft of the International Basic Safety Standards provides the following requirements in this regard:

para 4.16 of the International Basic Safety Standards (version 4.0 in revision)

In the exceptional circumstances of para. 4.15 (a), (b) and (c), response organizations and employers shall make all reasonable efforts to keep doses to emergency workers, below the values set out in Schedule IV, Table IV-2. In addition, emergency workers undertaking actions in which their doses may approach or exceed the values set out in Schedule IV, Table IV-2 shall do so only when the benefits to others clearly outweigh their own risk.

The current Japanese regulations allow worker's emergency exposures to reach 100 mSv, however, METI and the Ministry of Health, Labor and Welfare have declared, on 15 March, that emergency workers were for this situation allowed up to 250 mSv.

Tasks	Guidance Values ⁽ⁱ⁾
Life saving actions	HP(10) < 500 mSv ⁽ⁱⁱ⁾ This value may be exceeded under the circumstances where the benefit to others clearly outweighs the emergency worker's own risk and the emergency worker volunteers to take the action, and understands and accepts this risk.
Actions, to prevent severe deterministic health effects and Actions to prevent the development of catastrophic conditions	HP(10) < 500 mSv
Actions to avert a large collective dose	HP(10) < 100 mSv

⁽ⁱ⁾ These values apply only to exposure from external penetrating radiation. The dose from non-penetrating external radiation and from intake or skin contamination need to be prevented by all possible means. Should this not be feasible, the effective dose and equivalent dose to an organ received shall be limited to minimize the health risk to the individual in line with the risk associated with the guidance values given here.

[ii] $H_p(10)$ is the personal dose equivalent $H_p(d)$ where $d = 10$ mm.

Radiation Effects

Stochastic Effects: These are generally cancer, leukemia (and perhaps cardiovascular effects) that can be caused by radiation exposure. The risk of a stochastic effect occurring is proportional to the dose incurred, with an overall risk of 5% per Sievert of exposure. As such, radiation is a weak carcinogen.

Stochastic effects are generally only statistically visible when individual exposures to a large population exceed about 100 mSv. There seems to be evidence of such effects due to acute AND chronic exposures at this level.

Deterministic Effects: These are effects due to very high exposures that provoke massive cell killing, but such effects take place only after exposures exceed a given threshold. Above such a threshold, the severity of the effect will be proportional to the dose. In the case of deterministic effects, doses are measured in absorbed dose, measured in Gray (Gy) and not in Sieverts (Sv).

Deterministic effects, in general, begin to occur at about 1 to 2 Gy of exposure. Here, chronic exposures, for example in fractionated cancer treatments, are less likely to provoke deterministic effects than acute doses. At doses of 5 to 10 Gy whole body, death is very likely even with extensive medical treatment.

**Radiation Protection Aspects of the Situation in Japan
After the Earthquake/Tsunami (situation as on 16 March 2011. 15:00)**

On 12 March, as a precautionary measure, the Japanese Prime Minister ordered the evacuation of residents living within 10 kilometres of the Fukushima Dai-ni nuclear power plant and within 20 kilometres of the Fukushima Daiichi nuclear power plant. Japan's Nuclear and Industrial Safety Agency (NISA) has reported that about 185,000 residents had been evacuated from the towns listed below as of 13 March. Japan has distributed 230,000 units of stable iodine to evacuation centres from the area around Fukushima Daiichi and Fukushima Dai-ni nuclear power plants, according to officials. The iodine has not yet been administered to residents; the distribution is a precautionary measure in the event that this is determined to be necessary.

Populations of evacuated towns near the affected nuclear power plants:

Hirono-cho	5,387
Naraha-cho	7,851
Tomioka-cho	15,786
Okuma-cho	11,186
Futaba-cho	6,936
Namie-cho	20,695
Tamura-shi	41,428
Minamisouma-shi	70,975
Kawauchi-mura	2,944
Kuzuo-mura	1,482
Total	184,670

15 March- Evacuation of the population from 20 km zone is continuing. The Japanese government has asked that residents out to a 30 km radius to take shelter indoors.

Decontamination

Fukushima – Dai-ichi plant: 133 individuals leaving the area were monitored, with 23 showing some level of contamination. These individuals were decontaminated (using soap and water) and sent to the evacuation center (operational level 13000 cpm)

No-fly zone

A 30 km no-fly zone has been established around the Dai-ichi plant, and the Japanese Coast Guard has established evacuation warnings within 10 km of Dai-ichi and 3 km Dai-ni.

Off-site Dose Rates

Radiological protection information, such as measured dose rates or contamination levels, continues to change rapidly, and remains sporadic and somewhat uncertain. So far, there is no reported data on deposited radionuclides in the environment, however dose rates are being reported by all Prefectures in Japan.

Only a few Prefectures are reporting dose rates above their normal variation. As of 21:00 on 16 March, Fukushima Prefecture is reporting dose rates in the range of 0.1 to 16 $\mu\text{Gy/hr}$
[県内各地方 環境放射能測定値 (第28報) について (Japanese only):

<http://www.pref.fukushima.jp/j/>]. This range is from about 10 to 100 times the normal background exposure rate. In 7 other Prefectures (Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa and Niigata), dose rates of from 10 to 50 times higher than normal are being reported as of 09:00 to 17:00 on 15 March. All other Prefectures (see web link) are reporting dose rates that are within normal ranges.

[Web link: http://eq.wide.ad.jp/index_en.html see latest readings under bullet "Environmental Radioactivity Measurement Results"].

Prefecture	Max (μSv/h)	Min (μSv/h)	Average (μSv/h)	Map Reference
Tochigi	1.318	0.359	0.701	9
Gunma	0.562	0.019	0.191	10
Saitama	1.222	0.096	0.328	11
Chiba	0.313	0.030	0.172	12
Tokyo	0.809	0.062	0.144	13
Kanagawa	0.182	0.054	0.109	14
Niigata	0.050	0.047	0.049	15

Relevant Links:

International Atomic Energy Agency:

<http://www.iaea.org/>

World Health Organisation:

<http://www.who.int/en/>

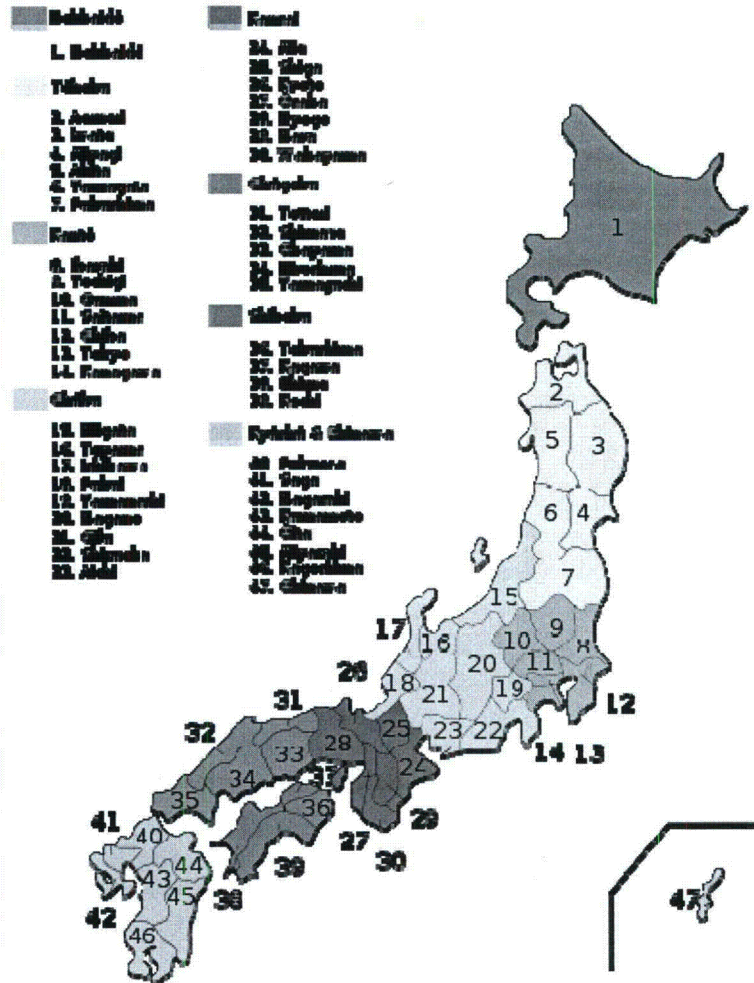
Regularly updates on development of the situation at the Japanese NPPs:

<http://www.jaif.or.jp/english/>






Disaster Prevention and Nuclear Safety Network for Nuclear Environment

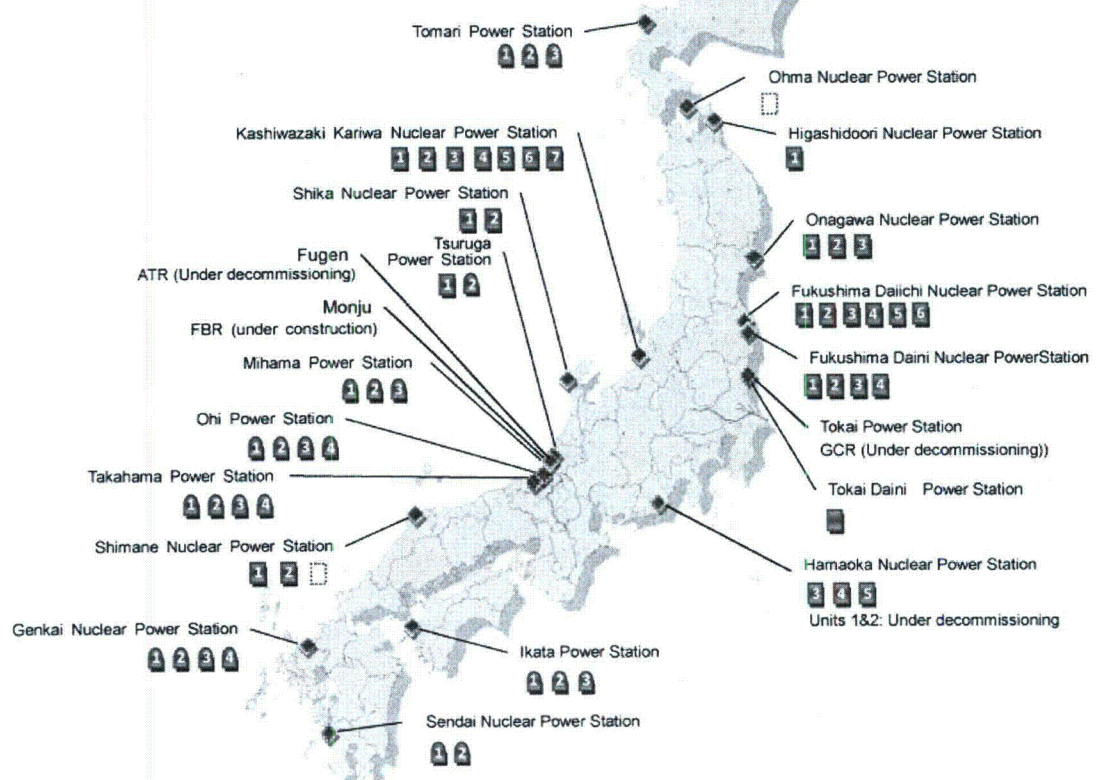
<http://www.bousai.ne.jp/eng/>

Regions and Prefectures of Japan



Location of Japanese Nuclear Power Plants

 Nuclear Power Plant
 BWR (in operation)  BWR (under construction)
 PWR (in operation)  PWR (under construction)



From: [Sheron, Brian](#)
To: [RidsResOd Resource](#); [Uhle, Jennifer](#); [RidsResPmdaMail Resource](#)
Cc: [Valentin, Andrea](#); [Donaldson, Leslie](#)
Subject: RE: FOR TICKETING ?? FW: 9/11 Commemoration Office Exhibits
Date: Wednesday, March 16, 2011 1:10:00 PM

Please ticket to PMDA.

Andrea/Leslie, it is your call if you want to do anything. I presume this would be assigned to Amy.

From: Flory, Shirley **On Behalf Of** [RidsResOd Resource](#)
Sent: Wednesday, March 16, 2011 12:03 PM
To: [Sheron, Brian](#); [Uhle, Jennifer](#); [RidsResPmdaMail Resource](#)
Subject: FOR TICKETING ?? FW: 9/11 Commemoration Office Exhibits

Should this be ticketed?

Thanks - Shirley

From: [Salus, Amy](#)
Sent: Wednesday, March 16, 2011 11:54 AM
To: [RidsCsoMailCenter Resource](#); [RidsOeMailCenter Resource](#); [RidsFsmeOd Resource](#); [RidsOiMailCenter Resource](#); [RidsOIS Resource](#); [RidsNroMailCenter Resource](#); [RidsNroOd Resource](#); [RidsNmssOd Resource](#); [RidsNrrOd Resource](#); [RidsAdmMailCenter Resource](#); [RidsResOd Resource](#); [RidsSbcrMailCenter Resource](#); [RidsRgn1MailCenter Resource](#); [RidsRgn2MailCenter Resource](#); [RidsRgn3MailCenter Resource](#); [RidsRgn4MailCenter Resource](#)
Cc: [Abraham, Susan](#); [Janney, Margie](#); [Huyck, Doug](#); [Evans, Michele](#); [Wiggins, Jim](#)
Subject: 9/11 Commemoration Office Exhibits

To: Office Directors
Regional Administrators

Subject: 9/11 Commemoration Office Exhibits

On September 1, 2011, the NRC will host a commemoration of the 10th anniversary of the events of September 11, 2001. The theme of the event is "A Day That Changed What We Do and Who We Are".

In remembrance of the events of 9/11, we are asking individual offices and regions if they would please submit an exhibit that shows how the events of that day changed the way the office/region does business. Exhibits could take the form of a poster, handouts, etc.

If your office will be submitting an exhibit for display at this special commemoration event, or for more information, please contact [Margie Janney](#) via email or at 301-415-7245 by March 31, 2011.

CA/47

Michele Evans
Acting Deputy Director
Office of Nuclear Security and Incident Response

From: Sheron, Brian
To: Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Subject: FW: COMMISSION E-READER....WEDNESDAY, MARCH 16, 2011
Date: Wednesday, March 16, 2011 1:12:00 PM
Attachments: Tab A 03-15-11 Reps. Markey-Capps 11-0118.pdf
Tab B 03-15-11 Rep. Lowey 11-0119.pdf

(b)(5)

From: Champ, Billie
Sent: Wednesday, March 16, 2011 12:14 PM
To: Commission E-Reader Distribution; E-Reader Distribution
Subject: COMMISSION E-READER....WEDNESDAY, MARCH 16, 2011

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Some of the information contained in the
Reader is not publicly available
If there are any questions, please contact SECY.~~

READING FILE

INDEX

March 16, 2011

INCOMING CORRESPONDENCE

Tab "A" 03/15/11 -- Letter from Reps. Edward Markey and Lois Capps, requests additional information related to the seismic safety features in nuclear reactors in the U.S.

Tab "B" 03/15/11 -- Letter from Rep. Nita Lowey, concerns safety factors at Indian Point.

Billie A. C-Lopes

CH/48

Congress of the United States
Washington, DC 20515

March 15, 2011

The Honorable Greg Jaczko
Chairman
Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Chairman Jaczko:

We write to request additional information related to the seismic safety features that are included in nuclear reactors currently in operation in this country. We are concerned that these reactors may not have the features necessary to withstand the sort of catastrophic earthquake and tsunami that has crippled several reactors in Japan, and caused a meltdown and the release of the highly radioactive materials contained within them.

The 9.0 magnitude earthquake caused a number of Japan's nuclear reactors to shut down automatically. However, a combination of tsunami-related damage and the long duration of the external power outages have subsequently led some of these reactors' emergency diesel generators, and thus cooling systems, to fail. To reduce rising pressure inside the Fukushima reactors, radioactive vapor is being vented, but three explosions have occurred as these pressures grew too high.¹ It appears as though meltdowns are proceeding at these reactors. Now life-threatening levels of radiation are being emitted, a 19-mile evacuation and no-fly zone has been established, a fire at a spent fuel pool at one of the units occurred, and 1,350 of the plant's 1,450 workers have been evacuated. Radioactive materials such as cesium and iodine have been detected as much as 100 miles away from these reactors.²

According to analysis prepared by Rep. Markey (see Appendix A, the map appended to this letter), there are eight nuclear reactors located on the seismically active West Coast of the United States, and twenty-seven nuclear reactors located near the New Madrid fault line in the Midwest.³ There are additionally thirty-one nuclear reactors in

¹ http://www.washingtonpost.com/business/economy/nuclear-crisis-deepens-as-third-reactor-loses-cooling-capacity/2011/03/14/ABk6rQV_story.html

² http://www.msnbc.msn.com/id/42066534/ns/world_news-asia-pacific/

³ See <http://pubs.usgs.gov/fs/2009/3071/pdf/F509-3071.pdf> In 1811-1812, three major earthquakes (magnitude 7 to 7.7 on the commonly used Richter Scale) occurred near the town of New Madrid, MO. In 1886, a large earthquake (Richter Scale magnitude of about 7) occurred near Charleston, S.C. The United States Geological Survey has estimated that the chance of having an earthquake similar to one of the 1811-12 sequence in the next 50 years is about 7 to 10 percent, and the chance of having a magnitude 6 or larger earthquake in 50 years is 25 to 40 percent.

3/15...To EDO to Prepare Response for Chaiman's Signature...Date due Comm
March 31..Cpy to: RF, OCA to Ack...11-0118...Commission Correspondence
Note: Response requested: ~~Col~~ Friday, April 8, 2011

the United States that are of the same Mark 1 or Mark 2 design as those currently imperiled in Japan, and twelve of these are located in seismically active zones.

The Nuclear Regulatory Commission (NRC)⁴ indicates that safety-significant structures, systems, and components of nuclear reactors must be designed to take into account:

- “the most severe natural phenomena historically reported for the site and surrounding area. The NRC then adds a margin for error to account for the historical data’s limited accuracy;
- appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena; and
- the importance of the safety functions to be performed.”

According to its website⁵, the San Onofre nuclear power plant, which is located 45 miles from Long Beach, California, is designed to withstand a 7.0 magnitude earthquake. An NRC staff memo⁶ indicates that the Diablo Canyon nuclear power plant, which is located 12 miles from San Luis Obispo, California, is designed to withstand a 7.5 magnitude earthquake. But according to the Southern California Earthquake Center,⁷ there is an 82 percent probability of an earthquake of 7.0 magnitude occurring in the next 30 years, and a 37 percent probability that an earthquake of 7.5 magnitude will occur.

It is not just resilience to the direct effects of an earthquake that raises concerns. While all nuclear power plants are equipped with emergency diesel generators, it is clear from the Japanese catastrophe that these are not themselves infallible, since they all appear to have failed at the Fukushima reactors. These can also fail for other reasons. For example, in 1990,⁸ the Vogtle plant in Georgia experienced a station blackout when a truck knocked over a transmission pole in the switchyard causing a loss of offsite power. The emergency diesel generator started but failed to load. The power plant suffered a complete station blackout, but fortunately power was restored in just over half an hour. NRC regulations only require nuclear power plants to be able to sustain cooling function in a station blackout for 4-8 hours⁹ using back-up battery powered generation capacity.

The vulnerability to the effects of a total station blackout was also noted by the NRC in its 2003 report entitled “Regulatory Effectiveness of the Station Blackout

⁴ <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-seismic-issues.html>

⁵ <http://www.sce.com/PowerandEnvironment/PowerGeneration/SanOnofreNuclearGeneratingStation/publicsafety.htm>

⁶ Research Information Letter 09-001: Preliminary Deterministic Analysis of Seismic Hazard at Diablo Canyon Nuclear Power Plant from Newly Identified “Shoreline Fault”

⁷ <http://www.scecc.org/core/public/scecccontext.php/3935/13662>

⁸ <http://query.nytimes.com/gst/fullpage.html?res=9C0CEEDF123AF932A35757C0A966958260>

⁹ http://adamswebsearch2.nrc.gov/idmws:DocContent.dll?library=PU_ADAMS^pbntad01&LogonID=ba229e2ba98e61e668d07a5da3c0e726&id=032520158

Rule.”¹⁰ Appendix B of this report (attached to this letter) provides reactor-specific information related to outages experienced, demonstrating that many nuclear reactors in this country have already experienced lengthy power outages. The second column in this table reports the overall risk of core damage frequency as calculated by the plant owners. The third column reports the risk of core damage due to complete station blackout as calculated by the plant owners, which is also expressed as a percentage in column 4. If emergency diesel generators were truly fully reliable, there would be no risk associated with a complete station blackout. Instead, many nuclear reactors are estimated to have a real risk of core damage due to a complete station blackout. The fifth column in this table shows four parameters. The first parameter is the battery coping duration in hours, which can easily be seen to be four hours for most reactors, so some reactors can operate on batteries for eight hours.

Clearly, the risks of core damage to reactors due to a complete power outage are non-trivial and have already been contemplated by the NRC. The 4-8 hour battery generation capacity currently in place at U.S. reactor sites would not have helped mitigate the effects of the Japanese earthquake and subsequent tsunami.

Finally, the spent fuel pools at these nuclear reactors can also fail. If the water that cools these fuel rods drains, the zirconium cladding them can catch fire and lead to another source of melting fuel that can spew high level radioactive materials into the environment. This appears to have already occurred in Japan.

We are concerned that San Onofre, Diablo Canyon, and possibly other nuclear reactors located in seismically active areas are not designed with sufficient levels of resiliency against the sort of earthquakes scientists predict they could experience. We are also interested in more detailed information about just what it means to take the “most severe natural phenomena historically reported for the site and surrounding area” into account when designing the safety related features of nuclear reactors. Consequently, we ask for your prompt response to the following questions and requests for information.

- 1) Please provide the Richter or moment magnitude scale rating for each operating nuclear reactor in the United States. If no such rating information exists, then on what basis can such an assertion be made regarding the design of any single nuclear power plant?
- 2) The San Onofre reactor is reportedly designed to withstand a 7.0 earthquake, and the Diablo Canyon reactor is designed to withstand a 7.5 earthquake. According to the Southern California Earthquake Center,¹¹ there is an 82 percent probability of an earthquake of 7.0 magnitude in the next 30 years, and a 37 percent probability that an earthquake of 7.5 magnitude will occur. Shouldn't these reactors be retrofitted to ensure that they can withstand a stronger earthquake than a 7.5? If not, why not?
- 3) Please provide specific information regarding the differences in safety-significant structures between a nuclear power plant that is located in a seismically active area and one that is not. Please provide, for each operating nuclear reactor in a seismically

¹⁰ See <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1776/sr1776.pdf>

¹¹ <http://www.scec.org/core/public/scecontext.php/3935/13662>

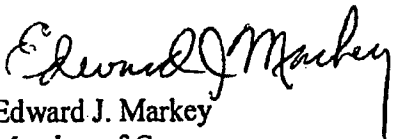
active area, a full list and description of the safety-significant design features that are included that are not included in similar models that are not located in seismically active areas.

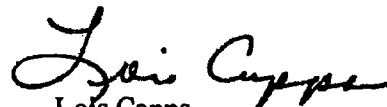
- 4) Please fully describe the emergency back-up power requirements that operating nuclear power plants must possess. How long are emergency diesel generators and back-up battery-powered generators required to be able to operate? If different requirements exist for different locations in the United States or for different types of reactors, please also include this information in your response.
- 5) For each operating nuclear power plant, please indicate a) whether the spent fuel pools are located inside or out of the containment structure, b) whether the emergency diesel generators are connected to the cooling and other equipment associated with the spent fuel pools, c) whether the battery-powered generators are connected to the cooling and other equipment associated with the spent fuel pools.
- 6) Please provide a list of all incidents at operating nuclear reactors since 1990 that have involved a) the loss of off-site power, b) a station blackout, or c) a failure of the battery-powered generators at the reactor. For each such incident, please fully describe the circumstances and duration, and impacts or damages, if any.
- 7) In your opinion, can any of the operating nuclear reactors in the United States withstand an earthquake of the magnitude experienced in Japan?

Please provide your response no later than close of business on Friday April 8, 2011.

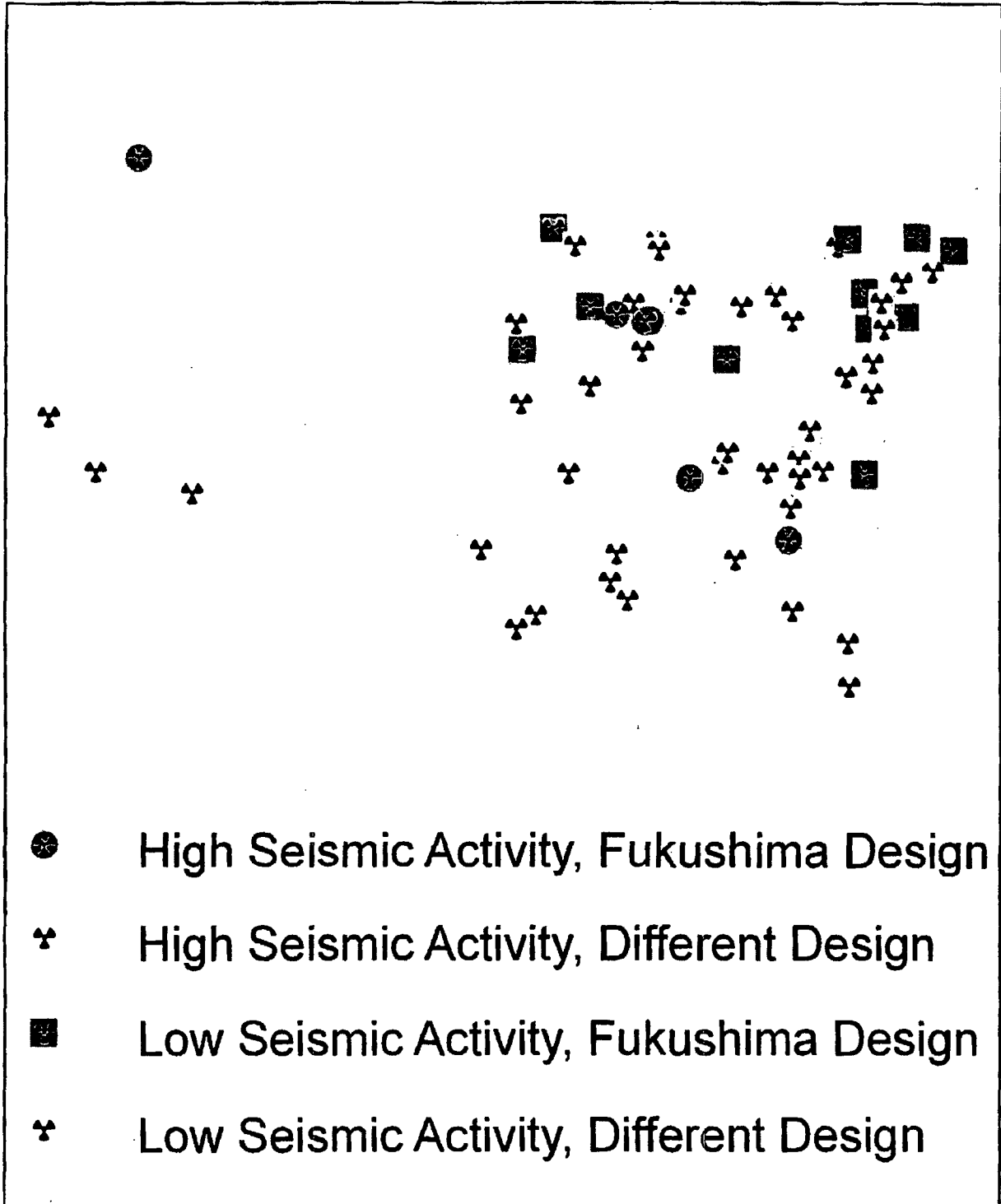
If you have any questions or concerns, please have your staff contact Dr. Michal Freedhoff of the Natural Resources Committee staff or Dr. Ilya Fischhoff of Rep. Markey's staff at 202-225-2836 or Jonathan Levenshus of Rep. Capps' staff at 202-225-3601.

Sincerely,


Edward J. Markey
Member of Congress


Lois Capps
Member of Congress

APPENDIX A



APPENDIX B

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-1 Operating pressurized-water reactors

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times ≥ 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Arkansas Nuclear One Unit 1	4.67E-05	1.58E-05	33.8	4/95/10/1	Added 1 DG and cross tie	3.58E-02	2	1			
Arkansas Nuclear One Unit 2	3.40E-05	1.23E-06	3.6	4/95/10/1	Added cross tie	5.84E-02	1	1			
Beaver Valley Unit 1	2.14E-04	6.51E-05	30.4	4/975/60/1	Added cross tie	6.64E-02	2				
Beaver Valley Unit 2	1.92E-04	4.86E-05	25.3	4/975/60/1	Added cross tie	7.44E-02	1				
Braidwood Units 1&2	2.74E-05	6.20E-06	22.6	4/95/10/1		4.53E-02	2				
Bryon Units 1&2	3.09E-05	4.30E-06	13.9	4/95/10/1		4.43E-02					
Cattaway	5.85E-05	1.80E-05	30.8	4/975/4/1		4.60E-02					
Calvert Cliffs Units 1&2	2.40E-04	8.32E-06	3.4	4/975/60/4	Added 1 EDG and one 1 DG	1.36E-01	3				
Catawba Units 1&2	5.80E-05	6.0E-07	10.3	4/95/10/1		2.0E-03	1			330	
Comanche Peak Units 1&2	5.72E-05	1.5E-05	26.2	4/95/4/1							

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-1 Operating pressurized-water reactors (Cont.)

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors						
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times \geq 240 minutes		
							Plant	Weather	Grid	Power	Shutdown	
Crystal River Unit 3	1.53E-05	3.28E-06	21.5	4/975/-/4	dc load shed. Added nonclass 1E battery	4.35E-01	3					
Davis-Besse	6.6E-05	3.50E-05	53	4/95/10/2	Added 1 DG	3.50E-02	2	1		1680		
DC Cook Units 1&2	6.2E-05	1.13E-05	18.1	4/975/-/2	dc load shed	4.0E-02	1					
Diablo Canyon Units 1&2	8.8E-05	5.0E-06	5.68	4/95/-/1	Added 1 DG	9.1E-02	1				261	917
Farley Units 1&2	1.3E-04	1.22E-05	9.4	4/95/10/3	Service water to Aac, auto load shedding	4.70E-02	2					
Fort Calhoun	1.36E-05	NA	-	4/95/-/2	DC load shed	2.17E-01	2					
Ginna	8.74E-05	1.0E-06	1.14	4/975/-/1		3.50E-03	4					
Harris	7.0E-05	1.71E-05	24.4	4/95/-/3	Lighting in several areas, ladder to isolation valve							
Indian Point Unit 2	3.13E-05	4.47E-06	14.3	8/95/60/2	Added a DG for gas turbine auxiliaries	6.91E-02	2		3	390		

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-1 Operating pressurized-water reactors (Cont.)

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times \geq 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Indian Point Unit 3	4.40E-05	4.80E-06	10.9	8/95/60/2		6.80E-02	1				
Kewaunee	6.6E-05	2.64E-05	40	4/95/60/2	Cross-tie to nonsafety power source	4.4E-02					
McGuire Units 1&2	4.0E-05	9.26E-06	23.3	4/95/10/1		7.0E-02	3				
Millstone Unit 2	3.42E-05	1.0E-10	NMN	8/975/60/5	Upgraded unit 1-2 crosstie	9.10E-02	1	1		330	
Millstone Unit 3	5.61E-05	5.10E-06	6	8/975/60/5	Added DG	1.12E-01					
North Anna Units 1&2	7.16E-05	8.0E-06	11.2	4/95/60/4	Added DG, switchgear, crosstie	1.14E-02					
Oconee Units 1, 2&3	2.3E-05	2.57E-06	11.2	4/975/10/1		9.0E-02	2				
Palisades	5.07E-05	9.10E-06	17.9	4/95/-/1	DC load shed, compressed air for ADVs	3.0E-02	3			388	
Palo Verde Units 1, 2&3	9.0E-05	1.91E-05	21.2	4/95/10/2	Added 2 gas turbines	7.83E-02	3			1138	
Point Beach Units 1&2	1.15E-04	1.51E-05	13.1	4/975/60/2	Gas turbine modifications	6.10E-02	4				

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-1 Operating pressurized-water reactors (Cont.)

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times \geq 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Prairie Island Units 1&2	5.05E-05	3.1E-06	6.14	4/975/10/3	Added 2 EDGs	-	1	2		296 296	
Robinson Unit 2	3.20E-04	2.6E-05	8.13	8/95/60/4	Modified conduit supports in switchgear room	6.1E-02	2			454	
Salem Unit 1	5.20E-05	2.10E-05	40.4	4/975/1/2	EDG compressed air mod	6.0E-02	1				
Salem Unit 2	5.5E-05	1.70E-05	30.9	4/975/1/2	EDG compressed air mod	6.0E-02	2			655	1675
San Onofre Units 2&3	3.0E-05	2.0E-06	6.67	4/95/1/1	DC load shed and crosstie	1.1E-01			2		
St. Lucie Unit 1	2.30E-05	2.65E-06	11.5	4/975/10/5	Added crosstie	1.5E-01	1		3		
St. Lucie Unit 2	2.62E-05	2.64E-06	10.1	4/975/10/5	Added crosstie	1.5E-01					
Seabrook	6.86E-05	1.53E-05	22.3	4/975/1/3	DC load shed	4.93E-02					
Sequoyah Units 1&2	1.70E-04	5.32E-06	3.2	4/975/1/2	DC load shed, added air supply	5.16E-03	2				

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-1 Operating pressurized-water reactors (Cont.)

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times ≥ 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Summer	2.0E-04	4.9E-05	24.5	4/95/1/3	DC load shed, battery mod	7.3E-02			1		
South Texas Units 1&2	4.3E-05	1.46E-05	34.9	4/975/10/5	Procedural cross-tie						
Surry Units 1&2	1.25E-04	8.09E-06	6.47	4/975/10/4	Added DG	7.69E-02					
Three Mile Island Unit 1	4.49E-04	1.57E-05	3.5	4/975/10/3	Modifications to existing DGs	5.68E-02					
Turkey Point Units 3&4	3.73E-04	4.70E-06	1.2	8/95/10/5	Added 2 EDGs and cross-tie	1.7E-01	4	2	7	7950 7908	335
Vogtle Units 1&2	4.9E-05	4.4E-07	11	4/95/1/2	Added 5 circuit breakers and lighting	6.6E-04					
Waterford Unit 3	1.80E-05	6.24E-06	34.7	4/975/1/4	DC load shed. Added portable air compressors for EDGs	3.6E-02					
Watts Bar Unit 1	8.0E-05	1.73E-05	21.6	4/975/1/1		3.64E-02					
Wolf Creek	4.2E-05	1.88E-05	44.8	4/95/1/1		5.12E-02					

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-2 Operating boiling-water reactors

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times ≥ 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Browns Ferry Units 2&3	4.80E-05	1.30E-05	27	4/95/-1	dc load shed	1.12E-01					
Brunswick Units 1&2	2.70E-05	1.80E-05	66.7	4/975/60/5	Modified controls for existing crosstie	7.40E-02	3				1508 814
Clinton	2.66E-05	9.8E-06	36.8	4/95/10/1	Added gas fans for selected room cooling	8.40E-02					
Cooper	7.97E-05	2.77E-05	34.8	4/95/-2		3.50E-02					
Dresden Units 2&3	1.8E-05	9.30E-07	5.03	4/95/60/2	Added 2 DGs	1.12E-01	3	1		240	
Duane Arnold	7.84E-06	1.90E-06	24.2	4/975/-2	dc load shed, RCIC insulation & main control room lighting	1.17E-01			1		
Fermi	5.70E-06	1.3E-07	NMN	4/95/60/1		1.88E-01					
FitzPatrick	1.92E-06	1.75E-06	NMN	4/95/-1	dc load shed, instrumentation and power supply mods	5.70E-02					
Grand Gulf	1.77E-05	7.46E-06	36.8	4/95/-2	dc load shed	6.80E-02					

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-2 Operating boiling-water reactors (Cont.)

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times \geq 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Hatch Unit 1	2.23E-05	3.30E-06	14.8	4/95/60/2	Replaced battery chargers	2.20E-02					
Hatch Unit 2	2.36E-05	3.23E-06	13.7	4/95/60/2	Replaced battery chargers	2.20E-02					
Hope Creek	4.63E-05	3.38E-05	73	4/95/-/2	Valve modifications	3.4E-02					
LaSalle Units 1&2	4.74E-05	3.82E-05	80.6	4/975/-/1	dc load shed, New batteries	9.60E-02	1				
Limerick Units 1&2	4.30E-06	1.0E-07	NMN	4/95/60/3	Upgraded cross-ties	5.9E-02					
Monticello	2.60E-05	1.20E-05	46.2	4/95/-/1	dc load shed	7.90E-02					
Nine Mile Point Unit 1	5.50E-06	3.50E-06	NMN	4/975/-/1	dc load shed, added two safety related batteries	5.00E-02	4			595	
Nine Mile Point Unit 2	3.10E-05	5.50E-06	17.7	4/975/-/1	dc load shed	1.20E-01					

Plant-Specific Station Blackout Information by Reactor Type and Operating Status

Table B-2 Operating boiling-water reactors (Cont.)

Plant	Plant CDF	SBO CDF	Percent SBO CDF of Plant CDF	Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather	Modification summary including dc load shed procedural modifications	SBO factors					
						PRA LOOP initiating event frequency	Number of LOOP events at power since commercial operation			LOOP event recovery times \geq 240 minutes	
							Plant	Weather	Grid	Power	Shutdown
Oyster Creek	3.90E-06	2.30E-06	NMN	4/975/60/1	Added crosstie & reactor pressure indication	3.26E-02	3				240
Peach Bottom Units 2 & 3	5.53E-06	4.81E-07	8.7	8/975/60/3	Cross-tie to hydro unit	5.9E-02					
Perry	1.30E-05	2.25E-06	43.4	4/95/10/1	Replaced selected cables	6.09E-02					
Pilgrim	5.80E-05	1.0E-10	NMN	8/975/10/4	Alarms to line-up Aac	6.17E-01	1	5			1263 534
Quad Cities Units 1&2	1.2E-06	5.72E-07	NMN	4/95/60/1	Added 2 DGs	4.81E-02	2				
River Bend	1.55E-05	1.35E-05	87.5	4/95/1/2	Minor structural mod	3.50E-02	1				
Susquehanna Units 1&2	1.7E-05	4.2E-11	NMN	4/975/1/2	dc load shed	-	1				
Vermont Yankee	4.30E-06	9.17E-07	21.3	8/975/10/4	Modified incoming line and controls	1.0E-01	2			277	
Washington Nuclear Plant Unit 2	1.73E-05	1.07E-05	61.1	4/95/1/1	dc load shed, replaced inverters	2.46E-02					

COMMITTEE ON APPROPRIATIONS

SUBCOMMITTEES:
RANKING MEMBER,
STATE, FOREIGN OPERATIONS, AND
RELATED PROGRAMS

LABOR, HEALTH AND HUMAN SERVICES,
AND EDUCATION

HOMELAND SECURITY



Nita M. Lowey
Congress of the United States
18th District, New York

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ROCKLAND
(845) 639-3488

Chairman Gregory B. Jaczko
U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, DC 20555-0001

March 15, 2011

Dear Chairman Jaczko:

The tragedy in Japan and the threat of meltdowns at the Fukushima Daiichi Nuclear Power Station shine a new light on the need for the heightened evaluation of nuclear power plants within high-population areas. Following the Japan tragedy, it is imperative that the NRC evaluate all possible threats, including terrorism, natural disasters, and the challenges that must be met in developing safety standards and evacuation procedures while determining the re-licensing of the Indian Point Nuclear Facility in Buchanan, New York.

A 2008 study by seismologists at the Columbia University Lamont-Doherty Earth Observatory found that earthquakes in the New York metropolitan area are common and that risks are particularly high due to infrastructure and high population. A 3.9 magnitude earthquake occurred in the Atlantic Ocean approximately 80 miles off Long Island as recently as November 30, 2010. In fact, there have been five earthquakes in the same area in the past two decades, including a 4.7 magnitude earthquake in 1992.

The Ramapo Seismic Zone is a particular threat because the zone passes within two miles of Indian Point. The Ramapo Seismic Zone includes the Dobbs Ferry fault in Westchester, which generated a 4.1 magnitude earthquake in 1985. The Columbia University study suggests that this pattern of subtle but active faults increases the risk to the New York City area and that an earthquake with a magnitude of 7.0 on the Richter scale is within reach. Disturbingly, Entergy measures the risk of an earthquake near Indian Point to be between 1.0 and 3.0 on the Richter scale, despite evidence to the contrary.

As our nation stands ready to assist the Japanese to calm this potential nuclear meltdown and disaster, we must not let the same mistakes happen on our shores. The NRC should study Indian Point's risk of and ability to sustain a disaster, including the impact of earthquakes and hurricanes, as well as collateral impacts such as loss of power, inability to cool reactors, and emergency evacuation routes. The NRC should evaluate how a similar incident in the New York metropolitan area could be further complicated due to a dramatically higher population and the effectiveness of proposed evacuation routes. We simply cannot allow those who live in the New York metropolitan area to be susceptible to such risks.

Sincerely,

Nita M. Lowey
Member of Congress

PRINTED ON RECYCLED PAPER

3/15...To EDO to Prepare Response for Chairman's Signature...Date due Comm:
March 30...Cpy to: RF, OCA to Ack....11-0119 Commission Correspondence

From: [Sheron, Brian](#)
To: [Gibson, Kathy](#); [Scott, Michael](#)
Subject: FW: RASCAL Dose Assessment person for this evening and tomorrow
Date: Wednesday, March 16, 2011 1:45:00 PM

What about Sami?

From: Moore, Scott
Sent: Wednesday, March 16, 2011 1:35 PM
To: Evans, Michele; OST02 HOC
Cc: Tracy, Glenn; Cohen, Miriam; Uhle, Jennifer; Sheron, Brian; Deegan, George
Subject: RASCAL Dose Assessment person for this evening and tomorrow

Michelle:

You asked for additional people to support RASCAL in the Ops Center for the 11-7 shift this evening, and the 7-3 shift tomorrow. We are checking our staff that may have experience with RASCAL, but are finding that many are already working the Operations Center on the Protective Measures team, in assigned roles. FSME will continue looking.

In addition, you may want to look into the following:

OHR offers a course in RASCAL. I believe that the most recent one was offered in Region I, and all of the attendees may have been from the Region, so that may not help you for shifts this evening, but if OHR could provide you with a list of staff who have completed the RASCAL course who are here, at HQ, then that could give you a group from which to draw upon.

Finally, Dr. Sami Sherbini, who is assigned to RES and was formerly of FSME, is well versed in dose assessment and codes, and may have RASCAL experience. He came to mind. You would need to talk to RES about Sami's availability.

We will still get back to you with an answer from FSME, in follow up to the conference call yesterday, but I wanted you to be aware of the RASCAL course and Sherbini.

Scott
x7875

CHA/49

From: Sheron, Brian
To: Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Subject: FW: NRR Actions: near-term
Date: Wednesday, March 16, 2011 1:49:00 PM
Importance: High

FYI.

From: Leeds, Eric
Sent: Wednesday, March 16, 2011 1:14 PM
To: Virgilio, Martin; Weber, Michael
Cc: Borchardt, Bill; Boger, Bruce; Grobe, Jack; Ruland, William; Johnson, Michael; Sheron, Brian; Evans, Michele
Subject: NRR Actions: near-term
Importance: High

Please see below. NRR has assembled a team, led by an SES manager to evaluate near term actions for the agency's response to the Japanese event. At this time, we are considering inspection as well as a generic communication and a review of "sensitive" licensing actions". I will keep you informed as we go forward I have discussed the current situation in Japan with the RAs and our preliminary thoughts for regulatory actions going forward.

We have also prepared a scheduling note for the commission meeting for next week. We will send it to you.

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
301-415-1270

From: Brown, Frederick
Sent: Wednesday, March 16, 2011 11:32 AM
To: Leeds, Eric; Boger, Bruce; Grobe, Jack
Subject: FW: Action: Consider potential on-site activities in near-term
Importance: High

FYI

From: Brown, Frederick
Sent: Wednesday, March 16, 2011 11:17 AM
To: Roberts, Darrell; Clifford, James; Croteau, Rick; Jones, William; Croteau, Rick; Darrell Roberts; James Clifford; Jones, William; Kennedy, Kriss; Shear, Gary; Troy Pruett; West, Steven
Cc: Vogel, Anton; Wilson, Peter; Miller, Chris; Weerakkody, Sunil; O'Brien, Kenneth; Reynolds, Steven; Munday, Joel; Moorman, James; Christensen, Harold; Westreich, Barry
Subject: Action: Consider potential on-site activities in near-term
Importance: High

On the DRA call today, I'm going to float the potential for either a smart sample or a TI to look at the following areas:

CH/50

- Licensee verification of 50.54(hh)(2) current status and readiness;
- Licensee verification of SBO current status and readiness consistent with their coping strategy;
- Licensee verification of Internal and External Flooding design features consistency with their licensing basis; and
- Licensee verification that their 50.54(hh)(2) equipment would survive a seismic event undamaged.

If you have thoughts, I'd like to hear them, and you may want to prep your DRAs.

Thanks,
Fred

From: Sheron, Brian
To: Ruland, William; Williams, Donna; Uhle, Jennifer; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen; Dion, Jeanne
Subject: RE: Planning for upcoming, short notice Commission meeting
Date: Wednesday, March 16, 2011 1:50:00 PM

Jeanne Dion is the RES POC.

From: Ruland, William
Sent: Wednesday, March 16, 2011 1:19 PM
To: Williams, Donna; Uhle, Jennifer; Sheron, Brian; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen
Subject: Planning for upcoming, short notice Commission meeting

Folks,

Attached find a early draft of a scheduling note for a Commission meeting that may be held as early as this coming Monday, March 21st. NRR has been assigned as the lead to pull the meeting together. As you could imagine, this will take some effort. To help with coordination, please provide me a contact so that we can draw on your expertise and help to make this happen. Alan Howe, currently deputy director of DORL, has the lead to pull this together.

I know you have many questions. I'd ask for your patience as we try to get this done. I'll keep you updated through the contact that you provide to us.

Thank you very much.

Bill Ruland

CH/51

From: Sheron, Brian
To: Leeds, Eric; Johnson, Michael; Haney, Catherine; Miller, Charles; Evans, Michele
Subject: RE: Should we cancel tomorrow's OD meeting?
Date: Wednesday, March 16, 2011 1:52:00 PM

I vote to cancel. Both Jennifer and I are up to our necks in requests, etc.

From: Leeds, Eric
Sent: Wednesday, March 16, 2011 1:49 PM
To: Johnson, Michael; Haney, Catherine; Sheron, Brian; Miller, Charles; Evans, Michele
Subject: Should we cancel tomorrow's OD meeting?

Or I'll send a deputy (if I have....)....

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
301-415-1270

CH/52

From: [Sheron, Brian](#)
To: [Dion, Jeanne](#)
Cc: [Uhle, Jennifer](#)
Subject: FW: Planning for upcoming, short notice Commission meeting
Date: Wednesday, March 16, 2011 1:55:00 PM

From: Johnson, Michael
Sent: Wednesday, March 16, 2011 1:54 PM
To: Ruland, William; Williams, Donna; Uhle, Jennifer; Sheron, Brian; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen
Subject: RE: Planning for upcoming, short notice Commission meeting

Donna Williams is NRO's poc.

From: Ruland, William
Sent: Wednesday, March 16, 2011 1:19 PM
To: Williams, Donna; Uhle, Jennifer; Sheron, Brian; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen
Subject: Planning for upcoming, short notice Commission meeting

Folks,

Attached find a early draft of a scheduling note for a Commission meeting that may be held as early as this coming Monday, March 21st. NRR has been assigned as the lead to pull the meeting together. As you could imagine, this will take some effort. To help with coordination, please provide me a contact so that we can draw on your expertise and help to make this happen. Alan Howe, currently deputy director of DORL, has the lead to pull this together.

I know you have many questions. I'd ask for your patience as we try to get this done. I'll keep you updated through the contact that you provide to us.

Thank you very much.

Bill Ruland

CH/53

From: [Sheron, Brian](#)
To: [Dion, Jeanne](#)
Cc: [Uhle, Jennifer](#)
Subject: FW: Planning for upcoming, short notice Commission meeting
Date: Wednesday, March 16, 2011 1:57:00 PM

From: Moore, Scott
Sent: Wednesday, March 16, 2011 1:56 PM
To: Ruland, William; Howe, Allen
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Deegan, George; Evans, Michele; Doane, Margaret; Mamish, Nader; Wiggins, Jim; Dorman, Dan; Haney, Catherine; Brenner, Eliot; Miller, Charles; Sheron, Brian; Uhle, Jennifer; Williams, Donna
Subject: RE: Planning for upcoming, short notice Commission meeting

George Deegan (415-7834) is FSME's POC.

From: Ruland, William
Sent: Wednesday, March 16, 2011 1:19 PM
To: Williams, Donna; Uhle, Jennifer; Sheron, Brian; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen
Subject: Planning for upcoming, short notice Commission meeting

Folks,

Attached find a early draft of a scheduling note for a Commission meeting that may be held as early as this coming Monday, March 21st. NRR has been assigned as the lead to pull the meeting together. As you could imagine, this will take some effort. To help with coordination, please provide me a contact so that we can draw on your expertise and help to make this happen. Alan Howe, currently deputy director of DORL, has the lead to pull this together.

I know you have many questions. I'd ask for your patience as we try to get this done. I'll keep you updated through the contact that you provide to us.

Thank you very much.

Bill Ruland

CA/54

From: Sheron, Brian
To: Dion, Jeanne
Subject: FW: Planning for upcoming, short notice Commission meeting
Date: Wednesday, March 16, 2011 2:05:00 PM
Attachments: Scheduling NoteMar2011 JapaneseEvent agh 3-16-2011.docx

Here 'tis.....

From: Ruland, William
Sent: Wednesday, March 16, 2011 1:19 PM
To: Williams, Donna; Uhle, Jennifer; Sheron, Brian; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen
Subject: Planning for upcoming, short notice Commission meeting

Folks,

Attached find a early draft of a scheduling note for a Commission meeting that may be held as early as this coming Monday, March 21st. NRR has been assigned as the lead to pull the meeting together. As you could imagine, this will take some effort. To help with coordination, please provide me a contact so that we can draw on your expertise and help to make this happen. Alan Howe, currently deputy director of DORL, has the lead to pull this together.

I know you have many questions. I'd ask for your patience as we try to get this done. I'll keep you updated through the contact that you provide to us.

Thank you very much.

Bill Ruland

CH/55

Draft: 3/16/11

SCHEDULING NOTE

Title: BRIEFING ON JAPANESE EVENT and US RESPONSE (Public?)

Purpose: To provide the Commission a status on the recent event in Japan, and to provide an overview of staff actions to date, early planned actions

Scheduled: March XX, 2011
9:00 am

Duration: Approx. 2 hours

Location: Commissioners' Conference Room OWFN

Participants: **Presentation**

NRC Staff Panel **50 mins.***

Bill Borchardt, Executive Director for Operations 15 mins.*
Topic: Overview of Japanese Event and U.S. response

Mike Weber, Deputy Executive Director Materials, Waste,
Research, State, Tribal and Compliance Programs 10 mins.*
Topic: Potential consequences; what will be seen in U.S.

Marty Virgilio, Deputy Executive Director for Reactor
and Preparedness Programs 10 mins.*
Topic: Situation assessment for U.S. reactors and applicants

Elliot Brenner, OPA 5 mins.*
Topic: Communication Challenges

Eric Leeds, Director, NRR 10 mins.*
Topic: Path forward; Near term and longer term

Commission Q & A **30 mins.**

Discussion – Wrap-up **5 mins.**

Break **10 mins.**

Closed session

Strategy and agenda planning

Documents:

Staff background material due to SECY: March __, 2011.

Slides due to SECY: March __, 2011.

From: [Sheron, Brian](#)
To: [Dion, Jeanne](#)
Subject: FW: Planning for upcoming, short notice Commission meeting
Date: Wednesday, March 16, 2011 2:06:00 PM

Already did.

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 1:51 PM
To: Ruland, William; Williams, Donna; Uhle, Jennifer; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen; Dion, Jeanne
Subject: RE: Planning for upcoming, short notice Commission meeting

Jeanne Dion is the RES POC.

From: Ruland, William
Sent: Wednesday, March 16, 2011 1:19 PM
To: Williams, Donna; Uhle, Jennifer; Sheron, Brian; Moore, Scott; Miller, Charles; Brenner, Eliot; Haney, Catherine; Dorman, Dan; Wiggins, Jim; Evans, Michele; Doane, Margaret; Mamish, Nader
Cc: Johnson, Michael; Holahan, Gary; Leeds, Eric; Grobe, Jack; Howe, Allen
Subject: Planning for upcoming, short notice Commission meeting

Folks,

Attached find a early draft of a scheduling note for a Commission meeting that may be held as early as this coming Monday, March 21st. NRR has been assigned as the lead to pull the meeting together. As you could imagine, this will take some effort. To help with coordination, please provide me a contact so that we can draw on your expertise and help to make this happen. Alan Howe, currently deputy director of DORL, has the lead to pull this together.

I know you have many questions. I'd ask for your patience as we try to get this done. I'll keep you updated through the contact that you provide to us.

Thank you very much.

Bill Ruland

CH/56

From: Sheron, Brian
To: Dion, Jeanne
Cc: Uhle, Jennifer
Subject: FW: IRC Staffing
Date: Wednesday, March 16, 2011 9:12:00 PM

From: Boyce, Tom (RES)
Sent: Wednesday, March 16, 2011 5:15 PM
To: Case, Michael
Cc: Richards, Stuart; Sheron, Brian
Subject: RE: IRC Staffing

(b)(6)



From: Case, Michael
Sent: Wednesday, March 16, 2011 7:16 AM
To: Graves, Herman; Hogan, Rosemary; Csonotos, Aladar; Koshy, Thomas; Lin, Bruce; Boyce, Tom (RES); Ali, Syed; Murphy, Andrew; Tregoning, Robert; Gavrilas, Mirela; Sydnor, Russell; Lorette, Phillip
Cc: Richards, Stuart
Subject: FW: IRC Staffing

Can you all start to think about this and let me know of any potential names by around noon?

From: Sheron, Brian
Sent: Tuesday, March 15, 2011 5:27 PM
To: Coyne, Kevin; Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Cc: Dion, Jeanne
Subject: IRC Staffing

I participated on a conference call with other ODs and led by Michele Evans, acting deputy OD in NSIR at 4 pm today.

The purpose of the conference call was to discuss staffing for the IRC for the near future. The IRC is

CH/57

currently staffed with members of the Reactor safety team, the Protective Measures team, Liaison Team, etc. There is also an ET member there. None of the teams are at their full compliment. What Michele is looking for is people that can staff the IRC and relieve the staff that are currently there. She said they are currently running 3 shifts (11pm-7am, 7am – 3pm, and 3pm to 11 pm). They would like to find staff that can work shifts for 4 days in a row (I think she wants 4 days on, 3 days off). She said the staff do not have to have had IRC training.

Several of us said we would certainly canvas our staff to see who was qualified to work in the IRC and could work there, but we needed to know what technical disciplines they were looking for. Michele did not have a list of needed disciplines, but said she would generate one and send it out. As of 5:15 pm I have not received a list yet.

However, I am assuming they will be looking for staff with expertise in such areas as systems analysis, severe accidents, radiological dose assessment, etc. In anticipation that these are the technical disciplines of interest, can you please start identifying your staff that you believe have some of the requisite skills needed for the IRC, and start asking if they would be available to work shifts in the IRC if asked to. HR said they would be eligible for normal overtime compensation.

Also, they will be looking for staff to go to Japan and relieve the technical staff that recently went there. There were 2 BWR experts that left over the weekend, and a team of 9 more (6 engineers and 3 OIP staff) left yesterday. The thinking is that the staff that recently went over would come back in 2 weeks, which is when they want to send a replacement team over there. So please check to see if you have any staff with the proper technical credentials, are reasonably good communicators, and would be willing to spend about 2 weeks in Japan as part of the team there.

I will forward the list of desired disciplines as soon as I receive them from Michele. Michele said she will be looking for the list of potential IRC replacements by COB tomorrow (3/16/11), thus, I will need your candidates by mid-afternoon.

For the team that will replace the one that was just sent to Japan, she said she would like us to update the list we previously sent by COB 3/17.

From: Sheron, Brian
To: Tallarico, Alison; Evans, Michele; Ash, Darren; Borchardt, Bill; Boyce, Thomas (OIS); Buchholz, Jeri; Burns, Stephen; Carpenter, Cynthia; Casto, Chuck; Cohen, Miriam; Collins, Elmo; Dapas, Marc; Dean, Bill; Doane, Margaret; Dorman, Dan; Dyer, Jim; Gallagher, Johanna; Greene, Kathryn; Haney, Catherine; Holahan, Gary; Howell, Art; Johns, Nancy; Johnson, Michael; Kelley, Corenthis; Leeds, Eric; Lew, David; Mamish, Nader; McCree, Victor; Miller, Charles; Moore, Scott; Muessle, Mary; Pederson, Cynthia; Satorius, Mark; Schaeffer, James; Tracy, Glenn; Uhle, Jennifer; Virgilio, Martin; Weber, Michael; Wert, Leonard; Wiggins, Jim
Subject: RE: Action: ERB Items for Review
Date: Wednesday, March 16, 2011 9:15:24 PM

No objection.

From: Tallarico, Alison
Sent: Wednesday, March 16, 2011 4:28 PM
To: Evans, Michele; Ash, Darren; Borchardt, Bill; Boyce, Thomas (OIS); Buchholz, Jeri; Burns, Stephen; Carpenter, Cynthia; Casto, Chuck; Cohen, Miriam; Collins, Elmo; Dapas, Marc; Dean, Bill; Doane, Margaret; Dorman, Dan; Dyer, Jim; Gallagher, Johanna; Greene, Kathryn; Haney, Catherine; Holahan, Gary; Howell, Art; Johns, Nancy; Johnson, Michael; Kelley, Corenthis; Leeds, Eric; Lew, David; Mamish, Nader; McCree, Victor; Miller, Charles; Moore, Scott; Muessle, Mary; Pederson, Cynthia; Satorius, Mark; Schaeffer, James; Sheron, Brian; Tallarico, Alison; Tracy, Glenn; Uhle, Jennifer; Virgilio, Martin; Weber, Michael; Wert, Leonard; Wiggins, Jim
Subject: Action: ERB Items for Review

(b)(5)



CH/58

(b)(5)



Thanks
Alison Tallarico (for Johanna Gallagher)
301-492-2326

From: [Sheron, Brian](#)
To: [Sangimino, Donna-Marie](#)
Cc: [Valentin, Andrea](#); [Dion, Jeanne](#)
Subject: RE: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing
Date: Wednesday, March 16, 2011 9:17:15 PM

Agreed.

From: Sangimino, Donna-Marie
Sent: Wednesday, March 16, 2011 4:53 PM
To: Sheron, Brian
Cc: Valentin, Andrea; Dion, Jeanne
Subject: RE: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing

Brian,

After discussing the options within the IPT, I'd like to suggest that we (Wendy, Jeff and I) not staff the op center or OIP. Jeff is going to the CNS meeting in Vienna the first two weeks of April, Wendy is pressed with a variety of foreign travel and international agreement tickets and I'm just returning from the PMDA rotation trying to get back up to speed on outstanding international issues. I will defer to your judgment – if you deem it appropriate that RES pony up a body for international support we will adjust and do so.

Thanks

Donna-Marie

From: Sheron, Brian
Sent: Wednesday, March 16, 2011 10:35 AM
To: Sangimino, Donna-Marie
Cc: Valentin, Andrea; Dion, Jeanne
Subject: RE: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing

Send me the names. We are getting two requests from two different sources, and I'm not sure they are talking to each other.

From: Sangimino, Donna-Marie
Sent: Wednesday, March 16, 2011 9:52 AM
To: Sheron, Brian
Cc: Valentin, Andrea; Dion, Jeanne
Subject: FW: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

Brian,

As discussed at our 845, I'll forward proposed names suitable for assisting OIP and the international liaison position at the Ops Ctr to Jeanne by 3pm today.

Donna-Marie

From: Williams, Shawn
Sent: Wednesday, March 16, 2011 9:34 AM

CH/59

To: ICWG
Subject: FW: Request for staff that can support OIP Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

fyi

From: Muessle, Mary
Sent: Wednesday, March 16, 2011 9:32 AM
To: Evans, Michele; Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
Cc: Williams, Shawn; Andersen, James; Ramsey, Jack
Subject: Additional Staff requirements outside Ops Center Long Term Staffing
Importance: High

OPA and OIP expect large call volumes today and in the next few weeks given expected news from Japan. OIP is looking for names of people who have desk officer or other OIP or international experience to assist them in the event that current staff cannot meet the work demands for call inquiries as well as ongoing international work. Please provide Shawn Williams and I a list of names that could serve to help OIP in this capacity and their general availability over the next week and month. It is difficult to determine the need level at this time, but as in the Op Center, it is anticipated OIP will have for an additional month. We would like the list of names by COB today.

Thanks
Mary

Mary Muessle
Assistant for Operations - Acting
Office of the Executive Director for Operations
U.S. Nuclear Regulatory Commission
301-415-1703 office
301-415-2700 fax

From: Evans, Michele
Sent: Tuesday, March 15, 2011 5:53 PM
To: Hackett, Edwin; Brenner, Eliot; Schmidt, Rebecca; Powell, Amy; Droggitis, Spiros; Doane, Margaret; Mamish, Nader; Dyer, Jim; Brown, Milton; Greene, Kathryn; Stewart, Sharon; Howard, Patrick; Miller, Charles; Moore, Scott; Cohen, Miriam; Tracy, Glenn; Haney, Catherine; Dorman, Dan; Johnson, Michael; Holahan, Gary; Leeds, Eric; Boger, Bruce; Grobe, Jack; Zimmerman, Roy; Campbell, Andy; Sheron, Brian; Uhle, Jennifer; Dean, Bill; Lew, David; McCree, Victor; Wert, Leonard; Casto, Chuck; Satorius, Mark; Pederson, Cynthia; Collins, Elmo; Howell, Art; Muessle, Mary; Andersen, James; Akstulewicz, Brenda; Belmore, Nancy; Quesenberry, Jeannette; Kreuter, Jane; Armstrong, Janine; Hudson, Sharon; Ellis, Marv; Hasan, Nasreen; Ronewicz, Lynn; Schumann, Stacy; Daniels, Stanley; Casby, Marcia; Thomas, Loretta; Walker, Dwight; Sprogeris, Patricia; Schwarz, Sherry; Ross, Robin; Cohen, Shari; Riddick, Nicole; Flory, Shirley; Veltri, Debra; Matakas, Gina; ODaniell, Cynthia; Miles, Patricia; Lee, Pamela; Dubose, Sheila; Buckley, Patricia; Tomczak, Tammy; Owen, Lucy; Tannenbaum, Anita; Gusack, Barbara; Harrington, Holly; Ricketts, Paul; Howell, Linda; Higginbotham, Tina; Ross, Brenda; Boyce, Thomas (OIS); Schaeffer, James; Jackson, Donald
Subject: Follow-up from 4 pm teleconference on Ops Center Long Term Staffing

Everyone,

Please find attached 1) a list of current positions being staffed in the Ops Center and 2) the staff identified as available to support in Japan.

Regarding additional staff available to support in the ops center, the primary needs are for the specialized positions on the PMT and anyone with previous international experience in OIP.

Regarding support in Japan, please provide any updates/changes to the list by COB March 17. The target time frame for sending these staff members is March 27-April 9, so please consider that when considering staff to put on the list.

Thanks for your support.

Michele

From: [Sheron, Brian](#)
To: [OST04 Hoc](#); [Haney, Catherine](#); [Johnson, Michael](#)
Cc: [Flory, Shirley](#)
Subject: RE: Go-books
Date: Wednesday, March 16, 2011 9:20:19 PM

Please send mine to Shirley Flory.

From: OST04 Hoc
Sent: Wednesday, March 16, 2011 2:54 PM
To: Haney, Catherine; Sheron, Brian; Johnson, Michael
Subject: Go-books

Shortly, you should be receiving hard copy go-books to support your public outreach efforts. Further updates to the books will be sent electronically. Please identify where you would like your electronic updates to be sent (yourselves, administrative staff, etc.).

Regards,
Melissa Ralph, NSIR
Melissa.Ralph@NRC.gov <<mailto:Melissa.Ralph@NRC.gov>>
LIA07.hoc@nrc.gov <<mailto:LIA07.hoc@nrc.gov>> (Operations Center)

CH/60

From: Sheron, Brian
To: Rini, Brett; Uhle, Jennifer
Subject: RE: Update
Date: Wednesday, March 16, 2011 9:25:30 PM

That's fine. Come in when things have settled down.

From: Rini, Brett
Sent: Wednesday, March 16, 2011 4:31 PM
To: Sheron, Brian; Uhle, Jennifer
Subject: Update

Brian/Jennifer,

(b)(6)



Thanks for your understanding,

Brett

CH/b1

From: [Sheron, Brian](#)
To: [Gibson, Kathy](#)
Cc: [Uhle, Jennifer](#); [Tinkler, Charles](#)
Subject: RE: MACCS run
Date: Thursday, March 17, 2011 7:27:00 AM

How far out can MACCS calculate? What is the limitation? Validation data?

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

From: Gibson, Kathy
Sent: Wednesday, March 16, 2011 10:46 PM
To: Sheron, Brian
Cc: Uhle, Jennifer
Subject: Re: MACCS run

It is being run beyond 50, sorry I should have said beyond. There are apparently difficulties because Nate Bixler is away teaching a MACCS class and there are questions about whether we have an appropriate spent fuel model (our models were high density and these are low density pools). However Charlie and Randy Gauntt are working it. Randy is clear we need something tomorrow and I passed on to Charlie and him Jennifer's specifications for the runs (3 reactors + 3 pools, and 3 reactors + 6 pools over 4 days).

I saw on the news that they tried dropping water from helicopters but because they were so high up they only hit the target once. But they are bringing 11 water cannon truck to the site. Also 180 staff are working rotating shifts.

Also, Jennifer, it doesn't appear that Jason talked to Sandia or Richard today. We called Jason but were unable to contact him tonight, so I will check in the morning.

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

From: Sheron, Brian
To: Gibson, Kathy
Cc: Uhle, Jennifer
Sent: Wed Mar 16 21:21:06 2011
Subject: RE: MACCS run

Why are we only running it out to 50 miles. I was told Rascal calculates out to 50 miles and they already ran the RASCAL analysis in the IRC. I would think we would want to run MACCS out to further distances to see what the projected doses are and whether our (U.S.) recommendation that U.S. citizens in Japan evacuate out to 50 miles remains valid, or if we should increase the recommended evacuation zone.

From: Gibson, Kathy
Sent: Wednesday, March 16, 2011 3:09 PM
To: Sheron, Brian
Subject: MACCS run

Sandia is doing a MACCS run out to 50 miles at Jennifer's request. Charlie is on the phone with Sandia to ensure they are using the "right" source term considering multiple reactors and spent fuel pools.

CH/62

From: [Sheron, Brian](#)
To: [Borchardt, Bill](#)
Subject: RE: Assistance requested
Date: Thursday, March 17, 2011 7:42:00 AM

OK, will do.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 7:37 AM
To: Sheron, Brian
Subject: FW: Assistance requested

Brian – FYI (since you'll see Pete Lyons at the DOE mtg)
Bill

From: Virgilio, Martin
Sent: Thursday, March 17, 2011 6:28 AM
To: Borchardt, Bill; Weber, Michael
Cc: Casto, Chuck; McDermott, Brian; Wiggins, Jim
Subject: Assistance requested

Bill/Mike

DOE engaged Chuck directly earlier today requesting he add a group of DOE staff (unspecified number and skills) on his team. Chuck views this as a burden and additional management challenge that he does not need at this time. I agree. Could one of you please follow up with Pete Lyons today to turn this off, for now. It may be tolerable at some time down the road.

We (including Chuck) are working with INPO to identify one individual that has knowledge and field experience in severe accident management strategies and procedures.

Marty

CH/63

From: Sheron, Brian
To: Bonaccorso, Amy; Calvo, Antony; Case, Michael; Coe, Doug; Correia, Richard; Dion, Jeanne; Gibson, Kathy; Lui, Christiana; Richards, Stuart; Rini, Brett; Sangimino, Donna-Marie; Uhle, Jennifer; Valentin, Andrea
Subject: FW: Tomorrow's News Tonight -- Please Read and Delete
Date: Thursday, March 17, 2011 7:55:00 AM

From: Harrington, Holly
Sent: Wednesday, March 16, 2011 6:37 PM
To: Harrington, Holly
Subject: Tomorrow's News Tonight -- Please Read and Delete

~~internal use only -- no distribution outside NRC -- no redistribution
may contain material proprietary to news agencies~~

JAPAN, ETC. -- The onslaught of media calls continues. Reporter questions include status of Japanese reactors, plume modeling and radiation monitoring, KI, seismic standards for NRC reactors, security vulnerabilities at U.S. plants, the Chairman's Hill briefing, Cong. Markey's letter to the NRC, and many other related topics. Some media outlets we talked to include: Platts; Ocala (Fla.)Star-Banner; Wall Street Journal; WBBH-TV, Ft. Myers, Fla.; WKMS-FM, Murray, Ky.; CBS-New York; Reuters-Washington; Tampa Tribune; ABC-Washington; WSPA-TV. Spartanburg, S.C.; Chattanooga (Tenn.) Times-Free Press; Miami Herald; The State of Columbia, S.C.; The Monroe (La.) News-Star CNN, LA Times, Associated Press, Reuters, ABC News, CBS Evening news, NPR, CBS TV (Bakersfield, CA), OC Register, Kansas City Star, Science World Magazine, Argus Media, Dallas Morning News, St. Louis Beacon, Channel News Asia, WAMU radio (D.C.), KHO-TV Houston, CNN Online, Huffington Post, Beijing TV station, Anchorage Daily News, KXXV TV Colleen, Texas, Cleveland Plain Dealer, MSNBC, Columbia Chronicle (Chicago), Fox News, Michigan Messenger, Il Riformista (Italy), AFP, Chicago Tribune, Bio World Today, National Journal, Xinhua News Agency (China), Patch.com, Quad Cities Tribune, KSTT, The Vindicator, Columbus Dispatch, the Mirror Evening (China), TBS, 60 Minutes, Environmental and Energy, PA Cable Network, WAMC-AM, Nashua Telegraph, Greenfield Recorder, Journal News, Congressional Quarterly, Reading Eagle, Albany Times Union, Pittsburgh Tribune, TV Golo, Good Morning America, Channel 10 Philadelphia, WNYC, SNL, ABC.

VICTORIA COUNTY SITE -- CNN Online, Victoria Advocate and Houston TV stations attended ASLB oral argument to hear contentions by public interest group. Judge Baretta did a number of interviews explaining the process but not talking about the case. He also explained that this meeting was previously scheduled prior to Japan and that they would not be discussing Japan incident. OPA provided interview to Texas Public Radio and talked to the Austin American Statesmen and San Antonio Express.

HONEYWELL -- The Huffington Post continues to show interest in Honeywell as a staff "labor reporter" called Region II to ask a series of questions related to our past inspections, the safety of the facility, and the \$11.8 million EPA fine assessed last week. The reporter was told that the waste storage violations cited by the EPA are outside the NRC's jurisdiction and we are satisfied that the process lines we regulate are running safely. She asked for and will be granted an interview with an NRC DFFI branch chief tomorrow.

Press Releases Issued Today

NRC PROVIDES PROTECTIVE ACTION RECOMMENDATIONS BASED ON U.S. GUIDELINES

CH/64

~~internal use only -- no distribution outside NRC -- no redistribution
may contain material proprietary to news agencies~~

From: [Sheron, Brian](#)
To: [Lyons, Peter](#)
Subject: Meeting this Afternoon
Date: Thursday, March 17, 2011 7:58:00 AM

Pete, Bill asked me to attend for the NRC, so I will be there.

CH/65

From: [Gibson, Kathy](#)
To: [Sheron, Brian](#); [Uhle, Jennifer](#)
Cc: [Scott, Michael](#); [Santiago, Patricia](#); [Holahan, Patricia](#)
Subject: Fw: MACCS Code
Date: Thursday, March 17, 2011 8:43:44 AM

Preliminary answers on how far out MACCS can go. We are pursuing further information with Sandia.

From: Schaperow, Jason
To: Gibson, Kathy
Cc: Tinkler, Charles; Chang, Richard; Gonzalez, Sergio
Sent: Thu Mar 17 08:38:52 2011
Subject: RE: MACCS Code

Hi Kathy,

I spoke with Charlie at 10:00 last night. He said he checked and MACCS can calculate out to 8000 miles. We usually run it out to 1000 miles. Validation out beyond 30 miles or so gets to be questionable.

Yesterday, Sandia got source terms together for a MACCS calculation. We think we are now in pretty good shape for some MACCS calculations. However, it appears that our key MACCS expert (Nate Bixler) is on travel, possibly here in the DC area. Richard and I are tracking him down now, and should be able to find him once it is around 8:00 Mountain Time (Albuquerque).

Jason

From: Gonzalez, Sergio
Sent: Thursday, March 17, 2011 8:29 AM
To: Chang, Richard; Schaperow, Jason; Nosek, Andrew; Navarro, Carlos
Cc: Santiago, Patricia
Subject: MACCS Code

Good Morning:

Kathy wants to now by 8:30am

How far out can MACCS calculate? What is the limitation? Validation data?

Thanks,

Sergio E. Gonzalez

Program Manager (NSPDP), Special Projects Branch
Division of Systems Analysis
Office of Nuclear Regulatory Research
Phone- 301-251-7453
Sergio.Gonzalez@nrc.gov

CA/bb

From: [Gibson, Kathy](#)
To: [Sheron, Brian](#); [Uhle, Jennifer](#)
Subject: Fw: Fukushima No. 1
Date: Thursday, March 17, 2011 8:48:13 AM
Attachments: [3-16-11-Fukushima.ppt](#)

From: Lee, Richard
To: Gibson, Kathy; Scott, Michael
Sent: Thu Mar 17 08:39:25 2011
Subject: Fukushima No. 1

Kathy & Mike:

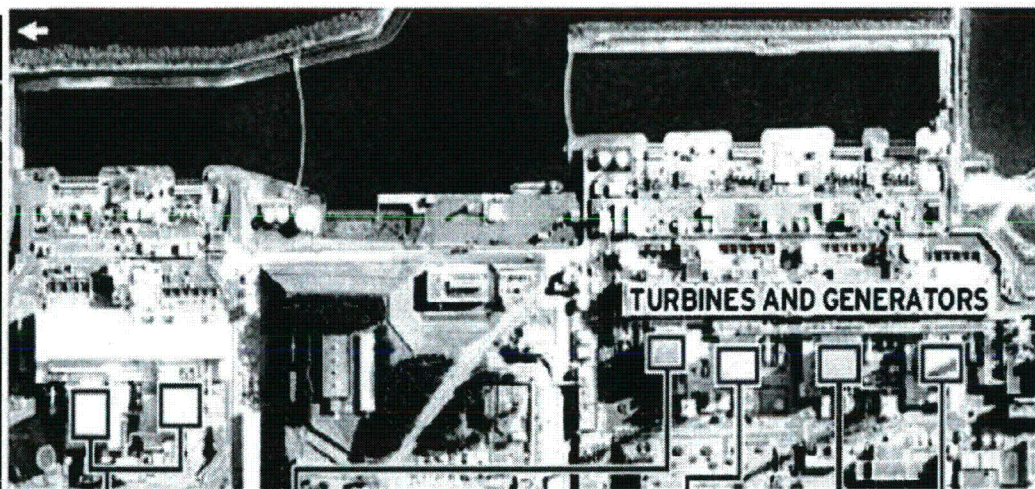
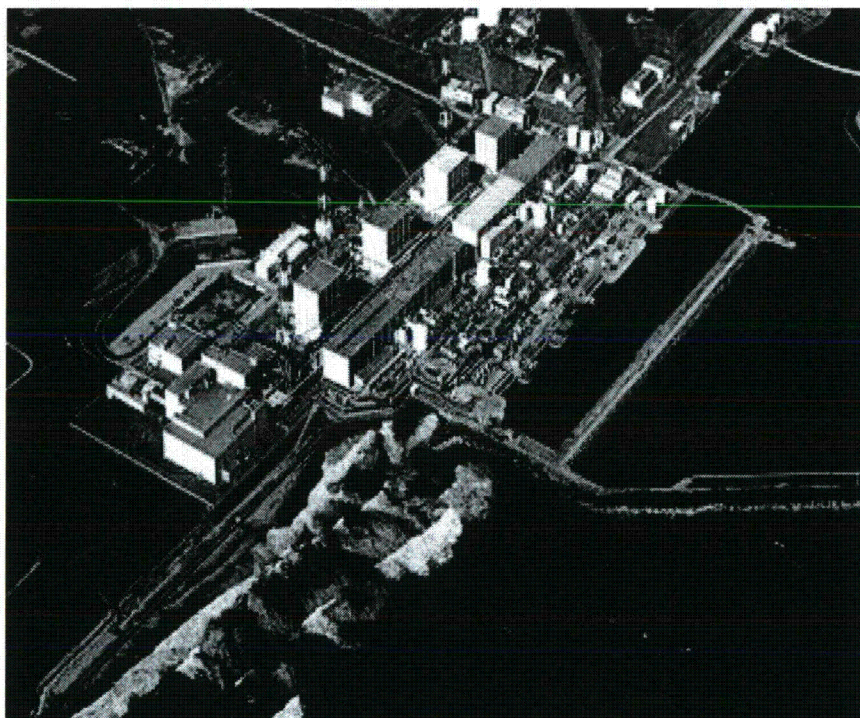
Attached is VGs received from Prof. Mike Corradini yesterday.

Richard

CH/67

Fukushima Daiichi Nuclear Station

- Six BWR units at the Fukushima Nuclear Station:
 - Unit 1: 439 MWe BWR, 1971 (unit was in operation prior to event)
 - Unit 2: 760 MWe BWR, 1974 (unit was in operation prior to event)
 - Unit 3: 760 MWe BWR, 1976 (unit was in operation prior to event)
 - Unit 4: 760 MWe BWR, 1978 (unit was in outage prior to event)
 - Unit 5: 760 MWe BWR, 1978 (unit was in outage prior to event)
 - Unit 6: 1067 MWe BWR, 1979 (unit was in outage prior to event)



Reactors 5 and 6
Had been stopped for regular maintenance.

Reactor 1
Explosion occurred near here about 3:40pm on Saturday, damaging exterior walls. Engineers flooding the core with seawater to keep it from overheating.

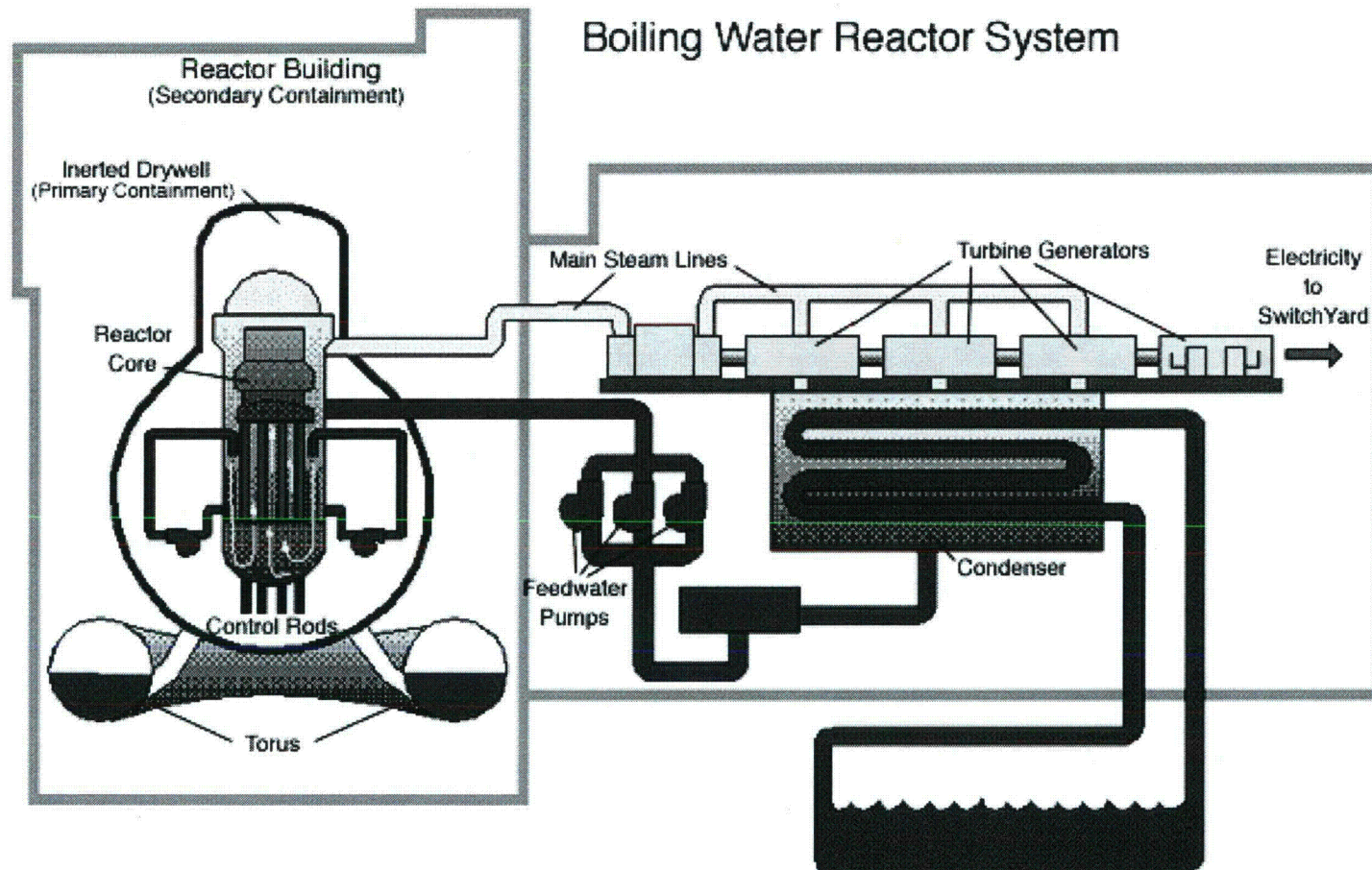
Reactor 2
Engineers adding water to reactor.

Reactor 3
In partial meltdown. Engineers are flooding core with seawater to keep it from overheating.

Reactor 4
Had been stopped for regular maintenance.

Fukushima Daiichi Unit 1

- Typical BWR 3 and 4 Reactor Design
- Some similarities to Duane Arnold Power Plant in Iowa



Fukushima Daiichi Unit 1

■ Mechanism of Boiling Water Reactor Power Station

Primary Containment Vessel (Dry Well)

It would confine radioactive substances discharged from the reactor facilities if some pipes were broken by accident.

Reactor Pressure Vessel

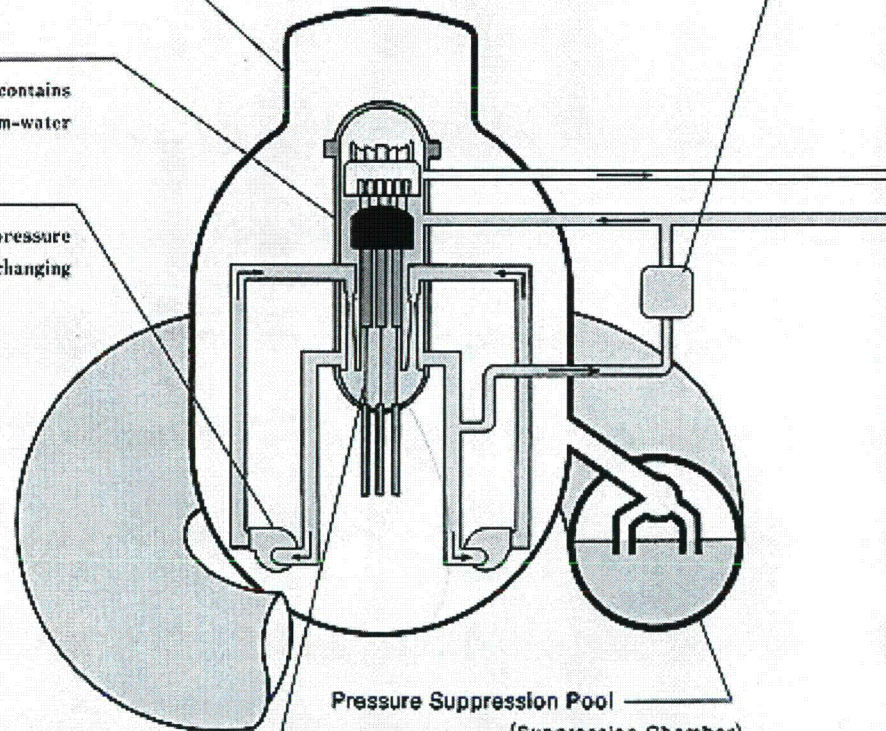
It is made of 12cm thick steel and contains fuel, control rods, jet pumps, steam-water separator and steam dryer.

Primary Recirculation pump

It circulates water in the reactor pressure vessel and changes reactor power by changing water quantity.

Cleanup Water System

It maintains the purity of the water circulating through the reactor.



Control Rods

They are used to start and stop the reactor and to change reactor power (amount of nuclear fission) by individually inserting and extracting from the bottom of the reactor.

Pressure Suppression Pool

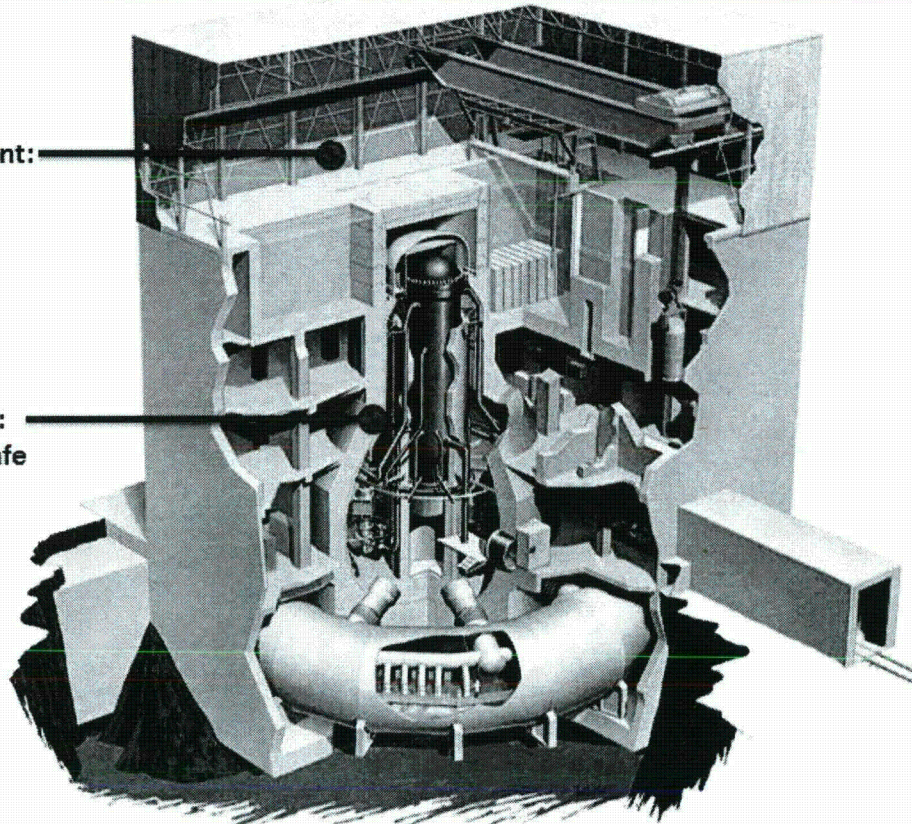
(Suppression Chamber)

It always contains water. Should pipes in the primary containment vessel ever break, leaked steam would be conducted into the pool, where it would be cooled down and condensed with a large amount of water to suppress any rise in pressure in the primary containment vessel.

Fukushima Daiichi Unit 1

Secondary containment:
Area of explosion at
Fukushima Daiichi 1

Primary containment:
Remains intact and safe



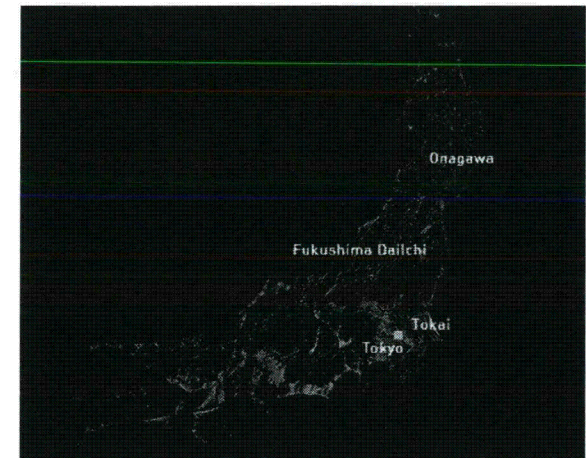
Boiling Water Reactor Design

Event Initiation

- The Fukushima nuclear facilities were damaged in a magnitude 9 earthquake on March 11 (Japan time), centered offshore of the Sendai region, which contains the capital Tokyo.
 - Plant designed for magnitude 8.2 earthquake. An 9 magnitude quake is much greater in magnitude.
- Serious secondary effects followed including a significantly larger tsunami, significant aftershocks and a major fire at a fossil fuel installation.



By Janet Loehrke, USA TODAY



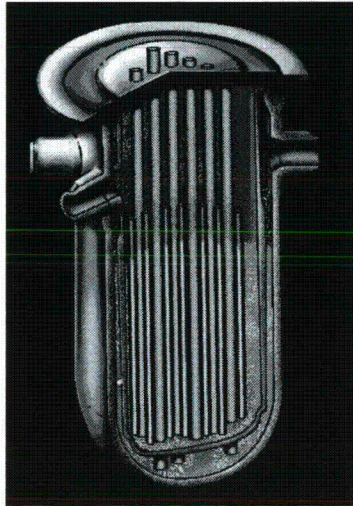
Initial Response

- Nuclear reactors were shutdown automatically. Within seconds the control rods were inserted into core and nuclear chain reaction stopped.
- Cooling systems were placed in operation to remove the residual heat. The residual heat load is about 3% of the heat load under normal operating conditions decreasing to much less than 1% after days.
- Earthquake resulted in the loss of offsite power which is the normal supply to a plant when it is shutdown.
- Emergency Diesel Generators started and powered station emergency cooling systems.
- One hour later, the station was struck by the tsunami. The tsunami was larger than what the plant was designed for (20ft waves). The tsunami took out all multiple sets of the backup Emergency Diesel generators and likely damaged the service water pumps which provide cooling from the sea.
- Reactor operators were able to utilize emergency battery power to provide power for cooling the core for 8 hours.
- Operators followed abnormal operating procedures and emergency operating procedures.

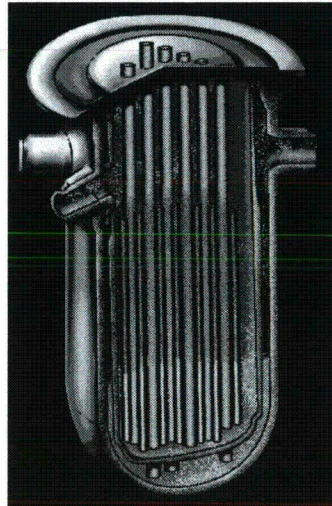
Loss of Makeup

- Offsite power could not be restored and delays occurred obtaining and connecting portable generators.
- After the batteries ran out, residual heat could not be carried away any more.
- Reactor temperatures increased and water levels in the reactor decreased, eventually uncovering and overheating the core.
- Hydrogen was produced from metal-clad/water reactions in the reactor.
- Operators vented the reactor to relieve steam pressure and energy (and hydrogen) was released into the primary containment (drywell) causing primary containment temperatures and pressures to increase.
- Operators took actions to vent the primary containment to control containment pressure and hydrogen levels through the wetwell. Required to protect the primary containment from failure.
- Primary Containment Venting is through a filtered path that travels through duct work in the secondary containment to an elevated release point on the refuel floor (on top of the reactor building).
- A hydrogen detonation subsequently occurred while venting the reactor building above the drywell. Occurred shortly following an aftershock at the station. Spark likely ignited hydrogen.

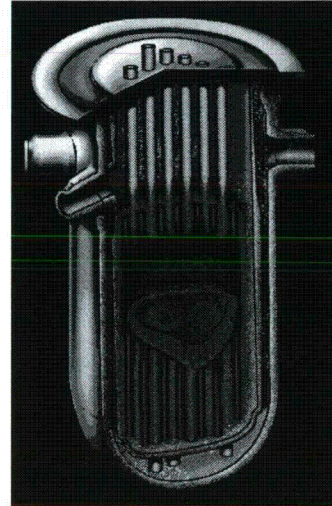
Core Damage Sequence



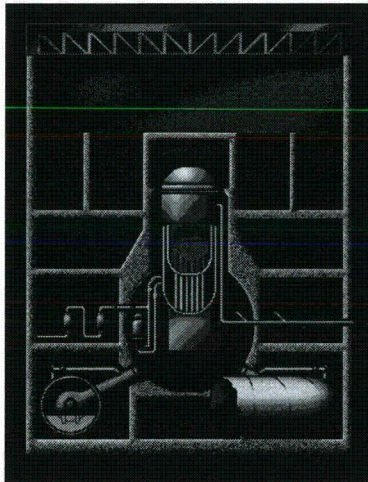
Core Uncovered



Fuel Overheating



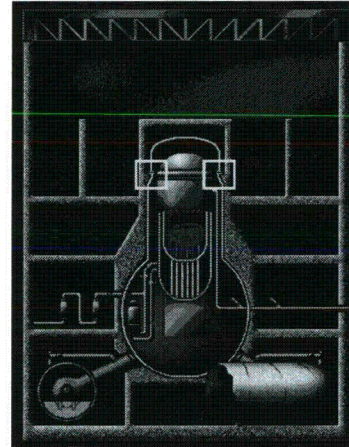
Fuel melting - Core Damaged



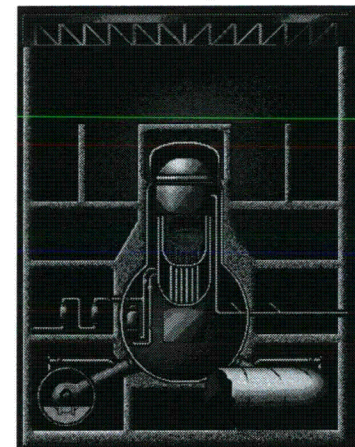
Core Damaged but retained in vessel



Core Melt-through
Some portions of core melt into lower RPV head



Containment pressurizes.
Leakage possible at drywell head



Releases of hydrogen into secondary containment

Hydrogen Detonation at Unit 1

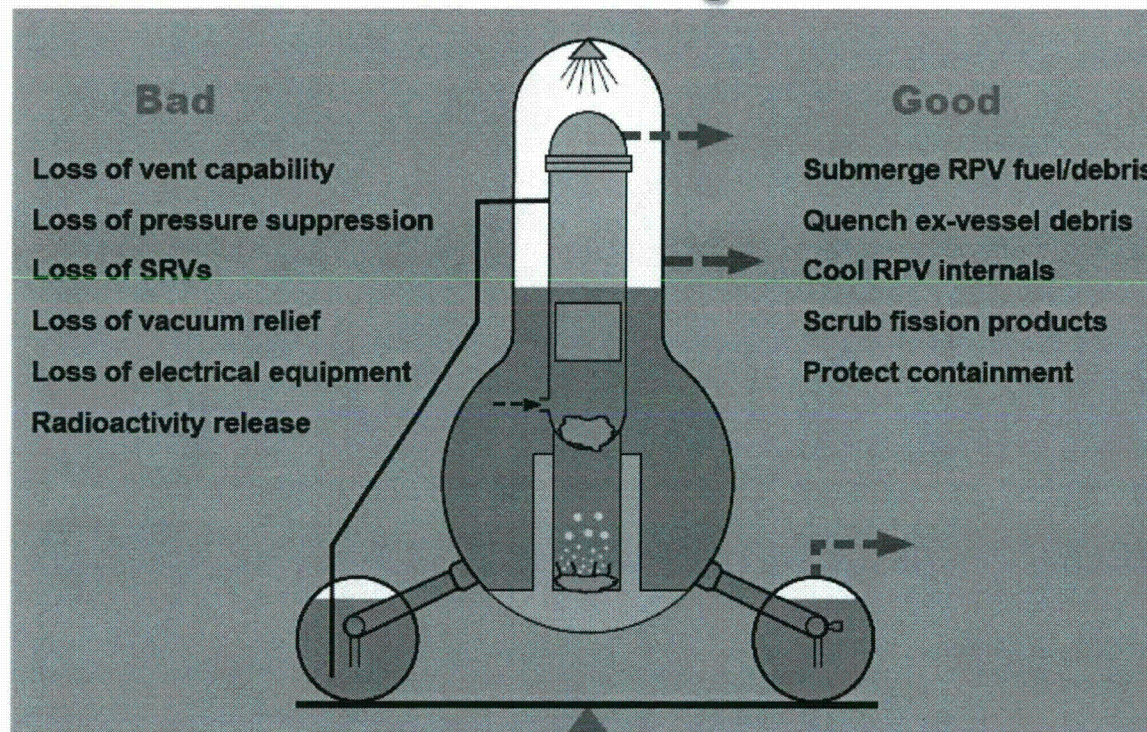


Reactor Building

Mitigating Actions

- The station was able to deploy portable power generators and utilize portable fire pumps to inject sea water into the reactor and primary containment.
- Station operators began flooding the reactor vessel
- Reports suggest that pumps were also injecting water into the containment – but it's unclear
- Boric acid was added to the seawater used for injection. Boric acid is “liquid control rod”. The boron captures neutrons and speeds up the cooling down of the core. Boron also reduces the release of iodine by buffering the containment water pH.

Containment Flooding Effects



Emergency Response

- Equivalent of General Emergency declared to the initial events in Unit 1 on Friday.
- Evacuation of public performed within 20 km (13 miles) of plant; approximately 200,000 people evacuated and sheltering in place within 30km (20 miles).
- Similar hydrogen detonation subsequently occurred at Unit 3 late on Sunday, March 14th (Japan time). Primary containment appears to remain intact at Unit's 1 and 3 throughout the accident. There was considerable damage to the secondary containment (reactor building). A similar scenario occurred in Unit 2 on Tuesday.
- Recorded radiation levels have spiked after each event (above) at the Fukushima Daiichi site (140-800mrem/hr). Radiation levels were subsequently reduced to a few millirem after the after cooling was restored. The NRC's radiation dose limit for the public is 100 millirem per year and natural background is about 300 mrem per year.
- Several injured workers were reported at the plant with radiation exposure of ~10rem.
- Authorities distributed Potassium-iodide tablets to protect the public from potential health effects of radioactive isotopes of iodine that could potentially be released. This is quickly taken up by the body and its presence prevents the take-up of iodine-131 should people be exposed to it.
- Over 300 after shocks have occurred and continue to challenge station response.
- THE SITUATION FOR SPENT FUEL POOLS HAS NOT BEEN ADDRESSED HERE

From: Sheron, Brian
To: Bowman, Gregory
Subject: FW: MACCS Code
Date: Thursday, March 17, 2011 8:55:00 AM

(b)(5)

I have to go to a meeting at DOE this afternoon at Bill B's request, so you can follow up with Jennifer or Kathy Gibson. Jennifer will be attending the 10 am alignment meeting today.

From: Gibson, Kathy
Sent: Thursday, March 17, 2011 8:44 AM
To: Sheron, Brian; Uhle, Jennifer
Cc: Scott, Michael; Santiago, Patricia; Holahan, Patricia
Subject: Fw: MACCS Code

Preliminary answers on how far out MACCS can go. We are pursuing further information with Sandia.

From: Schaperow, Jason
To: Gibson, Kathy
Cc: Tinkler, Charles; Chang, Richard; Gonzalez, Sergio
Sent: Thu Mar 17 08:38:52 2011
Subject: RE: MACCS Code

Hi Kathy,

(b)(5)

Yesterday, Sandia got source terms together for a MACCS calculation. We think we are now in pretty good shape for some MACCS calculations. However, it appears that our key MACCS expert (Nate Bixler) is on travel, possibly here in the DC area. Richard and I are tracking him down now, and should be able to find him once it is around 8:00 Mountain Time (Albuquerque).

CH/68

Jason

From: Gonzalez, Sergio
Sent: Thursday, March 17, 2011 8:29 AM
To: Chang, Richard; Schaperow, Jason; Nosek, Andrew; Navarro, Carlos
Cc: Santiago, Patricia
Subject: MACCS Code

Good Morning:

Kathy wants to now by 8:30am

How far out can MACCS calculate? What is the limitation? Validation data?

Thanks,

Sergio E. Gonzalez

Program Manager (NSPDP), Special Projects Branch
Division of Systems Analysis
Office of Nuclear Regulatory Research
Phone- 301-251-7453
Sergio.Gonzalez@nrc.gov

From: [Sheron, Brian](mailto:Sheron_Brian)
To: [Gibson, Kathy](mailto:Gibson_Kathy)
Cc: [Uhle, Jennifer](mailto:Uhle_Jennifer)
Subject: FW: ANNOUNCEMENT: Cancer Risk Assessment Committee Upcoming Meeting Dates
Date: Thursday, March 17, 2011 9:56:00 AM

From: Wingo, Erin [<mailto:EWingo@nas.edu>]
Sent: Thursday, March 17, 2011 9:27 AM
Cc: Kosti, Ourania; Crowley, Kevin; Whetstone, Shauntee; Greenleaf, Toni; Powell, Amy; Annie Caputo; Arjun Makhijani; Art Reardon; Barbara O'Neal; Bill Freebairn; Bonnie Richter; Brian O'Connell; Sheron, Brian; Carolyn Hill; Cindy Folkes; Conrad Miller; Craig Pitncy; Cynthia and Joseph Sauer; Daniel J. Strom; Dave Rossin; David Shafer; Denise Fontana; Damon, Dennis; Derek Hagemeyer; Diane D'Arrigo (dianed@nirs.org); Dick Mangrum; Donna Cragle; Doreen Hill; Doug Guarmo; Elaine Hirmin; Emma Petty; Farrell Callahan; Frank Currier; Gail Butler; Harold Peterson; Janet Hill; Jeffery Patterson; Uhle, Jennifer; Weil, Jenny; Jerry Bonanno; Jimmy Boling; Joe Smith; Tomon, John; Julie Reardon; Kathryn McElveen; Gibson, Kathy; Mattern, Kevin; LC M ; Leigh Garten; Lewis Cuthbert; Liz Lynch; Lynn Ehrle; Marcia Marks; Marth Linet; Mary Lampert; Mary Olson; Mary Reardon; Marshall, Michael; Michal Freedhoff; Michele Boyd; Mohammad Saha; Nancy Ingham; Coleman, Neil; Noelle Metting; Pam Williams; Pat Baker; Milligan, Patricia; Paul Gunter; Payne Studios; Pino; Ralph Anderson; Robert P. Shaw; Rochelle Beckers; Roger Witherspoon; Burnell, Scott; Seth Tuler; Shirley Vaine; Bush-Goddard, Stephanie; Garry, Steven; Steve Wing; Steven Schaffer; Susan McElreath; Brock, Terry; Shaffer, Vered; Walsh, Jennifer; Yongsoo Hwang
Subject: ANNOUNCEMENT: Cancer Risk Assessment Committee Upcoming Meeting Dates

Dear interested parties,

The committee on Cancer Risk Assessment has released a tentative list of dates and locations for its upcoming meetings. These meetings will include an open session, which we welcome the public to attend. Further meeting details, such as speakers and agenda showing the time of the open session, will be made available closer to each meeting date.

The tentative dates and locations are as follows:

	location	dates
Meeting #2	Chicago	April 18-19, 2011
Meeting #3	Atlanta	May 23-24, 2011
Meeting #4	Los Angeles	July 20-21, 2011
Meeting #5	TBD	August 29-30, 2011

Please, feel free to circulate this message to interested parties. You can direct any inquiries regarding these meeting dates to the project email at crs@nas.edu

C44/69

From: [Sheron, Brian](#)
To: [Borchardt, Bill](#); [Leeds, Eric](#); [Haney, Catherine](#); [Johnson, Michael](#)
Cc: [Weber, Michael](#); [Schmidt, Rebecca](#); [Batkin, Joshua](#); [HOO Hoc](#)
Bcc: [Uhle, Jennifer](#); [Flory, Shirley](#)
Subject: RE:
Date: Thursday, March 17, 2011 10:04:00 AM

I should be able to attend. I'll meet you in the ops center around 7am.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 9:44 AM
To: Leeds, Eric; Haney, Catherine; Sheron, Brian; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject:

Senate EPW staff has requested a briefing Fri @9:30 (location TBD). I believe that Pete Lyons will be representing DOE. I am planning to represent NRC. I invite any of the 4 addressees of this email (the 4 new "Communicators") to come along to get a sense of what the hill is interested in, etc. It is totally your call. I plan to be in the ops center at 7am to get a last minute update and then take metro (7:45) downtown.

Please let me know whether you plan to attend or not.

Bill

CH/10

From: [Sheron, Brian](#)
To: [Coe, Doug](#); [Covne, Kevin](#)
Cc: [Uhle, Jennifer](#)
Subject: FW: FYI - April meetings in DC on how high reliability organizations manage catastrophic risks
Date: Thursday, March 17, 2011 11:08:00 AM

See below. Is someone attending? Should/can someone attend?

From: Weber, Michael
Sent: Wednesday, March 16, 2011 6:56 PM
To: Sheron, Brian; Uhle, Jennifer
Cc: Bowman, Gregory; Evans, Michele; Wiggins, Jim; Case, Michael
Subject: FYI - April meetings in DC on how high reliability organizations manage catastrophic risks

These meetings could be interesting, especially in light of our ongoing response to the situation in Japan.

From: Sanfilippo, Nathan
Sent: Wednesday, March 16, 2011 11:45 AM
To: Weber, Michael
Cc: Bowman, Gregory; Franovich, Mike
Subject: FW: April meetings in DC on how high reliability organizations manage catastrophic risks

Mike,

During our meeting with the CSB last week, they mentioned these two meetings in April that we might be interested in. Perhaps you could pass to RES?

Thanks,
Nathan

From: Hoyle, Bill [mailto:Bill.Hoyle@csb.gov]
Sent: Tuesday, March 15, 2011 4:36 PM
To: Franovich, Mike
Cc: Sanfilippo, Nathan
Subject: April meetings in DC on how high reliability organizations manage catastrophic risks

Michael and Nathan,

Thanks so much for your time last week. It was extremely helpful. Below are links to two interesting meetings in DC next month.

Regards,
Bill Hoyle
CSB Senior Investigator

April 19th http://berkeleysph.qualtrics.com/SE/?SID=SV_e4zISCHqiZ0PIR6

April 20-21 http://www.high-reliability.org/Documents/Conferences/Washington_DC/Agenda/Agenda Intl HRO Conference April2011.pdf

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From: Weerakkody, Sunil
To: Leeds, Eric; Boger, Bruce; Grobe, Jack
Cc: Sheron, Brian; Uhle, Jennifer; Wiggins, Jim; Evans, Michele
Subject: Question w.r.t. NRC's New Strategic Plan for Out Years for you to ponder
Date: Thursday, March 17, 2011 11:14:34 AM

Eric\Jack\Bruce,

As the NRR representative overseeing the NRC Strategic Plan development activities, I have the following question for you to ponder among yourself and share your views, when time permits, so that I can effectively represent NRR. I will be posing this same question to members of the Steering Group to initiate a dialogue among the members.

“Should we be re-evaluating our revision to the Strategic Plan for FY 13-18 in light of the events unfolding in Japan?” i.e., “Will NRR revisit HIGH-LEVEL priorities, strategies, goals, etc...of the operating reactor business line during the next 5 years?”

Sunil D. Weerakkody
Deputy Director - DRS (Acting)
NRC - RGN I
Tel: 610-337-5128

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From: Langlie, Liz
To: Prescott, Paul; Hall, Victor; Zhang, Deanna; Rebstock, Paul; Hilton, Nick; Cool, Donald; Dehmel, Jean-Claude; Jankovich, John; Poole, Brooke; Dube, Donald; Lois, Erasmia; Stutzke, Martin; Hudson, Daniel; Drouin, Mary; Nove, Carol; Scarbrough, Thomas; Lee, Mike; Dean, Bill; McCree, Victor; Satorius, Mark; Collins, Elmo; Denissen, Christie; Munson, Clifford; Ake, Jon; Manoly, Kamal; Kokaiko, Lawrence; Miller, Kenn; Daley, Robert; Tappert, John; Casto, Chuck; Kahler, Robert; Dozier, Jerry; Imboden, Andy; Stone, AnnMarie; Galloway, Melanie; Howe, Andrew; Tjader, Theodore; Mrowca, Lynn; Sieracki, Diane; Cheok, Michael; Cai, June; Dion, Jeanne; Pederson, Perry; Costello, Ralph; Hiser, Allen; Carpenter, Gene; Frumkin, Daniel; Held, Wesley; Scales, Kerby; Roquecruz, Carla; Concepcion, Milton; Day, Kerstun; Shaffer, Vered; Cullingford, Michael; Bailey, Stewart; Clody, SherVerne; Tetter, Keith; Moyer, Carol; Carpenter, Robert; Stevens, Gary; Kennedy, James; Barkley, Richard; Markley, Michael; Doolittle, Elizabeth; Som, Swagata; Rivera-Varona, Aida; Mroz (Sahm), Sara; Sangimino, Donna-Marie; Drucker, David; Evans, Jonathan; Thompson, Catherine; Cai, June; Emche, Danielle; VandenBerghe, John; Tregoning, Robert; Oudinot, Daniele; Mills, Daniel; Gall, Jennifer; Calvo, Antony; Ansoosheepoor, Rasool; Miller, Barry; Sakai, Stacie; Williams, Donna; Cartwright, William; Tene, Kimberly; Sellman, Ahsan; Sall, Basia; Reed, Wendy; Snyder, Amy; Cupidon, Les; Shropshire, Alan; Chang, Richard; Barrett, Harold; Xu, Jim; Lu, Shanlai; Park, Sunwoo; Hernandez, Raul; Gall, Jennifer; Ruland, William; Ziqh, Ghani; Gingrich, Chester; Whitman, Josh; Esmaili, Hossein; Gibson, Kathy; Brock, Terry; Khanna, Meena; Klein, Paul; Hardies, Robert; Kozal, Jason; Powell, Raymond; Pederson, Cynthia; Guthrie, Eugene; Daley, Robert; Vogel, Anton; Brown, Frederick; Kelly, Joseph; Srinivasan, Makuteswara; Lobel, Richard; Laur, Steven; Mitchell, Reggie; Rheaume, Cynthia; Noggle, James; Libby, Earl; Case, Michael; Mizuno, Geary; Benowitz, Howard; Whitney, James; Schnetzler, Bonnie; Giantelli, Adelaide; Barry, Terrence; Chang, Richard; Schaperow, Jason; Tinkler, Charles; Santiago, Patricia; Patel, Jigar
Cc: Givvines, Mary; Kipfer, Lorna; Oliveto, Betsy; Reckley, William; Murphy, Martin; Sydnor, Russell; Zimmerman, Roy; Bush-Goddard, Stephanie; Cullingford, Michael; Ruland, William; Karlin, Alex; Demoss, Gary; Norris, Wallace; Camper, Larry; Virgilio, Martin; Markley, Michael; Haney, Catherine; Wilson, George; Tappert, John; McDermott, Brian; Sheron, Brian; Holian, Brian; Harrison, Donnie; Elliott, Robert; Campbell, Andy; Doane, Margaret; Erlanger, Craig; Case, Michael; Klein, Alex; Mrowca, Lynn; Ulses, Anthony; Uhle, Jennifer; Gibson, Kathy; Gavrilas, Mirela; Virgilio, Martin; Holahan, Gary; Morris, Scott; Pederson, Cynthia; Scott, Michael; Dennig, Robert; Dyer, Jim; Nicholson, Thomas; Matthews, David; Johnson, Clay; Coffin, Stephanie; Bonaccorso, Amy; Anderson, Patricia; Schum, Constance; Wright, Jason; Padilla, William; Doan, Brian; Coates, Carlotta; Emche, Danielle; Doolittle, Elizabeth; Galloway, Melanie; Case, Michael; Dudes, Laura; Lorson, Raymond; Cullingford, Michael; Machalek, Woody; Wilson, George; Knowles, Eric; Valentin, Andrea; Betsy Oliveto
Subject: THANK YOU and ACTION: Sample Speaker Thank you Letter and Template for Unanswered Session Questions
Date: Thursday, March 17, 2011 1:00:23 PM
Attachments: Sample Speaker TY Ltr.doc
Sample Format for Qs&As.docx
Importance: High

Dear Session Coordinators and Chairs,

The 2011 RIC was very successful and I thank you on behalf of Lorna Kipfer, Betsy Oliveto and the RIC Planning Committee for greatly adding to that success! We have received many compliments on the technical session content and we appreciate the hard work you and your speakers put into making RIC sessions educational, timely and interesting.

It is now time for conference wrap up actions, which include thanking all speakers for their participation and responding to unanswered session questions, which will be posted on the RIC website. Attached is a sample speaker thank you letter for your reference – feel free to customize the letter to meet your needs. Please send thank you notes to your speakers in the next couple of weeks and let us know via email when this action has been completed – *we do not need to be copied on thank you notes*. Feel free to send your thank you letters via regular mail or email.

Also attached is a question and answer template. If you have unanswered questions from your session, please respond in the *Option A* format listed on the attached template; or, if all questions were answered at your session onsite, please respond in the *Option B* format. Please send your responses to me at liz.langlie@nrc.gov by March 23.

Our goal is to have audio and video of plenary sessions, audio of technical sessions, transcripts for plenary and technical sessions, updated technical presentations and

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unanswered questions on the external website by the end of March. We understand that it is an extremely busy time for many of you as a result of the Japan earthquake and tsunami, so please let us know if you are unable to send responses to unanswered questions by March 23.

I enjoyed working with each of you on the RIC technical sessions this year and I hope to work with you again on RIC 2012! Please don't hesitate to contact me or Lorna Kipfer if you have any questions and thank you again for your efforts to make the RIC such a successful conference.

Best,
Liz

Liz Langlie
Program Specialist, NRR/PMDA
U.S. Nuclear Regulatory Commission (NRC)
301/415-7237
O-13E9
liz.langlie@nrc.gov



SAMPLE THANK YOU LETTER TO TECHNICAL SESSION SPEAKERS

DATE

NAME
TITLE
ORGANIZATION
ADDRESS

Dear Mr./Mrs./Ms. _____:

Thank you for presenting at the U.S. Nuclear Regulatory Commission's 23rd Annual Regulatory Information Conference (RIC), March 8 – 10, 2011, in Rockville, Maryland. This year the total number of participants reached over 2,900 participants including international representatives from 28 countries.

Initial feedback from participants indicates that this year's RIC was another resounding success. Your dedication and support helps the NRC "raise the bar" each year to develop a comprehensive program filled with discussion topics that are timely and relevant.

Your presentation on "____(speaker presentation title)_____" during the ____ (session number and title)____ session provided important information and another perspective about initiatives that are underway in the nuclear arena. *[optional: The interest of the attendees was evident by the range of questions raised during the question-and-answer period following the panel presentations.]*

All final presentation slides and questions that were not addressed during the conference are being compiled and will be posted on the NRC's RIC website at: <http://www.nrc.gov/public-involve/conference-symposia/ric/index.html>. Again, thank you for your participation at NRC's 2011 Regulatory Information Conference. It is your commitment and support that helped to make the RIC a success.

We hope you will join us for the 24th Annual RIC March 13-15, 2012, scheduled to be held at the Bethesda North Marriott Hotel and Conference Center, Rockville, Maryland.

Warm regards,

Session Chair or Coordinator (as appropriate)



SUGGESTED FORMATS FOR PROVIDING QUESTIONS AND ANSWERS

Option A - Please follow the sample format below for sessions that have unanswered questions:

Session Day and Time: [ex: Tuesday, March 8, 1:30 p.m. - 3:00 p.m.]

Session Number and Title: [ex: T1 10 CFR Part 21 and Commercial-Grade Degradation]

Session Chair: [enter name and office of Session Chair]

Session Coordinator: [enter name, office, telephone number and email address of Session Coordinator]

Question 1:

Answer 1:

Question 2:

Answer 2:

Option B - Please follow the sample format below for sessions where all the questions received were answered during the session:

Session Day and Time: [ex: Tuesday, March 8, 1:30 p.m. - 3:00 p.m.]

Session Number and Title: [ex: T1 10 CFR Part 21 and Commercial-Grade Degradation]

Session Chair: [enter name and office of Session Chair]

Session Coordinator: [enter name, office, telephone number and email address of Session Coordinator]

All questions received were answered during the session.

From: Dehn, Jeff
To: Sheron, Brian
Cc: Sangimino, Donna-Marie
Subject: FYI: LTO Forum Update
Date: Thursday, March 17, 2011 1:01:11 PM

Brian,

Just a quick FYI follow up. I've registered you, Donna-Marie and Rebecca Smith-Kevern (DOE/LWR Technologies Director) for the LTO forum. M. Johnson and E. Leeds have been registered by their Intl Liaisons. Margie Doane will be registered by OIP, and I've asked OIP to get anyone going from the Chairman's office to register ASAP.

Thank you,

Jeff

Jeff Dehn

International Relations Specialist
Office of Nuclear Regulatory Research (RES)
US Nuclear Regulatory Commission
jeff.dehn@nrc.gov
301-251-7672
C-6D22

CAH/74

From: Boger, Bruce
To: Grobe, Jack; Weerakkody, Sunil; Leeds, Eric
Cc: Sheron, Brian; Uhle, Jennifer; Wiggins, Jim; Evans, Michele
Subject: RE: Question w.r.t. NRC's New Strategic Plan for Out Years for you to ponder
Date: Thursday, March 17, 2011 1:09:25 PM

Great topic of discussion, but as Jack indicates, a little too early in our understanding of the path forward in the longer term.

From: Grobe, Jack
Sent: Thursday, March 17, 2011 12:52 PM
To: Weerakkody, Sunil; Leeds, Eric; Boger, Bruce
Cc: Sheron, Brian; Uhle, Jennifer; Wiggins, Jim; Evans, Michele
Subject: Re: Question w.r.t. NRC's New Strategic Plan for Out Years for you to ponder

Sunil

On the surface I would say no. However it is really too early to say difinitively.
Jack Grobe, Deputy Director, NRR

From: Weerakkody, Sunil
To: Leeds, Eric; Boger, Bruce; Grobe, Jack
Cc: Sheron, Brian; Uhle, Jennifer; Wiggins, Jim; Evans, Michele
Sent: Thu Mar 17 11:14:31 2011
Subject: Question w.r.t. NRC's New Strategic Plan for Out Years for you to ponder

Eric\Jack\Bruce,

As the NRR representative overseeing the NRC Strategic Plan development activities, I have the following question for you to ponder among yourself and share your views, when time permits, so that I can effectively represent NRR. I will be posing this same question to members of the Steering Group to initiate a dialogue among the members.

“Should we be re-evaluating our revision to the Strategic Plan for FY 13-18 in light of the events unfolding in Japan?” i.e., “Will NRR revisit HIGH-LEVEL priorities, strategies, goals, etc...of the operating reactor business line during the next 5 years?”

Sunil D. Weerakkody
Deputy Director - DRS (Acting)
NRC - RGN I
Tel: 610-337-5128

C44/75

From: Sheron, Brian
To: Borchardt, Bill; Schmidt, Rebecca; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: Re:
Date: Thursday, March 17, 2011 5:44:13 PM

Yes, I will already be down there.

From: Borchardt, Bill
To: Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Sent: Thu Mar 17 12:59:53 2011
Subject: RE:

Unfortunately this would conflict with the NRC all hands briefing. Can 1 of the 4 "communicators" handle the 11:45?

From: Schmidt, Rebecca
Sent: Thursday, March 17, 2011 12:48 PM
To: Sheron, Brian; Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

The House has now asked for the same briefing at 11:45. Bill are you available for that one too?

From: Sheron, Brian
Sent: Thursday, March 17, 2011 10:05 AM
To: Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject: RE:

I should be able to attend. I'll meet you in the ops center around 7am.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 9:44 AM
To: Leeds, Eric; Haney, Catherine; Sheron, Brian; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject:

Senate EPW staff has requested a briefing Fri @9:30 (location TBD). I believe that Pete Lyons will be representing DOE. I am planning to represent NRC. I invite any of the 4 addressees of this email (the 4 new "Communicators") to come along to get a sense of what the hill is interested in, etc. It is totally your call. I plan to be in the ops center at 7am to get a last minute update and then take metro (7:45) downtown.

Please let me know whether you plan to attend or not.

Bill

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From: Sheron, Brian
To: Haney, Catherine; Borchardt, Bill; Schmidt, Rebecca; Leeds, Eric; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan
Subject: Re:
Date: Thursday, March 17, 2011 5:46:56 PM

I will handle it since I'll already be down there.

From: Haney, Catherine
To: Borchardt, Bill; Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan
Sent: Thu Mar 17 13:47:00 2011
Subject: RE:

Seems to me that Brian might be the best candidate since he is already downtown. I tried calling him to discuss who would go. Shirley told me that Brian was at DOE (meeting doesn't end until 5 pm) and that his schedule on Friday was open. She tentatively put the 11:45 briefing on his schedule.

I'm happy to be a back up. If Brian can't do it, I'd like to go down and listen in on the 9:30 briefing.

Unfortunately, we might not have a firm answer until later this evening unless Mike J wants to volunteer in Brian's place.

As an aside, I'm scheduled to leave for France on Saturday afternoon. I spoke with Mike W last night about whether I should cancel. The view was I should continue with the trip. Of course, I can change plans up until I get on the plane. You might want to consider using Dan as a communicator next week. I will leave my "go to book" for him.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 1:00 PM
To: Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

Unfortunately this would conflict with the NRC all hands briefing. Can 1 of the 4 "communicators" handle the 11:45?

From: Schmidt, Rebecca
Sent: Thursday, March 17, 2011 12:48 PM
To: Sheron, Brian; Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

The House has now asked for the same briefing at 11:45. Bill are you available for that one too?

From: Sheron, Brian
Sent: Thursday, March 17, 2011 10:05 AM
To: Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc

CHA/TM

Subject: RE:

I should be able to attend. I'll meet you in the ops center around 7am.

From: Borchardt, Bill

Sent: Thursday, March 17, 2011 9:44 AM

To: Leeds, Eric; Haney, Catherine; Sheron, Brian; Johnson, Michael

Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc

Subject:

Senate EPW staff has requested a briefing Fri @9:30 (location TBD). I believe that Pete Lyons will be representing DOE. I am planning to represent NRC. I invite any of the 4 addressees of this email (the 4 new "Communicators") to come along to get a sense of what the hill is interested in, etc. It is totally your call. I plan to be in the ops center at 7am to get a last minute update and then take metro (7:45) downtown.

Please let me know whether you plan to attend or not.

Bill

From: Sheron, Brian
To: Valentin, Andrea
Subject: Fw:
Date: Thursday, March 17, 2011 5:48:00 PM
Attachments: Work Schedule and Premium Pay Guidance for Japan Response 3.docx

From: Davidson, Lawrence

To: Abraham, Susan; Abrams, Charlotte; Ader, Charles; Akstulewicz, Frank; Albert, Ronald; Allwein, Russell; Alston, Timothy; Andersen, James; Anderson, Joseph; Armentrout, Deborah; Ash, Darren; Ash, Melissa; Astwood, Heather; Auluck, Rajender; Austin, Joseph; Ayres, David; Bahadur, Sher; Bailey, Marissa; Bailey, Stewart; Baker, Pamela; Banas, Paul; Barss, Dan; Bartlett, Bruce; Bartley, Jonathan; Bartley, Malion; Batkin, Joshua; Baum, Robin; Bayliff, Shirley; Beardsley, James; Beasley, Benjamin; Bell, Hubert; Bell, Marvin; Bellamy, Ronald; Bellinger, Alesha; Benjamin, Jamie; Benner, Eric; Benney, Brian; Bergman, Thomas; Biggins, James; Bladey, Cindy; Blamey, Alan; Bloom, Steven; Bloomer, Tamara; Blount, Tom; Boger, Bruce; Boland, Anne; Bolduc, Angela; Bonser, Brian; Borchardt, Bill; Borden, William; Bouling, Ramona; Bower, Fred; Bower, Phyllis; Boyce, Tom (RES); Boyce, Thomas (OIS); Brady, Joseph; Brenner, Eliot; Brezovec, Michael; Broaddus, Doug; Brooks, Kenneth; Brown, Frederick; Brown, Tony; Brown, Milton; Brown, Rohn; Bubar, Patrice; Buchholz, Jeri; Buckley, Michael; Bumpass, Sheila; Burns, Stephen; Burritt, Arthur; Burton, Stephen; Burton, William; Bush-Goddard, Stephanie; Cain, Chuck; Caldwell, Robert; Calle, Joselito; Cameron, Jamnes; Campbell, Andy; Campbell, Larry; Campbell, Stephen; Campbell, Vivian; Camper, Larry; Caniano, Roy; Cardenas, Daniel; Carlson, Robert; Carpenter, Cynthia; Case, Michael; Casto, Chuck; Casto, Greg; Cataldo, Paul; Catts, Michelle; Champion, Bryan; Chang, Helen; Chang, Lydia; Cheok, Michael; Chernoff, Harold; Chernoff, Margaret; Chokshi, Nilesh; Christensen, Harold; Clark, Jeff; Clay, Earnestine; Clayton, Brent; Clifford, James; Cobey, Eugene; Cochrum, Steven; Coe, Doug; Cohen, Miriam; Cohen, Ronald; Cohen, Stephen; Colaccino, Joseph; Coleman, Judy; Collins, Daniel; Collins, Elmo; Conte, Richard; Cook, Christopher; Corbett, James; Cordes, John; Correia, Richard; Costello, Ralph; Coyne, Kevin; Croteau, Rick; Crowe, Eddy; Cruz, Jeffrey; Csontos, Aladar; Cabbage, Amy; Cubellis, Louis; Cullison, David; Curtis, David; Daley, Robert; Daly, Jill; Dambly, Jan; Daniel, Susan; Danna, James; Dapas, Marc; Davis, Henry; Davis, Jack; Davis, Marlone; Dean, Michael; Dean, Bill; Dehn, Janine; Delligatti, Mark; Dembek, Stephen; Demoss, Gary; Dennig, Robert; Dentel, Glenn; Desai, Binoy; Dias, Antonio; Diaz-Toro, Diana; Dickson, Billy; Dingbaum, Stephen; DiPaolo, Eugene; Dixon, John; Dixon-Herrity, Jennifer; Doane, Margaret; Dodmead, James; Doerflein, Lawrence; Donaldson, Leslie; Donnell, Tremaine; Donoghue, Joseph; Doornbos, Roger; Dorman, Dan; Dorsey, Jeryll; Dosch, William; Dreisbach, Jason; Droggitis, Spiros; Dudes, Laura; Dumbacher, David; Duncan, Eric; Dwyer, James; Dyer, Jim; Eads, Johnny; Easson, Pamela; Egan, Dennis; Egli, Richard; Einberg, Christian; Elkins, Scott; Ellegood, John; Elliott, Robert; Ellsbury, Richard; Erlanger, Craig; Ernstes, Michael; Brown, Cris; Evans, Carolyn; Michele.ca@nrc.gov <Michele.ca@nrc.gov>; Farnholtz, Thomas; Felts, Russell; Fenton, Darlene; Ferdas, Marc; Ferrell, Kimberly; Ficks, Ben; Fields, Leslie; Finney, Patrick; Fitch, Karen; Flanders, Scott; Flynn, Sean; Foster, Jack; Franke, Mark; Franovich, Rani; Fredericks, Carl; Freeman, Scott; Fretz, Robert; Frumkin, Daniel; Frye, Timothy; Fuller, Michael; Gaddy, Vincent; Gallo, Jenny; Galloway, Melanie; Gartman, Michael; Gavrilas, Mirela; Giantelli, Adelaide; Gibson, Kathy; Giessner, John; Gitter, Joseph; Givvines, Mary; Gody, Tony; Golder, Jennifer; Golshan, KG; Gorham, Tajuan; Gott, William; Graham, Thorne; Grancorvitz, Teresa; Grant, Jeffery; Graser, Dan; Gray, Mel; Greene, Kathryn; Grice, Thomas; Griffin, Steven; Grobe, Jack; Hawkins, Kimberly; Gusack, Barbara; Guthrie, Eugene; Guttmann, Jack; Haag, Robert; Habighorst, Peter; Hackett, Edwin; Haeg, Lucas; Haire, Mark; Hall, Donald; Hall, Patricia; Hamzehee, Hossein; Haney, Catherine; Hansell, Samuel; Harris, Tim; Harrison, Donnie; Hatchett, Gregory; Hawken, Roy; Hay, Michael; Hayden, Elizabeth; Hays, Myra; Heck, James; Heck, Jared; Helton, Shana; Henderson, Pamela; Hickey, James; Hiland, Patrick; Hills, David; Hilton, Nick; Hiltz, Thomas; Hirsch, Patricia; Hoeg, Tim; Hogan, Rosemary; Holahan, Gary; Holahan, Patricia; Holian, Brian; Holland, Crystal; Holody, Daniel; Holonich, Joseph; Holt, BJ; Hopper, George; Howard, Patrick; Howe, Allen; Howell, Art; Howell, Linda; Hoxie, Chris; Hsia, Anthony; Hsu, Caroline; Hsueh, Kevin; Huber, Deborah; Hudson, Jody; Humerick, David; Hunegs, Gordon; Hunter, James; Huth, Virginia; Hutto, Andy; Huyck, Doug; Imboden, Andy; Itzkowitz, Marvin; Jackson, Deborah; Jackson, Donald; Jackson, Terry; James, Lois; Jankovich, John; Janney, Margie; Jarvis, Rodney; Jenkins, Ronaldo; Jernell, Eleni; Johns, Nancy; Johnson, Michael; Johnson, Clay; Johnson, Robert; Jolicoeur, John; Jones, Bradley; Jones, Evan; Jones, William; Josey, Jeffrey; Joustra, Judith; Julian, Emile; Jung, Ian; Junge, Michael; Kahler, Robert;

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Kaplan, Michele; Karas, Rebecca; Kellar, Ray; Kelley, Corenthis; Kemerer, Myron; Kemker, Brian; Kennedy, Kriss; Kennedy, Silas; Kerben, Valerie; Kern, David; Khanna, Meena; Kim, Yong; Kimble, Daniel; King, Donald; King, Michael; Kinneman, John; Kirkland, John; Kirkwood, Sara; Klein, Alex; Knutson, Ed; Kobetz, Timothy; Kokajko, Lawrence; Kolaczyk, Kenneth; Konzman, Carl; Koshy, Thomas; Kowal, Mark; Kramer, John; Krohn, Paul; Krsek, Robert; Krupnick, David; Kulesa, Gloria; Kulp, Jeffrey; Kunowski, Michael; Lam, Donna; Lambert, Kenneth; Landau, Mindy; Langan, Scott; Lankford, Jeffrey; Lantz, Ryan; Lara, Julio; Larkin, Grant; Laura, Richard; Layton, Michael; Le, Hong; Lee, Bert; Lee, David; Lee, Richard; Lee, Samson; Lee, Samuel; Leeds, Eric; Lennartz, Jay; Lesser, Mark; Lew, David; Lewis, Robert; Lipa, Christine; Lombard, Mark; Long, Chris; Lopez, Joseph; Lorson, Raymond; Loudon, Patrick; Lubinski, John; Luehman, James; Lui, Christiana; Lukes, Robert; Lund, Louise; Lupold, Timothy; Lyons-Burke, Kathy; Ma, May; Madden, Patrick; Madison, Wil; Magruder, Stewart; Mamish, Nader; Markley, Michael; Marshall, Jane; Marshfield, Mark; Martin, Gillian; Masnik, Michael; Masse, Todd; Matheson, Mary; Mathew, Roy; Matthews, David; Mattingley, Joel; Maxin, Mark; Mayfield, Michael; McCann, Carrie; McConnell, Keith; McCoppin, Michael; McCoy, Gerald; McCrary, Cheryl; McCree, Victor; McDermott, Brian; McGhee, James; McGill, Clinton; McGinty, Tim; McGowan, Anna; McHale, John; McKelvey, Harold; McKenna, Eileen; McKenney, Christopher; McKirgan, John; McMillan, Joseph; McMurtray, Anthony; Mendiola, Anthony; Meyer, David; Michalak, Paul; Miller, Charles; Miller, Chris; Miller, Geoffrey; Miller, Marie; Miller, Mark; Miller, Michael; Miotla, Sherri; Mitchell, Matthew; Mitchell, Reggie; Mohseni, Aby; Monk, Robert; Monninger, John; Montgomery, Jack; Moore, Scott; Moore, Thomas; Moorman, James; Morris, Eddie; Morris, James; Morris, R. Michael; Morris, Scott; Morrissey, Thomas; Moulding, Patrick; Moy, Romena; Mrowca, Lynn; Muessle, Mary; Munday, Joel; Murphy, Jerome; Murphy, Martin; Musser, Randy; Narick, Marianne; Nazario, Tomy; Nease, Rebecca; Neff, Deborah; Nelson, Robert; Nichols, Russell; Nieh, Ho; Norato, Michael; Norris, Michael; Nute-Blackshear, Lora; OBrien, Kenneth; OBryan, Phil; O'Donohue, Kathleen; Offutt, David; Ogle, Chuck; OKeefe, Neil; Oklesson, Edward; Ordaz, Vonna; Orth, Steven; O'Sullivan, Kevin; Ott, William; Ousley, Elizabeth; Owens, Janice; Paradiso, Karen; Partlow, Benjamin; Pascarelli, Robert; Peck, Michael; Pederson, Cynthia; Pelke, Patricia; Pellet, John; Pelton, David; Peralta, Juan; Perry, Jamila; Perry, Neil; Persinko, Andrew; Peters, Sean; Peterson, Gordon; Peterson, Hironori; Pham, Bo; Phillips, Charles; Piccone, Josephine; Pool, Stephen; Poole, Brooke; Powell, Amy; Powell, Dawn; Powell, Raymond; Prescott, Peter; Pretzello, Andrew; Price, Georgette; Pruett, Troy; Pstrak, David; Pulliam, Timothy; Quay, Theodore; Quichocho, Jessie; Rabideau, Peter; Rahimi, Meraj; Raione, Richard; Rajnic, Cecilia; Ramirez, Frances; Rasmussen, Richard; Rasouli, Houman; Raspa, Rossana; Rayland, Andrew; Raymond, William; Reckley, William; Reddick, Darani; Reece, James; Regan, Christopher; Reis, Terrence; Remsburg, Kristy; Reynolds, Steven; Reynoso, John; Rheaume, Cynthia; Ricci, John; Rich, Daniel; Rich, Thomas; Richards, Stuart; Ricketts, Paul; Riemer, Kenneth; Ring, Mark; Roach, Edward; Roach, Gregory; Roberts, Darrell; Rodgers, Felecia; Rogge, John; Rosenberg, Stacey; Ross, Thierry; Ross-Lee, MaryJane; Rothschild, Trip; Rough, Richard; Rowhani, Bahman; Royal, Judith; Rubenstone, James; Rubic, Mark; Ruiz, Robert; Ruland, William; Rule, David; Rutkowski, John; Rutledge, Steven; Rzepka, Robert; Sabisch, Andrew; Safford, Carrie; Salgado, Nancy; Salley, MarkHenry; Salter, Susan; Sanchez, Alba; Sanchez, Alfred; Sangimino, Donna-Marie; Santiago, Patricia; Santos, Cayetano; Sargent, Kimberly; Satorius, Mark; Schaaf, Robert; Schaeffer, James; Schmidt, Rebecca; Schneider, Max; Schnetzler, Bonnie; Schoenmann, Sandra; Schroeder, Daniel; Schum, Constance; Scott, Catherine; Scott, Michael; Sealing, Donna; Segala, John; Serepca, Beth; Seymour, Deborah; Shaeffer, Scott; Shaffer, Steve; Shannon, Mel; Shannon, Michael; Sharkey, Jeffrey; Shay, Jason; Shear, Gary; Shehee, James; Sheron, Brian; Shields, James; Shoop, Undine; Shuaibi, Mohammed; Silva, Patricia; Simms, Sophonia; Skeen, David; Skokowski, Richard; Smith, Arthur; Smith, Brian; Smith, Galen; Smith, Rich; Smith, Tuwanda; Solorio, Dave; Sosa, Belkys; Sotiropoulos, Dina; Spencer, Mary; Spindler, David; Spitzberg, Blair; StAmour, Norman; Stablein, King; Stapleton, Bernard; Stetson, Kathleen; Stewart, Scott; Stewart, Sharon; Stoedter, Karla; Stone, AnnMarie; Suber, Gregory; Subosits, Stephen; Sullivan, Allen; Swain, Karol; Sydnor, Russell; Sykes, Marvin; Szyperski, Bill; Tailleart, Don; Talley, Sandra; Tappert, John; Tate, Travis; Taylor, Robert; Tenaglia, Mickey; Terao, David; Terry, Leslie; Thaggard, Mark; Thomas, Brian; Thomas, Christopher; Thorp, John; Tonacci, Mark; Tracy, Glenn; Tran, Tu; Trapp, James; Travick, Vanette; Trent, Glenn; Tschiltz, Michael; Turner, Joseph; Turtill, Richard; Uhle, Jennifer; Ulses, Anthony; Usilton, William; Valentin, Andrea; Vogel, Anton; Vias, Steven; Vietti-Cook, Annette; Virgilio, Martin; VonTill, Bill; Voytko, Victoria; Walker, Tracy; Walker, Wayne; Wall, Scott; Warnick, Greg; Wastler, Sandra; Waters, Michael; Watson, Bruce; Weaver, Doug; Webber, Robert; Weber, Michael; Weerakkody, Sunil; Welling, Blake; Werkheiser, David; Werner, Greg; Wert, Leonard; West, Garmon; West, Steven; Westreich, Barry; Whetstine, Jack; White, Duncan; White, Darrell; Whited, Ryan; Whitten, Jack; Widdup, Joseph; Widmann, Malcolm; Wiggins, Jim; Williams, Barbara; Williams, Evelyn; Williams, Kevin; Williams, Michael; Williams, Mona; Williams-Johnson, Patrice; Williamson, Edward; Wilson, Ernest; Wilson,

George; Wilson, Peter; Wood, Gene; Wood, Kent; Wright, Lisa (Gibney); Wrona, David; Wunder, George; Yerokun, Jimi; Young, Cale; Young, Mitzi; Zane, Steven; Zeiler, John; Zimmerman, Jacob; Zimmerman, Roy; Zabler, Marian

Cc: Scott, Tracy; Tallarico, Alison; Thoman, Raymond; Jones, Jackie; Blair, Tina; Chin, Allison; Dean, Vivian; Evans(HR), Marilyn; Himmelberg, Jude; Jackson, Briana; Jaigobind, Savi; Silberfeld, Dafna; Watson, Madonna; Williams, Michelle; Atkinson, Jeanne; Broadwater, Lynne; Brown, Keisa; Hicks, Beverly; Hicks, Valencia; Jonsson, Dawn; Lindsay, Sandy; Marziale, Riqueza; ORourke, Christine; Reeves, Gloria; Scott, Mary; Thomas-Richards, Karen; Todd, Colleen

Sent: Thu Mar 17 14:06:26 2011

Subject:

Managers, supervisors, team leaders, and T&L Coordinators,

Attached for your information is a document that addresses, in detail, work schedules and premium pay for individuals who serve in and support the NRC Operations Center or work in Japan, in response to the current, serious nuclear power plant issues in that country. NSIR and the NRC Japanese support team leader will provide the document to all participants.

T&L Coordinators, please note that participants in your organization may contact you to request a change in their HRMS workgroups for pay periods in which they perform emergency response work.

Participants should contact me if they have any questions on work schedules or premium pay.

Larry Davidson
Office of Human Resources
Nuclear Regulatory Commission
301-492-2286; lawrence.davidson@nrc.gov

WORK SCHEDULE AND PREMIUM PAY GUIDANCE FOR RESPONSE TO EVENTS IN JAPAN

Please first review this document and contact Larry Davidson of the Office of Human Resources (301-492-2286 or lawrence.davidson@nrc.gov) for any needed assistance.

Work Schedules

One or more types of work schedules may be appropriate during a pay period in which you serve in and support the NRC Operations Center or work in Japan, in response to the current, serious nuclear power plant issues in that country. You are authorized to select the type of work schedule you will work during the pay period depending on:

- Your specific workdays and work clock hours in the Operations Center or in Japan, as well as any flexibility you have to choose those workdays and clock hours;
- Your entitlement to premium pay for work in the Operations Center or Japan;
- Your performance, if any, of regular duties outside of the Operations Center/Japan during the pay period; and,
- Your loss of earned credit hours if you switch from NEWFlex to another type of work schedule.

Possible work schedules include:

- Compressed work schedule – Appropriate if, during the entire pay period, your workdays and work clock hours are fixed (i.e., you do not have any flexibility to choose either) and there are fewer than ten nonovertime workdays in the pay period (at least one nonovertime workday contains more than eight nonovertime hours). Note that restrictions on nonovertime work clock hours and weekend workdays have been lifted for the pay period. An Expanded-Compressed Work Schedule may be appropriate (see the Yellow Announcement at <http://www.internal.nrc.gov/announcements/yellow/2003/2003-032.html> and Article 6.10.3 of the Collective Bargaining Agreement).
- NEWFlex - Appropriate if, during at least a portion of the pay period, you have some discretion to select your workdays and/or work clock hours (for example, if/when performing regular duties outside of the Operations Center or Japan). Note that restrictions on nonovertime work clock hours and weekend workdays have been lifted for the pay period.
- First-40 – Appropriate if it is impracticable to prescribe a regular schedule of definite hours of duty for each workday of the workweek (likely not appropriate).

Note that you must advise your T&L coordinator to change your HRMS workgroup if you change the type of schedule you work, e.g., if you normally work CWS and change to NEWFlex for the pay period in which you serve in and support the NRC Operations Center or work in Japan. Also note that if you switch from NEWFlex to another type of work schedule, you will lose and will be paid for any accumulated credit hours.

Also note that if you work fewer than 80 hours serving in and supporting the NRC Operations Center or working in Japan, your "home" supervisor will allow you discretion, to the extent possible, to decide how/when to cover any missing time.

Premium Pay

Cap on Combined Salary Plus Premium Pay – The biweekly cap on premium pay has been lifted and will be applied on an annual basis during any pay period in which you serve in and support the NRC Operations Center or work in Japan (the annual cap will benefit you if you are paid a salary below the GG-15 step 10 salary rate). Your organization has been advised to contact CFO with employee names and dates of work.

Overtime pay or regular comp time – Overtime (limited to the higher of: your regular rate; or, 150% of GG-10 step 10) is paid for your work in excess of your full-time work schedule during the pay period. You may choose to be compensated via regular compensatory time off instead (limited to a 40-hour pay period carryover) if your overtime work was not scheduled in advance of the workweek, or regardless of when it was scheduled if you are on NEWFlex.

TRCs – Use "OT" for overtime pay and "COMPE" for regular comp time.

Night premium (10%) – This premium is paid for your *nonovertime* work between 6:00 p.m. and 6:00 a.m. the following morning, and for your *overtime* work during these clock hours if the work was scheduled in advance of the week in which you performed it. Also, this premium is paid for your periods of paid leave, if any, during night clock hours if, during the pay period, you have fewer than 8 hours of total paid leave inclusive of both night and day work.

TRC – NDIFF (hours must also be recorded under another TRC such as REG or OT).

Sunday premium (25%) – This premium is paid for your *nonovertime* work performed on a shift(s), any part(s) of which falls on a Sunday (e.g., a shift from Saturday at 6:00 p.m. to Sunday at 6:00 a.m.). Sunday premium is not payable for periods of nonwork, including leave, holidays not worked, and excused absence.

TRC – SUNP (hours must also be recorded under another TRC such as REG).

Standby status - You are eligible for special overtime pay if you are restricted by official order to a designated post of duty and assigned to be in a state of readiness to perform work, versus actually performing work, with limitations on your activities so substantial that you cannot use

your time effectively for your own purposes. We do not anticipate that any employee will be in a standby status.

Miscellaneous

Employee Assistance Program (EAP)

Free, confidential counseling is available to you and your family members to address emotional issues, work problems, substance abuse, stress, crisis, marital/family concerns, financial matters, legal issues, eldercare resources, and childcare referrals. Call 1-800-869-0276 or check www.eapconsultants.com.

Travel

If you travel to/from Japan:

- Keep a log of specific travel times and work clock hours to help NRC compute your entitlement to compensation.
- Consider enrolling in the Smart Traveler Enrollment Program or STEP) to make it easier for the Embassy/Consulates to contact you in case of an emergency. You may enroll at <https://travelregistration.state.gov>, or if you have no internet access, directly at the U.S. Embassy or U.S. Consulates.
- If you are paid a salary below the GG-15 step 10 salary rate, you are entitled to overtime pay (limited to higher of: your regular rate; or, 150% of GG-10 step 10) for travel to/from Japan, and if the travel is during night hours (6:00 p.m. to 6:00 a.m.) and scheduled in advance of the workweek, you are also entitled to night premium pay. You may substitute regular compensatory time off (limited to a 40-hour pay period carryover) for overtime pay if your travel was not scheduled in advance of the workweek, or regardless of when it was scheduled if you are on NEWFlex.

TRCs – Use “OT” for overtime pay, “COMPE” for regular comp time, and “NDIFF” for night premium pay.

From: Scott, Michael
To: Sheron, Brian; Uhle, Jennifer
Cc: Gibson, Kathy
Subject: RECOMMENDED ATTENDANCE AT NGNP ANNUAL R&D MEETING - ALBUQUERQUE
Date: Thursday, March 17, 2011 5:54:26 PM

Brian and Jennifer:

(b)(5)

Thanks

Mike

CH/79

From: Sheron, Brian
To: Anderson, James; Landau, Mindy
Subject: FW: Request for Support from NRO
Date: Thursday, March 17, 2011 6:36:00 PM

FYI.

From: Sheron, Brian
Sent: Thursday, March 17, 2011 6:36 PM
To: Muessle, Mary; Uhle, Jennifer
Subject: RE: Request for Support from NRO

Jennifer, can you see if we have anyone we can spare? I just got back from downtown and it is 6:35pm. I have to be at WQF at 7am tomorrow morning and accompany Borchardt downtown to brief senate staff at 9:30 am, then I have to meet with House staff at 11:45 am and brief them, so I doubt I'll be back before late afternoon. I don't want any of the severe accident or seismic staff doing this. They need to focus on the Japanese crisis.

From: Muessle, Mary
Sent: Thursday, March 17, 2011 1:53 PM
To: Sheron, Brian; Uhle, Jennifer
Subject: Fw: Request for Support from NRO

Can you help? By the way, Jennifer looks great on tv!

Sent from NRC BlackBerry
Mary Muessle

(b)(6)

From: Landau, Mindy
To: Muessle, Mary
Sent: Thu Mar 17 13:49:21 2011
Subject: FW: Request for Support from NRO

Mary, if you can think of anyone in RES as well who meets this description, please let me know so OPA can recruit them....

Mindy

From: Johnson, Michael
Sent: Thursday, March 17, 2011 12:02 PM
To: Landau, Mindy
Cc: Muessle, Mary; Andersen, James
Subject: Re: Request for Support from NRO

We'll try to support.
From my blackberry.

From: Landau, Mindy
To: Johnson, Michael

CH/80

Cc: Muessle, Mary; Andersen, James
Sent: Thu Mar 17 11:28:40 2011
Subject: Request for Support from NRO

Hi Mike,

OPA is requesting about four staff who could assist them, as soon as possible, in responding to inquiries from the press and the public. Obviously, these folks need to have a good working knowledge of the event at a high level, and can also speak about our regulatory processes and have a calm, measured demeanor (and not get too far in the weeds). They may have to be "on loan" for a month or two, depending on how long the public scrutiny continues.

I know that NRR and NSIR are already strapped, but this would be a great opportunity for our fine staff in NRO to help the agency out in big way!

Thanks
Mindy

Mindy S. Landau
Deputy Assistant for Operations
Communication and Performance Improvement
Office of the Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
301-415-8703
mindy.landau@nrc.gov

From: Sheron, Brian
To: Case, Michael; Richards, Stuart; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: Seismic
Date: Thursday, March 17, 2011 6:51:00 PM

- 1.) Secretary Chu at DOE is scheduled to be interviewed on 5 talk shows Sunday morning. He has requested a 1 page summary of our seismic regulatory requirements. I gave him the 3/16 version of your seismic Q&A package and suggested his staff could screen it and perhaps pull out pertinent info on our regs, however, I haven't read it yet and don't know to what extent it does or doesn't discuss our regulatory requirements. Can you quickly pull together a 1-2 page summary of our seismic regulatory requirements, run them by NRR if possible, and then e-mail them to Pete Lyons at DOE (peter.lyons@nuclear.energy.gov). He needs them tomorrow. Please CC me.
Remember, he is just looking for a high level summary sufficient to answer likely questions he might get during the interviews.

- 2.) Can you please e-mail the latest version of your seismic Q&As to Mike Weber.

Thanks.

CH/81

From: [Sheron, Brian](#)
To: [Gibson, Kathy](#); [Scott, Michael](#)
Cc: [Uhle, Jennifer](#)
Subject: Effect of Salt
Date: Thursday, March 17, 2011 6:56:00 PM

During my meeting today with Secretary Chu, the issue of salt water injection came up. The Japanese are injection seawater into the reactors. The seawater is boiling off, leaving salt. While there are obvious questions about how salt might affect coolability of the core (clogging coolant channels, etc.), a question was raised about how the salt might affect the Cesium release. Do we have any info on what the effect might be?

CH/82

From: Weber, Michael
To: Jaczko, Gregory
Cc: Sheron, Brian; Uhle, Jennifer; RST01 Hoc; OST02 HOC; LIA05 Hoc; Coggins, Angela; Batkin, Joshua; Virgilio, Martin; Borchardt, Bill
Subject: FYI - SUMMARY OF TODAY'S MEETING WITH SECRETARY CHU ON WAYS TO ASSIST JAPAN
Date: Thursday, March 17, 2011 7:30:52 PM

Good evening, Chairman. Secretary Chu hosted a "brain storming" meeting downtown this afternoon on what steps might be taken to assist Japan authorities in controlling the nuclear power plants at Fukushima-Daiichi and preventing additional releases. Brian Sheron represented the NRC at the meeting and called me on his return to the office. You may recall that Pete Lyons invited the NRC to participate in the meeting. The meeting lasted a full four hours.

In addition to the Secretary and Dr. Lyons, other participants included Administrator D'Agostino, Director Holdren, Admiral Grossenbacher, John Kelly (DOE-NE), Bob Budnitz, Per Peterson (Blue Ribbon Commission), and others. The group discussed a number of different topics:

- Problem solving techniques that might be explored like PIRT and Failure Modes and Effects Analysis
- Percent of the reactor cores that might be released if the accident progresses, current configuration of the cores, and driving mechanisms for release
- Expected accumulation of salt from the evaporating seawater in the reactors and the coolability of a salt-encrusted core
- Potential effect of the salt on Cs releases due to the formation of CsCl
- Prophylactic doses of KI and side effects
- NRC seismic design requirements for NPPs in the United States
- Possible strategies for getting water in the Spent Fuel Pools, suppressing Zr fuel fires, or for removing the spent fuel from the pools
- Average annual doses to members of the U.S. population and sources

The Secretary stated that he will be interviewed on 5 talk shows this coming Sunday morning, so he was interested in getting background information about several topics. He asked for a one page summary of our seismic design requirements. Given the tight time constraints, Brian was not sure that we could turn around a summary that fast, so he provided the Secretary with a current copy of draft Q&As on seismic issues that has been prepared by RES, NRR, and other NRC offices. I will forward to you a copy of these Q&As – they are in draft form and extensive (10s of pages). Dr. Lyons will document today's meeting. Brian got the impression from the Secretary that he may have a similar meeting at some point in the future. Brian did not hear any ideas that sounded feasible that we were not already aware of. Some of the participants heard ideas that they plan to look into, but it did not sound like there were any specific ideas to pass to our team in Japan at this time.

Mike

Michael Weber
Deputy Executive Director for Materials, Waste, Research,
State, Tribal, and Compliance Programs

CH/83

U.S. Nuclear Regulatory Commission

301-415-1705

Mail Stop O16E15

From: [Weber, Michael](#)
To: [Jaczko, Gregory](#)
Cc: [Sheron, Brian](#); [Uhle, Jennifer](#); [RST01 Hoc](#); [OST02 HOC](#); [LIA05 Hoc](#); [Coggins, Angela](#); [Batkin, Joshua](#); [Virgilio, Martin](#); [Borchardt, Bill](#); [Brenner, Eliot](#)
Subject: FYI - Q&As on SEISMIC ISSUES PROVIDED TO SECRETARY CHU (OUO ATTACHMENT)
Date: Thursday, March 17, 2011 7:44:08 PM
Attachments: [Seismic Questions for Incident Response 3-17-11 2am.pdf](#)

I am forwarding the Q&As that Brian gave to Secretary Chu. Note that they are labeled Official Use Only.

Mike

Michael Weber
Deputy Executive Director for Materials, Waste, Research,
State, Tribal, and Compliance Programs
U.S. Nuclear Regulatory Commission

301-415-1705
Mail Stop O16E15

CH/84

Compiled Seismic Questions for NRC Response to the March 11, 2011 Japanese Earthquake and Tsunami

This is current as of 3-17-11 at 2am.

The keeper of this file is Annie Kammerer. Please provide comments, additions and updates to Annie with CC to Clifford Munson and Jon Ake.

A SharePoint site has been set up so that anyone can download the latest Q&As. The site is found at NRC>NRR>NRR TA or at <http://portal.nrc.gov/edo/nrr/NRR%20TA/FAQ%20Related%20to%20Events%20Occuring%20in%20Japan/Forms/AllItems.aspx>

A list of topics is shown in the Table of Contents at the front of this document.

A list of all questions is provided at the end of the document.

We greatly appreciate the assistance of the many people who have contributed. The enclosed list of questions and answers has been compiled from multiple sources including, questions forwarded from NRC staff, GI-199 communications plan, Diablo Canyon communications plan, the NEI website, lists of questions that followed the 2007 earthquake that shut down the Kashiwazaki-Kariwa plant, and others. Please do not distribute beyond the NRC.

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Natural Hazards and Ground Shaking Design Levels

1) Did the Japanese underestimate the size of the maximum credible earthquake that could affect the plants?

Public response: The magnitude of the earthquake was somewhat greater than was expected for that part of the subduction zone by seismologists worldwide. The Japanese plants were recently reviewed to ground shaking similar to that observed. The review level ground motions were expected to result from a smaller earthquake closer to the sites.

Additional, technical, non-public information: None.

2) Can a very large earthquake and tsunami happen here?

Public response: This earthquake was caused by a "subduction zone" event, which is the type of mechanism that produces the largest magnitude earthquakes. A subduction zone is a tectonic plate boundary where one tectonic plate is pushed under another plate. In the continental US, the only subduction zone is the Cascadia subduction zone which lies off the coast of northern California, Oregon and Washington. So, an earthquake and tsunami this large could only happen in that region. The only plant in that area is Columbia, which is far from the coast and the subduction zone. Outside of the Cascadia subduction zone, earthquakes are not expected to exceed a magnitude of approximate 8, which is 10 times smaller than a magnitude 9.

Additional, technical, non-public information: Magnitude is on a log scale, so 9 is 10 times bigger than an 8.

3) Has this changed our perception of Earthquake risk?

Public Answer: This does not change the NRC's perception of earthquake hazard (i.e. ground shaking) at US plants. It is too early to tell what the lessons from this earthquake are from an engineering perspective. The NRC will look closely at all aspects of response of the plants to the earthquake and tsunami to determine if any actions need to be taken in US plants and if any changes are necessary to NRC regulations.

Additional, technical, non-public information: We expect that there would be lessons learned and we may need to seriously relook at common cause failures, including dam failure and tsunami.

4) What magnitude earthquake are US plants designed to?

Public Answer: Each plant is designed to a ground-shaking level that is appropriate for its location, given the possible earthquake sources that may affect the site and its tectonic environment. Ground shaking is a function of both the magnitude of an earthquake and the distance from the fault to the site. The magnitude alone cannot be used to predict ground motions. The existing plants were designed on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquake expected in the area around the plant. Several tables that include plant design ground motions are provided as the first table in the "additional information" section of this document.

Additional, technical non-public information: In the past, "deterministic" or "scenario based" analyses were used to determine ground shaking (seismic hazard) levels. Now a probabilistic method is used that accounts for possible earthquakes of various magnitudes that come from potential sources (including background seismicity) and the likelihood that each particular hypothetical earthquake occurs.

5) How many US reactors are located in active earthquake zones (and which reactors)?

Public Answer: Although we often think of the U.S. as having “active” and “non-active” earthquake zones, earthquakes can actually happen almost anywhere. Seismologists typically separate the U.S. into low, moderate, and high seismicity zones. The NRC requires that every plant be designed for site-specific ground motions that are appropriate for their locations. In addition, the NRC has specified a minimum ground shaking level to which plants must be designed.

Seismic designs at U.S. nuclear power plants are developed in terms of seismic ground motion spectra, which are called the Safe Shutdown Earthquake ground motion response spectra (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Currently operating nuclear power plants developed their SSEs based on a “deterministic” or “scenario earthquake” that accounts for the largest earthquake expected in the area around the plant.

Generally speaking, seismic activity in the regions surrounding U.S. plants is much lower than that for Japan since most U.S. plants are located in the interior of the stable continental U.S. However, the most widely felt earthquakes within the continental U.S. are the 1811-12 New Madrid sequence and the 1886 Charleston, SC, which were estimated to be between about magnitude 7.0 to 7.75. Nuclear power plants in the U.S. are sited far away from these two earthquake zones as well as other identified potential seismic sources.

On the west coast of the U.S., the two nuclear power plants are designed to specific ground motions from earthquakes of about magnitude 7+ on faults located just offshore of the plants. The earthquakes on these faults are mainly strike-slip (horizontal motion) type earthquakes, not subduction zone earthquakes. Therefore, the likelihood of a tsunami from these faults is remote.

Additional, technical non-public information: None.

6) How many reactors are along coastal areas that could be affected by a tsunami (and which ones)?

Public Answer: Many plants are located in coastal areas that could potentially be affected by tsunami. Two plants, Diablo Canyon and San Onofre, are on the Pacific Coast, which is known to have tsunami hazard. There are also two plants on the Gulf Coast, South Texas and Crystal River. There are many plants on the Atlantic Coast or on rivers that may be affected by a tidal bore resulting from a tsunami. These include St. Lucie, Turkey Point, Brunswick, Oyster Creek, Millstone, Pilgrim, Seabrook, Calvert Cliffs, Salem/Hope Creek, and Surry. Tsunami on the Gulf and Atlantic Coasts occur, but are very rare. Generally the flooding anticipated from hurricane storm surge exceeds the flooding expected from a tsunami for plants on the Atlantic and Gulf Coast.

Additional, technical non-public information: A table with information on tsunami design levels is provided in the “Additional Information” section of this document.

7) If the earthquake in Japan was a larger magnitude than considered by plant design, why can't the same thing happen in the US?

Public response: *Discuss in terms of, IPEEE, Seismic PRA to be provided by Nilesh*

Additional, technical, non-public information: ADD

8) What if an earthquake like the Sendai earthquake occurred near a US plant?

Public response: *ADD*

Additional, technical, non-public information: *ADD*

9) What would be the results of a tsunami generated off the coast of a US plant? (Or why are we confident that large tsunamis will not occur relatively close to US shores?)

Public response: *Request for answer by Henry Jones, Goutam Bagchi and/or Richard Raione (once the tsunami fact sheet is done and you have time).*

Additional, technical, non-public information: *ADD*

10) Can this happen here i.e. an earthquake that significantly damages a nuclear power plant? Are the Japanese plants similar to U.S. plants?

Public Answer: All U.S. nuclear power plants are built to withstand environmental hazards, including earthquakes and tsunamis. Even those plants that are located within areas with low and moderate seismic activity are designed for safety in the event of such a natural disaster. The NRC requires that safety-significant structures, systems, and components be designed to take into account even rare and extreme seismic and tsunami events.

The Japanese facilities are similar in design to several US facilities.

Additional technical, non-public information: Currently operating reactors were designed using a "deterministic" or "maximum credible earthquake" approach. Seismic hazard for the new plants is determined using a probabilistic seismic hazard assessment approach that explicitly addresses uncertainty, as described in Regulatory Guide 1.208. The NRC requires that adequate margin beyond the design basis ground shaking levels is assured. The NRC further enhances seismic safety for beyond-design-basis events through the use of a defense-in-depth approach.

In addition, the NRC reviews the seismic risk at operating reactors as needed when information may have changed. Over the last few years the NRC has undertaken a program called Generic Issue 199, which is focused on assessing hazard for plants in the central and eastern US using the latest techniques and data and determining the possible risk implications of any increase in the anticipated ground shaking levels. This program will help us assure that the plants are safe under exceptionally rare and extreme ground motions that represent beyond-design-basis events.

11) What level of earthquake hazard are the US reactors designed for?

Public Answer: Each reactor is designed for a different ground motion that is determined on a site-specific basis. The existing plants were designed on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquake expected in the area around the plant. New reactors are designed using probabilistic techniques that characterize the hazard (i.e. ground shaking levels) and uncertainty at the proposed site. Ground motions from all potential seismic sources in the region are estimated and used to develop an appropriate site specific ground motion, which has a return period of 10,000 years on average over very long time periods.

Additional technical, non-public information: *None*

12) Does the NRC consider earthquakes of magnitude 9?

Public Answer: Earthquakes with very large magnitudes, such as the recent earthquake of the coast of Japan, occur only within subduction zones. Subduction zones are regions where one of the earth's

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tectonic plates is subducting beneath another. In the continental US, the only subduction zone is the Cascadia subduction zone, which lies off of the coast of northern California, Oregon, and Washington. The only nuclear power plant in that area is Columbia, which is far from the coast and the subduction zone.

Seismic designs at U.S. nuclear power plants are developed in terms of seismic ground motion spectra, which are called the Safe Shutdown Earthquake ground motion response spectra (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Currently operating nuclear power plants developed their SSEs based on a "deterministic" or "scenario earthquake" basis that account for the largest earthquake expected in the area around the plant. Seismic activity in the regions surrounding U.S. plants is much lower than that for Japan since most U.S. plants are located in the interior of the stable continental U.S. The largest earthquakes within the continental U.S. are the 1811-12 New Madrid sequence and the 1886 Charleston, SC, which were estimated to be between about magnitude 7 to 7.5. On the west coast of the U.S., the two nuclear power plants are designed to specific ground motions from earthquakes of about magnitude 7 on faults located just offshore of the plants. The earthquakes on these faults are mainly strike-slip (horizontal motion) type earthquakes, not subduction zone earthquakes. Therefore, the likelihood of a tsunami from these faults is very remote.

Additional technical, non-public information: None.

13) What are the definitions of the SSE and OBE?

CLEAN UP BELOW information – late question

From RG1.208 Safe Shutdown Earthquake Ground Motion (SSE). The vibratory ground motion for which certain structures, systems, and components are designed, pursuant to Appendix S to 10 CFR Part 50, to remain functional. The SSE for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface

Appendix S to 10 CFR Part 50 (3) has the following information: Required Plant Shutdown. If vibratory ground motion exceeding that of the Operating Basis Earthquake Ground Motion or if significant plant damage occurs, the licensee must shut down the nuclear power plant. If systems, structures, or components necessary for the safe shutdown of the nuclear power plant are not available after the occurrence of the Operating Basis Earthquake Ground Motion, the licensee must consult with the Commission and must propose a plan for the timely, safe shutdown of the nuclear power plant. Prior to resuming operations, the licensee must demonstrate to the Commission that no functional damage has occurred to those features necessary for continued operation without undue risk to the health and safety of the public and the licensing basis is maintained.

The the ratio is provided in guidance as the ratio that the licensees can chose without additional analysis. The OBE mostly used to be half for existing plants, but now it's a 1/3 unless you do analyses to show why it should be 1/2.

Definition of Safe Shutdown Earthquake	The safe-shutdown earthquake (SSE) for the site is the ground motion response spectra (GMRS), which also satisfies the minimum requirement of paragraph IV(a)(1)(i) of Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," to Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the Code of Federal Regulations (10 CFR Part 50).
Definition of Operating Basis Earthquake:	To satisfy the requirements of paragraph IV(a)(2)(A) of Appendix S to 10 CFR Part 50, the operating-basis earthquake (OBE) ground motion is defined as follows: (i) For the certified design portion of the plant, the OBE ground motion is one-third

	(ii)	of the CSDRS. For the safety-related noncertified design portion of the plant, the OBE ground motion is one-third of the design motion response spectra, as stipulated in the design certification conditions specified in design control document (DCD).
	(iii)	The spectrum ordinate criterion to be used in conjunction with Regulatory Guide 1.166, "Pre-Earthquake Planning and Immediate Nuclear Power Plant Operator Post-earthquake Actions," issued March 1997, is the lowest of (i) and (ii).

14) What is the likelihood of the design basis or "SSE" ground motions being exceeded over the life of the plant?

To estimate the probability of exceeding a specified ground motion level, such as an SSE, during a given time interval, the Poisson model is generally used. Using seismic hazard curves from the 2008 US Geological Survey National Seismic Hazard Map and assuming a 60-year life for a typical nuclear power plant, we can estimate the probability of exceeding the SSE over the life of the plant. The NRC recently performed these estimates as part of its GI-199 program (see Questions 54-59). The mean probability value for the plants in the Central and Eastern United States is less than 2%, with values ranging from a low of 0.1% to a high of 6%.

It is important to remember that there is margin above the design basis. In the mid to late 1990s, the NRC staff reviewed the potential for ground motions beyond the design basis as part of the Individual Plant Examination of External Events (IPEEE). From this review, the staff determined that seismic designs of operating plants in the United States have adequate safety margins for withstanding earthquakes built into the designs.

15) What is magnitude anyway? What is the Richter Scale? What is intensity?

ADD

16) We need to pull Q&As out of the Markey/Capp letter of March 15th...there's a lot there to answer...

ADD

17) How do magnitude and ground motion relate to each other?

ADD

18) How are combined seismic and tsunami events treated in risk space? Are they considered together?

the PRA Standard (ASME/ANS-Ra-Sa2009) does address the technical requirements for both seismic events and tsunamis (tsunami hazard under the technical requirements for external flooding analysis). But together? The standard does note that uncertainties associated with probabilistic analysis of tsunami hazard frequency are large and that an engineering analysis can usually be used to screen out tsunamis.

19) How are aftershocks treated in terms of risk assessment?

Seismic PRAs do not consider the affect of aftershocks since there are not methods to predict equipment fragility after the first main shock.

Design Against Natural Hazards & Plant Safety in the US

21) Are power plants designed for Tsunami's?

Public Answer: Yes. Plants are built to withstand a variety of environmental hazards and those plants that might face a threat from tsunami are required to withstand large waves and the maximum wave height at the intake structure (which varies by plant.)

Additional, technical, non-public information: Tsunami are considered in the design of US nuclear plants. Nuclear plants are designed to withstand flooding from not only tsunami, but also hurricane and storm surge; therefore there is often significant margin against tsunami flooding. However, it should be noted that Japanese experience has shown that drawdown can be a significant problem.

Currently the US NRC has a tsunami research program that is focused on developing modern hazard assessment techniques and additional guidance through cooperation with the National Oceanic and Atmospheric Administration and the United States Geological Survey. This has already lead to several technical reports and an update to NUREG 0-800. The NOAA and USGS contractors are also assisting with NRO reviews of tsunami hazard. A new regulatory guide on tsunami hazard assessment is currently planned in the office of research, although it is not expected to be available in draft form until 2012.

22) What level of Tsunami are we designed for?

Public Answer: Like seismic hazard, the level of tsunami that each plant is designed for is site-specific and is appropriate for what may occur at each location.

Additional, technical, non-public information: None.

23) Which plants are close to known active faults? What are the faults and how far away are they from the plants?

Public Answer: Jon to develop answer with Dogan's help. I created a placeholder table for your use "Table of Plants Near Known Active Faults" to be populated in the additional information section. The plots that Dogan made are in the additional information section under "Plot of Mapped Active Quaternary Faults and Nuclear Plants in the US". This is really high priority after the congressional hearings.

Additional, technical, non-public information: ADD

24) How was the seismic design basis for an existing nuclear power plant established?

Public Answer: The seismic ground motion used for the design basis was determined from the evaluation of the maximum historic earthquake within 200 miles of the site, without explicitly considering the time spans between such earthquakes; safety margin was then added beyond this maximum historic earthquake to form a hypothetical *design basis earthquake*. The relevant regulation for currently operating plants is 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (<http://www.nrc.gov/reading-rm/doc-collections/cfr/part100/part100-appa.html>).

Additional, technical, non-public information: See discussion at end of GI-199 section for discussion of safety margin and design basis.

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25) Is there margin above the design basis?

Public Answer: Yes, there is margin beyond the design basis). In the mid to late 1990s, NRC staff reviewed the plants' assessments of potential consequences of severe earthquakes (earthquakes beyond the safety margin included in each plant's design basis), which licensees performed as part of the Individual Plant Examination of External Events (or IPEEE) program. From this review, the staff determined that seismic designs of operating plants in the United States have adequate safety margins, for withstanding earthquakes, built into the designs.

Additional, technical, non-public information: None.

26) Are US plants safe?

Public Answer: US plants are designed for appropriate earthquake shaking levels and are safe. Currently the NRC is also conducting a program called Generic Issue 199, which is reviewing the adequacy of earthquake design of US NPPs in the central and eastern North America based on the latest data and analysis techniques.

Additional, technical, non-public information: None.

27) Was the Japanese plant designed for this type of accident? Are US plants?

Public Answer: Plants in both the US and Japan area designed for earthquake shaking. In addition to the design of the plants, significant effort goes into emergency response planning and accident mitigation. This approach is called defense-in-depth.

Additional, technical, non-public information: None.

28) Why do we have confidence that US nuclear power plants are adequately designed for earthquakes and tsunamis?

Public Answer: Plants in both the US and Japan area designed for earthquake shaking. In addition to the design of the plants, significant effort goes into emergency response planning and accident mitigation. This approach is called defense-in-depth.

Additional, technical, non-public information: None.

29) Can this happen here i.e. an earthquake that significantly damages a nuclear power plant? Are the Japanese plants similar to U.S. plants?

Public Answer: All U.S. nuclear power plants are built to withstand environmental hazards, including earthquakes and tsunamis. Even those plants that are located within areas with low and moderate seismic activity are designed for safety in the event of such a natural disaster. The NRC requires that safety-significant structures, systems, and components be designed to take into account even rare and extreme seismic and tsunami events. Nuclear power plants are designed to be safe based on the most severe natural phenomena historically reported for the site and surrounding area. The Japanese facilities are similar in design to several US facilities.

Additional technical, non-public information: Currently operating reactors were designed using a "deterministic" or "maximum credible earthquake" approach. Seismic hazard for the new plants is determined using a probabilistic seismic hazard assessment approach that explicitly addresses uncertainty, as described in Regulatory Guide 1.208. The NRC requires that adequate margin beyond the design basis ground shaking levels is assured. The NRC further enhances seismic safety for beyond-design-basis events through the use of a defense-in-depth approach.

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In addition, the NRC reviews the seismic risk at operating reactors as needed when information may have changed. Over the last few years the NRC has undertaken a program called Generic Issue 199, which is focused on assessing hazard for plants in the central and eastern US using the latest techniques and data and is determining the possible risk implications of any increase in the anticipated ground shaking levels. This program will help us assure that the plants are safe under exceptionally rare and extreme ground motions that represent beyond-design-basis events.

The reactor design is a Boiling Water Reactor that is similar to some U.S. designs, including Oyster Creek, Nine Mile Point and Dresden Units 2 and 3.

30) Could an accident like the one at Japan's Fukushima Daiichi nuclear plant happen in the United States?

Public response: It is difficult to answer this question until we have a better understanding of the precise problems and conditions that faced the operators at Fukushima Daiichi. We do know, however, that Fukushima Daiichi Units 1-3 lost all offsite power and emergency diesel generators. This situation is called "station blackout." U.S. nuclear power plants are designed to cope with a station blackout event that involves a loss of offsite power and onsite emergency power. The Nuclear Regulatory Commission's detailed regulations address this scenario. U.S. nuclear plants are required to conduct a "coping" assessment and develop a strategy to demonstrate to the NRC that they could maintain the plant in a safe condition during a station blackout scenario. These assessments, proposed modifications and operating procedures were reviewed and approved by the NRC. Several plants added additional AC power sources to comply with this regulation.

In addition, U.S. nuclear plant designs and operating practices since the terrorist events of September 11, 2001, are designed to mitigate severe accident scenarios such as aircraft impact, which include the complete loss of offsite power and all on-site emergency power sources.

U.S. nuclear plant designs include consideration of seismic events and tsunamis'. It is important not to extrapolate earthquake and tsunami data from one location of the world to another when evaluating these natural hazards. These catastrophic natural events are very region- and location-specific, based on tectonic and geological fault line locations.

Additional technical, non-public information: None

31) Should U.S. nuclear facilities be required to withstand earthquakes and tsunamis of the kind just experienced in Japan? If not, why not?

Public response: U.S. nuclear reactors are designed to withstand an earthquake equal to the most significant historical event or the maximum projected seismic event and associated tsunami without any breach of safety systems.

The lessons learned from this experience must be reviewed carefully to see whether they apply to U.S. nuclear power plants. It is important not to extrapolate earthquake and tsunami data from one location of the world to another when evaluating these natural hazards, however. These catastrophic natural events are very region- and location-specific, based on tectonic and geological fault line locations.

The U.S. Geological Survey (USGS) conducts continuous research of earthquake history and geology, and publishes updated seismic hazard curves for various regions in the continental US. These curves are updated approximately every six years. NRC identified a generic issue (GI-199) that is currently undergoing an evaluation to assess implications of this new information to nuclear plant sites located in the central and eastern United States. The industry is working with the NRC to address this issue.

Additional technical, non-public information: None

32) Can you summarize the plant seismic design basis for the US plants? Are there any special issues associated with seismic design?

Public response: Please see one of the several tables provided in the "Additional information" section of this document

Additional, technical, non-public information: None

33) How do we know that the equipment in plants is safe in earthquakes?

Public response: All equipment important to safety (required to safely shutdown a nuclear power plant) is qualified to withstand earthquakes in accordance with plants' licensing basis and NRC regulations.

Additional, technical, non-public information: 10 CFR 50, Appendix A, General Design Criterion 2 and 4, 10 Part 100, and Appendix S. Guidance: Regulatory Guides 1.100, IEEE 344 and ASME QME-I

34) How do we know equipment will work if the magnitude is bigger than expected, like in Japan?

Public response: Plant systems are designed to mitigate a design basis earthquake which includes margin above the postulated site specific earthquake. (reviewers comment: this needs to be expanded)

Additional, technical, non-public information: See part 100 Reactor Site Criteria

35) Are US plants susceptible to the same kind of loss of power as happened in Japan?

Public response: NRC recognized that there is the possibility of a total loss of AC power at a site, called a 'Station Blackout', or SBO. Existing Regulations require the sites to be prepared for the possibility of an SBO. In addition to battery powered back-up system to immediately provide power for emergency systems, NRC regulations require the sites to have a detailed plan of action to address the loss of AC power while maintaining control of the reactor.

There has also been an understanding that sites can lose offsite power as well. Of course, this can be caused by earthquake. However, hurricane- or tornado-related high winds may potentially damage the transmission network in the vicinity of a nuclear plant as well. Flood waters can also affect transformers used to power station auxiliary system. These types of weather related events have the potential to degrade the offsite power source to a plant.

The onsite Emergency Diesel Generators need fuel oil stored in tanks that are normally buried underground. These tanks and associated pumps/piping require protection from the elements. Above ground tanks have tornado/missile protection.

In case both offsite and onsite power supplies fail, NRC has required all licensee to evaluate for a loss of all AC power (station blackout) scenario and implement coping measures to safely shutdown the plant law 10 CFR 50.63.

Additional, technical, non-public information: Some plants have safeguards equipment below sea level and rely on watertight doors or Bilge pumps to remove water from equipment required to support safe shutdown. Overflowing rivers can result in insurmountable volume of water flooding the vulnerable areas. SBO definition in 10CFR50.2, SBO plan requirements in 10CFR50.63

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36) How do we know that the EDGs in Diablo Canyon and SONGS will not fail to operate like in Japan?

Public response: EDGs are installed in a seismically qualified structure. Even if these EDGs fail, plants can safely shutdown using station blackout power source law 10 CFR 50.63.

Additional, technical, non-public information: None.

37) Is all equipment at the plant vulnerable to tsunami?

Public response: Plants are designed law GDC 2 to withstand protection against natural phenomena such as tsunami, earthquakes. (reviewers comment: this needs to be expanded. I need assistance with this)

Additional, technical, non-public information: ADD

38) What protection measures do plants have against tsunami?

Public response: Plants are designed law GDC 2 to withstand protection against natural phenomena such as tsunami, earthquakes. (note from reviewer: add information on breakwater from songs and Diablo example. I need assistance with this)

Additional, technical, non-public information: ADD

39) Is there a risk of loss of water during tsunami drawdown? Is it considered in design?

Public response: *Goutam, Henry and Rich, can you guys answer this?*

Additional, technical, non-public information: ADD

40) Are nuclear buildings built to withstand earthquakes? What about tsunami?

Public response: *There is language elsewhere in this document that answers that...copy here.*

Additional, technical, non-public information: ADD

41) Are aftershocks considered in the design of equipment at the plants? Are aftershocks considered in design of the structure?

Public response: ADD

Additional, technical, non-public information: ADD

42) Are there any special issues associated with seismic design at the plants? For example, Diablo Canyon has special requirements. Are there any others?

Public response: Both SONGS and Diablo canyon are licensed with an automatic trip for seismic events. (can this be expanded? any others?) *Mike Markley, can your group assist with this?*

Additional, technical, non-public information: ADD

43) Is the NRC planning to require seismic isolators for the next generation of nuclear power plants? How does that differ from current requirements and/or precautions at existing U.S. nuclear power plants?

Public response: The NRC would not require isolators for the next generation of plants. However, it is recognized that a properly designed isolation system can be very effective in mitigating the effect of

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earthquake. Currently the NRC is preparing guidance for plant designers considering the use of seismic isolation devices.

Additional, technical, non-public information: A NUREG is in the works in the office of research. It is expected to be available for comment in 2011.

44) Are there any U.S. nuclear power plants that incorporate seismic isolators? What precautions are taken in earthquake-prone areas?

Public response: No currently constructed nuclear power plants in the US use seismic isolators. However seismic isolation is being considered for a number of reactor designs under development. Currently seismic design of plants is focused on assuring that design of structures, systems, and components are designed and qualified to assure that there is sufficient margin beyond the design basis ground motion.

Additional, technical, non-public information: None.

45) Do you think that the recent Japan disaster will cause any rethinking of the planned seismic isolation guidelines, particularly as it regards earthquakes and secondary effects such as tsunamis?

Public response: Whenever an event like this happens, the NRC thoroughly reviews the experience and tries to identify any lessons learned. The NRC further considers the need to change guidance or regulations. In this case, the event will be studied and any necessary changes will be made to the guidance under development. However, it should be noted that Japan does not have seismically isolated nuclear plants.

Additional, technical, non-public information: None.

About Japanese Hazard, Design and Earthquake Impact

46) Was the damage done to the plants from the Earthquake or the Tsunami?

Public response: It is hard to tell at this point. In the nuclear plants there seems to have been some damage from the shaking. However, the tsunami lead to some of the biggest problems in terms of the loss of backup power. This is also true in the general population; the tsunami seems to have lead to most of the deaths.

Additional, technical, non-public information: None

47) What is the design level of the Japanese plants? Was it exceeded?

Public response: As a result of a significant change in seismic regulations in 2006, the Japanese regulator initiated a program to reassess seismic hazard and seismic risk for all nuclear plants in Japan. This resulted in new assessments of higher ground shaking levels (i.e. seismic hazard) and a review of seismic safety for all Japanese plants. The program is still on-going, but has already resulted in retrofit in some plants. Therefore, it is useful to discuss both the design level and a review level ground motion for the plants, as shown below.

Currently we do not have official information. However, it appears that the ground motions (in terms of peak ground acceleration) are similar to the S_2 shaking levels, although the causative earthquakes are different. Thus the design basis was exceeded, but the review level may not have been.

Table: Original Design Basis Ground Motions (S_2) and New Review Level Ground Motions (S_3) Used for Review of Japanese Plants

Plant sites	Contributing earthquakes used for determination of hazard	New DBGM S_3	Original DBGM S_1
Onagawa	Soutei Miyagiken-oki (M8.2)	580 gal (0.59g)	375 gal (0.38g)
Fukushima	Earthquake near the site (M7.1)	600 gal (0.62g)	370 gal (0.37g)
Tokai	Earthquakes specifically undefined	600 gal (0.62g)	380 gal (0.39g)
Hamaoka	Assumed Tokai (M8.0), etc.	800 gal (0.82g)	600 gal (0.62g)

Additional, technical, non-public information: None

48) What are the Japanese S_1 and S_2 ground motions and how are they determined?

Public response: Japanese nuclear power plants are designed to withstand specified earthquake ground motions, previously specified as S_1 and S_2 , but now simply S_3 . The design basis earthquake ground motion S_1 was defined as the largest earthquake that can reasonably be expected to occur at the site of a nuclear power plant, based on the known seismicity of the area and local faults that have shown activity during the past 10,000 years. A power reactor could continue to operate safely during an S_1 level earthquake, though in practice they are set to trip at lower levels. The S_2 level ground motion was based on a larger earthquake from faults that have shown activity during the past 50,000 years and assumed to be closer to the site. The revised seismic regulations in May 2007 replaced S_1 and S_2 with S_3 .

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The S₅ design basis earthquake is based on evaluating potential earthquakes from faults that have shown activity during the past 130,000 years. The ground motion from these potential earthquakes are simulated for each of the sites and used to determine the revised S₅ design basis ground motion level. Along with the change in definition, came a requirement to consider "residual risk", which is a consideration of the beyond-design-basis event.

Additional, technical, non-public information: None

49) Did this earthquake affect Kashiwazaki-Kariwa NPP?

Public response: No, this earthquake did not affect Kashiwazaki-Kariwa NPP and all reactors remained in their pre-earthquake operating state. It also did not trip during an earthquake of magnitude XX that occurred on the western side subsequent to the 8.9 earthquake. This is very important for the stability of Japan's energy supply due to the loss of production at TEPCO's Fukushima NPPs.

Additional, technical, non-public information: None

50) How high were the tsunami at the plants?

Public response: The actual tsunami height at the plants is not currently known. However, NOAA has publically information on the recordings at sea for many areas.

Additional, technical, non-public information: A preliminary rough estimate of tsunami height at the plant locations was provided to NRC by NOAA shortly after the earthquake. This was developed using NOAA's global ocean model and is shown in the "additional information" section. Most notably, there was a 6 meter wave at Fukushima and the wave at Onogawa may have been between 18 and 23 meters.

51) Wikileaks has a story that quotes US embassy correspondence and some un-named IAEA expert stating that the Japanese were warned about this ... Does the NRC want to comment?

<http://www.dailymail.co.uk/news/article-1366721/Japan-tsunami-Government-warned-nuclear-plants-withstand-earthquake.html>

Public response: TBD Annie to explain the history of their recent retrofit program.

Additional, technical, non-public information: The article talks about that the plants and that were checked for a M=7, but the earthquake was a 9. The reality is the 7 close in (that they assumed) had similar ground motions to a 9 farther away. They did check (and retrofit) the plant to the ground motions that they probably saw (or nearly). The problem was the tsunami. We probably need a small write up so that staff understands, even if we keep it internal.

What happened in US Plants during the earthquake?

52) Was there any damage to U.S. reactors from either the earthquake or the resulting tsunami?

Public Answer: No

Additional, technical non-public information: Two US plants on the Pacific Ocean (Diablo Canyon and San Onofre) experienced higher than normal sea level due to tsunami. However, the wave heights were consistent with previously predicted levels and this had no negative impact to the plants. In response, Diablo Canyon Units 1 and 2 declared an "unusual event" based on tsunami warning following the Japanese earthquake. They have since exited the "unusual event" declaration, based on a downgrade to a tsunami advisory.

53) Have any lessons for US plants been identified?

Public Answer: The NRC is in the process of following and reviewing the event in real time. This, inevitably, leads to the indemnification of lessons that warrant further study. However, a complete understanding of lessons learned requires more information than is currently available to NRC staff.

Additional, technical non-public information: We need to take a closer look at common cause failures, such as earthquake and tsunami, and earthquake and dam failure.

Future Actions, Reassessment of US Plants and GI-199

54) What is the NRC doing about the emergencies at the nuclear power plants in Japan? Are you sending staff over there?

Public Answer: We are closely following events in Japan, working with other agencies of the federal government, and have been in direct contact with our counterparts in that country. In addition, we are ready to provide assistance if there is a specific request. An NRC staffer is participating in the USAID team headed to Japan.

Additional technical, non-public information: We are taking the knowledge that the staff has about the design of the US nuclear plants and we are applying this knowledge to the Japan situation. For example, this includes calculations of severe accident mitigation that have been performed.

55) With NRC moving to design certification, at what point is seismic capability tested – during design or modified to be site-specific? If in design, what strength seismic event must these be built to withstand?

Public Answer: During design certification, vendors propose a seismic design in terms of a ground motion spectrum for their nuclear facility. This spectrum is called a standard design response spectrum and is developed so that the proposed nuclear facility can be sited at most locations in the central and eastern United States. The vendors show that this design ground motion is suitable for a variety of different subsurface conditions such as hard rock, deep soil, or shallow soil over rock. Combined License and Early Site Permits applicants are required to develop a site specific ground motion response spectrum that takes into account all of the earthquakes in the region surrounding their site as well as the local site geologic conditions. Applicants estimate the ground motion from these postulated earthquakes to develop seismic hazard curves. These seismic hazard curves are then used to determine a site specific ground motion response spectrum that has a maximum annual likelihood of 1×10^{-4} of being exceeded. This can be thought of as a ground motion with a 10,000 year return period. This site specific ground motion response spectrum is then compared to the standard design response spectrum for the proposed design. If the standard design ground motion spectrum envelopes the site specific ground motion spectrum then the site is considered to be suitable for the proposed design. If the standard design spectrum does not completely envelope the site specific ground motion spectrum, then the COL applicant must do further detailed structural analysis to show that the design capacity is adequate. Margin beyond the standard design and site specific ground motions must also be demonstrated before fuel loading can begin.

Additional technical, non-public information: None.

56) Can we get the rankings of the plants in terms of safety? (Actually this answer should be considered any time GI-199 data is used to “rank” plants)

The objective of the GI-199 Safety/Risk Assessment was to perform a conservative, screening-level assessment to evaluate if further investigations of seismic safety for operating reactors in the central and eastern U.S. (CEUS) are warranted consistent with NRC directives. The results of the GI-199 SRA should not be interpreted as definitive estimates of plant-specific seismic risk. The nature of the information used (both seismic hazard data and plant-level fragility information) make these estimates useful only as a screening tool. The NRC does not rank plants by seismic risk.

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Currently operating nuclear plants in the United States remain safe, with no need for immediate action. This determination is based on NRC staff reviews of updated seismic hazard information and the conclusions of the Generic Issue 199 Screening Panel. Existing plants were designed with considerable margin to be able to withstand the ground motions from the "deterministic" or "scenario earthquake" that accounted for the largest earthquake expected in the area around the plant. During the mid-to late-1990s, the NRC staff reassessed the margin beyond the design basis as part of the Individual Plant Examination of External Events (IPEEE) program. The results of the GI-199 assessment demonstrate that the probability of exceeding the design basis ground motion may have increased at some sites, but only by a relatively small amount. In addition, the Safety/Risk Assessment stage results indicate that the probabilities of seismic core damage are lower than the guidelines for taking immediate action.

57) Is the earthquake safety of US plants reviewed once the plants are constructed?

Public response: Yes, earthquake safety is reviewed during focused design inspections, under the Generic Issues Program (GI-199) and as part of the Individual Plant Evaluation of External Events program (IPEEE) that was conducted in response to Generic Letter 88-20 Supplement 4.

Additional, technical, non-public information: None.

58) Does the NRC ever review tsunami risk for existing plants?

Public Answer: The NRC has not conducted a generic issue program on tsunami risk to date. However, some plants have been reviewed as a result of the application for a license for a new reactor. In the ASME/ANS 2009 seismic probabilistic risk assessment standard, all external hazards are included.

Additional, technical, non-public information: None.

59) Does GI-199 consider tsunami?

Public response: GI-199 stems from the increased in perceived seismic hazard focused on understanding the impact of increased ground motion on the risk at a plant. GI-199 does not consider tsunami

Additional, technical, non-public information: In the past there has been discussion about a GI program on tsunami, but the NRC's research and guidance was not yet at the point it would be effective. We are just getting to this stage and the topic should be revisited.

60) What is Generic Issue 199 about?

Public Answer: Generic Issue 199 investigates the safety and risk implications of updated earthquake-related data and models. These data and models suggest that the probability for earthquake ground shaking above the seismic design basis for some nuclear power plants in the Central and Eastern United States is still low, but larger than previous estimates.

Additional, technical, non-public information: See additional summary/discussion of GI-199 and terms below.

61) Where can I get current information about Generic Issue 199?

Public Answer: The public NRC Generic Issues Program (GIP) website (<http://www.nrc.gov/about-nrc/regulatory/gen-issues.html>) contains program information and documents, background and historical information, generic issue status information, and links to related programs. The latest Generic Issue Management Control System quarterly report, which has regularly updated GI-199 information, is publicly available at <http://www.nrc.gov/reading-rm/doc-collections/generic->

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[issues/quarterly/index.html](http://www.gpo.gov/quarterly/index.html). Additionally, the U.S. Geological Survey provides data and results that are publicly available at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>.

Additional, technical, non-public information: The GI-199 section of the NRC internal GIP website (<http://www.internal.nrc.gov/RES/projects/GIP/Individual%20GIs/GI-0199.html>) contains additional information about Generic Issue 199 (GI-199) and is available to NRC staff.

62) How was the seismic design basis for an existing nuclear power plant established?

Public Answer: The seismic ground motion used for the design basis was determined from the evaluation of the maximum historic earthquake within 200 miles of the site, without explicitly considering the time spans between such earthquakes; safety margin was then added beyond this maximum historic earthquake to form a hypothetical *design basis earthquake*. The relevant regulation for currently operating plants is 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (<http://www.nrc.gov/reading-rm/doc-collections/cfr/part100/part100-appa.html>).

Additional, technical, non-public information: See discussion at end of GI-199 section for discussion of safety margin and design basis.

63) Is there margin above the design basis?

Public Answer: Yes, there is margin beyond the design basis. In the mid to late 1990s, NRC staff reviewed the plants' assessments of potential ground motion beyond the safety margin included in each plant's design basis, which licensees performed as part of the Individual Plant Examination of External Events (or IPEEE) program. From this review, the staff determined that seismic designs of operating plants in the United States have adequate safety margins, for withstanding earthquakes, built into the designs.

Additional, technical, non-public information: The goal of seismic engineering is to design structures, systems and components that explicitly do not fail at the design level. The application of specific codes, standards, and analysis techniques results in margin beyond the design level. The assessments carried out as part of the IPEEE program demonstrated that margin exists in the operating reactors against seismic demand.

64) Are all U.S. plants being evaluated as a part of Generic Issue 199?

Public Answer: The scope of the Generic Issue 199 (GI-199) Safety/Risk Assessment is limited to all plants in the Central and Eastern United States. Although plants at the Columbia, Diablo Canyon, Palo Verde, and San Onofre sites are not included in the GI-199 Safety/Risk Assessment, the Information Notice on GI-199 is addressed to all operating power plants in the U.S. (as well as all independent spent fuel storage installation licensees). The staff will also consider inclusion of operating reactors in the Western U.S. in its future generic communication information requests.

Additional, technical, non-public information: The staff is currently developing specific information needs to be included in a Generic Letter to licensees in the CEUS.

65) Are the plants safe? If you are not sure they are safe, why are they not being shut down? If you are sure they are safe, why are you continuing evaluations related to this generic issue?

Public Answer: Yes, currently operating nuclear plants in the United States remain safe, with no need for immediate action. This determination is based on NRC staff reviews associated with Early Site

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Permits and updated seismic hazard information, the conclusions of the Generic Issue 199 Screening Panel (comprised of technical experts), and the conclusions of the Safety/Risk Assessment Panel (also comprised of technical experts).

No immediate action is needed because: (1) existing plants were designed to withstand anticipated earthquakes with substantial design margins, as confirmed by the results of the Individual Plant Examination of External Events program; (2) the probability of exceeding the *safe shutdown earthquake* ground motion may have increased at some sites, but only by a relatively small amount; and (3) the Safety/Risk Assessment Stage results indicate that the probabilities of seismic core damage are lower than the guidelines for taking immediate action.

Even though the staff has determined that existing plants remain safe, the Generic Issues Program criteria (Management Directive 6.4) direct staff to continue their analysis to determine whether any cost-justified plant improvements can be identified to make plants enhance plant safety.

Additional, technical, non-public information : The Safety/Risk Assessment results confirm that plants are safe. The relevant risk criterion for GI-199 is total *core damage frequency* (CDF). The threshold for taking immediate regulatory action (found in NRR Office Instruction LIC-504, see below) is a total CDF greater than or on the order of 10^{-3} (0.001) per year. For GI-199, the staff calculated seismic CDFs of 10^{-4} (0.0001) per year and below for nuclear power plants operating in the Central and Eastern U.S. (CEUS) (based on the new U.S. Geological Survey seismic hazard curves). The CDF from internal events (estimated using the staff-developed Standardized Plant Analysis of Risk models) and fires (as reported by licensees during the IPEEE process and documented in NUREG-1742), when added to the seismic CDF estimates results in the total risk for each plant to be, at most, 4×10^{-4} (0.0004) per year or below. This is well below the threshold (a CDF of 10^{-3} [0.001] per year) for taking immediate action. Based on the determination that there is no need for immediate action, and that this issue has not changed the licensing basis for any operating plant, the CEUS operating nuclear power plants are considered safe. In addition, as detailed in the GI-199 Safety/Risk Assessment there are additional, qualitative considerations that provide further support to the conclusion that plants are safe.

Note: The NRC has an integrated, risk-informed decision-making process for emergent reactor issues (NRR Office Instruction LIC-504, ADAMS Accession No. ML100541776 [not publically available]). In addition to deterministic criteria, LIC-504 contains risk criteria for determining when an emergent issue requires regulatory action to place or maintain a plant in a safe condition.

66) What do you mean by "increased estimates of seismic hazards" at nuclear power plant sites?

Public Answer: *Seismic hazard* (earthquake hazard) represents the chance (or probability) that a specific level of ground shaking could be observed or exceeded at a given location. Our estimates of seismic hazard at some Central and Eastern United States locations have changed based on results from recent research, indicating that earthquakes occurred more often in some locations than previously estimated. Our estimates of seismic hazard have also changed because the models used to predict the level of ground shaking, as caused by a specific magnitude earthquake at a certain distance from a site, changed. The increased estimates of seismic hazard at some locations in the Central and Eastern United States were discussed in a memorandum to the Commission, dated July 26, 2006. (The memorandum is available in the NRC Agencywide Documents Access and Management System [ADAMS] under Accession No. ML052360044).

Additional, technical, non-public information: See additional discussion of terms below.

67) What do the following terms mean?

- Annual exceedance frequency
- Core damage frequency
- Design basis earthquake or safe shutdown earthquake
- Ground acceleration
- High confidence of low probability of failure capacity
- Large early release frequency
- Seismic hazard
- Seismic margin
- Seismic risk

Public Answer: The terms are defined as follows:

Annual exceedance frequency (AEF) – Number of times per year that a site’s ground motion is expected to exceed a specified acceleration.

Core damage frequency (CDF) – Expected number of core damage events per unit of time. *Core damage* refers to the uncovering and heat-up of the reactor core, to the point that prolonged oxidation and severe fuel damage are not only anticipated but also involve enough of the core to result in off-site public health effects if released. *Seismic core damage frequency* refers to the component of total CDF that is due to seismic events.

Design basis earthquake or safe shutdown earthquake (SSE) – A design basis earthquake is a commonly employed term for the *safe shutdown earthquake (SSE)*; the SSE is the earthquake ground shaking for which certain structures, systems, and components are designed to remain functional. In the past, the SSE has been commonly characterized by a standardized spectral shape associated with a peak *ground acceleration* value.

Ground acceleration – Acceleration produced at the ground surface by seismic waves, typically expressed in units of *g*, the acceleration of gravity at the earth’s surface.

High confidence of low probability of failure (HCLPF) capacity – A measure of *seismic margin*. In *seismic risk* assessment, *HCLPF capacity* is defined as the earthquake motion level, at which there is high confidence (95%) of a low probability (at most 5%) of failure of a structure, system, or component.

Large early release frequency (LERF) – The expected number of large early releases per unit of time. A *large early release* is the rapid, unmitigated release of airborne fission products from the containment building to the environment, occurring before the effective implementation of off-site emergency response and protective actions, such that there is a potential for early health effects. *Seismic large early release frequency* refers to the component of total LERF that is due to seismic events.

Seismic hazard – Any physical phenomenon, such as ground motion or ground failure, that is associated with an earthquake and may produce adverse effects on human activities (such as posing a risk to a nuclear facility).

Seismic margin – The difference between a plant’s capacity and its seismic design basis (*safe shutdown earthquake, or SSE*).

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Seismic risk – The risk (frequency of occurrence multiplied by its consequence) of severe earthquake-initiated accidents at a nuclear power plant. A severe accident is an accident that causes core damage, and, possibly, a subsequent release of radioactive materials into the environment. Several risk metrics may be used to express *seismic risk*, such as *seismic core damage frequency* and *seismic large early release frequency*.

68) Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-06} , or 0.000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct?

Public Response: Yes, at least partly. In the subject documents the frequencies for core damage or ground motion exceedance have been expressed in the form "2.5E-06". As you noted this is equivalent to 2.5×10^{-6} , or 0.000025 per year. If, for example, the core damage frequency was estimated as 2.5E-06, this would be equivalent to an expectation of 2.5 divided by a million per year. It is not really correct to think of these values as "once every 400,000 years," the two numbers are mathematically equivalent but do not convey the same statistical meaning within this context. Rather, you could characterize it as 1 in 400,000 per year of something occurring.

Additional, technical, non-public information: None

69) The GI-199 documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the Central and Eastern U.S. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the Western U.S.?

Public Response: At this time the staff has not formally developed updated probabilistic seismic hazard estimates for the existing nuclear power plants in the Western U.S. However, NRC staff during the mid-to late-1990's reviewed the plants' assessments of potential consequences of severe ground motion from earthquakes beyond the plant design basis as part of the Individual Plant Examination of External Events (IPEEE) program. From this review, the NRC staff determined that the seismic designs of operating plants in the U.S. have adequate safety margin. NRC staff has continued to stay abreast of the latest research on seismic hazards in the Western U.S. and interface with colleagues at the U.S. Geological Survey. The focus of Generic Issue 199 has been on the CEUS. However, the Information Notice that summarized the results of the Safety/Risk Assessment was sent to all existing power reactor licensees. The documents that summarize existing hazard estimates are contained in the Final Safety Analysis Reports (FSARS) and in the IPEEE submittals. It must be noted that following 9/11 the IPEEE documents are no longer publicly available.

Additional, technical, non-public information: None

70) The GI-199 documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment."

Public Response: The new consensus hazard curves are being developed in a cooperative project that has NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) participation. The title is: the Central and Eastern U.S. Seismic Source Characterization (CEUS-SSC) project. The project is being conducted following comprehensive standards to ensure quality and regulatory defensibility. It is in its final phase and is expected to be publicly released in the fall of 2011. The project manager is Larry Salamone (Lawrence.salamone@srs.gov, 803-645-9195) and the technical lead on the project is Dr. Kevin Coppersmith (925-974-3335, kcoppersmith@earthlink.net). Additional information on this project can be found at: <http://mydocs.epri.com/docs/ANT/2008-04.pdf>, and http://my.epri.com/portal/server.pt?open=512&objID=319&&PageID=218833&mode=2&in_hi_us_erid=2&cached=true.

Additional, technical, non-public information: None

71) What is the timetable now for consideration of any regulatory changes from the GI-199 research?

Public Response: The NRC is working on developing a Generic Letter (GL) to request information from affected licensees. The GL will likely be issued in a draft form within the next 2 months to stimulate discussions with industry in a public meeting. After that it has to be approved by the Committee to Review Generic Requirements, presented to the Advisory Committee on Reactor Safeguards and issued as a draft for formal public comments (60 days). After evaluation of the public comments it can then be finalized for issuance. We expect to issue the GL by the end of this calendar year, as the new consensus seismic hazard estimates become available. The information from licensees will likely require 3 to 6 months to complete. Staff's review will commence after receiving licensees' responses. Based on staff's review, a determination can be made regarding cost beneficial backfits where it can be justified.

Additional, technical, non-public information: None

Seismic Probabilistic Risk Assessment (SPRA)

72) The NRC increasingly uses risk-information in regulatory decisions. Are risk-informed PRAs useful in assessing an event such as this?

Public response: Nilesh Chokshi to provide Q&As on SPRA

Additional, technical, non-public information: None

Plant-Specific Questions

SONGS questions

73) SONGS received a white finding in 2008 for 125VDC battery issue related to the EDGs that went undetected for 4 years. NRC issued the white finding as there was increased risk that one EDG may not have started due to a low voltage condition on the battery on one Unit (Unit 2). Aren't all plants susceptible to the unknown? Is there any assurance the emergency cooling systems will function as desired in a Japan-like emergency?

Public response: The low voltage condition was caused by a failure to properly tighten bolts on a electrical breaker that connected the battery to the electrical bus that would be relied on to start the EDG in case of a loss of off-site power. This was corrected immediately on identification and actions taken to prevent its reoccurrence. The 3 other EDGs at SONGS were not affected.

Additional, technical, non-public information: None

74) Has the earthquake hazard at SONGS been reviewed like DCNPP is doing? Are they planning on doing an update before relicensing?

Public Answer: Relicensing does not evaluate the potential change to seismic siting of a plant. If there is a seismic design concern, it would be addressed for the plant as it is currently operating.

The closest active fault is approximately five miles offshore from San Onofre, a system of folds and faults exist called the OZD. The Cristianitos fault is ½ mile southeast, but is an inactive fault. Other faults such as the San Andreas and San Jacinto, which can generate a larger magnitude earthquake, are far enough away that they would produce ground motions less severe than the OZD for San Onofre.

Past history relative to nearby major quakes have been of no consequences to San Onofre. In fact, three major earthquakes from 1992 to 1994 (Big Bear, Landers and Northridge), ranging in distance from 70-90 miles away and registering approximately 6.5 to 7.3 magnitude, did not disrupt power production at San Onofre. The plant is expected to safely shutdown if a major earthquake occurs nearby. Safety related structures, systems and components have been designed and qualified to remain functional and not fail during and after an earthquake.

Additional, technical, non-public information: None

75) Is possible to have a tsunami at songs that is capable of damaging the plant?

Public Information: The San Onofre Units 2 and 3 plant grade is elevation +30.0 feet MLLW. The controlling tsunami for San Onofre occurring during simultaneous high tide and storm surge produces a maximum runup to elevation +15.6 feet MLLW at the Unit 2 and 3 seawall. When storm waves are superimposed, the predicted maximum runup is to elevation +27 MLLW. Tsunami protection for the SONGS site is provided by a reinforced concrete seawall constructed to elevation +30.0 MLLW. A tsunami greater than this height is extremely unlikely.

Additional, technical, non-public information: None

76) Does SONGS have an emergency plan for tsunami?

Public Response: The SONGS emergency plan does initiate the emergency response organization and results in declaration of emergency conditions via their EALs. The facility would then make protective

action recommendations to the Governor, who would then decide on what protective actions would be ordered for the residents around SONGS.

Additional, technical, non-public information: None

77) Has evacuation planning at SONGS considered tsunami?

Public Response: These considerations would be contained in the State and local (City, County) emergency plans, which are reviewed by FEMA. FEMA then certifies to the NRC that they have "reasonable assurance" that the off-site facilities can support operation of SONGS in an emergency.

Additional, technical, non-public information: None

78) Is SONGS designed against tsunami and earthquake?

Public Response: Yes. SONGS is designed against both tsunami and earthquake.

Additional, technical, non-public information: None

79) What is the height of water that SONGS is designed to withstand?

Public Response: 30 feet. Information for all plants can be found in the "Additional Information" section of this document.

Additional, technical, non-public information: None

80) What about drawdown and debris?

Public Response: *Good question...can HQ answer? Goutam, Henry, or Rich...can you help with this one?*

Additional, technical, non-public information: None

81) Will this be reviewed in light of the Japan quake.

Public Response: The NRC will do a through assessment of the lessons learned from this event and will review all potential issues at US nuclear plants as a result.

Additional, technical, non-public information: None

82) Could all onsite and offsite power be disrupted from SONGS in the event of a tsunami, and if that happened, could the plant be safely cooled down if power wasn't restored for days after?

Public Response: Seismic Category I equipment is equipment that is essential to the safe shutdown and isolation of the reactor or whose failure or damage could result in significant release of radioactive material. All Seismic Category I equipment at SONGS is designed to function following a DBE with ground acceleration of 0.67g.

The operating basis earthquake (1/2 of the DBE) is characterized by maximum ground shaking of 0.33g. Historically, even this level of ground shaking has not been observed at the site. Based on expert analysis, the average recurrence interval for 0.33g ground shaking at the San Onofre site would be in excess of 1000 years and, thus, the probability of occurrence in the 40-year design life of the plant would be less than 1 in 25. The frequency of the DBE would be much more infrequent, and very unlikely to occur during the life of the plant. Even if an earthquake resulted in greater than the DBE movement/acceleration at SONGS, the containment structure would ultimately protect the public from harmful radiation release, in the event significant damage occurred to Seismic category 1 equipment.

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Additional, technical, non-public information: None

83) Are there any faults nearby SONGS that could generate a significant tsunami?

Public Response: Current expert evaluations estimate a magnitude 7 earthquake about 4 miles from SONGS. This is significantly less than the Japan quake, and SONGS has been designed to withstand this size earthquake without incident. Should discuss the different tectonic nature (not a subduction zone like Japan)?

Additional, technical, non-public information: None

84) What magnitude or shaking level is SONGS designed to withstand? How likely is an earthquake of that magnitude for the SONGS site?

Public Response: The design basis earthquake (DBE) is defined as that earthquake producing the maximum vibratory ground motion that the nuclear power generating station is designed to withstand without functional impairment of those features necessary to shut down the reactor, maintain the station in a safe condition, and prevent undue risk to the health and safety of the public. The DBE for SONGS was assessed during the construction permit phase of the project. The DBE is postulated to occur near the site (5 miles), and the ground accelerations are postulated to be quite high (0.67g), when compared to other nuclear plant sites in the U.S (0.25g or less is typical for plants in the eastern U.S.). Based on the unique seismic characteristics of the SONGS site, the site tends to amplify long-period motions, and to attenuate short-period motions. These site-specific characteristics were accounted for in the SONGS site-specific seismic analyses.

Additional, technical, non-public information: None

85) Could SONGS withstand an earthquake of the magnitude of the Japanese earthquake?

Public Response: We do not have current information on the ground motion at the Japanese reactors. SONGS was designed for approximately a 7.0 magnitude earthquake 4 miles away. The Japanese earthquake was much larger (8.9), but was also almost 9 miles away. The local ground motion at a particular plant is significantly affected by the local soil and bedrock conditions. SONGS was designed (.67g) to withstand more than 2 times the design motion at average US plants.

Additional, technical, non-public information: None

86) What about the evacuation routes at SONGS? How do we know they are reasonable?

Public Response: FEMA reviews off-site evacuation plans formally every 2 years during a biennial emergency preparedness exercise. NRC evaluates on-site evacuation plans during the same exercise. Population studies are formally done every 10 years, and evacuation time estimates are re-evaluated at that time. FEMA reviews these evacuation plans, and will conclude their acceptability through a finding of "reasonable assurance" that the off-site facilities and infrastructure is capable of protecting public health and safety in the event of an emergency at SONGS. The next such exercise is planned for April 12, 2011.

Additional, technical, non-public information: None

87) Regarding tsunami at Diablo and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami?

Public response: See below

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88) What is the design level flooding for DNCPP and SONGS? Can a tsunami be larger?

Public response: Both the Diablo Canyon (main plant) and SONGS are located above the flood level associated with tsunami. However, the intake structures and Auxiliary Sea Water System at Diablo canyon are designed for combination of tsunami-storm wave activity. SONGS has reinforced concrete cantilevered retaining seawall and screen well perimeter wall designed to withstand the design basis earthquake, followed by the maximum predicted tsunami with coincident storm wave action

Additional, technical, non-public information: None

89) Is there potential linkage between the South Coast Offshore fault near San Onofre NPP and the Newport-Inglewood Fault system and/or the Rose Canyon fault? Does this potential linkage impact the maximum magnitude that would be assigned to the South Coast Offshore fault and ultimately to the design basis ground motions for this facility?

Public response: Stephanie and Jon to answer (you may want to change the question) based on the discussions in the articles sent by Lara U.

Additional, technical, non-public information: Proposed action is to check the FSAR for San Onofre and read the discussion on characterization of the offshore fault. A quick look at discussion of the Newport Inglewood from other sources suggest this is part of the "system". It would be helpful to check the basis for segmenting the fault in the FSAR. Probably have to dig on this a bit, may need to look at the USGS/SCEC/ model for this area.

Diablo Canyon Questions

90) Now after the Japan tragedy, will the NRC finally hear us (A4NR) and postpone DC license renewal until seismic studies are complete? How can you be sure that what happened there is not going to happen at Diablo with a worse cast quake and tsunami?

Public response: ADD

Additional, technical, non-public information: ADD

91) The evacuation routes at DCNPP see are not realistic. Highway 101 is small...and can you imagine what it will be like with 40K people on it? Has the evacuation plan been updated w/ all the population growth?

Public Response: FEMA reviews off-site evacuation plans formally every 2 years during a biennial emergency preparedness exercise. NRC evaluates on-site evacuation plans during the same exercise. Population studies are formally done every 10 years, and evacuation time estimates are re-evaluated at that time. FEMA reviews these evacuation plans, and will conclude their acceptability through a finding of "reasonable assurance" that the off-site facilities and infrastructure is capable of protecting public health and safety in the event of an emergency at DCNPP.

Additional, technical, non-public information: None

92) Are there local offshore fault sources capable of producing a tsunami with very short warning times?

Public Response: ADD- question forwarded to region

Additional, technical, non-public information: ADD

93) Are there other seismically induced failure modes (other than tsunami) that would yield LTSBO? Flooding due to dam failure or widespread liquefaction are examples.

Public Response: ADD question forwarded to region

Additional, technical, non-public information: ADD

94) Ramifications of beyond design basis events (seismic and tsunami) and potential LTSBO on spent fuel storage facilities?

Public Response: ADD question forwarded to region

Additional, technical, non-public information: ADD

95) Why did a Emergency Warning go out for a 'tsunami' that was only 6 ft high? Do these guys really know what they're doing? Would they know it if a big one was really coming? Crying wolf all the time doesn't instill a lot of confidence.

Public Response: The warning system performed well. The 6 foot wave was predicted many hours before and arrived at the time it was predicted. Federal officials to accurately predicted the tsunami arrival time and size; allowing local official to take appropriate measures as they saw necessary to warn and protect the public. It should be understood that even a 6 foot tsunami is very dangerous. Tsunami have far more energy and power than wind-driven waves.

Additional, technical, non-public information: ADD

96) How big did the Japanese think a quake/tsunami could be before 3/11? Why were they so wrong (assuming this quake/tsunami was bigger than what they had designed the plant for)?

Public Response: ADD can HQ answer?

Additional, technical, non-public information: ADD

The Japanese were supposed to have one of the best tsunami warning systems around. What went wrong last week (both with the reactors and getting the people out...see #1, evacuation plan above)?

Public Response: ADD can HQ answer?

Additional, technical, non-public information: ADD

97) Regarding tsunami at Diablo and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami?

Public Response: Both the Diablo Canyon (main plant) and SONGS are located above the flood level associated with tsunami. However, the intake structures and Auxiliary Sea Water System at Diablo canyon are designed for combination of tsunami-storm wave activity. SONGS has reinforced concrete cantilevered retaining seawall and screen well perimeter wall designed to withstand the design basis earthquake, followed by the maximum predicted tsunami with coincident storm wave action

Additional, technical, non-public information: ADD

NOTE: need to add to SONGS and DCNPP... Canyon and San Onofre IPEEEs - based on the Technical Evaluation Reports, Diablo did consider a locally induced tsunami in a limited way (the aux service water pumps were assumed to become flooded following a seismic event) while SONGS did not consider a coupled seismic/tsunami event.

98) Shouldn't the NRC make licensees consider a Tsunami coincident with a seismic event that triggers the Tsunami?

ADD

99) Given that SSCs get fatigued over time, shouldn't the NRC consider after-shocks in seismic hazard analyses?

ADD

100) Did the Japanese also consider an 8.9 magnitude earthquake and resulting tsunami "way too low a probability for consideration"?

ADD

101) GI-199 shows that the scientific community doesn't know everything about the seismicity of CEUS. And isn't there a prediction that the West coast is likely to get hit with some huge earthquake in the next 30 years or so? Why does the NRC continue to license plants on the west coast?

ADD

Work the following into Q&As as time permits.

After an earthquake, in order to restart, in practice a licensee needs to determine from engineering analysis that the stresses on the plant did not exceed their licensed limits. That would be a very tall order for a plant that experienced a beyond design basis quake, and probably is why it had taken Japan so long to restore the KK plants following the earlier quake.

Has industry done anything on tsunami hazards? Also, has anyone done work to look at the effect of numerous cycles of low amplitude acceleration following a larger event. I would expect we would have some information because how do we know a plant would be fit to start back up after an event? We cannot possibly do NDE on everything to determine if flaws have propagated to the point where they need to be replaced.

Indian Point Questions

102) Why is Indian Point safe if there is a fault line so close to it?

Public Response: The Ramapo fault system, which passes through the Indian Point area, is a group of Mesozoic age faults, extending from southeastern New York to northern New Jersey, as well as further southwest. The fault system is composed of a series of southeast-dipping, northeast-striking faults. Various faults of the system contain evidence of repeated slip in various directions since Proterozoic time, including Mesozoic extensional reactivation. However, the USGS staff, who reviewed 31 geologic features in the Appalachian Mountains and Coastal Plain and compiled a National Database on Quaternary Faulting (Crone and Wheeler, 2000), listed the Ramapo fault system as low risk because the fault system lacks evidence for Quaternary slip. They further pointed out that the Ramapo fault system, and 17 other geologic features, "have little or no published geologic evidence of Quaternary tectonic faulting that could indicate the likely occurrence of earthquakes larger than those observed historically" (Wheeler and Crone, 2004). Among these faults, the Ramapo fault system is one of the three that underwent a paleoseismological study. In two trenches excavated across the Ramapo fault, no evidence of Quaternary tectonic faulting was found (Wheeler and Crone, 2000). Because the Ramapo fault system is relatively inactive, because the Indian Point plants are built on solid bedrock, and because the plants are designed to safely shutdown in the event of an earthquake of the highest intensity ever recorded in that area, the NRC has concluded that the risk of significant damage to the reactors due to a probable earthquake in the area is extremely small.

Additional, technical, non-public information: The Question asks: Why is Indian Point safe if there is a fault line beneath it? The response focuses on the Ramapo fault (within a couple of miles not directly beneath) specifically and also states that the plant is designed for the largest observable earthquake. The information is consistent with the literature and the UFSAR for IP related to the Ramapo fault.

The letter that was sent to the NRC from Rep Lowey refers to the Ramapo seismic zone (RSZ) and the Dobbs Ferry fault. The letter incorrectly states that the Dobbs Ferry fault is located within the Ramapo seismic zone. Based on the literature, it is not. It is close, but it is considered to be in the Manhattan Prong more to the east (more like 10-15 miles away) while the Ramapo fault system is considered to be in the Reading Prong (a couple of miles away from IP). Also for clarification, the seismicity is considered to be within the Precambrian/Paleozoic basement at depths greater than the Mesozoic Newark Basin where the RSZ is situated.

103) Comments From the letter received 3/16/11 from Congresswoman Lowey:

Text of the letter:

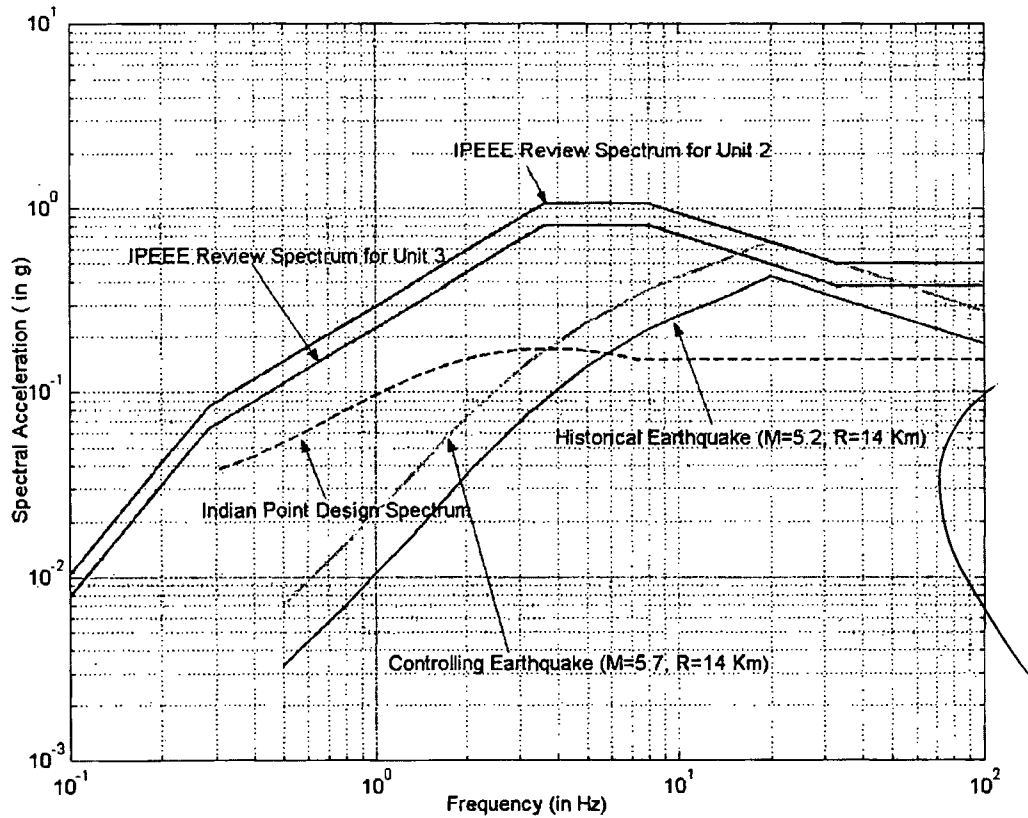
A 2008 study by seismologists at the Columbia University Lamont-Doherty Earth Observatory found that earthquakes in the New York metropolitan area are common and that risks are particularly high due to infrastructure and high population. A 3.9 magnitude earthquake occurred in the Atlantic Ocean approximately 80 miles off Long Island as recently as November 30, 2010. In fact, there have been five earthquakes in the same area in the past two decades, including a 4.7 magnitude earthquake in 1992.

The Ramapo Seismic Zone is a particular threat because the zone passes within two miles of Indian Point. The Ramapo Seismic zone includes the Dobbs Ferry fault in Westchester, which generated a 4.1 magnitude earthquake in 1955. The Columbia University study suggests that this pattern of subtle but active faults increases the risk to the New York City area and that an earthquake with a magnitude of 7.0 on the Richter scale is within reach. Disturbingly, Entergy measures the risk of an earthquake near Indian Point to be between 1.0 and 3.0 on the Richter scale, despite evidence to the contrary.

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As our nation stands ready to assist the Japanese to calm this potential nuclear meltdown and disaster, we must not let the same mistakes happen on our shores. The NRC should study Indian Point's risk of, and ability to sustain a disaster, including the impact of earthquakes and hurricanes, as well as collateral impacts such as loss of power, inability to cool reactors and emergency evacuation routes. The NRC should evaluate how a similar incident in the New York metropolitan area could be further complicated due to a dramatically higher population and the effectiveness of the proposed evacuation routes.

NRR has the lead in response. We can assist NRR at their request. Either way, we need to turn this into appropriate questions and then provide answers consistent with the formal response.



Questions for the Japanese

NOTE: These were all collected from what we produced after the KKNPP earthquake. These need to be gone through and revised for this event. We should separate into high, medium and low priorities:

The below is pulled from an KKNPP summary...to be reviewed...

- What seismic monitoring equipment exists at the plants? Can we get the recordings from the
- Are there recordings of the tsunami at the plant location?
- What is the geology and soil profile at the plants?
- NOAA has a prediction of very large tsunami waves at Onagawa. Are these accurate?

The below is pulled from an KKNPP summary...to be reviewed...

DESIGN BASES: Exactly what is the design basis ground motion for each of the plants? Did it change through time (i.e. from the first plant to the seventh)? Where was the design basis motion defined, at the top of rock, at the ground surface, at the floor level or somewhere else? Were the site-specific geotechnical properties used in the development of the design basis ground motions for each plant?

SEISMIC HAZARDS: What assumptions were used in the seismic hazard evaluation to arrive at the design basis ground motions? What faults were considered, what magnitudes and geometries were assumed? What activity rates were assumed for both fault sources and "background" earthquakes?

OBSERVATIONS-GROUND MOTIONS: What ground motions were recorded and where were they recorded? Specifically, what free-field, in-structure and down-hole recordings were obtained? What are the locations of the instruments that obtained records? Did all the instruments respond as planned, or are there lessons to be learned? Can the digital data be shared with the NRC? Is there any way of evaluating how well the existing analysis methods predicted the observed motions at different points within the plant?

OBSERVATIONS-DAMAGE: What damage was observed at the plants? How well did equipment such as cranes perform? Were there observations of displacements of equipment from anchorages, were cracks observed in any of the buildings? How well did non-nuclear safety type of buildings and equipment perform? What types of geotechnical phenomena were observed, was there ground deformation/slope failures, lateral spreading or liquefaction near the facility? Did the ABWRs perform better or similar to the older designs?

And another set from the KKNPP earthquake...to be reviewed...

Please provide the following information in the time frame indicated:

Highest Priority Questions – as soon as possible

- A timeline describing the order of events and the individual plant responses to the earthquake
- Confirmation that all operating and shut down units achieved or maintained safe-shutdown conditions without manual operator intervention or complications. Did all safety-related systems respond to the seismic scram as designed? Please note if there were any unexpected plant responses to the event, including any spurious signals.
- A more detailed description of the impacts of the earthquake on the plant (e.g., what systems were involved, which pipes were damaged, where did the leakage occur (pipe wall, joints, fittings,,etc).
- A description of seismic instrumentation at the site and at each of the 7 units, soil/rock shear wave properties through depth, instrument location and mounting condition, all the recorded

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data on the basis of unified starting time, such that the coherency of motion through the surface or the foundations and at depth can be determined

- Full spectrum seismic design basis for the plant.
- What actually caused the Unit 3B house transformer fire?

Additional Questions – please provide answers as more information is developed

- Damage to buildings, slope failures, intake structure failure, if any
- Behavior of cranes, cables and conduits
- Failures of any large pumps and valves, pipe mounted control or valve failure
- Instances of any relay or vibration sensitive components malfunctioning
- Nature of damage to service water and fire-suppression piping - their diameter, material they are made of including their elastic properties, design standards used for the piping design, nature of failure (at support, anchor motion, failure of anchors, subsidence differential movement etc)
- Were there any systems that changed state?
- Impact on physical security, and any vulnerabilities identified
- Were there any impacts on the grid because of the event?
- Please describe the switchyard performance?
- What emergency preparedness concerns have been identified as a result of the event?

3B Transformer Specific Questions – please respond when there is time and other issues have been addressed

- What are the primary and secondary voltages of the transformer?
- What type of transformer - liquid or dry-type (air-cooled)?
- Who was the manufacturer of the transformer?
- What are the physical dimensions of the transformer?
- How are the transformer coils restrained within the cabinet?
- What is the clearance between transformer energized component and cabinet?
- What is the relative displacement for connection between the high voltage leads and the first anchor point (adequate slack?) in the transformer?
- What was the natural frequency of the burned transformer, if known?
- What was the acceleration level (or the response spectrum, if available) at the support location of the burned transformer?
- What seismic requirements exist for the burned transformer? Was the transformer tested or analyzed to a specific acceleration or response spectra, and if so, what are they?
- Are there any of the same type of transformer installed at other locations in the plant?

Additional Information

Table of Design Basis Ground Motions for US Plants

Design Basis Earthquake Information					
Nuclear Plant By State/Location	Maximum Observed Or Inferred Intensity (MMI Scale)	Relative Distance Of Seismic Source	Design SSE Peak Acceleration, <i>g</i>	OBE Peak Acceleration, <i>g</i>	Soil Condition
New York					
Fitzpatrick	VI	Near	0.15	0.08	Soil
GINNA 1	VIII/IX	>60 miles	0.2	0.08	Rock
Indian Point 2, 3	VII	Near	0.15	0.1	Rock
Nine Mile Point 1	IX-X	>60 miles	0.11	0.06	Rock
Nine Mile Point 2	VI	Near	0.15	0.075	Rock
New Jersey					
Salem 1,2	VII-VIII	Near	0.2	0.1	Deep Soil
Connecticut					
Millstone 1, 2, 3	VII	Near	0.17	0.07	Rock
Vermont					
Vermont Yankee	VI	Near	0.14	0.07	Rock
Ohio					
Davis Besse 1	VII	Near	0.15	0.08	Rock
Perry 1	VII	Near	0.15	0.08	Rock
Georgia					
Hatch 1, 2	VII	Near	0.15	0.08	Deep Soil
Vogtle 1, 2	VII-VIII	Near	0.2	0.12	Deep Soil
Tennessee					
Sequoyah 1, 2	VIII	Near	0.18	0.09	Rock
Watts Bar 1	VIII	Near	0.18	0.09	Rock
California					
San Onofre 2, 3	IX-X	Near	0.67	0.34	Soil
Diablo Canyon 1, 2	X-XI	Near	0.75	0.20	Rock
Florida					

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Crystal River 3	V	Near	0.10	0.05	Rock
St. Lucie 1, 2	VI	Near	0.10	0.05	Soil
Turkey Point 3, 4	VII	Near	0.15	0.05	Rock

NOTES:

MMI=Modified Mercalli Intensity, a measure of observed/reported damage and severity of shaking.
Relative distance measure used in FSAR to develop SSE acceleration, "Near" indicates distance less than 10 miles.

SSE=Safe Shutdown Earthquake ground motion, for horizontal acceleration, in units of earth's gravity, *g*.
OBE=Operating Basis Earthquake ground motion, level of horizontal acceleration, which if exceeded requires plant shutdown.

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Table of SSE, OBE and Tsunami Water Levels

Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration, (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Alabama			
Browns Ferry	0.200	0.100	N/A (Non-Coastal)
Farley	0.100	0.050	N/A (Non-Coastal)
Arkansas			
Arkansas Nuclear	0.200		N/A (Non-Coastal)
Arizona			
Palo Verde	0.200	0.100	N/A (Non-Coastal)
California			
Diablo Canyon	0.400	0.200	The design basis maximum combined wave runup is the greater of that determined for near-shore or distantly-generated tsunamis, and results from near-shore tsunamis. For distantly-generated tsunamis, the combined runup is 30 feet. For near-shore tsunamis, the combined wave runup is 34.6 feet, as determined by hydraulic model testing. The safety-related equipment is installed in watertight compartments to protect it from adverse sea wave events to elevation +48 feet above MLLW.
San Onofre	0.670	0.340	The controlling tsunami occurs during simultaneous high tide and storm surge produces a maximum runup to elevation +15.6 feet mean lower low water line (mllw) at the Unit 2 and 3 seawall. When storm waves are superimposed, the predicted maximum runup is to elevation +27 mllw. Tsunami protection for the SONGS site is provided by a reinforced concrete seawall constructed to elevation +30.0 mllw.
Connecticut			
Millstone	0.170	0.090	18 ft SWL
Florida			
Crystal River	0.050	0.025	N/A (Non-Coastal)

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration, (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
St. Lucie	0.100	0.050	No maximum tsunami level, bounded by PMH surge of +18 MLW wave runup, with plant openings at +19.5 MLW
Turkey Point	0.150	0.050	No maximum tsunami level, bounded by PMH surge of +18.3 MLW water level, site protected to +20 MLW with vital equipment protected to +22 MLW
Georgia			
Hatch	0.150	0.080	N/A (Non-Coastal)
Vogtle	0.200	0.120	N/A (Non-Coastal)
Illinois			
Braidwood	0.200	0.090	N/A (Non-Coastal)
Byron	0.200	0.090	N/A (Non-Coastal)
Clinton	0.250	0.100	N/A (Non-Coastal)
Dresden	0.200	0.100	N/A (Non-Coastal)
LaSalle	0.200	0.100	N/A (Non-Coastal)
Quad Cities	0.240	0.120	N/A (Non-Coastal)
Iowa			
Duane Arnold	0.120	0.060	N/A (Non-Coastal)
Kansas			
Wolf Creek	0.120	0.060	N/A (Non-Coastal)
Louisiana			
River Bend	0.100	0.050	
Waterford	0.100		Floods - 30 feet MSL
Maryland			
Calvert Cliffs	0.150	0.080	14 ft design wave
Massachusetts			
Pilgrim	0.150	0.080	*Storm flooding design basis - 18.3ft
Michigan			
D.C. Cook	0.200	0.100	N/A
Fermi	0.150	0.080	N/A
Palisades	0.200	0.100	N/A

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration, (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Missouri			
Callaway	0.200		N/A (Non-Coastal)
Mississippi			
Grand Gulf	0.150	0.075	N/A
Minnesota			
Monticello	0.120	0.060	N/A (Non-Coastal)
Prarie Island	0.120	0.060	N/A (Non-Coastal)
Nebraska			
Cooper	0.200	0.100	N/A (Non-Coastal)
Fort Calhoun	0.170	0.080	N/A (Non-Coastal)
New York			
Fitzpatrick	0.150	0.080	N/A (Non-Coastal)
Ginna	0.200	0.080	N/A
Indian Point	0.150	0.100	15 ft msl
Nine Mile Point, Unit 1	0.110	0.060	N/A
Nine Mile Point, Unit 2	0.150	0.075	N/A
New Hampshire			
Seabrook	0.250	0.125	(+) 15.6' MSL Still Water Level (Tsunami Flooding -Such activity is extremely rare on the U.S. Atlantic coast and would result in only minor wave action inside the harbor.)
New Jersey			
Hope Creek	0.200	0.100	35.4 MSL The maximum probable tsunami produces relatively minor water level changes at the site. The maximum runup height reaches an elevation of 18.1 feet MSL with coincident 10 percent exceedance high tide)
Oyster Creek	0.184	0.092	(+) 23.5' MSL Still Water Level (Probable Maximum Tsunami - Tsunami events are not typical of the eastern coast of the United States and have not, therefore, been addressed.)

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration, (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Salem	0.200	0.100	21.9 MSL (There is no evidence of surface rupture in East Coast earthquakes and no history of significant tsunami activity in the region)
North Carolina			
Brunswick	0.160	0.030	N/A
McGuire	0.150	0.080	N/A (Non-Coastal)
Shearon Harris	0.150		N/A (Non-Coastal)
Ohio			
Davis-Besse	0.150	0.080	N/A
Perry	0.150	0.080	N/A
Pennsylvania			
Beaver Valley	0.130	0.060	N/A (Non-Coastal)
Limerick	0.150	0.075	N/A (Non-Coastal)
Peach Bottom	0.120	0.050	N/A (Non-Coastal)
Three Mile Island	0.120	0.060	N/A (Non-Coastal)
Susquehanna	0.150	0.080	N/A (Non-Coastal)
South Carolina			
Catawba	0.150	0.080	N/A (Non-Coastal)
Oconee	0.150	0.050	N/A (Non-Coastal)
Robinson	0.200	0.100	N/A (Non-Coastal)
V.C. Summer	0.250	0.150	N/A (Non-Coastal)
Tennessee			
Sequoyah	0.180	0.090	N/A (Non-Coastal)
Watts Bar, Unit 1	0.180	0.090	N/A (Non-Coastal)
Texas			
Comanche Peak	0.120	0.060	N/A
South Texas Project	0.100	0.050	N/A
Vermont			

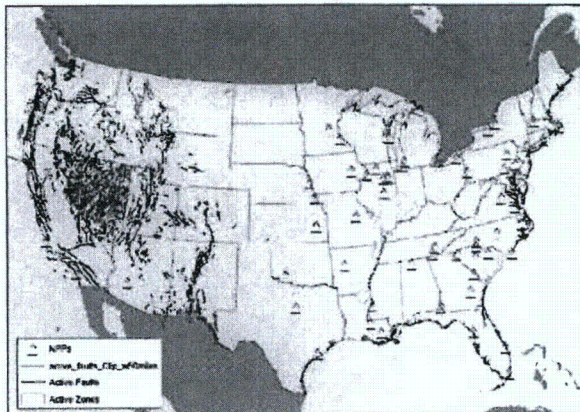
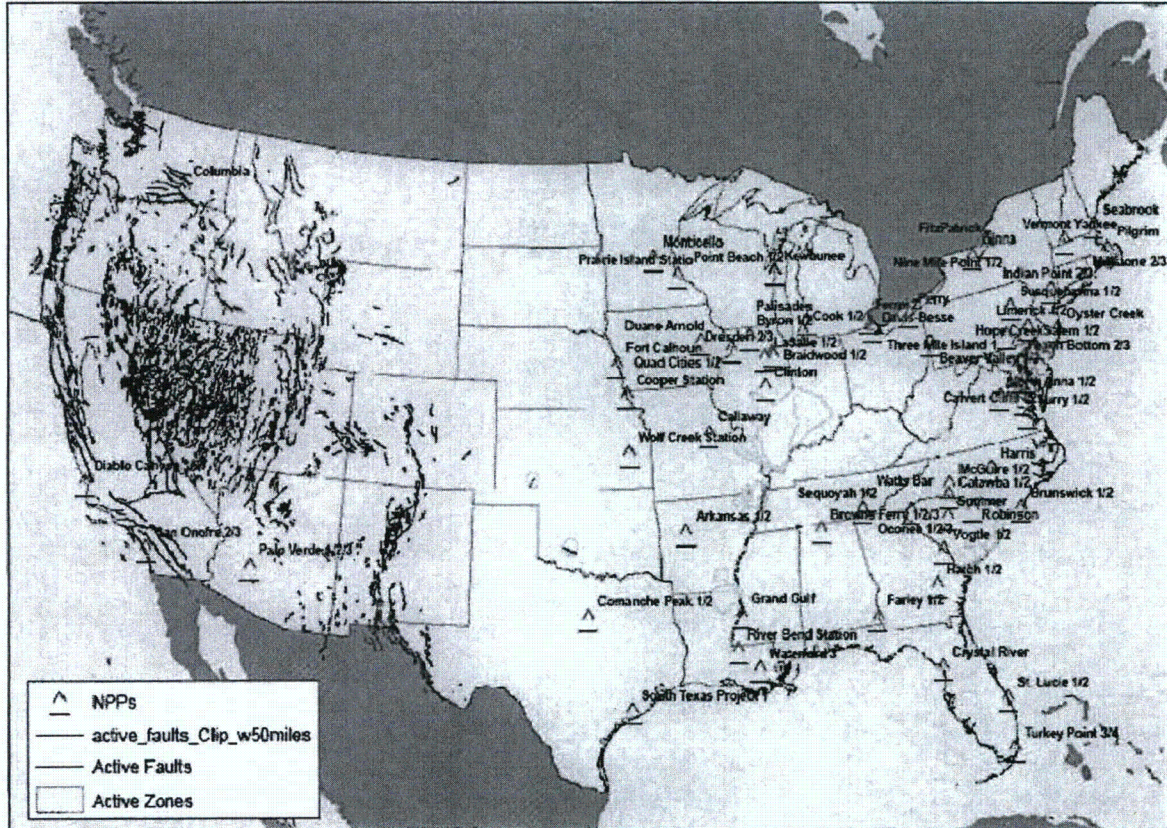
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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Vermont Yankee	0.140	0.070	N/A
Virginia			
North Anna	0.180		N/A
Surry	0.150	0.080	N/A
Washington			
Columbia	0.250		N/A (Non-Coastal)
Wisconsin			
Kewaunee	0.120	0.060	N/A
Point Beach	0.120		N/A
Definition of Safe Shutdown Earthquake	The safe-shutdown earthquake (SSE) for the site is the ground motion response spectra (GMRS), which also satisfies the minimum requirement of paragraph IV(a)(1)(i) of Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," to Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the Code of Federal Regulations (10 CFR Part 50).		
Definition of Operating Basis Earthquake:	<p>To satisfy the requirements of paragraph IV(a)(2)(A) of Appendix S to 10 CFR Part 50, the operating-basis earthquake (OBE) ground motion is defined as follows:</p> <ul style="list-style-type: none"> (iv) For the certified design portion of the plant, the OBE ground motion is one-third of the CSDRS. (v) For the safety-related noncertified design portion of the plant, the OBE ground motion is one-third of the design motion response spectra, as stipulated in the design certification conditions specified in design control document (DCD). (vi) The spectrum ordinate criterion to be used in conjunction with Regulatory Guide 1.166, "Pre-Earthquake Planning and Immediate Nuclear Power Plant Operator Post-earthquake Actions," issued March 1997, is the lowest of (i) and (ii). 		

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Plot of Mapped Active Quaternary Faults and Nuclear Plants in the US

It is important to note that this plot somewhat misleading as faults in the central and eastern US are not well characterized. For example, the faults responsible for very large historic events, such as the 1811 and 1812 New Madrid Earthquakes, and the 1886 Charleston Earthquakes have not been conclusively located.



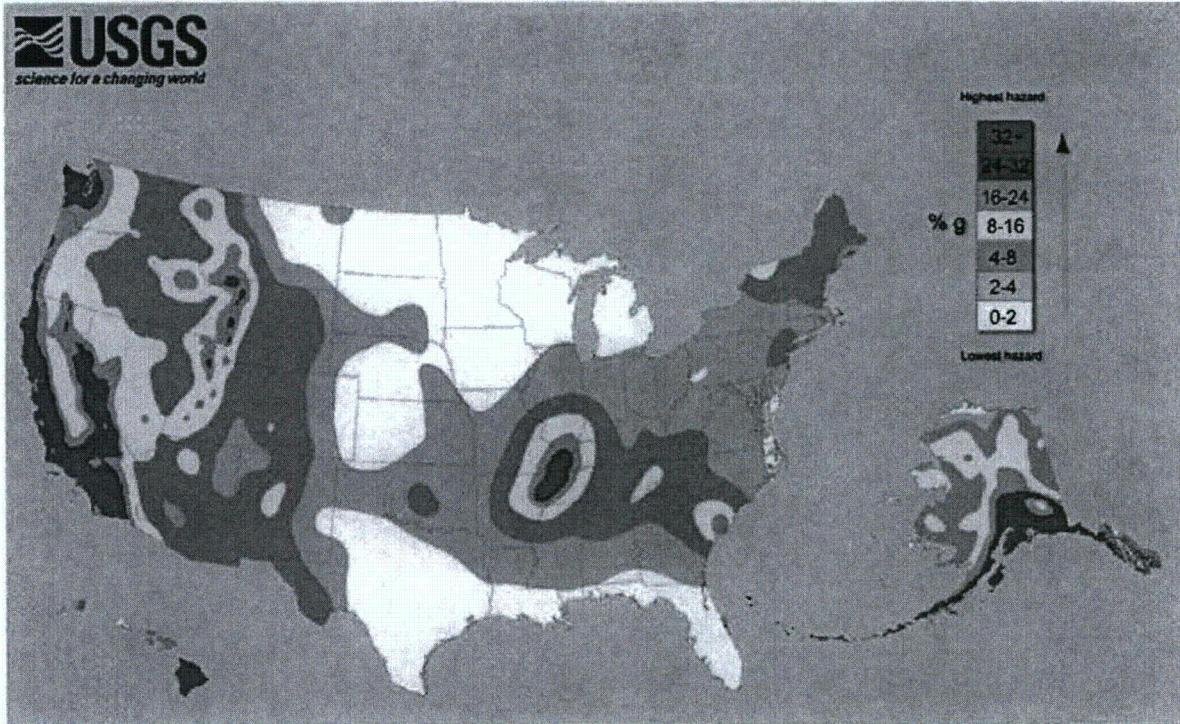
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Nuclear Plants in the US Compared to the USGS National Seismic Hazard Maps

Dogan to create the map

USGS US National Seismic Hazard Maps

Many version of this map are available at the USGS website at <http://earthquake.usgs.gov/hazards/>



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Plot of Nuclear Plants in the US Compared to Recent Earthquakes

Not sure of the date on this...It's an awesome plot. can we get this updated with a date? Who made this originally (NRO?RES?)



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Table of Plants Near Known Active Faults

It should be noted that in much of the Central and Eastern US, the seismicity comes from "background" seismicity. Background seismicity is earthquake activity, where the earthquakes cannot be tied to known faults.

Jon Ake and Dogan Seber to complete. High priority to support chairman in response to questions asked by congress.

PLACEHOLDER ONLY....TO BE COMPLETED ON 3/17/11 PLEASE DON'T USE!!!

Plant (state)	Nearest Active Fault or Fault Zone	Distance to Fault or Range of Distances to Zones	Type of Faulting Mechanism	Range of Maximum Magnitude (M _w)	OBE (g)	SSE (g)
Columbia						
Diablo Canyon (CA)	Hosgri Fault	5 miles	Predominantly Strike Slip	7.5		
	Shoreline Fault	0.5 miles	Strike Slip	6.25 to 6.75 best estimate by NRC staff in RIL 09-001. Final report on the fault in review by NRC staff		
San Onofre (CA)						
Comanche Peak	Meers					

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Table From GI-199 Program Containing SSE, SSE Exceedance Frequencies, Review Level Earthquakes, and Seismic Core Damage Frequencies

Plant	Bucket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HGLPE) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Arkansas 1	05000313	0.2	2.8E-04	0.3	4.1E-06	0.3g full-scope EPRI SMA	GI-199
Arkansas 2	05000368	0.2	9.7E-05	0.3	4.1E-06	0.3g focused-scope EPRI SMA	GI-199
Beaver Valley 1	05000334	0.12	3.3E-04	n/a	4.8E-05	seismic PRA	GI-199
Beaver Valley 2	05000412	0.12	2.7E-04	n/a	2.2E-05	seismic PRA	GI-199
Braidwood 1	05000456	0.2	6.7E-05	0.3	7.3E-06	0.3g focused-scope EPRI SMA	GI-199
Braidwood 2	05000457	0.2	6.7E-05	0.3	7.3E-06	0.3g focused-scope EPRI SMA	GI-199
Browns Ferry 1	05000259	0.2	2.5E-04	0.3	3.7E-06	0.3g focused-scope EPRI SMA	GI-199
Browns Ferry 2	05000260	0.2	2.5E-04	0.26	5.4E-06	0.3g focused-scope EPRI SMA	GI-199
Browns Ferry 3	05000296	0.2	2.5E-04	0.26	5.4E-06	0.3g focused-scope EPRI SMA	GI-199
Brunswick 1	05000325	0.16	7.3E-04	0.3	1.5E-05	0.3g focused-scope EPRI SMA	GI-199
Brunswick 2	05000324	0.16	7.3E-04	0.3	1.5E-05	0.3g focused-scope EPRI SMA	GI-199
Byron 1	05000454	0.2	5.2E-05	0.3	5.8E-06	0.3g focused-scope EPRI SMA	GI-199
Byron 2	05000455	0.2	5.2E-05	0.3	5.8E-06	0.3g focused-scope EPRI SMA	GI-199
Callaway	05000483	0.2	3.8E-05	0.3	2.0E-06	0.3g focused-scope EPRI SMA	GI-199
Calvert Cliffs 1	05000317	0.15	1.9E-04	n/a	1.0E-05	seismic PRA	GI-199
Calvert Cliffs 2	05000318	0.15	1.9E-04	n/a	1.2E-05	seismic PRA	GI-199
Catawba 1	05000413	0.15	1.4E-04	n/a	3.7E-05	seismic PRA	GI-199
Catawba 2	05000414	0.15	1.4E-04	n/a	3.7E-05	seismic PRA	GI-199
Clinton	05000461	0.25	5.8E-05	0.3	2.5E-06	0.3g focused-scope EPRI SMA	GI-199
Columbia	05000397	0.25	1.7E-04	n/a	2.1E-05	seismic PRA	IPEEE
Comanche Peak 1	05000445	0.12	1.6E-05	0.12	4.0E-06	reduced-scope EPRI SMA; SSE = 0.12g	GI-199
Comanche	05000446	0.12	1.6E-05	0.12	4.0E-06	reduced-scope EPRI SMA; SSE =	GI-199

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (MCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Peak 2						0.12g	
Cooper	05000298	0.2	1.5E-04	0.3	7.0E-06	0.3g focused-scope EPRI SMA	GI-199
Crystal River 3	05000302	0.1	8.9E-05	0.1	2.2E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
D.C. Cook 1	05000315	0.2	2.1E-04	n/a	2.2E-05	seismic PRA	GI-199
D.C. Cook 2	05000316	0.2	2.1E-04	n/a	2.2E-05	seismic PRA	GI-199
Davis Besse	05000346	0.15	6.3E-05	0.26	6.7E-06	reduced-scope EPRI SMA	GI-199
Diablo Canyon 1	05000275	0.75	2.0E-04	n/a	4.1E-05	seismic PRA	IPEEE
Diablo Canyon 2	05000323	0.75	2.0E-04	n/a	4.1E-05	seismic PRA	IPEEE
Dresden 2	05000237	0.2	9.7E-05	0.26	1.9E-05	0.3g focused-scope EPRI SMA	GI-199
Dresden 3	05000249	0.2	9.7E-05	0.26	1.9E-05	0.3g focused-scope EPRI SMA	GI-199
Duane Arnold	05000331	0.12	2.3E-04	0.12	3.2E-05	reduced-scope EPRI SMA; SSE = 0.12g	GI-199
Farley 1	05000348	0.1	1.0E-04	0.1	2.8E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Farley 2	05000364	0.1	1.0E-04	0.1	2.8E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Fermi 2	05000341	0.15	1.0E-04	0.3	4.2E-06	0.3g focused-scope EPRI SMA	GI-199
Fitzpatrick	05000333	0.15	3.2E-04	0.22	6.1E-06	0.3g focused-scope NRC SMA	GI-199
Fort Calhoun 1	05000285	0.17	3.7E-04	0.25	5.4E-06	0.3g focused-scope NRC SMA	GI-199
Ginna	05000244	0.2	1.0E-04	0.2	1.3E-05	0.3g focused-scope EPRI SMA	GI-199
Grand Gulf	05000416	0.15	1.0E-04	0.15	1.2E-05	reduced-scope EPRI SMA; SSE = 0.15g	GI-199
Hatch 1	05000400	0.148	3.9E-04	0.29	2.3E-06	0.3g focused-scope EPRI SMA	GI-199
Hatch 2	05000321	0.15	2.7E-04	0.3	2.5E-06	0.3g focused-scope EPRI SMA	GI-199

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Hope Creek	05000366	0.2	9.7E-05	0.3	2.5E-06	0.3g focused-scope EPRI SMA	GI-199
Indian Point 2	05000354	0.15	4.9E-04	n/a	2.8E-06	seismic PRA	GI-199
Indian Point 3	05000247	0.15	4.9E-04	n/a	3.3E-05	seismic PRA	GI-199
Kewaunee	05000286	0.12	2.8E-04	n/a	1.0E-04	seismic PRA	GI-199
LaSalle 1	05000305	0.2	1.7E-04	n/a	5.1E-06	seismic PRA	GI-199
LaSalle 2	05000373	0.2	1.7E-04	n/a	2.8E-06	seismic PRA	GI-199
Limerick 1	05000374	0.15	1.8E-04	n/a	2.8E-06	seismic PRA	GI-199
Limerick 2	05000352	0.15	1.8E-04	0.15	5.3E-05	reduced-scope EPRI SMA	GI-199
McGuire 1	05000353	0.15	9.5E-05	0.15	5.3E-05	reduced-scope EPRI SMA	GI-199
McGuire 2	05000369	0.15	9.5E-05	n/a	3.1E-05	seismic PRA	GI-199
Millstone 1	05000370	0.254	9.3E-05	n/a	3.1E-05	seismic PRA	GI-199
Millstone 2	05000336	0.17	8.3E-05	0.25	1.1E-05	0.3g focused-scope EPRI SMA	GI-199
Millstone 3	05000423	0.17	8.3E-05	n/a	1.5E-05	seismic PRA	GI-199
Monticello	05000263	0.12	9.3E-05	0.12	1.9E-05	modified focused/expended reduced-scope EPRI SMA	GI-199
Nine Mile Point 1	05000220	0.11	1.5E-04	0.27	4.2E-06	0.3g focused-scope EPRI SMA	GI-199
Nine Mile Point 2	05000410	0.15	4.8E-05	0.23	5.6E-06	SPRA and focused-scope EPRI SMA	GI-199
North Anna 1	05000338	0.12	2.1E-04	0.16	4.4E-05	0.3g focused-scope EPRI SMA	GI-199
North Anna 2	05000339	0.12	2.1E-04	0.16	4.4E-05	0.3g focused-scope EPRI SMA	GI-199
Oconee 1	05000269	0.1	9.7E-04	n/a	4.3E-05	seismic PRA	GI-199
Oconee 2	05000270	0.1	9.7E-04	n/a	4.3E-05	seismic PRA	GI-199
Oconee 3	05000287	0.1	9.7E-04	n/a	4.3E-05	seismic PRA	GI-199
Oyster Creek	05000219	0.17	1.5E-04	n/a	1.4E-05	seismic PRA	GI-199
Palisades	05000255	0.2	1.4E-04	n/a	6.4E-06	seismic PRA	GI-199
Palo Verde 1	05000528	0.258	3.5E-05	0.3	3.8E-05	0.3g full-scope EPRI SMA	IPEEE
Palo Verde 2	05000529	0.258	3.5E-05	0.3	3.8E-05	0.3g full-scope EPRI SMA	IPEEE

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Palo Verde 3	05000530	0.258	3.5E-05	0.3	3.8E-05	0.3g full-scope EPRI SMA	IPEEE
Peach Bottom 2	05000277	0.12	2.0E-04	0.2	2.4E-05	modified focused-scope EPRI SMA	GI-199
Peach Bottom 3	05000278	0.12	2.0E-04	0.2	2.4E-05	modified focused-scope EPRI SMA	GI-199
Perry	05000440	0.15	2.2E-04	0.3	2.1E-05	0.3g focused-scope EPRI SMA	GI-199
Pilgrim 1	05000293	0.15	8.1E-04	n/a	6.9E-05	seismic PRA	GI-199
Point Beach 1	05000266	0.12	2.0E-04	n/a	1.1E-05	seismic PRA	GI-199
Point Beach 2	05000301	0.12	2.0E-04	n/a	1.1E-05	seismic PRA	GI-199
Prairie Island 1	05000282	0.12	2.0E-04	0.28	3.0E-06	0.3g focused-scope EPRI SMA	GI-199
Prairie Island 2	05000306	0.12	2.0E-04	0.28	3.0E-06	0.3g focused-scope EPRI SMA	GI-199
Quad Cities 1	05000254	0.24	8.2E-04	0.09	2.7E-05	0.3g focused-scope EPRI SMA	GI-199
Quad Cities 2	05000265	0.24	8.2E-04	0.09	2.7E-05	0.3g focused-scope EPRI SMA	GI-199
River Bend	05000458	0.1	2.4E-04	0.1	2.5E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Robinson (HR)	05000261	0.2	1.1E-03	0.28	1.5E-05	0.3g full-scope EPRI SMA	GI-199
Saint Lucie	05000335	0.1	1.4E-04	0.1	4.6E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Salem 1	05000389	0.2	2.6E-04	0.1	4.6E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Salem 2	05000272	0.2	2.6E-04	n/a	9.3E-06	seismic PRA	GI-199
San Onofre 2	05000361	0.67	1.2E-04	n/a	1.7E-05	seismic PRA	IPEEE
San Onofre 3	05000362	0.67	1.2E-04	n/a	1.7E-05	seismic PRA	IPEEE
Seabrook	05000311	0.25	1.3E-04	n/a	9.3E-06	seismic PRA	GI-199
Sequoyah 1	05000443	0.18	7.1E-04	n/a	2.2E-05	seismic PRA	GI-199
Sequoyah 2	05000327	0.18	7.1E-04	0.27	5.1E-05	0.3g full-scope EPRI SMA	GI-199
Shearon Harris 1	05000328	0.15	4.6E-05	0.27	5.1E-05	0.3g full-scope EPRI SMA	GI-199
South Texas 1	05000498	0.1	3.0E-05	n/a	6.2E-06	seismic PRA	GI-199

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
South Texas 2	05000499	0.1	3.0E-05	n/a	6.2E-06	seismic PRA	GI-199
Summer	05000395	0.15	3.9E-04	0.22	3.8E-05	0.3g focused-scope EPRI SMA	GI-199
Surry 1	05000280	0.15	2.2E-04	n/a	5.7E-06	seismic PRA	GI-199
Surry 2	05000281	0.15	2.2E-04	n/a	5.7E-06	seismic PRA	GI-199
Susquehanna 1	05000387	0.1	1.9E-04	0.21	1.3E-05	0.3g focused-scope EPRI SMA	GI-199
Susquehanna 2	05000388	0.1	1.9E-04	0.21	1.3E-05	0.3g focused-scope EPRI SMA	GI-199
Three Mile Island 1	05000289	0.12	1.0E-04	n/a	4.0E-05	seismic PRA	GI-199
Turkey Point 3	05000250	0.15	3.8E-05	0.15	1.0E-05	site-specific approach; SSE=0.15g	GI-199
Turkey Point 4	05000251	0.15	3.8E-05	0.15	1.0E-05	site-specific approach; SSE=0.15g	GI-199
Vermont Yankee	05000271	0.14	1.2E-04	0.25	8.1E-06	0.3g focused-scope EPRI SMA	GI-199
Vogtle 1	05000424	0.2	1.5E-04	0.3	1.8E-05	0.3g focused-scope EPRI SMA	GI-199
Vogtle 2	05000425	0.2	1.5E-04	0.3	1.8E-05	0.3g focused-scope EPRI SMA	GI-199
Waterford 3	05000382	0.1	1.1E-04	0.1	2.0E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Watts Bar	05000390	0.18	2.9E-04	0.3	3.6E-05	0.3g focused-scope EPRI SMA	GI-199
Wolf Creek	05000482	0.12	3.7E-05	0.2	1.8E-05	reduced-scope EPRI SMA	GI-199
25th percentile			9.6E-05		6.0E-06		
min			1.6E-05		2.0E-06		
median			1.7E-04		1.5E-05		
mean			3.1E-04		2.1E-05		
max			3.9E-03		1.0E-04		
75th percentile			2.6E-04		3.2E-05		

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Summary of seismological information from regional instrumentation

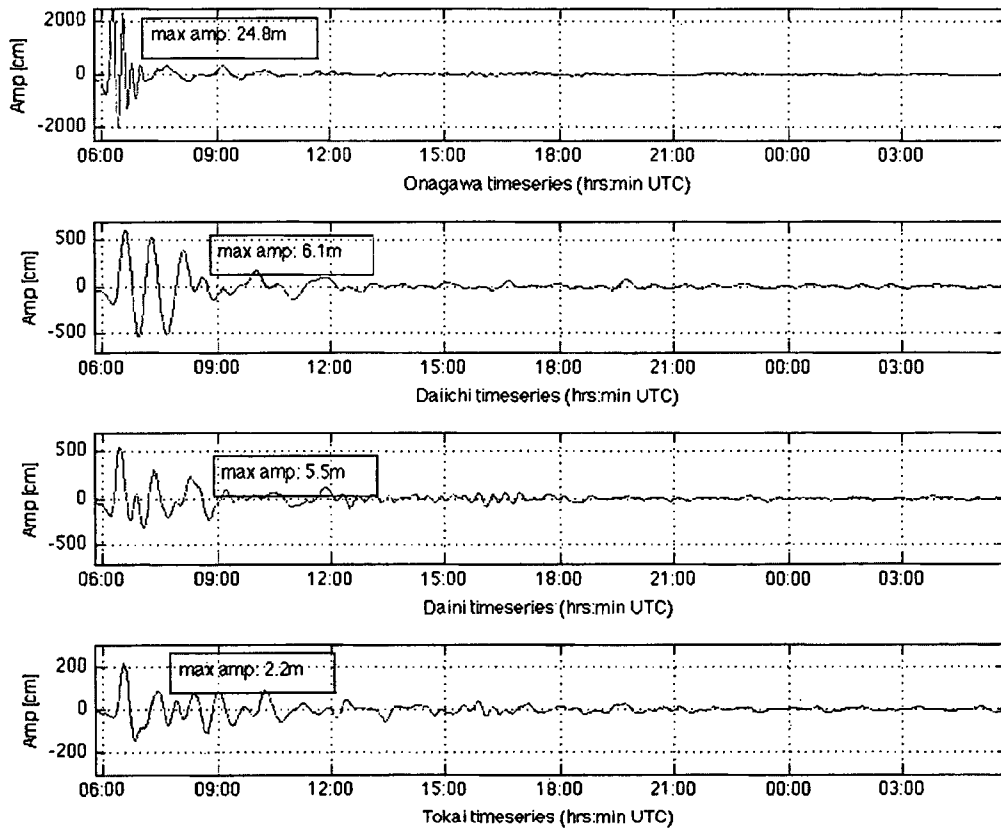
Placeholder: Rasool Anoooshehpoor is developing.

Tsunami Wave Heights at the Japanese Plants (unofficial from NOAA)

The below plots were developed for NRC seismic staff a few hours after the earthquake and tsunami by the PMEL group of NOAA. This group is responsible for scientific development of the models and tools used by the US tsunami warning system, as well as notification elements of system itself.

On 3/16/11, the PMEL NOAA team informed NRC staff that additional analyses have generally confirmed the below estimates and so they don't expect the final official numbers at the plant locations to change much.

Offshore wave amplitudes, scaled to the coastline



Fact Sheet on Protection of Nuclear Power Plants against Tsunami Flooding

Nuclear power plants are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The word tsunami literally means harbor wave. Tsunamis can be generated by large offshore earthquakes (usually greater than magnitude 6.5), submarine or on shore land slides or volcanoes. Some large onshore earthquakes close to the shoreline can generate tsunami. The Nuclear Regulatory Commission (NRC) requires all nuclear power plants to be protected against earthquakes, tsunamis and other natural hazards.

Background

Protection against tsunami effects was required for all operating plants and is required for all new reactors. Following the Indian Ocean tsunami on December 26, 2004, the President moved to protect lives and property by launching an initiative to improve domestic tsunami warning capabilities. This plan was placed under the auspices of the National Science and Technology Council through the President's initiative in July 2005 in the context of a broad national effort of tsunami risk reduction, and United States participated in international efforts to reduce tsunami risk worldwide. In response to the president's initiative, the NRC reviewed its licensing criteria and conducted independent studies and participated in international forums under the auspices of the International Atomic Energy Agency with many participating countries including India and Japan. The final report of the study was published in April 2009 as NUREG/CR 6966, "Tsunami Hazard Assessment at Nuclear Power Plant Sites in the United States of America," ADAMS Accession # ML0915901933. NRC revised its Standard Review Plan for conducting safety reviews of nuclear power plants in 2007. Section 2.4.6 specifically addresses tsunamis. The Office of Nuclear Regulatory Research is conducting tsunami studies in collaboration with the United States Geological Survey and has published a report on tsunami hazard in the Atlantic, Gulf and Pacific coastal areas. Selected nuclear power plants now get tsunami warning notification. The agency requires plant designs to withstand the effects of natural phenomena including effects of tsunamis. The agency's requirements, including General Design Criteria for licensing a plant, are described in Title 10 of the *Code of Federal Regulations* (10 CFR). These license requirements consist of incorporating margins in the initiating hazard and additional margins are due to traditional engineering practices such as "safety factors." Practices such as these add an extra element of safety into design, construction, and operations.

The NRC has always required licensees to design, operate, and maintain safety-significant structures, systems, and components to withstand the effects of natural hazards and to maintain the capability to perform their intended safety functions. The agency ensures these requirements are satisfied through the licensing, reactor oversight, and enforcement processes.

Tsunami Hazard Evaluation

Tsunami hazard evaluation is one component of the complete hydrological review requirements provided in the Standard Review Plan under Chapter 2.4. The safety determination of reactor sites require consideration of major flood causing events, including consideration of combined flood causing conditions. These conditions include Probable Maximum Flood (PMF) on Streams and Rivers, Potential Dam Failures, Probable Maximum Surge and Seiche Flooding and Probable Maximum Tsunami Hazards, among others. The most significant flooding event is called the design basis flood and flooding protection requirements are correlated to this flood level in 2.4.10.

The Probable Maximum Tsunami (PMT) is defined as that tsunami for which the impact at the site is derived from the use of best available scientific information to arrive at a set of scenarios reasonably expected to affect the nuclear power plant site taking into account (a) appropriate consideration of the most severe of the natural phenomena that have been historically reported or determine from geological and physical data for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (b) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (c) the importance of the safety functions to be performed.

Site-specific tsunami data are collected from historical tsunami records, paleotsunami evidence, regional tsunami assessments, site-specific tsunami mechanisms, site-specific data, such as submarine survey of

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sea bed and approach channel geometry. Effects of tsunami on a nuclear power plant can be flooding due to water run up, hydro-dynamic pressure on exterior walls of structures, impact of floating debris, and foundation scouring. In addition, tsunami can draw down water from the intake source of plant cooling water.

The tsunami database is available for interactive search and downloads on the internet at <http://www.ngdc.noaa.gov/hazard/tsu.shtml>.

Tsunami Safety Assessment

The licensing bases for existing nuclear power plants are based on historical data at each site. This data is used to determine probable maximum tsunami and the tsunami effects are evaluated for each site with potential for tsunami flooding. The potential for tsunami hazard is determined on a hierarchical analysis process that can identify tsunami potential based primarily on distance from tsunami source and site elevation. The NRC also required existing plants to assess their potential vulnerability to external events, as part of the Individual Plant Examination of External Events Program. This process ensured that existing plants are not vulnerable to tsunami hazard, and they continue to provide adequate public health and safety.

Today, the NRC utilizes a risk-informed regulatory approach, including insights from probabilistic assessments and traditional deterministic engineering methods to make regulatory decisions about existing plants (e.g., licensing amendment decisions). Any new nuclear plant the NRC licenses will use a probabilistic, performance-based approach to establish the plant's seismic hazard and the seismic loads for the plant's design basis.

Operating Plants

The NRC is fully engaged in national international tsunami hazard mitigation programs, and is conducting active research to refine the tsunami sources in the Atlantic, Gulf Coast and Pacific Coast areas. Diablo Canyon (DC) and San Onofre (SONGS) are two nuclear plant sites that have potential for tsunami hazard. Both the DC (main plant) and SONGS are located above the flood level associated with tsunami. However, the intake structures and Auxiliary Sea Water System at DC are designed for combination of tsunami-storm wave activity to 45 ft msl. SONGS has a reinforced concrete cantilevered retaining seawall and screen well perimeter wall designed to withstand the design basis earthquake, followed by the maximum predicted tsunami with coincident storm wave action, designed to protect at approximately 27 ft msl. These reactors are adequately protected against tsunami effects. Distant tsunami sources for DC include the Aleutian area, Kuril-Kamchatka region, and the South American coast (for Songs the Aleutian area). Distant sources for SONGS is limited by the presence of a broad continental shelf. Local or near sources for DC include the Santa Lucia Bank and Santa Maria Basin Faults (for Songs the Santa Ana wind).

Additional Information

To read more about risk-related NRC policy, see the fact sheets on Probabilistic Risk Assessment (<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/probabilistic-risk-asses.html>) and Nuclear Reactor Risk (<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/reactor-risk.html>). Each provides more information on the use of probability in evaluating hazards (including earthquakes) and their potential impact on plant safety margins. Other regulatory framework includes General Design Criterion 2, 10 CFR Part 100.23, Regulatory Guide 1.102 "Flood Protection for Nuclear Power Plants", Rev. 1 1976, Regulatory Guide 1.59 "Design Basis for Nuclear Power Plants" Rev. 2 1977 (update in progress), and USNRC Standard Review Plan "Probable Maximum Tsunami Flooding" Section 2.4.6, Rev. 2.

March 2011

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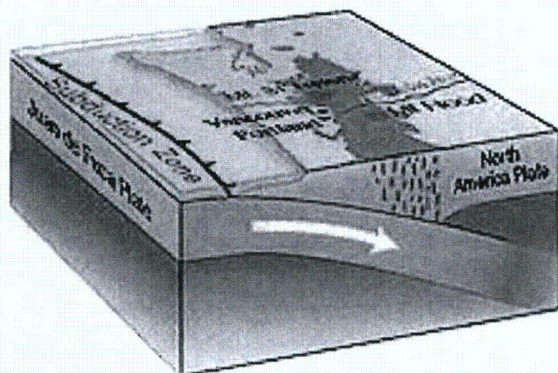
Seismicity of the Central and Eastern US Fact Sheet

Key Points:

- To date, very large earthquakes (Magnitudes greater than 8.25) have only occurred in specific geological settings, in particular the interfaces between tectonic plates in major **subduction zones**. The only subduction zone that potentially impacts the continental U.S. is the Cascadia zone off the coast of northern California, Oregon and Washington.
- Recent analyses of the magnitudes of the largest earthquakes **not associated** with subduction zones indicates magnitudes are less than ~8.25.
- The size (magnitude) of earthquakes is proportional to the fault area that slips in a given earthquake. The prediction of earthquake magnitudes for a specific fault considers the dimensions of the fault. Extremely large earthquakes do not occur on small faults.
- Nuclear power plants are licensed based on vibratory ground shaking, not earthquake magnitude. The ground shaking (accelerations) are used to estimate forces which are used in the seismic design process. In many cases smaller magnitude earthquakes closer to a site produce more severe ground shaking than larger, more distant earthquakes. Hence it is important to consider all potential earthquake sources regardless of magnitude.

Discussion: Earthquakes with very large magnitudes such as the March 2011 earthquake off the northeast coast of the Japanese island of Honshu occur within subduction zones, which are locations where one of the earth's tectonic plates is subducting beneath (being thrust under) another. The fault that defines the Japan Trench plate boundary dips to the west, i.e., becomes deeper towards the coast of Honshu. Large offshore earthquakes have historically occurred in the same subduction zone (in 1611, 1896, and 1933) all of which produced significant tsunami waves. The magnitudes of these previous large earthquakes have been estimated to be between 7.6 and 8.6. Prior to March 2011, the Japan Trench subduction zone has produced nine earthquakes with magnitudes greater than 7 just since 1973.

The only subduction zone that is capable of directly impacting the continental US is the Cascadia subduction zone, which lies off of the coast of northern California, Oregon, and Washington. The fault surface defined by this interface dips to the east (becomes deeper) beneath the coast. The Cascadia subduction zone is capable of producing very large earthquakes if all or a large portion of the fault area ruptures in a single event. However, the rate of earthquake occurrence along the Cascadia subduction zone is much less than has been observed along the Japan Trench subduction zone. The only operating nuclear power plant in that area is Columbia, which is far from the coast and the Cascadia subduction zone. The occurrence of earthquakes on the Cascadia subduction zone has been considered in the evaluation of the Columbia NPP.



Schematic Illustration of the Cascadia Subduction Zone

The size (magnitude) of earthquakes is proportional to the surface area of a fault that slips in a given earthquake. Large earthquakes are associated with large (long) faults. Hence, the prediction of earthquake magnitudes for a specific fault considers the dimensions of the fault. Identification of fault size is usually based on geologic mapping or the evaluation of spatial patterns of small earthquakes. To provide **a point of comparison**, the length of the fault that slipped during the March 11, 2011 magnitude 9 Japanese earthquake was >620 km, the length of the fault(s) that slipped during the magnitude 7.3 1992 Landers, CA earthquake was ~90 km and the estimated length of the Hosgi fault near Diablo Canyon NPP is 140 km and a magnitude of 7.5 is assigned to that fault. A number of major crustal faults or fault zones (not associated with the Cascadia subduction zone) have been identified that have produced earthquakes of magnitude 7.5 to 8 in the continental US (including California). ***These fault sources have been identified and characterized in seismic hazard assessments.***

Seismic designs at U.S. nuclear power plants are developed in terms of seismic ground motion spectra, which are called the Safe Shutdown Earthquake ground motion response spectra (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Currently operating nuclear power plants developed their SSEs based on a "deterministic" or "scenario earthquake" basis that account for the largest earthquake expected in the area around the plant. Seismic activity in the regions surrounding U.S. plants is much lower than that for Japan since **most U.S. plants are located in the interior of the stable continental U.S.** The largest earthquakes within the continental U.S. are the 1811-12 New Madrid sequence and the 1886 Charleston, SC, which were estimated to be between about magnitude 6.8 to 7.5. On the west coast of the U.S., the two nuclear power plants are designed to specific ground motions from earthquakes of about magnitude 7+ on faults located just offshore of the plants. The earthquakes on these faults are mainly strike-slip (horizontal motion on near vertical planes) type earthquakes, not subduction zone earthquakes. This fault geometry does not produce large tsunamigenic waves. Therefore, the likelihood of a significant tsunami from these faults is very remote.

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Design Basis Ground Motions and New Review Level Ground Motions Used for Review of Japanese Plants

Plant sites	Contributing earthquakes	New DBGM S ₂	Original DBGM S ₂
Tomari	Earthquakes undefined specifically	550 Gal	370 Gal
Onagawa	Soutei Miyagiken-oki (M8.2)	580	375
Higashidoori	Earthquakes undefined specifically	450	375
Fukushima	Earthquake near the site (M7.1)	600	370
Tokai	Earthquakes undefined specifically	600	380
Hamaoka	Assumed Tokai (M8.0), etc.	800	600
Shika	Sasanami-oki Fault (M7.6)	600	490
Tsuruga	Urazoko-Uchiikemi Fault (M6.9), etc. →Mera-Kareizaki - Kaburagi(M7.8), Shelf edge+B+Nosaka (M7.7)	800	532
Mihama	C, Fo-A Fault (M6.9)→ Shelf edge+B+Nosaka(M7.7)	750	405
Ohi	C, Fo-A Fault (M6.9)→Fo-A+Fo-B (M7.4)	700	405
Takahama	Fo-A Fault (M6.9) →Fo-A+Fo-B(M7.4)	550	370
Shimane	Shinji Fault (M7.1)	600	456
Ikata	Central Tectonic Structure (M7.6)	570	473
Genkai	Takekoba F. (M6.9) → Enhanced uncertainty consideration	540	370
Sendai	Gotandagawa F.(M6.9), F-A(M6.9)	540	372
Kashiwazaki-Kariwa	F-B Fault (M7.0), Nagaoka-plain-west Fault (M8.1)	2300 (R1 side) 1209 (R5 side)	450
Monjyu (Proto Type FBR)	Shiraki-Niu F.(M6.9) , C F.(M6.9)→Shelf edge+B+Nosaka(M7.7), Small Damping	760	408
Shimokita Reprocessing F.	Deto-Seiho F.(M6.8), Yokohama F.(M6.8)	450	320

Status of Review of Japanese NPPs to New Earthquake Levels Based on 2006 Guidance

Utility	Site (Unit)	Type	Dec.2010
Hokkaido	Tomari	PWR	△
Tohoku	Onagawa (Unit1)	BWR	◎
	Higashi-dori	BWR	△
Tokyo	Kashiwazaki-Kariwa	BWR	Unit 1,5,6,7 ◎
	Fukushima-No1	BWR	Unit 3 ◇, 5 ◎
	Fukushima-No2	BWR	Unit 4,5 ◎
Chubu	Hamaoka	BWR	△
Hokuriku	Shika (Unit 2)	BWR	◎
Kansai	Mihama(Unit 1)	PWR	◎
	Ohi(Unit 3,4)	PWR	◎
	Takahama (Unit 3,4)	PWR	◎
Chugoku	Shimane (Unit 1, 2)	BWR	◎
Shikoku	Ikata (Unit 3)	PWR	◎
Kyushu	Genkai (Unit 3)	PWR	◎
	Sendai (Unit 1)	PWR	◎
Japan Atomic Power	Tokai-Daini	BWR	○
	Tsuruga	BWR/PWR	△
JAEA	Monjyu	Proto Type FBR	◎
Japan Nuc. Fuel	Rokkasyo	Reprocessing	◎

◎: NSC review finished, ○: NISA review finished and in NSC review, △: Under review by NISA

US Portable Array briefing sheet for brief congressional staffers

NOTE: This is provided because IRIS participants let us know that here was a discussion about the NRC's involvement in this program. We have been involved in this for the last couple years.



The Incorporated Research Institutions for Seismology is the Consortium of United States Universities with Major Research Programs in Seismology and Related Fields.

The Transportable Array: A Science Investment that Can Be Leveraged

IRIS is installing the Transportable Array – a set of 400 broadband seismic instruments – in each of more than 1600 sites across the contiguous United States. The instruments operate at each site for two years and then are removed and redeployed further east. Roughly 1100 stations have been installed since 2003, and instruments have been removed from more than 600 of those sites in the western United States.

The National Science Foundation is funding the full cost to “roll” the Transportable Array across the US, more than \$90,000,000 over ten years. Comparatively small incremental investments could add significant data that are relevant to the safety of nuclear power plants. These efforts would be uniquely cost effective, since NSF is already funding installation, and they would feed data into an existing, standardized and widely used data management system that already incorporates the vast majority of seismic data from US networks. But these opportunities are time constrained: the array will be fully installed in the contiguous 48 states by late 2013.

More Value from Longer Term Regional Observations

A dense, uniform seismic network is necessary for long-term, broad-area seismic monitoring of the central and eastern United States due to low event recurrence rates and the risk of significant earthquakes ($M > 5$) anywhere in the region. Monitoring seismicity in the central and eastern US can be improved by turning selected sites into permanent seismic stations. A total of more than 35 Transportable Array stations have already been “adopted” by several organizations, creating a permanent legacy, but only in the western United States.

A strategic “1-in-4” plan would involve “adoption” of systematically selected stations in the central and eastern United States – every other station in both the east-west and north-south directions, creating a uniform grid of some 250 stations. Long-term regional operation could be combined with two optional enhancements to create a unique observatory for the study of seismicity, source characteristics, attenuation, and local ground acceleration.

Enhancement 1: Acquire Higher Frequency Data

Crustal rigidity in the central and eastern US makes it desirable to record high frequency characteristics of local and regional earthquakes. The existing instruments could be reconfigured to record high frequencies but doing so would nearly triple the data flow, necessitating improvements to the communications infrastructure.

Enhancement 2: Add Strong Motion Sensors

Acquiring strong motion sensors and reconfiguring field computers that record and telemeter the data would help to measure unique effects of severe shaking. The design anticipated this augmentation, and several stations in California and Washington were operated that way. Upgrade would be more efficient at sites that have not yet been installed.

Estimate of annual acquisition and O&M costs for the 1-in-4, 250-station network in central and eastern US.

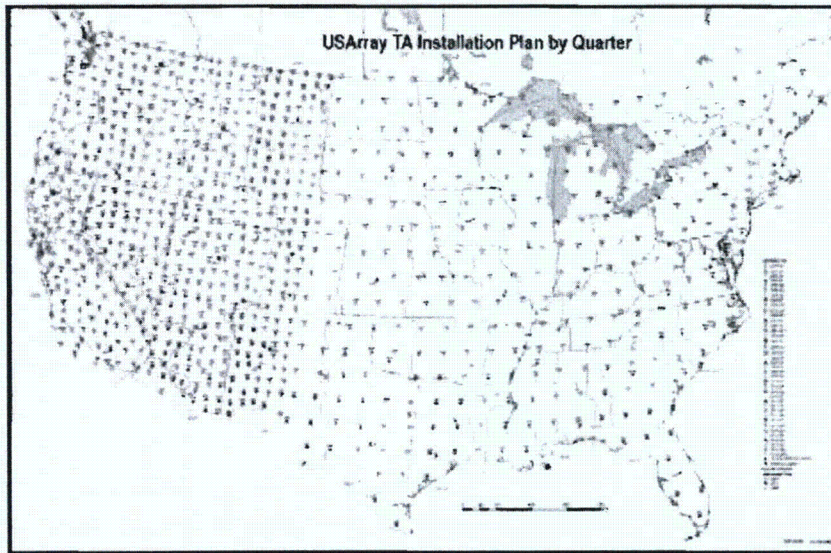
Year	Stations	Acquisition ¹	O&M ²	Total
2011	50	\$1,800,000	\$ 400,000	\$2,200,000
2012	50	\$1,800,000	\$ 800,000	\$2,600,000
2013	50	\$1,800,000	\$1,200,000	\$3,000,000
2014	50	\$1,800,000	\$1,600,000	\$3,400,000
2015	50	\$1,800,000	\$2,000,000	\$3,800,000
2016	–	–	\$2,000,000	\$2,000,000

¹ Assumes upgrades to six channel data loggers with strong motion sensors.

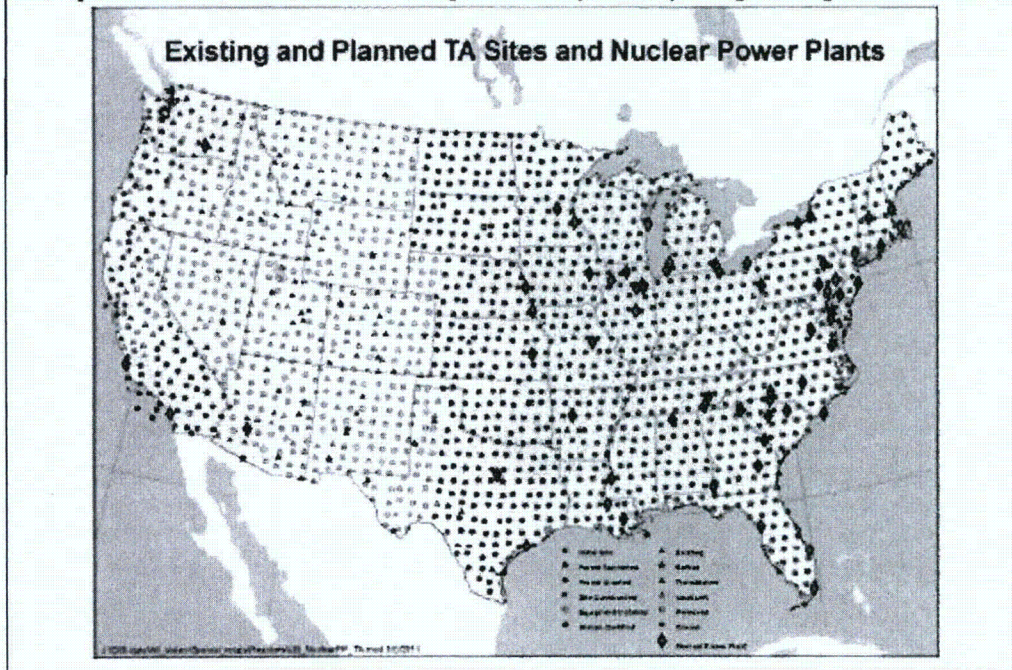
² Assumes a conservative estimate of \$8,000/station/year.

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The 1-in-4, 250-station network that could be created in the central and eastern US by "leaving behind" one out of every four Transportable Array stations during the years 2011 through 2015.



A large majority of nuclear power plants are located in the central and eastern parts of the US, where it is still possible to "leave behind" 1-in-4 Transportable Array stations for long-term regional observations.



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8) What if an earthquake like the Sendai earthquake occurred near a US plant?	3
9) What would be the results of a tsunami generated off the coast of a US plant? (Or why are we confident that large tsunamis will not occur relatively close to US shores?).....	3
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23) Which plants are close to known active faults? What are the faults and how far away are they from the plants? 6

24) How was the seismic design basis for an existing nuclear power plant established? 6

25) Is there margin above the design basis? 7

26) Are US plants safe? 7

27) Was the Japanese plant designed for this type of accident? Are US plants? 7

28) Why do we have confidence that US nuclear power plants are adequately designed for earthquakes and tsunamis? 7

29) Can this happen here i.e. an earthquake that significantly damages a nuclear power plant? Are the Japanese plants similar to U.S. plants? 7

30) Could an accident like the one at Japan’s Fukushima Daiichi nuclear plant happen in the United States? 8

31) Should U.S. nuclear facilities be required to withstand earthquakes and tsunamis of the kind just experienced in Japan? If not, why not? 8

32) Can you summarize the plant seismic design basis for the US plants? Are there any special issues associated with seismic design? 9

33) How do we know that the equipment in plants is safe in earthquakes? 9

34) How do we know equipment will work if the magnitude is bigger than expected, like in Japan? 9

35) Are US plants susceptible to the same kind of loss of power as happened in Japan? 9

36) How do we know that the EDGs in Diablo Canyon and SONGS will not fail to operate like in Japan? 10

37) Is all equipment at the plant vulnerable to tsunami? 10

38) What protection measures do plants have against tsunami? 10

39) Is there a risk of loss of water during tsunami drawdown? Is it considered in design? 10

40) Are nuclear buildings built to withstand earthquakes? What about tsunami? 10

41) Are aftershocks considered in the design of equipment at the plants? Are aftershocks considered in design of the structure? 10

42) Are there any special issues associated with seismic design at the plants? For example, Diablo Canyon has special requirements. Are there any others? 10

43) Is the NRC planning to require seismic isolators for the next generation of nuclear power plants? How does that differ from current requirements and/or precautions at existing U.S. nuclear power plants? 10

44) Are there any U.S. nuclear power plants that incorporate seismic isolators? What precautions are taken in earthquake-prone areas? 11

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- 45) Do you think that the recent Japan disaster will cause any rethinking of the planned seismic isolation guidelines, particularly as it regards earthquakes and secondary effects such as tsunamis?

11

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- 46) Was the damage done to the plants from the Earthquake or the Tsunami? 12
- 47) What is the design level of the Japanese plants? Was it exceeded? 12
- 48) What are the Japanese S_1 and S_2 ground motions and how are they determined? 12
- 49) Did this earthquake affect Kashiwazaki-Kariwa NPP? 13
- 50) How high were the tsunami at the plants? 13
- 51) Wikileaks has a story that quotes US embassy correspondence and some un-named IAEA expert stating that the Japanese were warned about this ... Does the NRC want to comment? 13

What happened in US Plants during the earthquake? 14

- 52) Was there any damage to U.S. reactors from either the earthquake or the resulting tsunami? 14
- 53) Have any lessons for US plants been identified? 14

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- 54) What is the NRC doing about the emergencies at the nuclear power plants in Japan? Are you sending staff over there? 15
- 55) With NRC moving to design certification, at what point is seismic capability tested – during design or modified to be site-specific? If in design, what strength seismic event must these be built to withstand? 15
- 56) Can we get the rankings of the plants in terms of safety? (Actually this answer should be considered any time GI-199 data is used to “rank” plants) 15
- 57) Is the earthquake safety of US plants reviewed once the plants are constructed? 16
- 58) Does the NRC ever review tsunami risk for existing plants? 16
- 59) Does GI-199 consider tsunami? 16
- 60) What is Generic Issue 199 about? 16
- 61) Where can I get current information about Generic Issue 199? 16
- 62) How was the seismic design basis for an existing nuclear power plant established? 17
- 63) Is there margin above the design basis? 17
- 64) Are all U.S. plants being evaluated as a part of Generic Issue 199? 17
- 65) Are the plants safe? If you are not sure they are safe, why are they not being shut down? If you are sure they are safe, why are you continuing evaluations related to this generic issue? 17

66) What do you mean by "increased estimates of seismic hazards" at nuclear power plant sites? 18

67) What do the following terms mean? 19

68) Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5 x 10^-06, or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct? 20

69) The GI-199 documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the Central and Eastern U.S. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the Western U.S.? 20

70) The GI-199 documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment." 21

71) What is the timetable now for consideration of any regulatory changes from the GI-199 research?..... 21

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72) The NRC increasingly uses risk-information in regulatory decisions. Are risk-informed PRAs useful in assessing an event such as this? 22

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73) SONGS received a white finding in 2008 for 125VDC battery issue related to the EDGs that went undetected for 4 years. NRC issued the white finding as there was increased risk that one EDG may not have started due to a low voltage condition on the battery on one Unit (Unit 2). Aren't all plants susceptible to the unknown? Is there any assurance the emergency cooling systems will function as desired in a Japan-like emergency? 23

74) Has the earthquake hazard at SONGS been reviewed like DCNPP is doing? Are they planning on doing an update before relicensing? 23

75) Is possible to have a tsunami at songs that is capable of damaging the plant?..... 23

76) Does SONGS have an emergency plan for tsunami? 23

77) Has evacuation planning at SONGS considered tsunami?..... 24

78) Is SONGS designed against tsunami and earthquake? 24

79) What is the height of water that SONGS is designed to withstand? 24

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80) What about drawdown and debris? 24

81) Will this be reviewed in light of the Japan quake. 24

82) Could all onsite and offsite power be disrupted from SONGS in the event of a tsunami, and if that happened, could the plant be safely cooled down if power wasn't restored for days after? 24

83) Are there any faults nearby SONGS that could generate a significant tsunami? 25

84) What magnitude or shaking level is SONGS designed to withstand? How likely is an earthquake of that magnitude for the SONGS site? 25

85) Could SONGS withstand an earthquake of the magnitude of the Japanese earthquake? 25

86) What about the evacuation routes at SONGS? How do we know they are reasonable? 25

87) Regarding tsunami at Diablo and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami? 25

88) What is the design level flooding for DNCPP and SONGS? Can a tsunami be larger? 26

89) Is there potential linkage between the South Coast Offshore fault near San Onofre NPP and the Newport-Inglewood Fault system and/or the Rose Canyon fault? Does this potential linkage impact the maximum magnitude that would be assigned to the South Coast Offshore fault and ultimately to the design basis ground motions for this facility? 26

Diablo Canyon Questions 27

90) Now after the Japan tragedy, will the NRC finally hear us (A4NR) and postpone DC license renewal until seismic studies are complete? How can you be sure that what happened there is not going to happen at Diablo with a worse cast quake and tsunami? 27

91) The evacuation routes at DCNPP see are not realistic. Highway 101 is small...and can you imagine what it will be like with 40K people on it? Has the evacuation plan been updated w/ all the population growth? 27

92) Are there local offshore fault sources capable of producing a tsunami with very short warning times? 27

93) Are there other seismically induced failure modes (other than tsunami) that would yield LTSBO? Flooding due to dam failure or widespread liquefaction are examples. 27

94) Ramifications of beyond design basis events (seismic and tsunami) and potential LTSBO on spent fuel storage facilities? 27

95) Why did a Emergency Warning go out for a 'tsunami' that was only 6 ft high? Do these guys really know what they're doing? Would they know it if a big one was really coming? Crying wolf all the time doesn't instill a lot of confidence. 27

96) How big did the Japanese think a quake/tsunami could be before 3/11? Why were they so wrong (assuming this quake/tsunami was bigger than what they had designed the plant for)? 28

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The Japanese were supposed to have one of the best tsunami warning systems around. What went wrong last week (both with the reactors and getting the people out...see #1, evacuation plan above)?..... 28

97) Regarding tsunami at Diablo and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami?..... 28

98) Shouldn't the NRC make licensees consider a Tsunami coincident with a seismic event that triggers the Tsunami? 28

99) Given that SSCs get fatigued over time, shouldn't the NRC consider after-shocks in seismic hazard analyses? 28

100) Did the Japanese also consider an 8.9 magnitude earthquake and resulting tsunami "way too low a probability for consideration"?..... 28

101) GI-199 shows that the scientific community doesn't know everything about the seismicity of CEUS. And isn't there a prediction that the West coast is likely to get hit with some huge earthquake in the next 30 years or so? Why does the NRC continue to license plants on the west coast? 29

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102) Why is Indian Point safe if there is a fault line so close to it?..... 30

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From: Sheron, Brian
To: Kammerer, Annie; Case, Michael; Richards, Stuart; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: RE: Seismic regulations summarization
Date: Thursday, March 17, 2011 8:28:22 PM

OK. Can you e-mail Pete Lyons early tomorrow and let him know that the one-pager will be coming but it will be around COB.

From: Kammerer, Annie
Sent: Thursday, March 17, 2011 7:52 PM
To: Sheron, Brian; Case, Michael; Richards, Stuart; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: RE: Seismic regulations summarization

I have sent the Q&As.

Unfortunately, there's not much on our regs in the Q&As yet. However, Jon and I had already discussed the need for a fact sheet on seismic regulation in the "additional information" section of the document because we are starting to get some questions.

Jon will lead the work to put together the information for Steve tonight. As you note, it's important to run it by NRR (and NRO). So, we'll send it to Meena, Kamal, Niles and Goutam tomorrow so that they can all review. If anyone else comes to mind, please let us know. I hope that the deadline of "tomorrow" is COB, instead of first thing.

Also, just FYI, we have been asked by NRR/DORL and OPA to pull a subset of Q&As together for a public release. This is to support several public meetings in the regions next week. We have to get it to OPA by COB tomorrow so that they can bless it. Those poor guys in the regions are getting pummeled.

Cheers,
Annie

From: Sheron, Brian
Sent: Thursday, March 17, 2011 6:51 PM
To: Case, Michael; Richards, Stuart; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: Seismic

1.) Secretary Chu at DOE is scheduled to be interviewed on 5 talk shows Sunday morning. He has requested a 1 page summary of our seismic regulatory requirements. I gave him the 3/16 version of your seismic Q&A package and suggested his staff could screen it and perhaps pull out pertinent info on our regs, however, I haven't read it yet and don't know to what extent it does or doesn't discuss our regulatory requirements. Can you quickly pull together a 1-2 page summary of our seismic regulatory requirements, run them by NRR if possible, and then e-mail them to Pete Lyons at DOE (peter.lyons@nuclear.energy.gov <<mailto:peter.lyons@nuclear.energy.gov>>). He needs them tomorrow. Please CC me.

Remember, he is just looking for a high level summary sufficient to answer likely questions he might get during the interviews.

2.) Can you please e-mail the latest version of your seismic Q&As to Mike Weber.

Thanks.

CH/85

2
From: Sheron, Brian
To: Brenner, Eliot; Virgilio, Martin; Weber, Michael
Cc: Uhle, Jennifer
Subject: FW: NBC deadline question for NRC on seismic hazard estimates
Date: Thursday, March 17, 2011 9:34:29 PM

fyi.

From: Bill Dedman [Bill.Dedman@msnbc.com]
Sent: Thursday, March 17, 2011 4:49 PM
To: Burnell, Scott
Cc: Manoly, Kamal; Sheron, Brian; Hiland, Patrick; OPA Resource
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

Scott,

Reporters from other news organizations are telling me that you're telling them that our numbers are wrong.

Is that true?

I'm making clear to these reporters:

Don't be misled. NRC hasn't said our numbers are wrong. I checked my interpretation with Scott Burnell in Public Affairs, who checked with the NRC technical staff before publication. No challenge from NRC has arrived after publication.

After all, they're NRC's numbers.

What NRC is saying is that it doesn't do rankings. That's right. We did, from NRC's data. That's what the story says. (If the NRC was publishing the American League East standings, it would list them alphabetically. That's OK with me: Yankees would be last.)

You can see for yourself in the NRC report that:

- NRC says the risk of quakes in the central and eastern states is higher than previously thought.
- It still thinks plants are safe.
- but their margin of safety is reduced.
- and some plants are now near the point where they should be re-examined, and perhaps retrofitted.
- and the staff says this should now move from being a research issue to a regulatory issue.
- and it has made its best estimates of the frequency (chance, odds) of an earthquake that would cause core damage to a plant, and those are in Appendix D, last column on the right.

Here are the links, which are also at the bottom of the article:

Resources

These links open in a new window.

The NRC report with new earthquake risk

estimates <<http://msnbcmedia.msn.com/i/msnbc/Sections/NEWS/quake%20nrc%20risk%20estimates.pdf>>, "Generic Issue 199 (GI-199), Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants, Safety/Risk Assessment," August 2010. PDF file. Note: Data for individual reactors are in appendix D. How to interpret the figures: Indian Point 3, in Appendix D, shows a value of 1.0E-04. That's scientific notation for 0.0001, or one out of 10,000. It says 04, and it gets three (04 minus 1) zeros between the decimal place and the value. I converted that to the words 1 in 10,000 chance each year.

An NRC fact sheet <<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-seismic-issues.html>> from November 2010, "Seismic Issues for Existing Nuclear Power Plants."

Earthquake history of each state <<http://earthquake.usgs.gov/earthquakes/states/>>, from the USGS.

A USGS brochure describing the changes in the 2008 seismic hazard

maps <<http://msnbcmedia.msn.com/i/msnbc/Sections/NEWS/usgs%202008%20seismic%20hazard%20maps.pdf>>. PDF file.

The NRC database of active nuclear reactors <<http://www.nrc.gov/reactors/operating/list-power-reactor-units.html>> in the U.S. Each reactor name links to technical and safety documents.

Industry response to

questions <<http://msnbcmedia.msn.com/i/msnbc/Sections/NEWS/industry%20faq%20on%20japanese%20situation.pdf>> about the situation in Japan. PDF file.

CH/86

A scientific paper describing the New Madrid earthquake <<http://articles.adsabs.harvard.edu/full/1996AREPS...24..339J/0000339.000.html>>, and what can be learned by melding modern science with writings from long ago.

A brochure with a table comparing values for magnitude and peak ground acceleration <<http://www.mgs.md.gov/esic/brochures/earthquake.html>>.

The ranking of 104 nuclear plants by risk, by msnbc.com from NRC data, in an Excel spreadsheet file <<http://msnbcmedia.msn.com/i/msnbc/Sections/NEWS/earthquake%20risk%20table%20msnbc.com%20public%20file.xls>>.
Bill

[cid:image001.jpg@01CBE4C3.554A27F0] <http://farm1.static.flickr.com/224/463372630_3244dd3db2.jpg?v=1176851663>

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archive of stories and videos: <http://dedman.msnbc.com>

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on Twitter: <http://twitter.com/billdedman>

on Facebook: <http://www.facebook.com/investigative.reporter>

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From: Burnell, Scott [<mailto:Scott.Burnell@nrc.gov>]
Sent: Wednesday, March 16, 2011 7:25 AM
To: Bill Dedman
Subject: RE: Numbers

Bill;

I understand you're making a honest effort to convey the latest research, but I have no doubt the technical staff are going to have significant problems with how you've presented it. I'll pass along whatever specific technical corrections they provide.

Scott

From: Bill Dedman
Sent: Wednesday, March 16, 2011 6:44 AM
To: 'Kamal.Manoly@nrc.gov'; 'brian.sheron@nrc.gov'; 'patrick.hiland@nrc.gov'; 'OPA.Resource@nrc.gov'
Subject: RE: NBC deadline question for NRC on seismic hazard estimates

This story is online now. If you see any error, please let me know right away.

Thanks,

Bill

http://www.msnbc.msn.com/id/42103936/ns/world_news-asiapacific/

From: Bill Dedman
Sent: Tuesday, March 15, 2011 9:06 AM
To: 'Kamal.Manoly@nrc.gov'; 'brian.sheron@nrc.gov'; 'patrick.hiland@nrc.gov'; 'OPA.Resource@nrc.gov'
Subject: NBC deadline question for NRC on seismic hazard estimates

Good morning,

My name is Bill Dedman. I'm a reporter for NBC News and msnbc.com, writing an article today about:

SAFETY/RISK ASSESSMENT RESULTS FOR GENERIC ISSUE 199, "IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES ON EXISTING PLANTS"

I reached out to NRC Public Affairs yesterday but have not heard back, and my deadline is end-of-day today. I'm hoping to get on the phone today with someone from NRC to make sure I'm conveying this information accurately to the public. If nothing else, I'm hoping one of the technical people can help clarify the points below. My telephone number is 203-451-9995.

I've read Director Brian Sheron's memo of Sept. 2, 2010, to Mr. Patrick Hiland; the safety/risk assessment of August 2010; its appendices A through D; NRC Information Notice 2010-18; and the fact sheet from public affairs from November 2010.

I have these questions:

1. I'd like to make sure that I accurately place in layman's terms the seismic hazard estimates. I need to make sure that I'm understanding the nomenclature for expressing the seismic core-damage frequencies. Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-06} , or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct?
2. These documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the Central and Eastern U.S. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the Western U.S.?
3. The documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, U.S. Department of Energy, U.S. Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment."
4. What is the timetable now for consideration of any regulatory changes from this research?

Thank you for your help.

Regards,

Bill Dedman

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From: [Sheron, Brian](#)
To: [Uhle, Jennifer](#)
Subject: FW: Seismic regulations summarization
Date: Thursday, March 17, 2011 9:42:12 PM

FYI.

From: Kammerer, Annie
Sent: Thursday, March 17, 2011 7:52 PM
To: Sheron, Brian; Case, Michael; Richards, Stuart; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: RE: Seismic regulations summarization

I have sent the Q&As.

Unfortunately, there's not much on our regs in the Q&As yet. However, Jon and I had already discussed the need for a fact sheet on seismic regulation in the "additional informaiton" section of the document because we are starting to get some questions.

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Cheers,
Annie

From: Sheron, Brian
Sent: Thursday, March 17, 2011 6:51 PM
To: Case, Michael; Richards, Stuart; Kammerer, Annie; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: Seismic

1.) Secretary Chu at DOE is scheduled to be interviewed on 5 talk shows Sunday morning. He has requested a 1 page summary of our seismic regulatory requirements. I gave him the 3/16 version of your seismic Q&A package and suggested his staff could screen it and perhaps pull out pertinent info on our regs, however, I haven't read it yet and don't know to what extent it does or doesn't discuss our regulatory requirements. Can you quickly pull together a 1-2 page summary of our seismic regulatory requirements, run them by NRR if possible, and then e-mail them to Pete Lyons at DOE (peter.lyons@nuclear.energy.gov<<mailto:peter.lyons@nuclear.energy.gov>>). He needs them tomorrow. Please CC me.

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2.) Can you please e-mail the latest version of your seismic Q&As to Mike Weber.

Thanks.

CH/87

From: Sheron, Brian
To: Uhle, Jennifer
Subject: FW: Seismic regulations summarization
Date: Thursday, March 17, 2011 9:58:48 PM

FYI.

From: Kammerer, Annie
Sent: Thursday, March 17, 2011 9:44 PM
To: Sheron, Brian; Case, Michael; Richards, Stuart; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: RE: Seismic regulations summarization

Will do.

From: Sheron, Brian
Sent: Thursday, March 17, 2011 8:28 PM
To: ~~Kammerer, Annie~~; Case, Michael; Richards, Stuart; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: RE: Seismic regulations summarization

OK. Can you e-mail Pete Lyons early tomorrow and let him know that the one-pager will be coming but it will be around COB.

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Cc: Weber, Michael
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CH/88

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2.) Can you please e-mail the latest version of your seismic Q&As to Mike Weber.

Thanks.

From: Sheron, Brian
To: Bonaccorso, Amy
Cc: Valentin, Andrea; Donaldson, Leslie; Kardaras, Tom; Uhle, Jennifer; Bush-Goddard, Stephanie; Gibson, Kathy
Subject: RE: Announcement for Chernobyl Seminar
Date: Thursday, March 17, 2011 10:12:55 PM

Looks fine.

From: Bonaccorso, Amy
Sent: Thursday, March 17, 2011 6:59 PM
To: Sheron, Brian
Cc: Valentin, Andrea; Donaldson, Leslie; Kardaras, Tom; Uhle, Jennifer; Bush-Goddard, Stephanie; Gibson, Kathy
Subject: Announcement for Chernobyl Seminar

Good evening all:

I have not gotten final details from Stephanie (cc'ed) about the health effects presentation she was considering, but we do need to send an announcement about this seminar. We have to nail down a time and I'm inclined to stick with 9:30 a.m. to 11:30 a.m. If anyone is uncomfortable with this – please let me know so I can have Graphics edit the poster. We also need to schedule VTCs.

Attached is the advertisement that can be posted on the monitors and also on the intranet.

Below is a sample announcement. Since we do not have a precise schedule (don't know if we will have an additional presentation from DSA), I can stay general:

Subject Line - RES Seminar: 25th Anniversary of Chernobyl – April 26, 2011 – 9:30 a.m. – 11:30 a.m.

A RES Seminar on the 25th Anniversary of Chernobyl will be held in the TWFN Auditorium on April 26, 2011 from 9:30 a.m. to 11:30 a.m. A summary of the accident, radiological impacts, and sarcophagus will be given by Brian Sheron, Director of the Office of Nuclear Regulatory Research, and Frank Congel (retired NRC employee), Former Director, Division of Incident Response Operations, NSIR and Former Director, OE.

Details about VTCs will be provided when available.

*If we want to make a decision not to include a presentation from DSA now, we can include the full draft agenda without the times.

DATE and TIME:

Tuesday, April 26, 2011
9:30 a.m. to 11:30 a.m.

TENTATIVE AGENDA:

9:30 a.m. – 9:40 a.m. - Introduction – Mike Weber – 10 minutes
9:40 a.m. – 10:00 a.m. - RBMK Reactor Type – Brian Sheron – 20 minutes
10:00 a.m. – 10:45 a.m. - Summary of Chernobyl Accident – Brian Sheron – 45 minutes
10:45 a.m. – 11:10 a.m. - Radiological Impact – Frank Congel – 25 minutes
11:10 a.m. – 11:30 a.m. - Sarcophagus – Frank Congel – 20 minutes

CH/89

Please let me know if this is okay.

Thanks,

Amy

From: Sheron, Brian
To: Droggitis, Spiros; Schmidt, Rebecca; Johnson, Michael; Haney, Catherine; Borchardt, Bill; Leeds, Eric
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan; Powell, Amy; Virgilio, Martin; Riley (OCA), Timothy
Subject: RE: Phone Congressional Liaison Team Briefing
Date: Thursday, March 17, 2011 10:13:43 PM

Spiros, Shirley Florey will contact you tomorrow morning with the dates I'm available to take the calls. I think we decided there were 3 days I could do it. She'll give you the dates.

From: Droggitis, Spiros
Sent: Thursday, March 17, 2011 3:51 PM
To: Schmidt, Rebecca; Johnson, Michael; Haney, Catherine; Borchardt, Bill; Sheron, Brian; Leeds, Eric
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan; Powell, Amy; Virgilio, Martin; Riley (OCA), Timothy
Subject: RE: Phone Congressional Liaison Team Briefing

To follow-up on Becky's request, here is the draft schedule for the daily Congressional staff calls which will be at 3:00 pm every day.

March 18 – Mike Johnson
March 19 –
March 20 –
March 21 –
March 22 – Mike Johnson
March 23 –
March 24 –
March 25 –

I would appreciate if Cathy, Eric and Brian could give me slots that they would be able to cover for the calls so I can finalize the schedule. We'll provide the calling information later. Thanks for your help, Spiros

From: Schmidt, Rebecca
Sent: Thursday, March 17, 2011 3:31 PM
To: Johnson, Michael; Haney, Catherine; Borchardt, Bill; Sheron, Brian; Leeds, Eric
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan; Droggitis, Spiros; Powell, Amy; Virgilio, Martin
Subject: Phone Congressional Liaison Team Briefing

All—We had our first call to Congressional staffers at 1:30 today. The call lasted about 1 hour. We invited over 500 staffers to listen in and ask questions. Mike and his team did a great job. It was good to spend the extra time today providing background material to them, but I'm thinking that we will probably shorten our briefing and instead answer more questions in the future. Spiros will be contacting you to set the schedule for the next several days. We will be doing the call at 3:00 daily. This effort is different than the 2 briefings tomorrow on the Hill. Thanks for all your help! Becky

From: Johnson, Michael
Sent: Thursday, March 17, 2011 2:57 PM
To: Haney, Catherine; Borchardt, Bill; Schmidt, Rebecca; Sheron, Brian; Leeds, Eric
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan
Subject: Re:

I can't support before late afternoon. I am planning on supporting a call at 300 tomorrow.
From my blackberry.

CH/90

From: Haney, Catherine
To: Borchardt, Bill; Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan
Sent: Thu Mar 17 13:47:00 2011
Subject: RE:

Seems to me that Brian might be the best candidate since he is already downtown. I tried calling him to discuss who would go. Shirley told me that Brian was at DOE (meeting doesn't end until 5 pm) and that his schedule on Friday was open. She tentatively put the 11:45 briefing on his schedule.

I'm happy to be a back up. If Brian can't do it, I'd like to go down and listen in on the 9:30 briefing.

Unfortunately, we might not have a firm answer until later this evening unless Mike J wants to volunteer in Brian's place.

As an aside, I'm scheduled to leave for France on Saturday afternoon. I spoke with Mike W last night about whether I should cancel. The view was I should continue with the trip. Of course, I can change plans up until I get on the plane. You might want to consider using Dan as a communicator next week. I will leave my "go to book" for him.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 1:00 PM
To: Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

Unfortunately this would conflict with the NRC all hands briefing. Can 1 of the 4 "communicators" handle the 11:45?

From: Schmidt, Rebecca
Sent: Thursday, March 17, 2011 12:48 PM
To: Sheron, Brian; Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

The House has now asked for the same briefing at 11:45. Bill are you available for that one too?

From: Sheron, Brian
Sent: Thursday, March 17, 2011 10:05 AM
To: Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject: RE:

I should be able to attend. I'll meet you in the ops center around 7am.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 9:44 AM
To: Leeds, Eric; Haney, Catherine; Sheron, Brian; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject:

Senate EPW staff has requested a briefing Fri @9:30 (location TBD). I believe that Pete Lyons will be representing DOE. I am planning to represent NRC. I invite any of the 4 addressees of this email (the 4 new "Communicators") to come along to get a sense of what the hill is interested in, etc. It is totally your call. I plan to be in the ops center at 7am to get a last minute update and then take metro (7:45) downtown.

Please let me know whether you plan to attend or not.

Bill

From: [Gibson, Kathy](#)
To: [Sheron, Brian](#)
Cc: [Scott, Michael](#)
Subject: Fw: SFP MACCS Analysis
Date: Thursday, March 17, 2011 8:45:32 AM

What we have so far on the MACCS run.

From: Santiago, Patricia
To: Gibson, Kathy; Scott, Michael
Sent: Thu Mar 17 06:21:34 2011
Subject: Fw: SFP MACCS Analysis

Fyi

Sent from an NRC BlackBerry
Patricia Santiago
202-510-6765

From: Gauntt, Randall O <rogaunt@sandia.gov>
To: Tinkler, Charles; Schaperow, Jason
Cc: Uhle, Jennifer; Santiago, Patricia; Pickering, Susan Y <sypicke@sandia.gov>; Jun, Raymond J <jjoonyu@sandia.gov>; McClellan, Yvonne <ymcclle@sandia.gov>; Burns, Shawn <spburns@sandia.gov>
Sent: Thu Mar 17 00:12:55 2011
Subject: SFP MACCS Analysis

All,

We got inventory from GE for 22 of the largest activity isotopes (actually for all Origen isotopes) for the total pool content of two offloads, the most recent being 105 days.

We have estimated release fractions from the earlier SFP work done at Sandia during the SFP assessment studies.

We estimate that this release fraction comes out over roughly 24 hours with some dragging out over a longer period – but for this cut we are taking the total release duration as 24 hrs.

The plume energy should be at least the decay heat, but since not all assemblies are actually going to burn, we will take decay heat (without additional chemical heat) as a reasonable surrogate for the plume energy.

We are trying to get this into MACCS now.

Decay heat is ~ 4 MW

	release fraction	FINAL Total Isotope	FINAL Total Curies	Released Curies
1	5.00E-05	pu241	25394580	1.27E+03
2	5.00E-05	cm242	5032489	2.52E+02
3	5.00E-05	cm244	1254704	6.27E+01
4	0.9	kr 85	2805074	2.52E+06
5	0.01	sr 89	11712735.7	1.17E+05
6	0.01	sr 90	23809390	2.38E+05
7	5.00E-05	y 90	23814870	1.19E+03
8	5.00E-05	y 91	19565900.2	9.78E+02
9	5.00E-05	zr 95	32504241.8	1.63E+03
10	0.25	nb 95	56736266	1.42E+07
11	0.01	ru103	17627056.1	1.76E+05
12	0.01	rh103m	17594143.2	1.76E+05
13	0.01	ru106	68616810	6.86E+05

CH/A1

14	0.01	rh106	68616810	6.86E+05
15	0.5	cs134	34649580	1.73E+07
16	0.5	cs137	33630970	1.68E+07
17	0.01	ba137m	31755750	3.18E+05
18	5.00E-05	ce141	10968373.7	5.48E+02
19	5.00E-05	ce144	98795980	4.94E+03
20	5.00E-05	pr144	98795980	4.94E+03
21	5.00E-05	pr144m	1382608.9	6.91E+01
22	5.00E-05	pm147	31139170	1.56E+03

From: Schmidt, Rebecca
To: Borchardt, Bill; Sheron, Brian
Subject: This morning's briefings
Date: Friday, March 18, 2011 6:44:57 AM

930 am in 406 senate dirksen (same room as hearing). I will meet you in the grill room -isenate chef -i in basement of dirksen in the hallway between dirksen and hart. I will be there around 900.

CH/92

From: [Sheron, Brian](#)
To: [Uhle, Jennifer](#)
Subject: Fw: UREGENT: Review of Seismic regulations summarization
Date: Friday, March 18, 2011 7:07:09 AM
Attachments: [Draft Fact Sheet on NRC Seismic Regulations.doc](#)

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

From: Kammerer, Annie
To: Khanna, Meena; Chokshi, Nilesh; Manoly, Kamal; Bagchi, Goutam
Cc: Ake, Jon; Sheron, Brian; Munson, Clifford; Tegeler, Bret
Sent: Fri Mar 18 03:19:32 2011
Subject: UREGENT: Review of Seismic regulations summarization

Meena, Nilesh, Kamal and Goutam:

I need to make an urgent request of you. We have been asked to put together a 1 to 2 page overview of the NRC's seismic regulations to support some interviews that Steven Chu is giving. This is due today (the 18th).

Jon Ake and Bret Tegler put together the attached. However, we would like to have you 4 review it. Note that Jon left some notes at the back in case they are of use to you.

Please take some time to review the document and provide comments using track changes. Please then return to me as quickly as possible.

Your assistance is greatly appreciated.

Cheers,
Annie

From: Sheron, Brian
Sent: Thursday, March 17, 2011 8:28 PM
To: Kammerer, Annie; Case, Michael; Richards, Stuart; Ake, Jon; Murphy, Andrew
Cc: Weber, Michael
Subject: RE: Seismic regulations summarization

OK. Can you e-mail Pete Lyons early tomorrow and let him know that the one-pager will be coming but it will be around COB.

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CH/93

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Cc: Weber, Michael
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Remember, he is just looking for a high level summary sufficient to answer likely questions he might get during the interviews.

2.) Can you please e-mail the latest version of your seismic Q&As to Mike Weber.

Thanks.

Fact Sheet: Summarization of the NRC's Regulatory Framework for Seismic Safety

Currently Operating Reactors (licensed prior to 1997):

The seismic regulatory basis for licensing of the currently operating nuclear power reactors is contained in the following regulations: 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," including the "General Design Criteria for Nuclear Power Plants," and 10 CFR Part 100 ("Seismic and Geologic Siting Criteria For Nuclear Power Plants") and Appendix A to that Part which describes general criteria that guide the evaluation of the suitability of proposed sites for nuclear power plants.

General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," in Appendix A requires that the structures, systems, and components (SSCs) important to safety be designed to withstand the effects of earthquakes, tsunamis, and seiches without loss of capability to perform their intended safety functions. The earthquake which could cause the maximum vibratory ground motion at the site is designated the **Safe Shutdown Earthquake (SSE)**.

Each plant is designed to a ground-shaking level (the SSE) that is appropriate for its location, given the possible earthquake sources that may affect the site and its tectonic environment. Ground shaking is a function of both the magnitude of an earthquake and the distance from the fault to the site. The magnitude alone cannot be used to predict ground motions. The existing plants were designed on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquake expected in the area around the plant based on an assessment of earthquakes that had occurred in the region historically. There is no specification of frequency of occurrence in the deterministic approach. GDC 2 and other design criteria require that the design include sufficient margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. There is no requirement for a periodic reassessment of the seismic design basis.

Proposed New Reactors (submitted after 1997):

In 1997 new rules governing reactor siting were established. 10 CFR Part 50, 100.23 and Appendix S establish the seismic design basis for plants licensed after January 10, 1997. Similar to pre-1997, Appendix S defines the SSE as "*the Safe-shutdown earthquake ground motion is the vibratory ground motion for which certain structures, systems, and components must be designed to remain functional.*" 10 CFR Part 100.23 "Geologic and Seismic Siting Criteria" requires that the applicant determine the SSE **and its uncertainty**, the potential for surface tectonic and nontectonic deformations. Regulatory Guide 1.165 (and subsequently Regulatory Guide 1.208) provides guidance on satisfying 10 CFR Part 100.23, one of which is performing a probabilistic seismic hazard assessment (**PSHA**).

Appendix S to 10 CFR Part 50 requires for SSE ground motions, SSCs will remain functional and within applicable stress, strain, and deformation limits. The required safety functions of SSCs must be assured during and after the vibratory ground motion through design, testing, or qualification methods. The evaluation must take into account soil-structure interaction effects and the expected duration of the vibratory motions. Appendix S also requires that the horizontal component of the SSE ground motion in the free field at the foundation elevation of structures must be an appropriate response spectrum with a peak ground acceleration (PGA) of at least 0.10g. Design basis loads for nuclear power plant structures, important to safety, include combined loads for seismic, wind, tornado, normal operating conditions (pressure and thermal), and accident conditions. Codes and standards, such as the American Institute of

Concrete (ACI-349) and the American Institute of Steel Construction (AISC N690), are used in the design of nuclear power plant structures to ensure a conservative, safe design under design basis loads.

In contrast to the deterministic approach used prior to 1997, the probabilistic method is used and explicitly accounts for possible earthquakes of various magnitudes that come from all plausible potential sources (including background seismicity) and the likelihood that each particular hypothetical earthquake occurs. The PSHA process provides a complete characterization of the ground motion and comprehensively addresses uncertainties in nuclear power plant seismic demands. The PSHA results are major input to seismic risk evaluation using either SPRA or SMA approaches. As for plants licensed prior to 1997, there is no requirement for a periodic reassessment of the seismic design basis.

In addition to the nominal seismic design, all new generation reactors have to demonstrate a **Seismic margin of 1.67** relative to the site-specific seismic demands. These designs are required to perform a Probabilistic Risk Assessment (PRA) based seismic margins analysis (SMA) to identify the vulnerabilities of their design to seismic events. The minimum high confidence, low probability of failure (HCLPF) for the plant should be at least 1.67 times the ground motion acceleration of the design basis safe-shutdown earthquake (SSE).

The Standard Review Plan (NUREG-0800), Regulatory Guides and Interim Staff Guidance provide the basis for staff reviews of existing reactors and new license applications.

Parking Lot

Below is input from Goutam to Jon in response to a 3/7/2011 Markey Letter question: Not sure if you want to pull anything from it.....

- 1. What is the magnitude of the earthquake for which the AP1000 would be able to maintain its ability to safely shut down the reactor? Will NRC require that the AP1000 be able to withstand earthquakes of the magnitudes experienced in all regions of the US, or otherwise limit their deployment to areas in which earthquakes beyond the threshold, "design-basis" magnitude have never experienced? Why or why not?**

The AP1000 is a standard reactor design that uses standard seismic design response spectra, or certified seismic design response spectra. A seismic design response spectrum characterizes the nature of ground motion. Ground motion for a standard design envelopes the operating nuclear power plants SSE spectra with additional margin in the Central and Eastern U.S. All standard plant seismic designs are expected to be suitable for the majority of sites within the continental U.S. Suitability of a standard design must be evaluated on the basis of site characteristics at any specific site. Site-specific seismic hazard is an important constraining factor, particularly for the Western U.S. sites. In addition to the nominal seismic design, all new generation reactors have to demonstrate a seismic margin of 1.67 relative to the site-specific seismic demands.

The concept of a single large magnitude earthquake controlling a plant design is associated with the deterministic idea of the safe shut down earthquake and is not used in siting new reactor designs. Ground motion for new reactor sites is determined using a complete probabilistic seismic hazard assessment (PSHA). The PSHA-derived seismic demands reflect ground motion produced by large earthquakes, generally at a distance from a specific site. The PSHA process provides a complete characterization of the ground motion and comprehensively addresses uncertainties in nuclear power plant seismic demands. New plant designs have very substantial margins against large ground motions. The core damage frequency associated with seismic events for new plants designed by ground motion from PSHA and the margin factor of 1.67 will be several factors lower than the Commission's expectation of less than 10^{-5} annually.

Seismic Margin

In SECY-93-087 (Policy, Technical and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Design) as modified by the Commission in a Staff Requirements Memorandum (SRM) dated June 21, 1993, the staff recommended and the Commission agreed that the plant designer should perform a Probabilistic Risk Assessment (PRA) based seismic margins analysis (SMA) to identify the vulnerabilities of their design to seismic events. In addition, the plant designer should construct logic models (i.e. event trees and fault trees) derived from the internal events PRA to address seismic failures. The designer

should determine all important accident sequences using the event trees and fault trees (based on fragility data for each component for each sequence). Subsequent to this, the designer should determine the minimum high confidence, low probability of failure (HCLPF) for the plant. SECY-93-087 states that the plant level HCLPF should be at least 1.67 times the ground motion acceleration of the design basis safe-shutdown earthquake (SSE). The accident sequences that dominate the plant level HCLPF indicate which structures, systems and components (SSC's) limit the seismic capability of the plant and provide a conservative estimate of the earthquake ground motion which the plant is expected to be able to withstand without core damage.

The capability of a particular structure, system, or component (SSC) to withstand beyond design basis earthquakes is measured by the value of the peak ground acceleration (PGA) at which there is a high confidence that the particular SSC will have a low probability of failure (HCLPF). The HCLPF capacity of a certain SSC corresponds to the earthquake level at which, with high confidence (95 percent), it is unlikely (probability less than $5E-02$) that failure of the SSC will occur. A HCLPF value for the entire plant is determined by finding the lowest sequence HCLPF that leads to core damage. It is a measure of the capability of the plant to withstand beyond design basis earthquakes without resulting in core damage. The plant HCLPF value, which is assessed from the SSC HCLPF values, has units of acceleration.

From: Sheron, Brian
To: Weber, Michael
Subject: Fw: Seismic Q&As March 18th 5am update
Date: Friday, March 18, 2011 7:14:31 AM
Attachments: Seismic Questions for Incident Response 3-18-11 5am.pdf

FYI.

From: Kammerer, Annie
To: Kammerer, Annie; Hiland, Patrick; Skeen, David; Case, Michael; RST01 Hoc
Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Gitter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Ruland, William; Dudes, Laura; Karas, Rebecca; Ake, Jon; Hogan, Rosemary; Uhle, Jennifer; Marshall, Michael; Uselding, Lara; Randall, John; Allen, Don; Burnell, Scott; Hayden, Elizabeth; Pires, Jose; Graves, Herman; Candra, Hernando; Murphy, Andrew; Sheron, Brian; Dricks, Victor; Warnick, Greg; Reynoso, John; Lantz, Ryan; Markley, Michael; Orders, William; Santiago, Patricia; Snodderly, Michael; Baggett, Steven; Sosa, Belkys; Davis, Roger; Franovich, Mike; Castleman, Patrick; Sharkey, Jeffrey; Boska, John; Ma, John; Tegeler, Bret; Patel, Pravin; Shams, Mohamed; Morris, Scott; Brenner, Eliot; Harrington, Holly; Seber, Dogan; Ledford, Joey; Johnson, Michael; Virgilio, Martin; Holahan, Vincent; Bergman, Thomas; Webb, Michael; Manoly, Kamal; Khanna, Meena; Screnci, Diane; Thomas, Eric; Nguyen, Quynh; Meighan, Sean
Sent: Fri Mar 18 06:50:33 2011
Subject: RE: Seismic Q&As March 18th 5am update

All,

Please see the updated version of the Seismic Q&As.

Among today's highlights:

- *We added a Terms and Definitions section at the end of the document. (We know that an acronyms list would be helpful too, but it will have to wait a little)
- *The "additional information" section has been split into tables, plots, and fact sheets
- *A high-level draft fact sheet on NRC's seismic regulations has been added
- *We added a section to track outstanding questions that have come in from congress. This will support those who get the tickets in the short terms (most likely NRR). The questions will be moved to the appropriate sections long term (as long as they are not duplicates.)

I'm sure we all agree this has been a crazy week! We're hoping that the weekend workload is lighter (if only because we won't get as many email from in house) and we can clean up this document and fill in some of the missing answers in preparation for the news story changing. We're trying hard to get out in front of the next wave.

Cheers,
Annie

From: Kammerer, Annie
Sent: Thursday, March 17, 2011 2:36 AM
To: Kammerer, Annie; Hiland, Patrick; Skeen, David; Case, Michael; RST01 Hoc
Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Gitter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Gitter, Joseph; Howe, Allen; Ruland, William; Dudes, Laura; Karas, Rebecca; Ake, Jon; Munson, Clifford; Hogan, Rosemary; Uhle, Jennifer; Marshall, Michael; Uselding, Lara; Randall, John; Allen, Don; Burnell, Scott; Hayden, Elizabeth; Pires, Jose; Graves, Herman; Candra, Hernando; Murphy, Andrew; Murphy, Andrew; Pires, Jose; Hogan, Rosemary; Sheron, Brian; Dricks, Victor; Warnick, Greg; Reynoso, John; Lantz, Ryan; Markley, Michael; Orders, William; Santiago, Patricia; Snodderly, Michael; Baggett, Steven; Sosa, Belkys; Davis, Roger; Franovich, Mike; Castleman, Patrick; Sharkey, Jeffrey; Boska, John; Ma, John; Tegeler, Bret; Patel, Pravin; Shams, Mohamed; Morris, Scott; Brenner, Eliot; Harrington, Holly; Seber, Dogan; Ledford, Joey; Johnson, Michael; Virgilio, Martin; Holahan, Vincent; Bergman, Thomas
Subject: Seismic Q&As March 17th 2am update

All,

As promised, a sharepoint site has been set up where our friends in NRR will be posting the latest version of the Seismic Q&A document on an ongoing basis. If someone would prefer to use the sharepoint site, instead of being on this distribution list, please let me know...

<http://portal.nrc.gov/edo/nrr/NRR%20IA/FAQ%20Related%20to%20Events%20Occuring%20in%20Japan/Forms/AllItems.aspx>

This latest update has a number of new questions (not many with answers today, but we are working hard). A high priority question we are working on is "how many plants are near a mapped active fault". We're focusing on anything within 50 miles. We're also pulling relevant questions from the congressional inquiries we just received; and will also give these high priority to support any needs by NRR.

Many new figures and some draft fact sheets have added to the "additional information" section. These include the NRO half of a tsunami fact sheet...a description of the tsunami research is still to come from RES.

Some good news: Yesterday's version seems to have been widely forwarded around the agency. So, we are also starting to get some excellent questions from staff looking forward. This is allowing us to feel that we are finally getting out in front of things to a small degree. Also, our team has grown and we now have someone acting as source of seismic expertise for the 11pm to 7 am shift. This means that we now have seismic experts available to the RST and OPA at the Op Center 24 hours, with 2 people during the day. That extra support is allowing us to get this out at least an hour earlier today ☺

CH/94

We are continuing to compile the questions that come in and update the seismic Q&A document. If you have suggested changes, or want to provide missing answers, please forward them to me for compilation.

This is a living document and will be updated daily in the foreseeable future.

Happy St. Paddy's Day. May the world (especially our friends in Japan) have the luck of the Irish today.

Cheers,
Annie

Dr. Annie Kammerer, PE
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US Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington DC 20555

(b)(6) mobil.
BB

From: Kammerer, Annie
Sent: Tuesday, March 15, 2011 3:41 AM
To: Hiland, Patrick; Skeen, David
Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Giltter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Kammerer, Annie; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Giltter, Joseph; Howe, Allen; Case, Michael; Ruland, William; Dudes, Laura; Karas, Rebecca; Ake, Jon; Munson, Clifford; Hogan, Rosemary; Uhle, Jennifer; Marshall, Michael; Uselding, Lara; Randall, John; Allen, Don; Burnell, Scott; Hayden, Elizabeth; Pires, Jose; Graves, Herman; Candra, Hernando; Murphy, Andrew; Murphy, Andrew; Pires, Jose; Hogan, Rosemary; Sheron, Brian; Dricks, Victor; Warnick, Greg; Reynoso, John; Lantz, Ryan; Markley, Michael
Subject: latest version of Q&As

All,

This is the first draft of the seismic-specific Q&As. It is pretty rough and there are many answers still missing, but people have contributed a lot and we thought it may be useful for many people trying to answer questions coming in.

We are continuing to compile the questions that come in and update the seismic Q&A document. If you have suggested changes, or want to provide missing answers, please forward them to me for compilation.

This is a living document and will be updated daily in the foreseeable future.

Annie

Dr. Annie Kammerer, PE
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Compiled Seismic Questions for NRC Response to the March 11, 2011 Japanese Earthquake and Tsunami

This is current as of 3-18-11 at 5am.

The keeper of this file is Annie Kammerer. Please provide comments, additions and updates to Annie with CC to Clifford Munson and Jon Ake.

A list of topics is shown in the Table of Contents at the front of this document.

A list of all questions is provided at the end of the document.

A list of terms and definitions is included at the end of the document.

We greatly appreciate the assistance of the many people who have contributed to this document. Please do not distribute beyond the NRC.

The latest Q&As are available on sharepoint at:

<http://portal.nrc.gov/edo/nrr/NRR%20TA/FAQ%20Related%20to%20Events%20Occuring%20in%20Japan/Forms/AllItems.aspx>

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Natural Hazards and Ground Shaking Design Levels

1) Did the Japanese underestimate the size of the maximum credible earthquake that could affect the plants?

Public response: The magnitude of the earthquake was somewhat greater than was expected for that part of the subduction zone by seismologists worldwide. The Japanese plants were recently reviewed to ground shaking similar to that observed. The review level ground motions were expected to result from a smaller earthquake closer to the sites.

Additional, technical, non-public information: A PDF file provided by John Anderson (prepared by Japanese colleagues) indicates that the majority of the recorded ground motions during the main shock were below the attenuation curve by Si & Midorikawa (1999). Most of the recorded motions fit well to median minus 1 sigma of their GMPE. There are also about a dozen stations with the recorded ground motions above 1g. The highest recorded PGA (~3g) is at the K-Net station MYG004. We can use this information to try to predict motions at the plants as soon as someone catches a breath.

2) Can a very large earthquake and tsunami happen here?

Public response: This earthquake was caused by a "subduction zone" event, which is the type of mechanism that produces the largest magnitude earthquakes. A subduction zone is a tectonic plate boundary where one tectonic plate is pushed under another plate. In the continental US, the only subduction zone is the Cascadia subduction zone which lies off the coast of northern California, Oregon and Washington. So, an earthquake and tsunami this large could only happen in that region. The only plant in that area is Columbia, which is far from the coast and the subduction zone. Outside of the Cascadia subduction zone, earthquakes are not expected to exceed a magnitude of approximate 8, which is 10 times smaller than a magnitude 9.

Additional, technical, non-public information: Magnitude is on a log scale, so 9 is 10 times bigger than an 8.

3) Has this changed our perception of earthquake risk?

Public Answer: This does not change the NRC's perception of earthquake hazard (i.e. ground shaking) at US plants. It is too early to tell what the lessons from this earthquake are from an engineering perspective. The NRC will look closely at all aspects of response of the plants to the earthquake and tsunami to determine if any actions need to be taken in US plants and if any changes are necessary to NRC regulations.

Additional, technical, non-public information: We expect that there would be lessons learned and we may need to seriously relook at common cause failures, including dam failure and tsunami.

4) What magnitude earthquake are US plants designed to?

Public Answer: Each plant is designed to a ground-shaking level that is appropriate for its location, given the possible earthquake sources that may affect the site and its tectonic environment. Ground shaking is a function of both the magnitude of an earthquake and the distance from the fault to the site. The magnitude alone cannot be used to predict ground motions. The existing plants were designed on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquake expected in the area around the plant. Several tables that include plant design ground motions are provided as the first table in the "additional information" section of this document.

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Additional, technical non-public information: In the past, “deterministic” or “scenario based” analyses were used to determine ground shaking (seismic hazard) levels. Now a probabilistic method is used that accounts for possible earthquakes of various magnitudes that come from potential sources (including background seismicity) and the likelihood that each particular hypothetical earthquake occurs.

5) How many US reactors are located in active earthquake zones (and which reactors)?

Public Answer: Although we often think of the US as having “active” and “non-active” earthquake zones, earthquakes can actually happen almost anywhere. Seismologists typically separate the US into low, moderate, and high seismicity zones. The NRC requires that every plant be designed for site-specific ground motions that are appropriate for their locations. In addition, the NRC has specified a minimum ground shaking level to which plants must be designed.

Seismic designs at US nuclear power plants are developed in terms of seismic ground motion spectra, which are called the Safe Shutdown Earthquake ground motion response spectra (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Currently operating nuclear power plants developed their SSEs based on a “deterministic” or “scenario earthquake” that accounts for the largest earthquake expected in the area around the plant.

Generally, seismic activity in the regions surrounding US plants is much lower than that for Japan since most US plants are located in the interior of the stable continental US. However, the most widely felt earthquakes within the continental US are the 1811-12 New Madrid sequence and the 1886 Charleston, SC, which were estimated to be between about magnitude 7.0 to 7.75. Nuclear power plants in the US are sited far away from these two earthquake zones as well as other identified potential seismic sources.

On the west coast of the US, the two nuclear power plants are designed to specific ground motions from earthquakes of about magnitude 7+ on faults located just offshore of the plants. The earthquakes on these faults are mainly strike-slip (horizontal motion) type earthquakes, not subduction zone earthquakes. Therefore, the likelihood of a tsunami from these faults is remote.

Additional, technical non-public information: None.

6) How many reactors are along coastal areas that could be affected by a tsunami (and which ones)?

Public Answer: Many plants are located in coastal areas that could potentially be affected by tsunami. Two plants, Diablo Canyon and San Onofre, are on the Pacific Coast, which is known to have tsunami hazard. There are also two plants on the Gulf Coast, South Texas and Crystal River. There are many plants on the Atlantic Coast or on rivers that may be affected by a tidal bore resulting from a tsunami. These include St. Lucie, Turkey Point, Brunswick, Oyster Creek, Millstone, Pilgrim, Seabrook, Calvert Cliffs, Salem/Hope Creek, and Surry. Tsunami on the Gulf and Atlantic Coasts occur, but are very rare. Generally the flooding anticipated from hurricane storm surge exceeds the flooding expected from a tsunami for plants on the Atlantic and Gulf Coast.

Additional, technical non-public information: A table with information on tsunami design levels is provided in the “Additional Information” section of this document.

7) If the earthquake in Japan was a larger magnitude than considered by plant design, why can't the same thing happen in the US?

Public response: *Discuss in terms of, IPEEE, Seismic PRA to be provided by Nilesh*

Additional, technical, non-public information: ADD

8) What if an earthquake like the Sendai earthquake occurred near a US plant?

Public response: ADD

Additional, technical, non-public information: ADD

9) What would be the results of a tsunami generated off the coast of a US plant? (Or why are we confident that large tsunamis will not occur relatively close to US shores?)

Public response: Request for answer by Henry Jones, Goutam Bagchi and/or Richard Raione (once the tsunami fact sheet is done and you have time).

Additional, technical, non-public information: ADD

10) Can this happen here (i.e., an earthquake that significantly damages a nuclear power plant)? Are the Japanese plants similar to US plants?

Public Answer: All US nuclear power plants are built to withstand environmental hazards, including earthquakes and tsunamis. Even those plants that are located within areas with low and moderate seismic activity are designed for safety in the event of such a natural disaster. The NRC requires that safety-significant structures, systems, and components be designed to take into account even rare and extreme seismic and tsunami events.

The Japanese facilities are similar in design to several US facilities.

Additional technical, non-public information: Currently operating reactors were designed using a "deterministic" or "maximum credible earthquake" approach. Seismic hazard for the new plants is determined using a probabilistic seismic hazard assessment approach that explicitly addresses uncertainty, as described in Regulatory Guide 1.208. The NRC requires that adequate margin beyond the design basis ground shaking levels is assured. The NRC further enhances seismic safety for beyond-design-basis events through the use of a defense-in-depth approach.

In addition, the NRC reviews the seismic risk at operating reactors as needed when information may have changed. Over the last few years the NRC has undertaken a program called Generic Issue 199, which is focused on assessing hazard for plants in the central and eastern US using the latest techniques and data and determining the possible risk implications of any increase in the anticipated ground shaking levels. This program will help us assure that the plants are safe under exceptionally rare and extreme ground motions that represent beyond-design-basis events.

11) What level of earthquake hazard are the US reactors designed for?

Public Answer: Each reactor is designed for a different ground motion that is determined on a site-specific basis. The existing plants were designed on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquake expected in the area around the plant. New reactors are designed using probabilistic techniques that characterize the hazard (i.e. ground shaking levels) and uncertainty at the proposed site. Ground motions from all potential seismic sources in the region are estimated and used to develop an appropriate site specific ground motion, which has a return period of 10,000 years on average over very long time periods.

Additional technical, non-public information: None

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12) Does the NRC consider earthquakes of magnitude 9?

Public Answer: Earthquakes with very large magnitudes, such as the recent earthquake of the coast of Japan, occur only within subduction zones. Subduction zones are regions where one of the earth's tectonic plates is subducting beneath another. In the continental US, the only subduction zone is the Cascadia subduction zone, which lies off of the coast of northern California, Oregon, and Washington. The only nuclear power plant in that area is Columbia, which is far from the coast and the subduction zone.

Seismic designs at US nuclear power plants are developed in terms of seismic ground motion spectra, which are called the Safe Shutdown Earthquake ground motion response spectra (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Currently operating nuclear power plants developed their SSEs based on a "deterministic" or "scenario earthquake" basis that account for the largest earthquake expected in the area around the plant. Seismic activity in the regions surrounding US plants is much lower than that for Japan since most US plants are located in the interior of the stable continental US. The largest earthquakes within the continental US are the 1811-12 New Madrid sequence and the 1886 Charleston, SC, which were estimated to be between about magnitude 7 to 7.5. On the west coast of the US, the two nuclear power plants are designed to specific ground motions from earthquakes of about magnitude 7 on faults located just offshore of the plants. The earthquakes on these faults are mainly strike-slip (horizontal motion) type earthquakes, not subduction zone earthquakes. Therefore, the likelihood of a tsunami from these faults is very remote.

Additional technical, non-public information: None.

13) What is the likelihood of the design basis or "SSE" ground motions being exceeded over the life of the plant?

To estimate the probability of exceeding a specified ground motion level, such as an SSE, during a given time interval, the Poisson model is generally used. Using seismic hazard curves from the 2008 USGS National Seismic Hazard Map and assuming a 60-year life for a typical nuclear power plant, we can estimate the probability of exceeding the SSE over the life of the plant. The NRC recently performed these estimates as part of its GI-199 program (see the section below titled "Reassessment of US Plants and GI-199"). The mean probability value for the plants in the Central and Eastern United States is less than 2%, with values ranging from a low of 0.1% to a high of 6%.

It is important to remember that there is margin above the design basis. In the mid to late 1990s, the NRC staff reviewed the potential for ground motions beyond the design basis as part of the Individual Plant Examination of External Events (IPEEE). From this review, the staff determined that seismic designs of operating plants in the United States have adequate safety margins for withstanding earthquakes built into the designs.

14) What is magnitude anyway? What is the Richter Scale? What is intensity?

ADD

An earthquake's magnitude is a measure of the strength of the earthquake as determined from seismographic observations and is an objective, quantitative measure of the size of an earthquake. The magnitude can be expressed in various ways based on seismographic records (e.g., Richter Local Magnitude, Surface Wave Magnitude, Body Wave Magnitude, and Moment Magnitude). Currently, the most commonly used magnitude measurement is the Moment Magnitude, Mw, which is based on the

seismic moment computed as the rupture force along the fault multiplied by the average amount of slip, and thus is a direct measure of the energy released during an earthquake.

(this definition was lifted from USGS) The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

The intensity of an earthquake is a qualitative description of the effects of the earthquake at a particular location, as evidenced by observed effects on humans, on human-built structures, and on the earth's surface at a particular location. Commonly used scales to specify intensity are the Rossi-Forel, Mercalli, and Modified Mercalli. The Modified Mercalli Intensity (MMI) scale describes intensities with values ranging from I to XII in the order of severity. MMI of I indicates an earthquake that was not felt except by a very few, whereas MMI of XII indicates total damage of all works of construction, either partially or completely.

15) How do magnitude and ground motion relate to each other?

ADD

16) How are combined seismic and tsunami events treated in risk space? Are they considered together?

The PRA Standard (ASME/ANS-Ra-Sa2009) does address the technical requirements for both seismic events and tsunamis (tsunami hazard under the technical requirements for external flooding analysis). *But together? The standard does note that uncertainties associated with probabilistic analysis of tsunami hazard frequency are large and that an engineering analysis can usually be used to screen out tsunamis.*

17) How are aftershocks treated in terms of risk assessment?

Seismic PRAs do not consider the affect of aftershocks since there are not methods to predict equipment fragility after the first main shock.

Design Against Natural Hazards & Plant Safety in the US

19) Are nuclear power plants designed for tsunamis?

Public Answer: Yes. Plants are built to withstand a variety of environmental hazards and those plants that might face a threat from tsunami are required to withstand large waves and the maximum wave height at the intake structure (which varies by plant.)

Additional, technical, non-public information: Tsunami are considered in the design of US nuclear plants. Nuclear plants are designed to withstand flooding from not only tsunami, but also hurricane and storm surge; therefore there is often significant margin against tsunami flooding. However, it should be noted that Japanese experience has shown that drawdown can be a significant problem.

Currently the US NRC has a tsunami research program that is focused on developing modern hazard assessment techniques and additional guidance through cooperation with the National Oceanic and Atmospheric Administration and the United States Geological Survey. This has already lead to several technical reports and an update to NUREG 0-800. The NOAA and USGS contractors are also assisting with NRO reviews of tsunami hazard. A new regulatory guide on tsunami hazard assessment is currently planned in the office of research, although it is not expected to be available in draft form until 2012.

20) What level of tsunami are we designed for?

Public Answer: Like seismic hazard, the level of tsunami that each plant is designed for is site-specific and is appropriate for what may occur at each location.

Additional, technical, non-public information: None.

21) Which plants are close to known active faults? What are the faults and how far away are they from the plants?

Public Answer: Jon to develop answer with Dogan's help. I created a placeholder table for your use "Table of Plants Near Known Active Faults" to be populated in the additional information section. The plots that Dogan made are in the additional information section under "Plot of Mapped Active Quaternary Faults and Nuclear Plants in the US". This is really high priority after the congressional hearings.

Additional, technical, non-public information: ADD

22) How was the seismic design basis for an existing nuclear power plant established?

Public Answer: The seismic ground motion used for the design basis was determined from the evaluation of the maximum historic earthquake within 200 miles of the site, without explicitly considering the time spans between such earthquakes; safety margin was then added beyond this maximum historic earthquake to form a hypothetical *design basis earthquake*. The relevant regulation for currently operating plants is 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (<http://www.nrc.gov/reading-rm/doc-collections/cfr/part100/part100-appa.html>).

Additional, technical, non-public information: See discussion at end of GI-199 section for discussion of safety margin and design basis.

23) Is there margin above the design basis?

Public Answer: Yes, there is margin beyond the design basis. In the mid to late 1990s, NRC staff reviewed the plants' assessments of potential consequences of severe earthquakes (earthquakes beyond the safety margin included in each plant's design basis), which licensees performed as part of the Individual Plant Examination of External Events (or IPEEE) program. From this review, the staff determined that seismic designs of operating plants in the United States have adequate safety margins, for withstanding earthquakes, built into the designs.

Additional, technical, non-public information: None.

24) Are US plants safe?

Public Answer: US plants are designed for appropriate earthquake shaking levels and are safe. Currently the NRC is also conducting a program called Generic Issue 199 (GI-199), which is reviewing the adequacy of earthquake design of US nuclear power plants in the central and eastern North America based on the latest data and analysis techniques.

Additional, technical, non-public information: None.

25) Was the Japanese plant designed for this type of accident? Are US nuclear plants?

Public Answer: Nuclear plants in both the US and Japan are designed for earthquake shaking. In addition to the design of the plants, significant effort goes into emergency response planning and accident mitigation. This approach is called defense-in-depth.

Additional, technical, non-public information: None.

26) Why do we have confidence that US nuclear power plants are adequately designed for earthquakes and tsunamis?

Public Answer: Nuclear plants in both the US and Japan are designed for earthquake shaking. In addition to the design of the plants, significant effort goes into emergency response planning and accident mitigation. This approach is called defense-in-depth.

Additional, technical, non-public information: None.

27) Can this happen here (i.e., an earthquake that significantly damages a nuclear power plant)? Are the Japanese plants similar to US plants?

Public Answer: All US nuclear power plants are built to withstand environmental hazards, including earthquakes and tsunamis. Even those plants that are located within areas with low and moderate seismic activity are designed for safety in the event of such a natural disaster. The NRC requires that safety-significant structures, systems, and components be designed to take into account even rare and extreme seismic and tsunami events. Nuclear power plants are designed to be safe based on the most severe natural phenomena historically reported for the site and surrounding area. The Japanese facilities are similar in design to several US facilities.

Additional technical, non-public information: Currently operating reactors were designed using a "deterministic" or "maximum credible earthquake" approach. Seismic hazard for the new plants is determined using a probabilistic seismic hazard assessment approach that explicitly addresses uncertainty, as described in Regulatory Guide 1.208. The NRC requires that adequate margin beyond the design basis ground shaking levels is assured. The NRC further enhances seismic safety for beyond-design-basis events through the use of a defense-in-depth approach.

In addition, the NRC reviews the seismic risk at operating reactors as needed when information may have changed. Over the last few years the NRC has undertaken a program called Generic Issue 199, which is focused on assessing hazard for plants in the central and eastern US using the latest techniques and data and is determining the possible risk implications of any increase in the anticipated ground shaking levels. This program will help us assure that the plants are safe under exceptionally rare and extreme ground motions that represent beyond-design-basis events.

The reactor design is a Boiling Water Reactor that is similar to some US designs, including Oyster Creek, Nine Mile Point and Dresden Units 2 and 3.

28) Could an accident like the one at Japan's Fukushima Daiichi nuclear plants happen in the US?

Public response: It is difficult to answer this question until we have a better understanding of the precise problems and conditions that faced the operators at Fukushima Daiichi. We do know, however, that Fukushima Daiichi Units 1-3 lost all offsite power and emergency diesel generators. This situation is called "station blackout." US nuclear power plants are designed to cope with a station blackout event that involves a loss of offsite power and onsite emergency power. The Nuclear Regulatory Commission's detailed regulations address this scenario. US nuclear plants are required to conduct a "coping" assessment and develop a strategy to demonstrate to the NRC that they could maintain the plant in a safe condition during a station blackout scenario. These assessments, proposed modifications and operating procedures were reviewed and approved by the NRC. Several plants added additional AC power sources to comply with this regulation.

In addition, US nuclear plant designs and operating practices since the terrorist events of September 11, 2001, are designed to mitigate severe accident scenarios such as aircraft impact, which include the complete loss of offsite power and all on-site emergency power sources.

US nuclear plant designs include consideration of seismic events and tsunamis'. It is important not to extrapolate earthquake and tsunami data from one location of the world to another when evaluating these natural hazards. These catastrophic natural events are very region- and location-specific, based on tectonic and geological fault line locations.

Additional technical, non-public information: None

29) Should US nuclear facilities be required to withstand earthquakes and tsunamis of the kind just experienced in Japan? If not, why not?

Public response: US nuclear reactors are designed to withstand an earthquake equal to the most significant historical event or the maximum projected seismic event and associated tsunami without any breach of safety systems.

The lessons learned from this experience must be reviewed carefully to see whether they apply to US nuclear power plants. It is important not to extrapolate earthquake and tsunami data from one location of the world to another when evaluating these natural hazards, however. These catastrophic natural events are very region- and location-specific, based on tectonic and geological fault line locations.

The United States Geological Survey (USGS) conducts continuous research of earthquake history and geology, and publishes updated seismic hazard curves for various regions in the continental US. These curves are updated approximately every six years. NRC identified a generic issue (GI-199) that is currently undergoing an evaluation to assess implications of this new information to nuclear plant sites located in the central and eastern United States. The industry is working with the NRC to address this issue.

Additional technical, non-public information: None

30) Can you summarize the plant seismic design basis for the US plants? Are there any special issues associated with seismic design?

Public response: Please see one of the several tables provided in the "Additional information" section of this document.

Additional, technical, non-public information: None

31) How do we know that the equipment in plants is safe in earthquakes?

Public response: All equipment important to safety (required to safely shutdown a nuclear power plant) is qualified to withstand earthquakes in accordance with plants' licensing basis and NRC regulations.

Additional, technical, non-public information: 10 CFR 50, Appendix A, General Design Criterion 2 and 4, 10 Part 100, and Appendix S. Guidance: Regulatory Guides 1.100, IEEE 344 and ASME QME-1

32) How do we know equipment will work if the magnitude is bigger than expected, like in Japan?

Public response: Nuclear plant systems are designed to mitigate a design basis earthquake which includes margin above the postulated site specific earthquake. (reviewers comment: this needs to be expanded)

Additional, technical, non-public information: See part 100 Reactor Site Criteria

33) Are US plants susceptible to the same kind of loss of power as happened in Japan?

Public response: NRC recognized that there is the possibility of a total loss of AC power at a site, called a 'Station Blackout', or SBO. Existing Regulations require the sites to be prepared for the possibility of an SBO. In addition to battery powered back-up system to immediately provide power for emergency systems, NRC regulations require the sites to have a detailed plan of action to address the loss of AC power while maintaining control of the reactor.

There has also been an understanding that sites can lose offsite power as well. Of course, this can be caused by earthquake. However, hurricane- or tornado-related high winds may potentially damage the transmission network in the vicinity of a nuclear plant as well. Flood waters can also affect transformers used to power station auxiliary system. These types of weather related events have the potential to degrade the offsite power source to a plant.

The onsite Emergency Diesel Generators need fuel oil stored in tanks that are normally buried underground. These tanks and associated pumps and piping require protection from the elements. Above ground tanks have tornado and missile protection.

In case both offsite and onsite power supplies fail, NRC has required all licensee to evaluate for a loss of all AC power (station blackout) scenario and implement coping measures to safely shutdown the plant law 10 CFR 50.63.

Additional, technical, non-public information: Some plants have safeguards equipment below sea level and rely on watertight doors or Bilge pumps to remove water from equipment required to support safe shutdown. Overflowing rivers can result in insurmountable volume of water flooding the vulnerable areas. SBO definition in 10CFR50.2, SBO plan requirements in 10CFR50.63

34) How do we know that the emergency diesel generators in Diablo Canyon and SONGS will not fail to operate like in Japan?

Public response: Emergency Diesel Generators are installed in a seismically qualified structure. Even if these EDGs fail, plants can safely shutdown using station blackout power source law 10 CFR 50.63.

Additional, technical, non-public information: None.

35) Is all equipment at the plant vulnerable to tsunami?

Public response: Nuclear plants are designed to withstand protection against natural phenomena such as tsunami, earthquakes. (reviewers comment: this needs to be expanded. I need assistance with this)

Additional, technical, non-public information: ADD

36) What protection measures do plants have against tsunami?

Public response: Plants are designed to withstand protection against natural phenomena such as tsunami, earthquakes. (note from reviewer: add information on breakwater from songs and Diablo example. I need assistance with this)

Additional, technical, non-public information: ADD

37) Is there a risk of loss of water during tsunami drawdown? Is it considered in design?

Public response: Goutam, Henry and Rich, can you guys answer this?

Additional, technical, non-public information: ADD

38) Are nuclear buildings built to withstand earthquakes? What about tsunami?

Public response: There is language elsewhere in this document that answers that...copy here.

Additional, technical, non-public information: ADD

39) Are aftershocks considered in the design of equipment at the plants? Are aftershocks considered in design of the structure?

Public response: ADD

Additional, technical, non-public information: ADD

40) Are there any special issues associated with seismic design at the plants? For example, Diablo Canyon has special requirements. Are there any others?

Public response: Both SONGS and Diablo canyon are licensed with an automatic trip for seismic events. (can this be expanded? any others?) Mike Markley, can your group assist with this?

Additional, technical, non-public information: ADD

41) Is the NRC planning to require seismic isolators for the next generation of nuclear power plants? How does that differ from current requirements and/or precautions at existing US nuclear power plants?

Public response: The NRC would not require isolators for the next generation of plants. However, it is recognized that a properly designed isolation system can be very effective in mitigating the effect of earthquake. Currently the NRC is preparing guidance for plant designers considering the use of seismic isolation devices.

Additional, technical, non-public information: A NUREG is in the works in the office of research. It is expected to be available for comment in 2011.

42) Are there any US nuclear power plants that incorporate seismic isolators? What precautions are taken in earthquake-prone areas?

Public response: No currently constructed nuclear power plants in the US use seismic isolators. However seismic isolation is being considered for a number of reactor designs under development. Currently seismic design of plants is focused on assuring that design of structures, systems, and components are designed and qualified to assure that there is sufficient margin beyond the design basis ground motion.

Additional, technical, non-public information: None.

43) Do you think that the recent Japan disaster will cause any rethinking of the planned seismic isolation guidelines, particularly as it regards earthquakes and secondary effects such as tsunamis?

Public response: Whenever an event like this happens, the NRC thoroughly reviews the experience and tries to identify any lessons learned. The NRC further considers the need to change guidance or regulations. In this case, the event will be studied and any necessary changes will be made to the guidance under development. However, it should be noted that Japan does not have seismically isolated nuclear plants.

Additional, technical, non-public information: None.

About Japanese Hazard, Design and Earthquake Impact

44) Was the damage done to the plants from the earthquake or the tsunami?

Public response: It is hard to tell at this point. In the nuclear plants there seems to have been some damage from the shaking. However, the tsunami led to some of the biggest problems in terms of the loss of backup power. This is also true in the general population; the tsunami seems to have led to most of the deaths.

Additional, technical, non-public information: None

45) What was the disposition of the plant during the time after the earthquake struck and before the tsunami arrived? Was there indication of damage to the plant solely from the earthquake (if so, what systems) and did emergency procedures function during this time.

Public response: Given that the Fukushima plant is not in the US, the NRC does not yet have enough information to answer this question.

Additional, technical, non-public information: Typically there would be the opportunity to get this data, but given the situation it is not clear.

46) What magnitude earthquake was the plant designed to withstand? For example, what magnitude earthquake was the plant expected to sustain with damage but continued operation? And with an expected shutdown but no release of radioactive material?

Public response: There are two shaking levels relevant to the Fukushima plant, the original design level ground motion and a newer review level ground motion. As a result of a significant change in seismic regulations in 2006, NISA, the Japanese regulator initiated a program to reassess seismic hazard and seismic risk for all nuclear plants in Japan. This resulted in new assessments of higher ground shaking levels (i.e. seismic hazard) and a review of seismic safety for all Japanese plants. The program is still ongoing, but has already resulted in retrofit in some plants. Therefore, it is useful to discuss both the design level and a review level ground motion for the plants. A relevant table is found a few questions down, and also in the "Additional Information: Useful Tables" section.

Plant sites	Contributing earthquakes used for determination of hazard	New DBGM S_1	Original DBGM S_1
Fukushima	Magnitude 7.1 Earthquake near the site	600 gal (0.62g)	370 gal (0.37g)

Additional, technical, non-public information: Add

47) Did this reactor sustain damage in the July 16, 2007 earthquake, as the Kashiwazaki power plant did? What damage and how serious was it?

Public response: Neither Fukushima power plant was affected by the 2007 earthquake.

Additional, technical, non-public information: None.

48) Was the Fukushima power plant designed to withstand a tsunami of any size? What sort of modeling was done to design the plant to withstand either seismic events or tsunamis? What specific design criteria were applied in both cases?

Public response: Japanese plants are designed to withstand both earthquake and tsunami. An English explanation of how Tsunami hazard assessments are undertaken for Japanese plants is found in Annex II to IAEA Guidance on Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations Assessment of Tsunami Hazard: Current Practice in Some States in Japan. The design ground motions are as shown above. We do not have information on the design basis tsunami.

Additional, technical, non-public information: Annie has a copy of the draft annex and will put them into ADAMS

49) What is the design level of the Japanese plants? Was it exceeded?

Public response: As a result of a significant change in seismic regulations in 2006, the Japanese regulator initiated a program to reassess seismic hazard and seismic risk for all nuclear plants in Japan. This resulted in new assessments of higher ground shaking levels (i.e. seismic hazard) and a review of seismic safety for all Japanese plants. The program is still on-going, but has already resulted in retrofit in some plants. Therefore, it is useful to discuss both the design level and a review level ground motion for the plants, as shown below.

Currently we do not have official information. However, it appears that the ground motions (in terms of peak ground acceleration) are similar to the S_s shaking levels, although the causative earthquakes are different. Thus the design basis was exceeded, but the review level may not have been.

Table: Original Design Basis Ground Motions (S_2) and New Review Level Ground Motions (S_s) Used for Review of Japanese Plants

Plant sites	Contributing earthquakes used for determination of hazard	New DBGM S_s	Original DBGM S_1
Onagawa	Soutei Miyagiken-oki (M8.2)	580 gal (0.59g)	375 gal (0.38g)
Fukushima	Earthquake near the site (M7.1)	600 gal (0.62g)	370 gal (0.37g)
Tokai	Earthquakes specifically undefined	600 gal (0.62g)	380 gal (0.39g)
Hamaoka	Assumed Tokai (M8.0), etc.	800 gal (0.82g)	600 gal (0.62g)

Additional, technical, non-public information: None

50) What are the Japanese S_1 and S_s ground motions and how are they determined?

Public response: Japanese nuclear power plants are designed to withstand specified earthquake ground motions, previously specified as S_1 and S_2 , but now simply S_s . The design basis earthquake ground motion S_1 was defined as the largest earthquake that can reasonably be expected to occur at the site of a nuclear power plant, based on the known seismicity of the area and local faults that have shown activity during the past 10,000 years. A power reactor could continue to operate safely during an S_1 level earthquake, though in practice they are set to trip at lower levels. The S_2 level ground motion was

based on a larger earthquake from faults that have shown activity during the past 50,000 years and assumed to be closer to the site. The revised seismic regulations in May 2007 replaced S_1 and S_2 with S_5 . The S_5 design basis earthquake is based on evaluating potential earthquakes from faults that have shown activity during the past 130,000 years. The ground motion from these potential earthquakes are simulated for each of the sites and used to determine the revised S_5 design basis ground motion level. Along with the change in definition, came a requirement to consider "residual risk", which is a consideration of the beyond-design-basis event.

Additional, technical, non-public information: None

51) Did this earthquake affect the Kashiwazaki-Kariwa nuclear power plant?

Public response: No, this earthquake did not affect Kashiwazaki-Kariwa nuclear power plant and all reactors remained in the state of operation prior to the March 11, 2011, Japan earthquake. It also did not trip during an earthquake of magnitude XX that occurred on the western side subsequent to the 8.9 earthquake. This is very important for the stability of Japan's energy supply due to the loss of production at TEPCO's Fukushima nuclear power plants.

Additional, technical, non-public information: None

52) How high was the tsunami at the Fukushima nuclear power plants?

Public response: The actual tsunami height at the plants is not currently known. However, NOAA has publically information on the recordings at sea for many areas.

Additional, technical, non-public information: A preliminary rough estimate of tsunami height at the plant locations was provided to NRC by NOAA shortly after the earthquake. This was developed using NOAA's global ocean model and is shown in the "additional information" section. Most notably, there was a 6 meter wave at Fukushima and the wave at Onogawa may have been between 18 and 23 meters.

53) Wikileaks has a story that quotes US embassy correspondence and some un-named IAEA expert stating that the Japanese were warned about this ... Does the NRC want to comment?

<http://www.dailymail.co.uk/news/article-1366721/Japan-tsunami-Government-warned-nuclear-plants-withstand-earthquake.html>

Public response: TBD Annie to explain the history of their recent retrofit program.

Additional, technical, non-public information: The article talks about that the plants and that they were checked for a magnitude 7, but the earthquake was a 9. The reality is that they assumed the magnitude 7 close in had similar ground motions to a 9 farther away. They did check (and retrofit) the plant to the ground motions that they probably saw (or nearly). The problem was the tsunami. We probably need a small write up so that staff understands, even if we keep it internal.

What Happened to US Nuclear Power Plants During the March 11, 2011, Japan Earthquake?

54) Was there any damage to US reactors from either the earthquake or the resulting tsunami?

Public Answer: No

Additional, technical non-public information: Two US plants on the Pacific Ocean (Diablo Canyon and San Onofre) experienced higher than normal sea level due to tsunami. However, the wave heights were consistent with previously predicted levels and this had no negative impact to the plants. In response, Diablo Canyon Units 1 and 2 declared an "unusual event" based on tsunami warning following the Japanese earthquake. They have since exited the "unusual event" declaration, based on a downgrade to a tsunami advisory.

55) Have any lessons for US plants been identified?

Public Answer: The NRC is in the process of following and reviewing the event in real time. This, inevitably, leads to the indemnification of lessons that warrant further study. However, a complete understanding of lessons learned requires more information than is currently available to NRC staff.

Additional, technical non-public information: We need to take a closer look at common cause failures, such as earthquake and tsunami, and earthquake and dam failure.

Response and Future Licensing Actions

56) What is the NRC doing about the emergencies at the nuclear power plants in Japan? Are you sending staff over there?

Public Answer: We are closely following events in Japan, working with other agencies of the federal government, and have been in direct contact with our counterparts in that country. In addition, we are ready to provide assistance if there is a specific request. An NRC staffer is participating in the USAID team headed to Japan.

Additional technical, non-public information: We are taking the knowledge that the staff has about the design of the US nuclear plants and we are applying this knowledge to the Japan situation. For example, this includes calculations of severe accident mitigation that have been performed.

57) With NRC moving to design certification, at what point is seismic capability tested – during design or modified to be site-specific? If in design, what strength seismic event must these be built to withstand?

Public Answer: During design certification, vendors propose a seismic design in terms of a ground motion spectrum for their nuclear facility. This spectrum is called a standard design response spectrum and is developed so that the proposed nuclear facility can be sited at most locations in the central and eastern United States. The vendors show that this design ground motion is suitable for a variety of different subsurface conditions such as hard rock, deep soil, or shallow soil over rock. Combined License and Early Site Permits applicants are required to develop a site specific ground motion response spectrum that takes into account all of the earthquakes in the region surrounding their site as well as the local site geologic conditions. Applicants estimate the ground motion from these postulated earthquakes to develop seismic hazard curves. These seismic hazard curves are then used to determine a site specific ground motion response spectrum that has a maximum annual likelihood of 1×10^{-4} of being exceeded. This can be thought of as a ground motion with a 10,000 year return period. This site specific ground motion response spectrum is then compared to the standard design response spectrum for the proposed design. If the standard design ground motion spectrum envelopes the site specific ground motion spectrum then the site is considered to be suitable for the proposed design. If the standard design spectrum does not completely envelope the site specific ground motion spectrum, then the COL applicant must do further detailed structural analysis to show that the design capacity is adequate. Margin beyond the standard design and site specific ground motions must also be demonstrated before fuel loading can begin.

Additional technical, non-public information: None.

Reassessment of US Plants and GI-199

58) Can we get the rankings of the plants in terms of safety? (Actually this answer should be considered any time GI-199 data is used to "rank" plants)

Public Response: The objective of the GI-199 Safety/Risk Assessment was to perform a conservative, screening-level assessment to evaluate if further investigations of seismic safety for operating reactors in the central and eastern US (CEUS) are warranted consistent with NRC directives. The results of the GI-199 SRA should not be interpreted as definitive estimates of plant-specific seismic risk. The nature of the information used (both seismic hazard data and plant-level fragility information) make these estimates useful only as a screening tool. The NRC does not rank plants by seismic risk.

Currently operating nuclear plants in the United States remain safe, with no need for immediate action. This determination is based on NRC staff reviews of updated seismic hazard information and the conclusions of the Generic Issue 199 Screening Panel. Existing plants were designed with considerable margin to be able to withstand the ground motions from the "deterministic" or "scenario earthquake" that accounted for the largest earthquake expected in the area around the plant. During the mid-to late-1990s, the NRC staff reassessed the margin beyond the design basis as part of the Individual Plant Examination of External Events (IPEEE) program. The results of the GI-199 assessment demonstrate that the probability of exceeding the design basis ground motion may have increased at some sites, but only by a relatively small amount. In addition, the Safety/Risk Assessment stage results indicate that the probabilities of seismic core damage are lower than the guidelines for taking immediate action.

Additional, technical, non-public information: None.

59) If the plants are designed to withstand the ground shaking why is there so much risk from the design level earthquake

Much of the risk in the total risk levels provided in the report comes from earthquakes stronger than the safe shutdown ground motion. The anything indicated in the geologic record used to determine the design requirements at these sites. The numbers are based on an evaluation of all of the potential seismic sources in the CEUS and are used to produce seismic hazard estimates (curves) for each site. The GI-199 effort to date has performed a screening assessment to determine if further, more detailed studies are warranted. This study has utilized information from plant-specific evaluation of external hazards, including earthquakes. That information was gathered to identify potential seismic vulnerabilities, not to produce robust risk estimates. Therefore, the GI-199 results should be viewed as preliminary and not definitive.

60) Does the NRC have a position on the MSNBC article that ranked the safety of US plants?

Public Response: The NRC is preparing to issue a press release responding to MSNBC article. The content below.

THE BELOW IS STILL DRAFT

A recent article by MSNBC (add reference) cites results of a US Nuclear Regulatory Commission study released in September, 2010. The study investigated the implications of updated seismic hazard estimates in the central and eastern United States. The study was prepared as a screening assessment to evaluate if further investigations of seismic safety for operating reactors in the central and eastern US (CEUS) are warranted, consistent with NRC directives. The report clearly states that "work to date supports a decision to continue ...; the methodology, input assumptions, and data are not sufficiently developed to support other regulatory actions or decisions." Accordingly, the results were not used to

rank or compare plants. The study produced plant-specific results of the estimated change in risk from seismic hazards. The study did not rely on the absolute value of the seismic risk except to assure that all operating plants are safe. The plant-specific results were used in aggregate to determine the need for continued evaluation and were included in the report for openness and transparency. The use of the absolute value of the seismic hazard-related risk, as done in the MSNBC article, is not the intended use, and the NRC considers it an inappropriate use of the results.

The report reached three main conclusions: 1) Seismic hazard estimates have increased at some operating plants in the central and eastern US; 2) there is no immediate safety concern, plants have significant safety margin and overall seismic risk estimates remain small; and 3) assessment of updated seismic hazards and plant performance should continue.

Additional, technical, non-public information: ADD.

61) Overall, how would the NRC characterize the CDF numbers? A quirk of numbers? A serious concern?

Public Response: The study is still underway and it is too early to predict the final outcome. However, staff has determined that there is no immediate safety concern and that overall seismic risk estimates remain small. If at any time the NRC determines that an immediate safety concern exists, action to address the issue will be taken. However, the NRC is focused on assuring safety during even very rare and extreme events. Therefore, the NRC has determined that assessment of updated seismic hazards and plant performance should continue.

Additional, technical, non-public information: None.

62) Describe the study and what it factored in – plant design, soils, previous quakes, etc.

Public Response: The study considers the factors that impact estimates of both the seismic hazard (i.e. ground shaking levels) at the site and the plants resistance to earthquakes (mathematically represented by the plant level fragility curve). Previous quakes, the tectonic environment, and the soils that underlie the site are all used in the development of the ground shaking estimates used in the analyses. Plant design and the seismic resistance of the important structures, systems, and components are all used in the development of plant level fragility curves.

Additional, technical, non-public information: None.

63) Explain “seismic curve” and “plant level fragility curve”.

Public Response: A seismic curve is a graphical representation of seismic hazard. Seismic hazard in this context is the highest level of ground motion expected to occur (on average) at a site over different periods of time. Plant level fragility is the probability of damage to plant structures, systems and components as a function of ground shaking levels.

Additional, technical, non-public information: None.

64) Explain the “weakest link model”.

Public Response: The weakest link model is a method for evaluating the importance of different frequencies of ground vibration to the overall plant performance. The model and its details are not integral to understanding the fundamental conclusions of the study.

Additional, technical, non-public information: None.

65) What would constitute fragility at a plant?

Public Response: Fragility is a term that relates the probability of failure of an individual structure, system or component to the level of seismic shaking it experiences. Plant level fragility is the probability of damage to sets of plant structures, systems and components as a function of ground shaking levels.

Additional, technical, non-public information: None.

66) The 1-in-18,868 risk for Limerick: What is the risk for? A jostling? A crack? Significant core damage leading to a meltdown?

Public Response: The objective of the GI-199 Safety/Risk Assessment was to perform a conservative, screening-level assessment to evaluate if further investigations of seismic safety for operating reactors in the central and eastern US (CEUS) are warranted consistent with NRC directives. The results of the GI-199 SRA should not be interpreted as definitive estimates of plant-specific seismic risk. The nature of the information used (both seismic hazard data and plant-level fragility information) make these estimates useful only as a screening tool. The use of the absolute value of the seismic hazard-related risk, as done in the MSNBC article, is not the intended use, and the NRC considers it an inappropriate use of the results.

Additional, technical, non-public information: None.

67) Can someone put that risk factor into perspective, using something other than MSNBC's chances of winning the lottery?

Public Response: As noted above, the risk factors determined in GI-199 were conservative estimates of risk intended for use as a screening tool. Use of these factors beyond this intended purpose is inappropriate.

Additional, technical, non-public information: None.

68) What, if anything, can be done at a site experiencing such a risk? (Or at Limerick in particular.)

Public Response: The probabilistic seismic risk analyses (SPRA) that are performed to determine the core damage frequency (CDF) numbers also provides a significant amount of information on what the plant vulnerabilities are. This allows the analyst to determine what can be done to the plant to address the risk.

Additional, technical, non-public information: None.

69) Has anyone determined that anything SHOULD be done at Limerick or any of the other PA plants?

Public Response: The fundamental conclusion of the report is that "work to date supports a decision to continue ...; the methodology, input assumptions, and data are not sufficiently developed to support other regulatory actions or decisions." The NRC is planning to issue a Generic Communication to operating reactor licensees in the CEUS requesting additional information. This includes the plants in PA.

Additional, technical, non-public information: None.

70) I noted the language on Page 20 of the report: This result confirms NRR's conclusion that currently operating plants are adequately protected against the change in seismic hazard estimates because the guidelines in NRR Office Instruction LIC-504 "Integrated Risk-Informed Decision Making Process for Emergent Issues" are not exceeded. Can someone please explain?

Public response: Can someone help with this?

Additional, technical, non-public information: None.

71) Is the earthquake safety of US plants reviewed once the plants are constructed?

Public response: Yes, earthquake safety is reviewed during focused design inspections, under the Generic Issues Program (GI-199) and as part of the Individual Plant Evaluation of External Events program (IPEEE) that was conducted in response to Generic Letter 88-20 Supplement 4.

Additional, technical, non-public information: None.

72) Does the NRC ever review tsunami risk for existing plants?

Public Answer: The NRC has not conducted a generic issue program on tsunami risk to date. However, some plants have been reviewed as a result of the application for a license for a new reactor. In the ASME/ANS 2009 seismic probabilistic risk assessment standard, all external hazards are included.

Additional, technical, non-public information: None.

73) Does GI-199 consider tsunami?

Public response: GI-199 stems from the increased in perceived seismic hazard focused on understanding the impact of increased ground motion on the risk at a plant. GI-199 does not consider tsunami

Additional, technical, non-public information: In the past there has been discussion about a GI program on tsunami, but the NRC's research and guidance was not yet at the point it would be effective. We are just getting to this stage and the topic should be revisited.

74) What is Generic Issue 199 about?

Public Answer: Generic Issue 199 (GI-199) investigates the safety and risk implications of updated earthquake-related data and models. These data and models suggest that the probability for earthquake ground shaking above the seismic design basis for some nuclear power plants in the Central and Eastern United States is still low, but larger than previous estimates.

Additional, technical, non-public information: See additional summary/discussion of GI-199 and terms below.

75) Where can I get current information about Generic Issue 199?

Public Answer: The public NRC Generic Issues Program (GIP) website (<http://www.nrc.gov/about-nrc/regulatory/gen-issues.html>) contains program information and documents, background and historical information, generic issue status information, and links to related programs. The latest Generic Issue Management Control System quarterly report, which has regularly updated GI-199 information, is publicly available at <http://www.nrc.gov/reading-rm/doc-collections/generic-issues/quarterly/index.html>. Additionally, the US Geological Survey provides data and results that are publicly available at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>.

Additional, technical, non-public information: The GI-199 section of the NRC internal GIP website (<http://www.internal.nrc.gov/RES/projects/GIP/Individual%20GIs/GI-0199.html>) contains additional information about Generic Issue 199 (GI-199) and is available to NRC staff.

76) How was the seismic design basis for an existing nuclear power plant established?

Public Answer: The seismic ground motion used for the design basis was determined from the evaluation of the maximum historic earthquake within 200 miles of the site, without explicitly considering the time spans between such earthquakes; safety margin was then added beyond this maximum historic earthquake to form a hypothetical *design basis earthquake*. The relevant regulation for currently operating plants is 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (<http://www.nrc.gov/reading-rm/doc-collections/cfr/part100/part100-appa.html>).

Additional, technical, non-public information: See discussion at end of GI-199 section for discussion of safety margin and design basis.

77) Is there margin above the design basis?

Public Answer: Yes, there is margin beyond the design basis. In the mid to late 1990s, NRC staff reviewed the plants' assessments of potential ground motion beyond the safety margin included in each plant's design basis, which licensees performed as part of the Individual Plant Examination of External Events (or IPEEE) program. From this review, the staff determined that seismic designs of operating plants in the United States have adequate safety margins, for withstanding earthquakes, built into the designs.

Additional, technical, non-public information: The goal of seismic engineering is to design structures, systems and components that explicitly do not fail at the design level. The application of specific codes, standards, and analysis techniques results in margin beyond the design level. The assessments carried out as part of the IPEEE program demonstrated that margin exists in the operating reactors against seismic demand.

78) Are all US plants being evaluated as a part of Generic Issue 199?

Public Answer: The scope of the Generic Issue 199 (GI-199) Safety/Risk Assessment is limited to all plants in the Central and Eastern United States. Although plants at the Columbia, Diablo Canyon, Palo Verde, and San Onofre sites are not included in the GI-199 Safety/Risk Assessment, the Information Notice on GI-199 is addressed to all operating power plants in the US (as well as all independent spent fuel storage installation licensees). The staff will also consider inclusion of operating reactors in the Western US in its future generic communication information requests.

Additional, technical, non-public information: The staff is currently developing specific information needs to be included in a Generic Letter to licensees in the CEUS.

79) Are the plants safe? If you are not sure they are safe, why are they not being shut down? If you are sure they are safe, why are you continuing evaluations related to this generic issue?

Public Answer: Yes, currently operating nuclear plants in the United States remain safe, with no need for immediate action. This determination is based on NRC staff reviews associated with Early Site Permits (ESP) and updated seismic hazard information, the conclusions of the Generic Issue 199 Screening Panel (comprised of technical experts), and the conclusions of the Safety/Risk Assessment Panel (also comprised of technical experts).

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No immediate action is needed because: (1) existing plants were designed to withstand anticipated earthquakes with substantial design margins, as confirmed by the results of the Individual Plant Examination of External Events program; (2) the probability of exceeding the *safe shutdown earthquake* ground motion may have increased at some sites, but only by a relatively small amount; and (3) the Safety/Risk Assessment Stage results indicate that the probabilities of seismic core damage are lower than the guidelines for taking immediate action.

Even though the staff has determined that existing plants remain safe, the Generic Issues Program criteria (Management Directive 6.4) direct staff to continue their analysis to determine whether any cost-justified plant improvements can be identified to make plants enhance plant safety.

Additional, technical, non-public information : The Safety/Risk Assessment results confirm that plants are safe. The relevant risk criterion for GI-199 is total *core damage frequency* (CDF). The threshold for taking immediate regulatory action (found in NRR Office Instruction LIC-504, see below) is a total CDF greater than or on the order of 10^{-3} (0.001) per year. For GI-199, the staff calculated seismic CDFs of 10^{-4} (0.0001) per year and below for nuclear power plants operating in the Central and Eastern US (CEUS) (based on the new US Geological Survey seismic hazard curves). The CDF from internal events (estimated using the staff-developed Standardized Plant Analysis of Risk models) and fires (as reported by licensees during the IPEEE process and documented in NUREG-1742), when added to the seismic CDF estimates results in the total risk for each plant to be, at most, 4×10^{-4} (0.0004) per year or below. This is well below the threshold (a CDF of 10^{-3} [0.001] per year) for taking immediate action. Based on the determination that there is no need for immediate action, and that this issue has not changed the licensing basis for any operating plant, the CEUS operating nuclear power plants are considered safe. In addition, as detailed in the GI-199 Safety/Risk Assessment there are additional, qualitative considerations that provide further support to the conclusion that plants are safe.

Note: The NRC has an integrated, risk-informed decision-making process for emergent reactor issues (NRR Office Instruction LIC-504, ADAMS Accession No. ML100541776 [not publically available]). In addition to deterministic criteria, LIC-504 contains risk criteria for determining when an emergent issue requires regulatory action to place or maintain a plant in a safe condition.

80) What do you mean by "increased estimates of seismic hazards" at nuclear power plant sites?

Public Answer: *Seismic hazard* (earthquake hazard) represents the chance (or probability) that a specific level of ground shaking could be observed or exceeded at a given location. Our estimates of seismic hazard at some Central and Eastern United States locations have changed based on results from recent research, indicating that earthquakes occurred more often in some locations than previously estimated. Our estimates of seismic hazard have also changed because the models used to predict the level of ground shaking, as caused by a specific magnitude earthquake at a certain distance from a site, changed. The increased estimates of seismic hazard at some locations in the Central and Eastern United States were discussed in a memorandum to the Commission, dated July 26, 2006. (The memorandum is available in the NRC Agencywide Documents Access and Management System [ADAMS] under Accession No. ML052360044).

Additional, technical, non-public information: See additional discussion of terms at the end of the document.

81) Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-6} , or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct?

Public Response: Yes, at least partly. In the subject documents the frequencies for core damage or ground motion exceedance have been expressed in the form "2.5E-06". As you noted this is equivalent to 2.5×10^{-6} , or 0.000025 per year. If, for example, the core damage frequency was estimated as 2.5E-06, this would be equivalent to an expectation of 2.5 divided by a million per year. It is not really correct to think of these values as "once every 400,000 years," the two numbers are mathematically equivalent but do not convey the same statistical meaning within this context. Rather, you could characterize it as 1 in 400,000 per year of something occurring.

Additional, technical, non-public information: None

82) The GI-199 documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the central and eastern US. What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the western US?

Public Response: At this time the staff has not formally developed updated probabilistic seismic hazard estimates for the existing nuclear power plants in the Western US. However, NRC staff during the mid- to late-1990's reviewed the plants' assessments of potential consequences of severe ground motion from earthquakes beyond the plant design basis as part of the Individual Plant Examination of External Events (IPEEE) program. From this review, the NRC staff determined that the seismic designs of operating plants in the US have adequate safety margin. NRC staff has continued to stay abreast of the latest research on seismic hazards in the Western US and interface with colleagues at the US Geological Survey. The focus of Generic Issue 199 has been on the CEUS. However, the Information Notice that summarized the results of the Safety/Risk Assessment was sent to all existing power reactor licensees. The documents that summarize existing hazard estimates are contained in the Final Safety Analysis Reports (FSARS) and in the IPEEE submittals. It must be noted that following 9/11 the IPEEE documents are no longer publicly available.

Additional, technical, non-public information: None

83) The GI-199 documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, US Department of Energy, US Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment."

Public Response: The new consensus hazard curves are being developed in a cooperative project that has NRC, US Department of Energy, US Geological Survey (USGS) and Electric Power Research Institute (EPRI) participation. The title is: The Central and Eastern US Seismic Source Characterization (CEUS-SSC) project. The project is being conducted following comprehensive standards to ensure quality and regulatory defensibility. It is in its final phase and is expected to be publicly released in the fall of 2011. The project manager is Larry Salamone (Lawrence.salamone@srs.gov, 803-645-9195) and the technical lead on the project is Dr. Kevin Coppersmith (925-974-3335, kcoppersmith@earthlink.net). Additional

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information on this project can be found at: <http://mydocs.epri.com/docs/ANT/2008-04.pdf>, and http://my.epri.com/portal/server.pt?open=512&objID=319&&PageID=218833&mode=2&in_hi_us_eriid=2&cached=true.

Additional, technical, non-public information: None

84) What is the timetable now for consideration of any regulatory changes from the GI-199 research?

Public Response: The NRC is working on developing a Generic Letter (GL) to request information from affected licensees. The GL will likely be issued in a draft form within the next 2 months to stimulate discussions with industry in a public meeting. After that it has to be approved by the Committee to Review Generic Requirements, presented to the Advisory Committee on Reactor Safeguards and issued as a draft for formal public comments (60 days). After evaluation of the public comments it can then be finalized for issuance. We expect to issue the GL by the end of this calendar year, as the new consensus seismic hazard estimates become available. The information from licensees will likely require 3 to 6 months to complete. Staff's review will commence after receiving licensees' responses. Based on staff's review, a determination can be made regarding cost beneficial backfits where it can be justified.

Additional, technical, non-public information: None

1. Please explain in plain language how the NRC determined plants are safe with regard to the results of our GI199 assessment report..
2. The GI199 Safety/Risk Assessment states 24 plants "lie in the continue zone" (pg 23) These plants "need more assessment." What are these 24 plants? Why are these plants that require further evaluation safe? (pg 23 and Figure 8)
3. Why is the list of plants identified by the NRC for further evaluation under GI199 different than those identified by MSNBC as the "top 10" likely to fail due to seismic event?
4. Why are plants safe when MSNBC calculations indicate several hundred percent increases in the risk of a seismic event that damages the core?
5. Why do Indian Point 2 and Indian Point 3 plants have different probabilities of failing due to a seismic event when the plants are located next to each other? Is IP3 calculated to be the most likely to fail due to a seismic event? Why? Why is IP2 different? Aren't these plant at the same location and very similar design?
6. Why is Pilgrim not in the NRC "continue to evaluate zone" but second on the MSNBC list as moist likely to fail due to a seismic event?

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Seismic Probabilistic Risk Assessment (SPRA)

85) The NRC increasingly uses risk-information in regulatory decisions. Are risk-informed PRAs useful in assessing an event such as this?

Public response: Nilesh Chokshi to provide Q&As on SPRA

Additional, technical, non-public information: None

Plant-Specific Questions

San Onofre Nuclear Generating Station (SONGS) Questions

86) SONGS received a white finding in 2008 for 125VDC battery issue related to the EDGs that went undetected for 4 years. NRC issued the white finding as there was increased risk that one EDG may not have started due to a low voltage condition on the battery on one Unit (Unit 2). Aren't all plants susceptible to the unknown? Is there any assurance the emergency cooling systems will function as desired in a Japan-like emergency?

Public response: The low voltage condition was caused by a failure to properly tighten bolts on a electrical breaker that connected the battery to the electrical bus that would be relied on to start the EDG in case of a loss of off-site power. This was corrected immediately on identification and actions taken to prevent its reoccurrence. The 3 other EDGs at SONGS were not affected.

Additional, technical, non-public information: None

87) Has the earthquake hazard at SONGS been reviewed like Diablo Canyon nuclear power plant (DCNPP) is doing? Are they planning on doing an update before relicensing?

Public Answer: Relicensing does not evaluate the potential change to seismic siting of a plant. If there is a seismic design concern, it would be addressed for the plant as it is currently operating.

The closest active fault is approximately five miles offshore from San Onofre, a system of folds and faults exist called the OZD need to write out full name. The Cristianitos fault is ½ mile southeast, but is an inactive fault. Other faults such as the San Andreas and San Jacinto, which can generate a larger magnitude earthquake, are far enough away that they would produce ground motions much less severe than the OZD for San Onofre.

Past history relative to nearby major quakes have been of no consequences to San Onofre. In fact, three major earthquakes from 1992 to 1994 (Big Bear, Landers and Northridge), ranging in distance from 70-90 miles away and registering approximately 6.5 to 7.3 magnitude, did not disrupt power production at San Onofre. The plant is expected to safely shutdown if a major earthquake occurs nearby. Safety related structures, systems and components have been designed and qualified to remain functional and not fail during and after an earthquake.

Additional, technical, non-public information: None

88) Is possible to have a tsunami at songs that is capable of damaging the plant?

Public Information: The San Onofre Units 2 and 3 plant grade is elevation +30.0 feet MLLW. The controlling tsunami for San Onofre occurring during simultaneous high tide and storm surge produces a maximum runup to elevation +15.6 feet MLLW at the Unit 2 and 3 seawall. When storm waves are superimposed, the predicted maximum runup is to elevation +27 MLLW. Tsunami protection for the SONGS site is provided by a reinforced concrete seawall constructed to elevation +30.0 MLLW. A tsunami greater than this height is extremely unlikely.

Additional, technical, non-public information: None

89) Does SONGS have an emergency plan for tsunami?

Public Response: The SONGS emergency plan does initiate the emergency response organization and results in declaration of emergency conditions via their EALs. The facility would then make protective

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action recommendations to the Governor, who would then decide on what protective actions would be ordered for the residents around SONGS.

Additional, technical, non-public information: None

90) Has evacuation planning at SONGS considered tsunami?

Public Response: These considerations would be contained in the State and local (City, County) emergency plans, which are reviewed by FEMA. FEMA then certifies to the NRC that they have "reasonable assurance" that the off-site facilities can support operation of SONGS in an emergency.

Additional, technical, non-public information: None

91) Is SONGS designed against tsunami and earthquake?

Public Response: Yes. SONGS is designed against both tsunami and earthquake.

Additional, technical, non-public information: None

92) What is the height of water that SONGS is designed to withstand?

Public Response: 30 feet (9.1 meters). Information for all plants can be found in the "Additional Information" section of this document.

Additional, technical, non-public information: None

93) What about drawdown and debris?

Public Response: *Good question...can HQ answer? Goutam, Henry, or Rich...can you help with this one?*

Additional, technical, non-public information: None

94) Will this be reviewed in light of the Japan earthquake.

Public Response: The NRC will do a thorough assessment of the lessons learned from this event and will review all potential issues at US nuclear plants as a result.

Additional, technical, non-public information: None

95) Could all onsite and offsite power be disrupted from SONGS in the event of a tsunami, and if that happened, could the plant be safely cooled down if power wasn't restored for days after?

Public Response: Seismic Category I equipment is equipment that is essential to the safe shutdown and isolation of the reactor or whose failure or damage could result in significant release of radioactive material. All Seismic Category I equipment at SONGS is designed to function following a DBE with ground acceleration of 0.67g.

The operating basis earthquake (1/2 of the DBE) is characterized by maximum ground shaking of 0.33g. Historically, even this level of ground shaking has not been observed at the site. Based on expert analysis, the average recurrence interval for 0.33g ground shaking at the San Onofre site would be in excess of 1000 years and, thus, the probability of occurrence in the 40-year design life of the plant would be less than 1 in 25. The frequency of the DBE would be much more infrequent, and very unlikely to occur during the life of the plant. Even if an earthquake resulted in greater than the DBE movement/acceleration at SONGS, the containment structure would ultimately protect the public from harmful radiation release, in the event significant damage occurred to Seismic category 1 equipment.

Additional, technical, non-public information: None

96) Are there any faults nearby SONGS that could generate a significant tsunami?

Public Response: Current expert evaluations estimate a magnitude 7 earthquake about 4 miles (6.4 km) from SONGS. This is significantly less than the Japan earthquake, and SONGS has been designed to withstand this size earthquake without incident. Should discuss the different tectonic nature (not a subduction zone like Japan)?

Additional, technical, non-public information: None

97) What magnitude or shaking level is SONGS designed to withstand? How likely is an earthquake of that magnitude for the SONGS site?

Public Response: The design basis earthquake (DBE) is defined as that earthquake producing the maximum vibratory ground motion that the nuclear power generating station is designed to withstand without functional impairment of those features necessary to shut down the reactor, maintain the station in a safe condition, and prevent undue risk to the health and safety of the public. The DBE for SONGS was assessed during the construction permit phase of the project. The DBE is postulated to occur near the site (5 miles (8km)), and the ground accelerations are postulated to be quite high (0.67g), when compared to other nuclear plant sites in the U.S (0.25g or less is typical for plants in the eastern US). Based on the unique seismic characteristics of the SONGS site, the site tends to amplify long-period motions, and to attenuate short-period motions. These site-specific characteristics were accounted for in the SONGS site-specific seismic analyses.

Additional, technical, non-public information: None

98) Could SONGS withstand an earthquake of the magnitude of the Japanese earthquake?

Public Response: We do not have current information on the ground motion at the Japanese reactors. SONGS was designed for approximately a 7.0 magnitude earthquake 4 miles (6.4 km) away. The Japanese earthquake was much larger (8.9), but was also almost 9 miles (14.5 km) away. The local ground motion at a particular plant is significantly affected by the local soil and bedrock conditions. SONGS was designed (0.67g) to withstand more than 2 times the design motion at average US plants.

Additional, technical, non-public information: None

99) What about the evacuation routes at SONGS? How do we know they are reasonable?

Public Response: FEMA reviews off-site evacuation plans formally every 2 years during a biennial emergency preparedness exercise. NRC evaluates on-site evacuation plans during the same exercise. Population studies are formally done every 10 years, and evacuation time estimates are re-evaluated at that time. FEMA reviews these evacuation plans, and will conclude their acceptability through a finding of "reasonable assurance" that the off-site facilities and infrastructure is capable of protecting public health and safety in the event of an emergency at SONGS. The next such exercise is planned for April 12, 2011.

Additional, technical, non-public information: None

100) Regarding tsunami at DCNPP and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami?

Public response: See below

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101) What is the design level flooding for DNCPP and SONGS? Can a tsunami be larger?

Public response: Both the Diablo Canyon (main plant) and SONGS are located above the flood level associated with tsunami. However, the intake structures and Auxiliary Sea Water System at Diablo canyon are designed for combination of tsunami-storm wave activity. SONGS has reinforced concrete cantilevered retaining seawall and screen well perimeter wall designed to withstand the design basis earthquake, followed by the maximum predicted tsunami with coincident storm wave action

Additional, technical, non-public information: None

102) Is there potential linkage between the South Coast Offshore fault near SONGS and the Newport-Inglewood Fault system and/or the Rose Canyon fault? Does this potential linkage impact the maximum magnitude that would be assigned to the South Coast Offshore fault and ultimately to the design basis ground motions for this facility?

Public response: Stephanie and Jon to answer (you may want to change the question) based on the discussions in the articles sent by Lara U.

Additional, technical, non-public information: Proposed action is to check the FSAR for San Onofre and read the discussion on characterization of the offshore fault. A quick look at discussion of the Newport Inglewood from other sources suggest this is part of the "system". It would be helpful to check the basis for segmenting the fault in the FSAR. Probably have to dig on this a bit, may need to look at the USGS/SCEC/ model for this area.

Diablo Canyon Nuclear Power Plant (DCNPP) Questions

103) Now after the Japan tragedy, will the NRC finally hear us (A4NR) and postpone DC license renewal until seismic studies are complete? How can you be sure that what happened there is not going to happen at Diablo with a worse cast earthquake and tsunami?

Public response: ADD

Additional, technical, non-public information: ADD

104) The evacuation routes at DCNPP see are not realistic. Highway 101 is small...and can you imagine what it will be like with 40K people on it? Has the evacuation plan been updated w/ all the population growth?

Public Response: FEMA reviews off-site evacuation plans formally every 2 years during a biennial emergency preparedness exercise. NRC evaluates on-site evacuation plans during the same exercise. Population studies are formally done every 10 years, and evacuation time estimates are re-evaluated at that time. FEMA reviews these evacuation plans, and will conclude their acceptability through a finding of "reasonable assurance" that the off-site facilities and infrastructure is capable of protecting public health and safety in the event of an emergency at DCNPP.

Additional, technical, non-public information: None

105) Are there local offshore fault sources capable of producing a tsunami with very short warning times?

Public Response: ADD- question forwarded to region

Additional, technical, non-public information: ADD

106) Are there other seismically induced failure modes (other than tsunami) that would yield LTSBO? Flooding due to dam failure or widespread liquefaction are examples.

Public Response: ADD question forwarded to region

Additional, technical, non-public information: ADD

107) Ramifications of beyond design basis events (seismic and tsunami) and potential LTSBO on spent fuel storage facilities?

Public Response: ADD question forwarded to region

Additional, technical, non-public information: ADD

108) Why did the Emergency Warning go out for a 'tsunami' that was only 6 ft (1.8 m) high? Do these guys really know what they're doing? Would they know it if a big one was really coming? Crying wolf all the time doesn't instill a lot of confidence.

Public Response: The warning system performed well. The 6 foot (1.8 meters) wave was predicted many hours before and arrived at the time it was predicted. Federal officials to accurately predicted the tsunami arrival time and size; allowing local official to take appropriate measures as they saw necessary to warn and protect the public. It should be understood that even a 6 foot tsunami is very dangerous. Tsunamis have far more energy and power than wind-driven waves.

Additional, technical, non-public information: ADD

109) How big did the Japanese think an earthquake and tsunami could be before March 11, 2011? Why were they so wrong (assuming this earthquake/tsunami was bigger than what they had designed the plant for)?

Public Response: ADD can HQ answer?

Additional, technical, non-public information: ADD

The Japanese were supposed to have one of the best tsunami warning systems around. What went wrong last week (both with the reactors and getting the people out...see #1, evacuation plan above)?

Public Response: ADD can HQ answer?

Additional, technical, non-public information: ADD

110) Regarding the tsunami at DCNPP and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami?

Public Response: Both the Diablo Canyon (main plant) and SONGS are located above the flood level associated with tsunami. However, the intake structures and Auxiliary Sea Water System at Diablo canyon are designed for combination of tsunami-storm wave activity. SONGS has reinforced concrete cantilevered retaining seawall and screen well perimeter wall designed to withstand the design-basis earthquake, followed by the maximum predicted tsunami with coincident storm wave action

Additional, technical, non-public information: ADD

NOTE: need to add to SONGS and DCNPP... Canyon and San Onofre IPEEEs - based on the Technical Evaluation Reports, Diablo did consider a locally induced tsunami in a limited way (the aux service water pumps were assumed to become flooded following a seismic event) while SONGS did not consider a coupled seismic/tsunami event.

111) Shouldn't the NRC make licensees consider a Tsunami coincident with a seismic event that triggers the Tsunami?

ADD

112) Given that SSCs get fatigued over time, shouldn't the NRC consider after-shocks in seismic hazard analyses?

ADD

113) Did the Japanese also consider an 8.9 magnitude earthquake and resulting tsunami "way too low a probability for consideration"?

ADD

- 114) GI-199 shows that the scientific community doesn't know everything about the seismicity of CEUS. And isn't there a prediction that the West coast is likely to get hit with some huge earthquake in the next 30 years or so? Why does the NRC continue to license plants on the west coast?**

Work the following into Q&As as time permits.

After an earthquake, in order to restart, In practice a licensee needs to determine from engineering analysis that the stresses on the plant did not exceed their licensed limits. That would be a very tall order for a plant that experienced a beyond design basis earthquake, and probably is why it had taken Japan so long to restore the KK plants following the earlier earthquake.

- 115) Has industry done anything on tsunami hazards? Also, has anyone done work to look at the effect of numerous cycles of low amplitude acceleration following a larger event. I would expect we would have some information because how do we know a plant would be fit to start back up after an event? We cannot possibly do NDE on everything to determine if flaws have propagated to the point where they need to be replaced.**

Indian Point Questions

116) Why is Indian Point safe if there is a fault line so close to it?

Public Response: The Ramapo fault system, located near the Indian Point Nuclear Power Plant, is an example of an old fault system that, based on geologic field evidence, has not been active in the last 65.5 million years. The Ramapo fault system extends primarily from southeastern New York to northern New Jersey and is made up of a series of northeast- oriented faults. Even though there is minor earthquake activity in the vicinity of the Ramapo faults, this earthquake activity cannot be directly correlated with any individual fault within the Ramapo fault system.

US nuclear power plants are designed and built to withstand the largest expected earthquake in the site region, based on observed historical seismicity and field evidence for prehistoric earthquakes, and are also designed to incorporate seismic safety margins. A potential earthquake in and around the vicinity of the Ramapo fault system was taken into account during the NRC licensing process for the Indian Point plants, and the plant design incorporated the largest expected earthquake in the site region. In summary, the Ramapo fault system exhibits no definitive evidence for recent fault displacement (i.e., no evidence for fault activity in the last 65.5 million years) and the Indian Point nuclear power plant was designed and built to safely shutdown in the event of an earthquake having the highest magnitude observed in the site region. Therefore, the NRC concluded that the risk of significant damage to the Indian Point reactors due to a potential earthquake is acceptable.

Additional, technical, non-public information: The information above and following is consistent with the literature and the UFSAR for IP related to the Ramapo fault. The Ramapo fault system, which passes through the Indian Point area, is a group of Mesozoic age faults, extending from southeastern New York to northern New Jersey, as well as further southwest. The fault system is composed of a series of southeast-dipping, northeast-striking faults. Various faults of the system contain evidence of repeated slip in various directions since Proterozoic time, including Mesozoic extensional reactivation. However, the USGS staff, who reviewed 31 geologic features in the Appalachian Mountains and Coastal Plain and compiled a National Database on Quaternary Faulting (Crone and Wheeler, 2000), listed the Ramapo fault system as low risk because the fault system lacks evidence for Quaternary slip. They further pointed out that the Ramapo fault system, and 17 other geologic features, "have little or no published geologic evidence of Quaternary tectonic faulting that could indicate the likely occurrence of earthquakes larger than those observed historically" (Wheeler and Crone, 2004). Among these faults, the Ramapo fault system is one of the three that underwent a paleoseismological study. In two trenches excavated across the Ramapo fault, no evidence of Quaternary tectonic faulting was found (Wheeler and Crone, 2000). Because the Ramapo fault system is relatively inactive, , and because the plants are designed to safely shutdown in the event of an earthquake of the highest intensity ever recorded in that area, the NRC has concluded that the risk of significant damage to the reactors due to a probable earthquake in the area is extremely small.

The letter that was sent to the NRC from Rep Lowey refers to the Ramapo seismic zone (RSZ) and the Dobbs Ferry fault. The letter incorrectly states that the Dobbs Ferry fault is located within the Ramapo seismic zone. Based on the literature, it is not. It is close, but it is considered to be in the Manhattan Prong more to the east (more like 10-15 miles away) while the Ramapo fault system is considered to be in the Reading Prong (a couple of miles away from IP). Also for clarification, the seismicity is considered to be within the Precambrian/Paleozoic basement at depths greater than the Mesozoic Newark Basin where the RSZ is situated.

Outstanding Questions from Congress

The below questions are gleaned from the congressional letters coming into the NRC. Because they generally cover different topics, they are being kept together as sets to assist the office assigned with response. Once a formal response is developed and sent, the questions will be moved to the appropriate sections.

117) Received 3/16/11 from Congresswoman Lowey

The key elements of the congresswoman's letter are as follows:

The Ramapo Seismic Zone is a particular threat because the zone passes within two miles of Indian Point. The Ramapo Seismic zone includes the Dobbs Ferry fault in Westchester, which generated a 4.1 magnitude earthquake in 1955. The Columbia University study suggests that this pattern of subtle but active faults increases the risk to the New York City area and that an earthquake with a magnitude of 7.0 on the Richter scale is within reach. Disturbingly, Entergy measures the risk of an earthquake near Indian Point to be between 1.0 and 3.0 on the Richter scale, despite evidence to the contrary.

The NRC should study Indian Point's risk of, and ability to sustain a disaster, including the impact of earthquakes and hurricanes, as well as collateral impacts such as loss of power, inability to cool reactors and emergency evacuation routes. The NRC should evaluate how a similar incident in the New York metropolitan area could be further complicated due to a dramatically higher population and the effectiveness of the proposed evacuation routes.

Public Response: Please see technical elements in the above question. NRR has the lead for developing the formal response

Additional, technical, non-public information: please see the significant amount of information above

118) From 3/16/11 Press Release from Senators Boxer and Feinstein

Plant Design and Operations

1. What changes to the design or operation of the Diablo Canyon and SONGS facilities have improved safety at the plants since they began operating in the mid-1980s?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

2. What emergency notification systems have been installed at California nuclear power plants? Has there ever been a lapse of these systems during previous earthquakes or emergencies?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

3. What safety measures are in place to ensure continued power to California reactors in the event of an extended power failure?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

Type of Reactor

4. What are the differences and similarities between the reactors being used in California (pressurized water reactors) and those in Japan (boiling water reactors), as well as the facilities used to house the reactors, including the standards to which they were built and their ability to withstand natural and manmade disasters?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

Earthquakes and Tsunamis

5. We have been told that both Diablo Canyon and San Onofre Nuclear Generating Station are designed to withstand the maximum credible threat at both plants, which we understand to be much less than the 9.0 earthquake that hit Japan. What assumptions have you made about the ability of both plants to withstand an earthquake or tsunami? Given the disaster in Japan, what are our options to provide these plants with a greater margin for safety?

Public Response: Annie and Kamal developing response

Additional, technical, non-public information: ADD

6. Have new faults been discovered near Diablo Canyon or San Onofre Nuclear Generating Station since those plants began operations? If so, how have the plants been modified to account for the increased risk of an earthquake? How will the NRC consider information on ways to address risks posed by faults near these plants that is produced pursuant to state law or recommendations by state agencies during the NRC relicensing process?

Public Response: Annie and Kamal developing response

Additional, technical, non-public information: ADD

7. What are the evacuation plans for both plants in the event of an emergency? We understand that Highway 1 is the main route out of San Luis Obispo, what is the plan for evacuation of the nearby population if an earthquake takes out portions of the highway and a nuclear emergency occurs simultaneously?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

8. What is the NRC's role in monitoring radiation in the event of a nuclear accident both here and abroad? What is the role of EPA and other federal agencies?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

9. What monitoring systems currently are in place to track potential impacts on the US, including California, associated with the events in Japan?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

10. 6. Which federal agency is leading the monitoring effort and which agencies have responsibility for assessing human health impacts? What impacts have occurred to date on the health or environment of the US or are currently projected or modeled in connection with the events in Japan?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

11. What contingency plans are in place to ensure that the American public is notified in the event that hazardous materials associated with the events in Japan pose an imminent threat to the US?

Public Response: NRR/DORL developing response

Additional, technical, non-public information: ADD

119) From 3/15/11 Press Release from Congresspeople Markey and Capps

Note that these are only the seismic questions. There are other questions that are structural

1. Provide the Richter or moment magnitude scale rating for each operating nuclear reactor in the United States. If no such information exists, on what basis can such an assertion be made regarding the design of any single nuclear power plant?

Public Response: US nuclear power plants are designed for different ground motions determined on a site-specific basis, which are called the Safe Shutdown Earthquake ground motions (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Ground motion, or shaking, is a function of both earthquake magnitude and distance from the fault to the site. The magnitude alone cannot be used to predict ground motions. Currently operating nuclear power plants developed their SSEs based on a "deterministic" or "scenario earthquake" basis that account for the largest earthquake expected in the area around the plant.

Please see the available table of Design Basis Ground Motions for US Plants in the Additional Information: Useful Tables.

Additional, technical, non-public information: ADD

2. The San Onofre reactor is reportedly designed to withstand a 7.0 earthquake, and the Diablo Canyon reactor is designed to withstand a 7.5 magnitude. According to the Southern California Earthquake Center (SCEC), there is an 82% probability of an earthquake 7.0 magnitude in the next 30 years, and a 37 percent probability that an earthquake of 7.5 magnitude will occur. Shouldn't these reactors be retrofitted to ensure that they can withstand a stronger earthquake than a 7.5? If not, why not?

Public Response: This needs to be edited and enhanced. The noted SCEC magnitudes and probabilities are sourced from Uniform California Earthquake Rupture Forecast (UCERF) Figure 2 (<http://www.scec.org/core/public/scecontext.php/3935/13662>). The value quoted describes the probability that an earthquake of that magnitude will occur somewhere in Southern California. The probability that earthquakes of those magnitudes occur near the plants is far smaller. Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location.

Additional, technical, non-public information: The colors in UCERF Figure 2 represent the probabilities of having a nearby earthquake rupture (within 3 or 4 miles) of magnitude 6.7 or larger in the next 30 years. Therefore, reading the colors off of Figure 2, the San Onofre and Diablo Canyon NPPs have a $\leq 10\%$ probability of having a $\geq M6.7$ earthquake rupture within 3 to 4 miles in the next 30 years. Therefore, retrofitting these reactors to withstand earthquakes of M7.5 or stronger based on the UCERF study would put an unnecessary burden on the licensees.

3. Provide specific information regarding the differences in safety-significant structures between a nuclear power plant that is located in a seismically active area and one that is not. Provide, for each operating nuclear reactor in a seismically active area, a full list and description of the safety-significant design features that are included that are not included in similar models that are not located in seismically active areas.

Public Response: This is a rough draft. We need to get some reviews of this. Assumed NRR will have ultimate responsibility for the response.

There are no differences in safety requirements for nuclear power plants located in seismically active areas and ones that are not. Regardless of site seismicity, Appendix S to 10 CFR Part 50 requires for site-specific SSE ground motions, structures, systems, and components will remain functional and within applicable stress, strain, and deformation limits. The required safety functions of SSCs must be assured during and after the vibratory ground motion through design, testing, or qualification methods. The evaluation must take into account soil-structure interaction effects and the expected duration of the vibratory motions. Appendix S also requires that the horizontal component of the SSE ground motion in the free field at the foundation elevation of structures must be an appropriate response spectrum with peak ground acceleration (PGA) of at least 0.10g. Design basis loads for nuclear power plant structures, important to safety, include combined loads for seismic, wind, tornado, normal operating conditions (pressure and thermal), and accident conditions. Codes and standards, such as the American Institute of Concrete (ACI-349) and the American Institute of Steel Construction (AISC N690), are used in the design of nuclear power plant structures to ensure a conservative, safe design under design basis loads. In addition to the nominal seismic design, all new generation reactors have to demonstrate a seismic margin of 1.67 relative to the site-specific seismic demands.

For the current operating fleet of nuclear power reactors, site-to-site differences in structural design can result from differences in external site hazards such as seismic, wind, tornado, and tsunami. For a low-seismicity region, wind or tornado loads may control the design. Conversely, for a high-seismicity region, seismic loads will likely control. Structures in high-seismicity regions have robust designs with typically higher capacity shear walls, as an example. Systems and components will also be more robust and are designed and tested to higher levels of acceleration.

Additional, technical, non-public information: ADD

4. In your opinion, can any operating nuclear reactors in the United States withstand an earthquake of the magnitude experience in Japan?

Public Response: The March 11, 2011, magnitude 9 earthquake that recently affected Japan is different than earthquakes that could affect US nuclear plants. Each US nuclear plant is designed to a ground-shaking level that is appropriate for its location, given the possible earthquake sources that may affect the site and its tectonic environment. The Japan earthquake was caused by a "subduction zone" event, which is the type of mechanism that produces the largest possible magnitude earthquakes. In the continental US, the only subduction zone is the Cascadia subduction zone which lies off the coast of northern California, Oregon and Washington, so an earthquake this large could only happen in that region. The only plant in that area is Columbia Generating Station, which is approximately 225 miles (363 km) from the coast and the subduction zone. Outside of the Cascadia subduction zone, earthquakes are not

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expected to exceed a magnitude of approximate 8, which is 10 times smaller than a magnitude 9.

Additional, technical, non-public information: ADD

Questions for the Japanese

NOTE: These were all collected from what we produced after the KKNPP earthquake. These need to be gone through and revised for this event. We should separate into high, medium and low priorities:

The below is pulled from an KKNPP summary...to be reviewed...

- What seismic monitoring equipment exists at the plants? Can we get the recordings from the
- Are there recordings of the tsunami at the plant location?
- What is the geology and soil profile at the plants?
- NOAA has a prediction of very large tsunami waves at Onagawa. Are these accurate?

The below is pulled from an KKNPP summary...to be reviewed...

DESIGN BASES: Exactly what is the design basis ground motion for each of the plants? Did it change through time (i.e. from the first plant to the seventh)? Where was the design basis motion defined, at the top of rock, at the ground surface, at the floor level or somewhere else? Were the site-specific geotechnical properties used in the development of the design basis ground motions for each plant?

SEISMIC HAZARDS: What assumptions were used in the seismic hazard evaluation to arrive at the design basis ground motions? What faults were considered, what magnitudes and geometries were assumed? What activity rates were assumed for both fault sources and "background" earthquakes?

OBSERVATIONS-GROUND MOTIONS: What ground motions were recorded and where were they recorded? Specifically, what free-field, in-structure and down-hole recordings were obtained? What are the locations of the instruments that obtained records? Did all the instruments respond as planned, or are there lessons to be learned? Can the digital data be shared with the NRC? Is there any way of evaluating how well the existing analysis methods predicted the observed motions at different points within the plant?

OBSERVATIONS-DAMAGE: What damage was observed at the plants? How well did equipment such as cranes perform? Were there observations of displacements of equipment from anchorages, were cracks observed in any of the buildings? How well did non-nuclear safety type of buildings and equipment perform? What types of geotechnical phenomena were observed, was there ground deformation/slope failures, lateral spreading or liquefaction near the facility? Did the ABWRs perform better or similar to the older designs?

And another set from the KKNPP earthquake...to be reviewed...

Please provide the following information in the time frame indicated:

Highest Priority Questions – as soon as possible

- A timeline describing the order of events and the individual plant responses to the earthquake
- Confirmation that all operating and shut down units achieved or maintained safe-shutdown conditions without manual operator intervention or complications. Did all safety-related systems respond to the seismic scram as designed? Please note if there were any unexpected plant responses to the event, including any spurious signals.
- A more detailed description of the impacts of the earthquake on the plant (e.g., what systems were involved, which pipes were damaged, where did the leakage occur (pipe wall, joints, fittings, etc).
- A description of seismic instrumentation at the site and at each of the 7 units, soil/rock shear wave properties through depth, instrument location and mounting condition, all the recorded

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data on the basis of unified starting time, such that the coherency of motion through the surface or the foundations and at depth can be determined

- Full spectrum seismic design basis for the plant.
- What actually caused the Unit 3B house transformer fire?

Additional Questions – please provide answers as more information is developed

- Damage to buildings, slope failures, intake structure failure, if any
- Behavior of cranes, cables and conduits
- Failures of any large pumps and valves, pipe mounted control or valve failure
- Instances of any relay or vibration sensitive components malfunctioning
- Nature of damage to service water and fire-suppression piping - their diameter, material they are made of including their elastic properties, design standards used for the piping design, nature of failure (at support, anchor motion, failure of anchors, subsidence differential movement etc)
- Were there any systems that changed state?
- Impact on physical security, and any vulnerabilities identified
- Were there any impacts on the grid because of the event?
- Please describe the switchyard performance?
- What emergency preparedness concerns have been identified as a result of the event?

3B Transformer Specific Questions – please respond when there is time and other issues have been addressed

- What are the primary and secondary voltages of the transformer?
- What type of transformer - liquid or dry-type (air-cooled)?
- Who was the manufacturer of the transformer?
- What are the physical dimensions of the transformer?
- How are the transformer coils restrained within the cabinet?
- What is the clearance between transformer energized component and cabinet?
- What is the relative displacement for connection between the high voltage leads and the first anchor point (adequate slack?) in the transformer?
- What was the natural frequency of the burned transformer, if known?
- What was the acceleration level (or the response spectrum, if available) at the support location of the burned transformer?
- What seismic requirements exist for the burned transformer? Was the transformer tested or analyzed to a specific acceleration or response spectra, and if so, what are they?
- Are there any of the same type of transformer installed at other locations in the plant?

Additional Information: Useful Tables

Table of Design Basis Ground Motions for US Plants

Design Basis Earthquake Information					
Nuclear Plant By State/Location	Maximum Observed Or Inferred Intensity (MMI Scale)	Relative Distance Of Seismic Source	Design SSE Peak Acceleration, <i>g</i>	OBE Peak Acceleration, <i>g</i>	Soil Condition
New York					
Fitzpatrick	VI	Near	0.15	0.08	Soil
GINNA 1	VIII/IX	>60 miles	0.2	0.08	Rock
Indian Point 2, 3	VII	Near	0.15	0.1	Rock
Nine Mile Point 1	IX-X	>60 miles	0.11	0.06	Rock
Nine Mile Point 2	VI	Near	0.15	0.075	Rock
New Jersey					
Salem 1,2	VII-VIII	Near	0.2	0.1	Deep Soil
Connecticut					
Millstone 1, 2, 3	VII	Near	0.17	0.07	Rock
Vermont					
Vermont Yankee	VI	Near	0.14	0.07	Rock
Ohio					
Davis Besse 1	VII	Near	0.15	0.08	Rock
Perry 1	VII	Near	0.15	0.08	Rock
Georgia					
Hatch 1, 2	VII	Near	0.15	0.08	Deep Soil
Vogtle 1, 2	VII-VIII	Near	0.2	0.12	Deep Soil
Tennessee					
Sequoyah 1, 2	VIII	Near	0.18	0.09	Rock
Watts Bar 1	VIII	Near	0.18	0.09	Rock
California					
San Onofre 2, 3	IX-X	Near	0.67	0.34	Soil
Diablo Canyon 1, 2	X-XI	Near	0.75	0.20	Rock
Florida					

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Crystal River 3	V	Near	0.10	0.05	Rock
St. Lucie 1, 2	VI	Near	0.10	0.05	Soil
Turkey Point 3, 4	VII	Near	0.15	0.05	Rock

NOTES:

MMI=Modified Mercalli Intensity, a measure of observed/reported damage and severity of shaking.
Relative distance measure used in FSAR to develop SSE acceleration, "Near" indicates distance less than 10 miles.

SSE=Safe Shutdown Earthquake ground motion, for horizontal acceleration, in units of earth's gravity, *g*.

OBE=Operating Basis Earthquake ground motion, level of horizontal acceleration, which if exceeded requires plant shutdown.

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Table of SSE, OBE and Tsunami Water Levels

Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration, (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Alabama			
Browns Ferry	0.200	0.100	N/A (Non-Coastal)
Farley	0.100	0.050	N/A (Non-Coastal)
Arkansas			
Arkansas Nuclear	0.200		N/A (Non-Coastal)
Arizona			
Palo Verde	0.200	0.100	N/A (Non-Coastal)
California			
Diablo Canyon	0.400	0.200	The design basis maximum combined wave runup is the greater of that determined for near-shore or distantly-generated tsunamis, and results from near-shore tsunamis. For distantly-generated tsunamis, the combined runup is 30 feet. For near-shore tsunamis, the combined wave runup is 34.6 feet, as determined by hydraulic model testing. The safety-related equipment is installed in watertight compartments to protect it from adverse sea wave events to elevation +48 feet above mean lower low water line (MLLWL).
San Onofre	0.670	0.340	The controlling tsunami occurs during simultaneous high tide and storm surge produces a maximum runup to elevation +15.6 feet mean lower low water line (MLLWL) at the Unit 2 and 3 seawall. When storm waves are superimposed, the predicted maximum runup is to elevation +27 MLLWL. Tsunami protection for the SONGS site is provided by a reinforced concrete seawall constructed to elevation +30.0 MLLWL.
Connecticut			
Millstone	0.170	0.090	18 ft SWL
Florida			
Crystal River	0.050	0.025	N/A (Non-Coastal)

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
St. Lucie	0.100	0.050	No maximum tsunami level, bounded by PMH surge of +18 MLW wave runup, with plant openings at +19.5 MLW
Turkey Point	0.150	0.050	No maximum tsunami level, bounded by PMH surge of +18.3 MLW water level, site protected to +20 MLW with vital equipment protected to +22 MLW
Georgia			
Hatch	0.150	0.080	N/A (Non-Coastal)
Vogtle	0.200	0.120	N/A (Non-Coastal)
Illinois			
Braidwood	0.200	0.090	N/A (Non-Coastal)
Byron	0.200	0.090	N/A (Non-Coastal)
Clinton	0.250	0.100	N/A (Non-Coastal)
Dresden	0.200	0.100	N/A (Non-Coastal)
LaSalle	0.200	0.100	N/A (Non-Coastal)
Quad Cities	0.240	0.120	N/A (Non-Coastal)
Iowa			
Duane Arnold	0.120	0.060	N/A (Non-Coastal)
Kansas			
Wolf Creek	0.120	0.060	N/A (Non-Coastal)
Louisiana			
River Bend	0.100	0.050	
Waterford	0.100		Floods – 30 feet MSL
Maryland			
Calvert Cliffs	0.150	0.080	14 ft design wave
Massachusetts			
Pilgrim	0.150	0.080	*Storm flooding design basis - 18.3ft
Michigan			
D.C. Cook	0.200	0.100	N/A
Fermi	0.150	0.080	N/A
Palisades	0.200	0.100	N/A

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Missouri			
Callaway	0.200		N/A (Non-Coastal)
Mississippi			
Grand Gulf	0.150	0.075	N/A
Minnesota			
Monticello	0.120	0.060	N/A (Non-Coastal)
Prarie Island	0.120	0.060	N/A (Non-Coastal)
Nebraska			
Cooper	0.200	0.100	N/A (Non-Coastal)
Fort Calhoun	0.170	0.080	N/A (Non-Coastal)
New York			
Fitzpatrick	0.150	0.080	N/A (Non-Coastal)
Ginna	0.200	0.080	N/A
Indian Point	0.150	0.100	15 ft msl
Nine Mile Point, Unit 1	0.110	0.060	N/A
Nine Mile Point, Unit 2	0.150	0.075	N/A
New Hampshire			
Seabrook	0.250	0.125	(+) 15.6' MSL Still Water Level (Tsunami Flooding -Such activity is extremely rare on the US Atlantic coast and would result in only minor wave action inside the harbor.)
New Jersey			
Hope Creek	0.200	0.100	35.4 MSL The maximum probable tsunami produces relatively minor water level changes at the site. The maximum runup height reaches an elevation of 18.1 feet MSL with coincident 10 percent exceedance high tide)
Oyster Creek	0.184	0.092	(+) 23.5' MSL Still Water Level (Probable Maximum Tsunami - Tsunami events are not typical of the eastern coast of the United States and have not, therefore, been addressed.)

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Salem	0.200	0.100	21.9 MSL (There is no evidence of surface rupture in East Coast earthquakes and no history of significant tsunami activity in the region)
North Carolina			
Brunswick	0.160	0.030	N/A
McGuire	0.150	0.080	N/A (Non-Coastal)
Shearon Harris	0.150		N/A (Non-Coastal)
Ohio			
Davis-Besse	0.150	0.080	N/A
Perry	0.150	0.080	N/A
Pennsylvania			
Beaver Valley	0.130	0.060	N/A (Non-Coastal)
Limerick	0.150	0.075	N/A (Non-Coastal)
Peach Bottom	0.120	0.050	N/A (Non-Coastal)
Three Mile Island	0.120	0.060	N/A (Non-Coastal)
Susquehanna	0.150	0.080	N/A (Non-Coastal)
South Carolina			
Catawba	0.150	0.080	N/A (Non-Coastal)
Oconee	0.150	0.050	N/A (Non-Coastal)
Robinson	0.200	0.100	N/A (Non-Coastal)
V.C. Summer	0.250	0.150	N/A (Non-Coastal)
Tennessee			
Sequoyah	0.180	0.090	N/A (Non-Coastal)
Watts Bar, Unit 1	0.180	0.090	N/A (Non-Coastal)
Texas			
Comanche Peak	0.120	0.060	N/A
South Texas Project	0.100	0.050	N/A
Vermont			

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Nuclear Plant Name By State/ Location	Safe Shutdown Earthquake (SSE) Peak Acceleration (g)	Operating Basis Earthquake (OBE) Peak Acceleration (g)	Probable Maximum Tsunami OR Maximum Tsunami Water Level
Vermont Yankee	0.140	0.070	N/A
Virginia			
North Anna	0.180		N/A
Surry	0.150	0.080	N/A
Washington			
Columbia	0.250		N/A (Non-Coastal)
Wisconsin			
Kewaunee	0.120	0.060	N/A
Point Beach	0.120		N/A
Definition of Safe Shutdown Earthquake	The safe-shutdown earthquake (SSE) for the site is the ground motion response spectra (GMRS), which also satisfies the minimum requirement of paragraph IV(a)(1)(i) of Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," to Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the Code of Federal Regulations (10 CFR Part 50).		
Definition of Operating Basis Earthquake:	<p>To satisfy the requirements of paragraph IV(a)(2)(A) of Appendix S to 10 CFR Part 50, the operating-basis earthquake (OBE) ground motion is defined as follows:</p> <ul style="list-style-type: none"> (i) For the certified design portion of the plant, the OBE ground motion is one-third of the CSDRS. (ii) For the safety-related noncertified design portion of the plant, the OBE ground motion is one-third of the design motion response spectra, as stipulated in the design certification conditions specified in design control document (DCD). (iii) The spectrum ordinate criterion to be used in conjunction with Regulatory Guide 1.166, "Pre-Earthquake Planning and Immediate Nuclear Power Plant Operator Post-earthquake Actions," issued March 1997, is the lowest of (i) and (ii). 		

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Table of Plants Near Known Active Faults

It should be noted that in much of the Central and Eastern US, the seismicity comes from "background" seismicity. Background seismicity is earthquake activity, where the earthquakes cannot be tied to known faults.

Jon Ake and Dogan Seber to complete. High priority to support chairman in response to questions asked by congress.

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Plant (state)	Nearest Active Fault or Fault Zone	Distance to Fault or Range of Distances to Zones	Type of Faulting Mechanism	Range of Maximum Magnitude (M _w)	OBE (g)	SSE (g)
Columbia						
Diablo Canyon (CA)	Hosgri Fault	5 miles	Predominantly Strike Slip	7.5		
	Shoreline Fault	0.5 miles	Strike Slip	6.25 to 6.75 best estimate by NRC staff in RIL 09-001. Final report on the fault in review by NRC staff		
San Onofre (CA)						
Comanche Peak	Meers					

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Table From GI-199 Program Containing SSE, SSE Exceedance Frequencies, Review Level Earthquakes, and Seismic Core Damage Frequencies

Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Arkansas 1	05000313	0.2	2.8E-04	0.3	4.1E-06	0.3g full-scope EPRI SMA	GI-199
Arkansas 2	05000368	0.2	9.7E-05	0.3	4.1E-06	0.3g focused-scope EPRI SMA	GI-199
Beaver Valley 1	05000334	0.12	3.3E-04	n/a	4.8E-05	seismic PRA	GI-199
Beaver Valley 2	05000412	0.12	2.7E-04	n/a	2.2E-05	seismic PRA	GI-199
Braidwood 1	05000456	0.2	6.7E-05	0.3	7.3E-06	0.3g focused-scope EPRI SMA	GI-199
Braidwood 2	05000457	0.2	6.7E-05	0.3	7.3E-06	0.3g focused-scope EPRI SMA	GI-199
Browns Ferry 1	05000259	0.2	2.5E-04	0.3	3.7E-06	0.3g focused-scope EPRI SMA	GI-199
Browns Ferry 2	05000260	0.2	2.5E-04	0.26	5.4E-06	0.3g focused-scope EPRI SMA	GI-199
Browns Ferry 3	05000296	0.2	2.5E-04	0.26	5.4E-06	0.3g focused-scope EPRI SMA	GI-199
Brunswick 1	05000325	0.16	7.3E-04	0.3	1.5E-05	0.3g focused-scope EPRI SMA	GI-199
Brunswick 2	05000324	0.16	7.3E-04	0.3	1.5E-05	0.3g focused-scope EPRI SMA	GI-199
Byron 1	05000454	0.2	5.2E-05	0.3	5.8E-06	0.3g focused-scope EPRI SMA	GI-199
Byron 2	05000455	0.2	5.2E-05	0.3	5.8E-06	0.3g focused-scope EPRI SMA	GI-199
Callaway	05000483	0.2	3.8E-05	0.3	2.0E-06	0.3g focused-scope EPRI SMA	GI-199
Calvert Cliffs 1	05000317	0.15	1.9E-04	n/a	1.0E-05	seismic PRA	GI-199
Calvert Cliffs 2	05000318	0.15	1.9E-04	n/a	1.2E-05	seismic PRA	GI-199
Catawba 1	05000413	0.15	1.4E-04	n/a	3.7E-05	seismic PRA	GI-199
Catawba 2	05000414	0.15	1.4E-04	n/a	3.7E-05	seismic PRA	GI-199
Clinton	05000461	0.25	5.8E-05	0.3	2.5E-06	0.3g focused-scope EPRI SMA	GI-199
Columbia	05000397	0.25	1.7E-04	n/a	2.1E-05	seismic PRA	IPEEE
Comanche Peak 1	05000445	0.12	1.6E-05	0.12	4.0E-06	reduced-scope EPRI SMA; SSE = 0.12g	GI-199
Comanche	05000446	0.12	1.6E-05	0.12	4.0E-06	reduced-scope EPRI SMA; SSE =	GI-199

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Peak 2						0.12g	
Cooper	05000298	0.2	1.5E-04	0.3	7.0E-06	0.3g focused-scope EPRI SMA	GI-199
Crystal River 3	05000302	0.1	8.9E-05	0.1	2.2E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
D.C. Cook 1	05000315	0.2	2.1E-04	n/a	2.2E-05	seismic PRA	GI-199
D.C. Cook 2	05000316	0.2	2.1E-04	n/a	2.2E-05	seismic PRA	GI-199
Davis Besse	05000346	0.15	6.3E-05	0.26	6.7E-06	reduced-scope EPRI SMA	GI-199
Diablo Canyon 1	05000275	0.75	2.0E-04	n/a	4.1E-05	seismic PRA	IPEEE
Diablo Canyon 2	05000323	0.75	2.0E-04	n/a	4.1E-05	seismic PRA	IPEEE
Dresden 2	05000237	0.2	9.7E-05	0.26	1.9E-05	0.3g focused-scope EPRI SMA	GI-199
Dresden 3	05000249	0.2	9.7E-05	0.26	1.9E-05	0.3g focused-scope EPRI SMA	GI-199
Duane Arnold	05000331	0.12	2.3E-04	0.12	3.2E-05	reduced-scope EPRI SMA; SSE = 0.12g	GI-199
Farley 1	05000348	0.1	1.0E-04	0.1	2.8E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Farley 2	05000364	0.1	1.0E-04	0.1	2.8E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Fermi 2	05000341	0.15	1.0E-04	0.3	4.2E-06	0.3g focused-scope EPRI SMA	GI-199
Fitzpatrick	05000333	0.15	3.2E-04	0.22	6.1E-06	0.3g focused-scope NRC SMA	GI-199
Fort Calhoun 1	05000285	0.17	3.7E-04	0.25	5.4E-06	0.3g focused-scope NRC SMA	GI-199
Ginna	05000244	0.2	1.0E-04	0.2	1.3E-05	0.3g focused-scope EPRI SMA	GI-199
Grand Gulf	05000416	0.15	1.0E-04	0.15	1.2E-05	reduced-scope EPRI SMA; SSE = 0.15g	GI-199
Hatch 1	05000400	0.148	3.9E-04	0.29	2.3E-06	0.3g focused-scope EPRI SMA	GI-199
Hatch 2	05000321	0.15	2.7E-04	0.3	2.5E-06	0.3g focused-scope EPRI SMA	GI-199

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Hope Creek	05000366	0.2	9.7E-05	0.3	2.5E-06	0.3g focused-scope EPRI SMA	GI-199
Indian Point 2	05000354	0.15	4.9E-04	n/a	2.8E-06	seismic PRA	GI-199
Indian Point 3	05000247	0.15	4.9E-04	n/a	3.3E-05	seismic PRA	GI-199
Kewaunee	05000286	0.12	2.8E-04	n/a	1.0E-04	seismic PRA	GI-199
LaSalle 1	05000305	0.2	1.7E-04	n/a	5.1E-06	seismic PRA	GI-199
LaSalle 2	05000373	0.2	1.7E-04	n/a	2.8E-06	seismic PRA	GI-199
Limerick 1	05000374	0.15	1.8E-04	n/a	2.8E-06	seismic PRA	GI-199
Limerick 2	05000352	0.15	1.8E-04	0.15	5.3E-05	reduced-scope EPRI SMA	GI-199
McGuire 1	05000353	0.15	9.5E-05	0.15	5.3E-05	reduced-scope EPRI SMA	GI-199
McGuire 2	05000369	0.15	9.5E-05	n/a	3.1E-05	seismic PRA	GI-199
Millstone 1	05000370	0.254	9.3E-05	n/a	3.1E-05	seismic PRA	GI-199
Millstone 2	05000336	0.17	8.3E-05	0.25	1.1E-05	0.3g focused-scope EPRI SMA	GI-199
Millstone 3	05000423	0.17	8.3E-05	n/a	1.5E-05	seismic PRA	GI-199
Monticello	05000263	0.12	9.3E-05	0.12	1.9E-05	modified focused/expended reduced-scope EPRI SMA	GI-199
Nine Mile Point 1	05000220	0.11	1.5E-04	0.27	4.2E-06	0.3g focused-scope EPRI SMA	GI-199
Nine Mile Point 2	05000410	0.15	4.8E-05	0.23	5.6E-06	SPRA and focused-scope EPRI SMA	GI-199
North Anna 1	05000338	0.12	2.1E-04	0.16	4.4E-05	0.3g focused-scope EPRI SMA	GI-199
North Anna 2	05000339	0.12	2.1E-04	0.16	4.4E-05	0.3g focused-scope EPRI SMA	GI-199
Oconee 1	05000269	0.1	9.7E-04	n/a	4.3E-05	seismic PRA	GI-199
Oconee 2	05000270	0.1	9.7E-04	n/a	4.3E-05	seismic PRA	GI-199
Oconee 3	05000287	0.1	9.7E-04	n/a	4.3E-05	seismic PRA	GI-199
Oyster Creek	05000219	0.17	1.5E-04	n/a	1.4E-05	seismic PRA	GI-199
Palisades	05000255	0.2	1.4E-04	n/a	6.4E-06	seismic PRA	GI-199
Palo Verde 1	05000528	0.258	3.5E-05	0.3	3.8E-05	0.3g full-scope EPRI SMA	IPEEE
Palo Verde 2	05000529	0.258	3.5E-05	0.3	3.8E-05	0.3g full-scope EPRI SMA	IPEEE

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEE Method	Source
Palo Verde 3	05000530	0.258	3.5E-05	0.3	3.8E-05	0.3g full-scope EPRI SMA	IPEEE
Peach Bottom 2	05000277	0.12	2.0E-04	0.2	2.4E-05	modified focused-scope EPRI SMA	GI-199
Peach Bottom 3	05000278	0.12	2.0E-04	0.2	2.4E-05	modified focused-scope EPRI SMA	GI-199
Perry	05000440	0.15	2.2E-04	0.3	2.1E-05	0.3g focused-scope EPRI SMA	GI-199
Pilgrim 1	05000293	0.15	8.1E-04	n/a	6.9E-05	seismic PRA	GI-199
Point Beach 1	05000266	0.12	2.0E-04	n/a	1.1E-05	seismic PRA	GI-199
Point Beach 2	05000301	0.12	2.0E-04	n/a	1.1E-05	seismic PRA	GI-199
Prairie Island 1	05000282	0.12	2.0E-04	0.28	3.0E-06	0.3g focused-scope EPRI SMA	GI-199
Prairie Island 2	05000306	0.12	2.0E-04	0.28	3.0E-06	0.3g focused-scope EPRI SMA	GI-199
Quad Cities 1	05000254	0.24	8.2E-04	0.09	2.7E-05	0.3g focused-scope EPRI SMA	GI-199
Quad Cities 2	05000265	0.24	8.2E-04	0.09	2.7E-05	0.3g focused-scope EPRI SMA	GI-199
River Bend	05000458	0.1	2.4E-04	0.1	2.5E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Robinson (HR)	05000261	0.2	1.1E-03	0.28	1.5E-05	0.3g full-scope EPRI SMA	GI-199
Saint Lucie	05000335	0.1	1.4E-04	0.1	4.6E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Salem 1	05000389	0.2	2.6E-04	0.1	4.6E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Salem 2	05000272	0.2	2.6E-04	n/a	9.3E-06	seismic PRA	GI-199
San Onofre 2	05000361	0.67	1.2E-04	n/a	1.7E-05	seismic PRA	IPEEE
San Onofre 3	05000362	0.67	1.2E-04	n/a	1.7E-05	seismic PRA	IPEEE
Seabrook	05000311	0.25	1.3E-04	n/a	9.3E-06	seismic PRA	GI-199
Sequoyah 1	05000443	0.18	7.1E-04	n/a	2.2E-05	seismic PRA	GI-199
Sequoyah 2	05000327	0.18	7.1E-04	0.27	5.1E-05	0.3g full-scope EPRI SMA	GI-199
Shearon Harris 1	05000328	0.15	4.6E-05	0.27	5.1E-05	0.3g full-scope EPRI SMA	GI-199
South Texas 1	05000498	0.1	3.0E-05	n/a	6.2E-06	seismic PRA	GI-199

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Plant	Docket	SSE (g's)	Frequency of Exceeding the SSE (per year)	RLE (HCLPF) (g's)	Seismic Core Damage Frequency (per year)	IPEEC Method	Source
South Texas 2	05000499	0.1	3.0E-05	n/a	6.2E-06	seismic PRA	GI-199
Summer	05000395	0.15	3.9E-04	0.22	3.8E-05	0.3g focused-scope EPRI SMA	GI-199
Surry 1	05000280	0.15	2.2E-04	n/a	5.7E-06	seismic PRA	GI-199
Surry 2	05000281	0.15	2.2E-04	n/a	5.7E-06	seismic PRA	GI-199
Susquehanna 1	05000387	0.1	1.9E-04	0.21	1.3E-05	0.3g focused-scope EPRI SMA	GI-199
Susquehanna 2	05000388	0.1	1.9E-04	0.21	1.3E-05	0.3g focused-scope EPRI SMA	GI-199
Three Mile Island 1	05000289	0.12	1.0E-04	n/a	4.0E-05	seismic PRA	GI-199
Turkey Point 3	05000250	0.15	3.8E-05	0.15	1.0E-05	site-specific approach; SSE=0.15g	GI-199
Turkey Point 4	05000251	0.15	3.8E-05	0.15	1.0E-05	site-specific approach; SSE=0.15g	GI-199
Vermont Yankee	05000271	0.14	1.2E-04	0.25	8.1E-06	0.3g focused-scope EPRI SMA	GI-199
Vogtle 1	05000424	0.2	1.5E-04	0.3	1.8E-05	0.3g focused-scope EPRI SMA	GI-199
Vogtle 2	05000425	0.2	1.5E-04	0.3	1.8E-05	0.3g focused-scope EPRI SMA	GI-199
Waterford 3	05000382	0.1	1.1E-04	0.1	2.0E-05	reduced-scope EPRI SMA; SSE = 0.1g	GI-199
Watts Bar	05000390	0.18	2.9E-04	0.3	3.6E-05	0.3g focused-scope EPRI SMA	GI-199
Wolf Creek	05000482	0.12	3.7E-05	0.2	1.8E-05	reduced-scope EPRI SMA	GI-199
25th percentile			9.6E-05		6.0E-06		
min			1.6E-05		2.0E-06		
median			1.7E-04		1.5E-05		
mean			3.1E-04		2.1E-05		
max			3.9E-03		1.0E-04		
75th percentile			2.6E-04		3.2E-05		

Design Basis Ground Motions and New Review Level Ground Motions Used for Review of Japanese Plants

Plant sites	Contributing earthquakes	New DBGM S ₁	Original DBGM S ₂
Tomari	Earthquakes undefined specifically	550 Gal	370 Gal
Onagawa	Soutei Miyagiken-oki (M8.2)	580	375
Higashidoori	Earthquakes undefined specifically	450	375
Fukushima	Earthquake near the site (M7.1)	600	370
Tokai	Earthquakes undefined specifically	600	380
Hamaoka	Assumed Tokai (M8.0), etc.	800	600
Shika	Sasanami-oki Fault (M7.6)	600	490
Tsuruga	Urazoko-Uchiikemi Fault (M6.9), etc. → Mera-Kareizaki - Kaburagi(M7.8), Shelf edge+B+Nosaka (M7.7)	800	532
Mihama	C, Fo-A Fault (M6.9)→ Shelf edge+B+Nosaka(M7.7)	750	405
Ohi	C, Fo-A Fault (M6.9)→Fo-A+Fo-B (M7.4)	700	405
Takahama	Fo-A Fault (M6.9) →Fo-A+Fo-B(M7.4)	550	370
Shimane	Shinji Fault (M7.1)	600	456
Ikata	Central Tectonic Structure (M7.6)	570	473
Genkai	Takekoba F. (M6.9) → Enhanced uncertainty consideration	540	370
Sendai	Gotandagawa F.(M6.9), F-A(M6.9)	540	372
Kashiwazaki-Kariwa	F-B Fault (M7.0), Nagaoka-plain-west Fault (M8.1)	2300 (R1 side) 1209 (R5 side)	450
Monjyu (Proto Type FBR)	Shiraki-Niu F.(M6.9) , C F.(M6.9)→Shelf edge+B+Nosaka(M7.7), Small Damping	760	408
Shimokita Reprocessing F.	Deto-Seiho F.(M6.8), Yokohama F.(M6.8)	450	320

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Status of Review of Japanese NPPs to New Earthquake Levels Based on 2006 Guidance

Utility	Site (Unit)	Type	Dec.2010
Hokkaido	Tomari	PWR	△
Tohoku	Onagawa (Unit1)	BWR	◎
	Higashi-dori	BWR	△
Tokyo	Kashiwazaki-Kariwa	BWR	Unit 1,5,6,7 ◎
	Fukushima-No1	BWR	Unit 3 ◇, 5 ◎
	Fukushima-No2	BWR	Unit 4,5 ◎
Chubu	Hamaoka	BWR	△
Hokuriku	Shika (Unit 2)	BWR	◎
Kansai	Mihama(Unit 1)	PWR	◎
	Ohi(Unit 3,4)	PWR	◎
	Takahama (Unit 3,4)	PWR	◎
Chugoku	Shimane (Unit 1, 2)	BWR	◎
Shikoku	Ikata (Unit 3)	PWR	◎
Kyushu	Genkai (Unit 3)	PWR	◎
	Sendai (Unit 1)	PWR	◎
Japan Atomic Power	Tokai-Daini	BWR	○
	Tsuruga	BWR/PWR	△
JAEA	Monju	Proto Type FBR	◎
Japan Nuc. Fuel	Rokkasyo	Reprocessing	◎

◎: NSC review finished, ○: NISA review finished and in NSC review, △: Under review by NISA

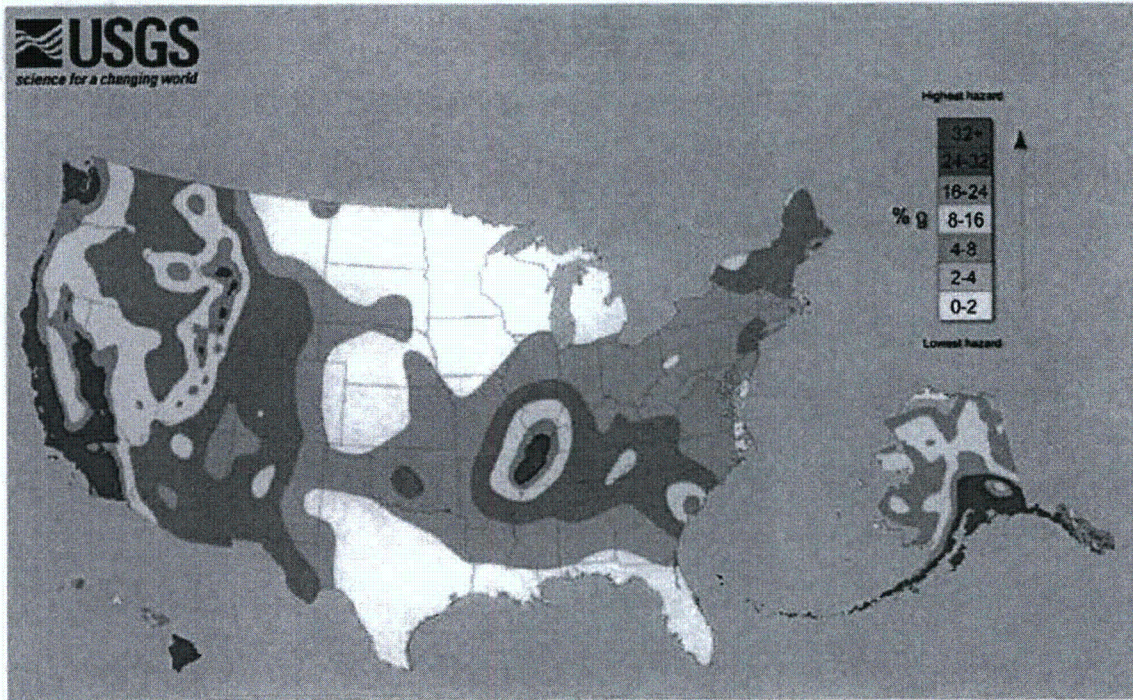
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Nuclear Plants in the US Compared to the USGS National Seismic Hazard Maps

Dogan to create the map

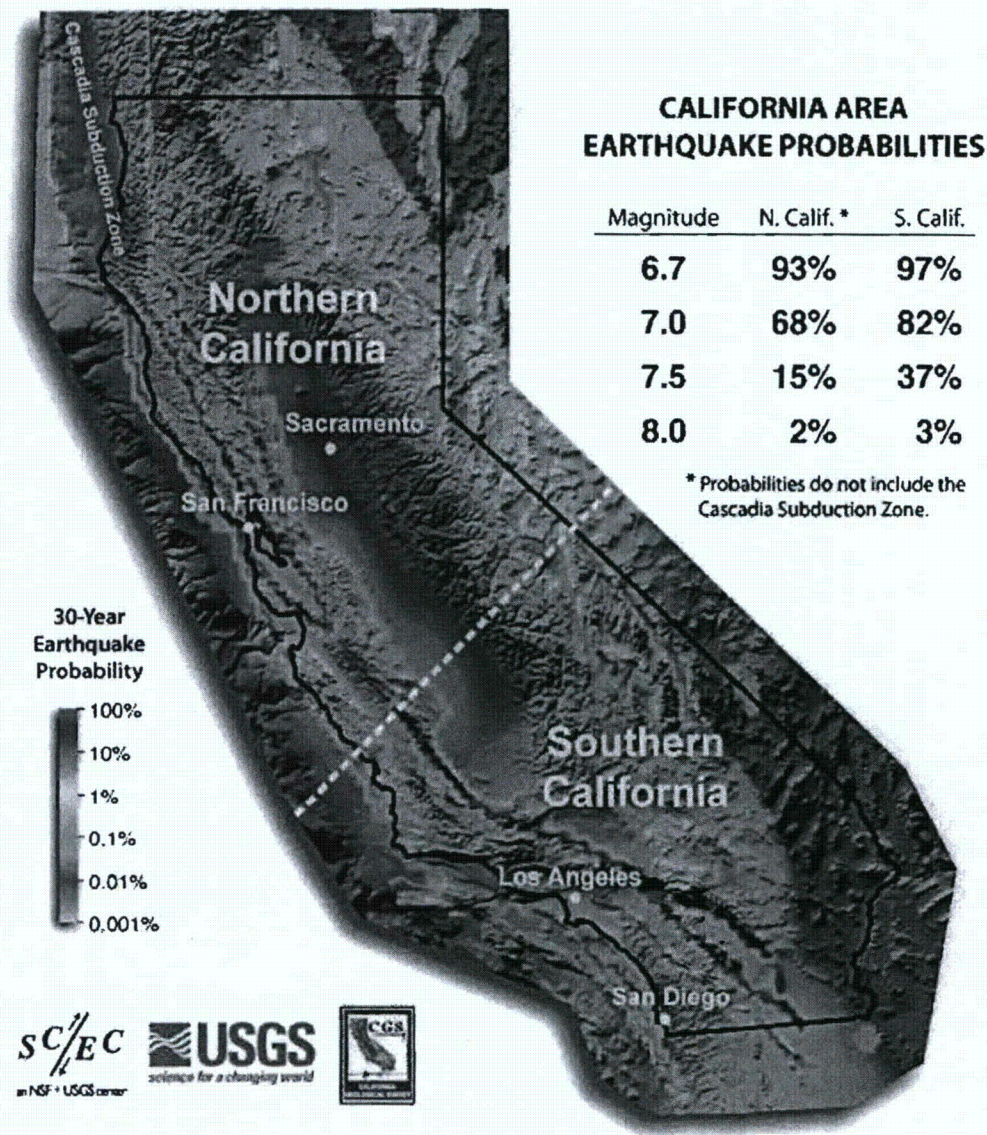
USGS US National Seismic Hazard Maps

Many version of this map are available at the USGS website at <http://earthquake.usgs.gov/hazards/>



UCERF Map of California Earthquake Probabilities for Northern versus Southern California

This is included in this document as Markey (inappropriately) used the below statistics to say that the probability of a magnitude 7 at SONGS was 82%. The dashed line of this California map is the boundary between northern and southern California used in the UCERF study. As shown in the table, the 30-year probability of an earthquake of magnitude 7.5 or larger is higher in the southern half of the state (37%) than in the northern half (15%).



Plot of Nuclear Plants in the US Compared to Recent Earthquakes

Not sure of the date on this...It's an awesome plot. can we get this updated with a date? Who made this originally (NRO?RES?)

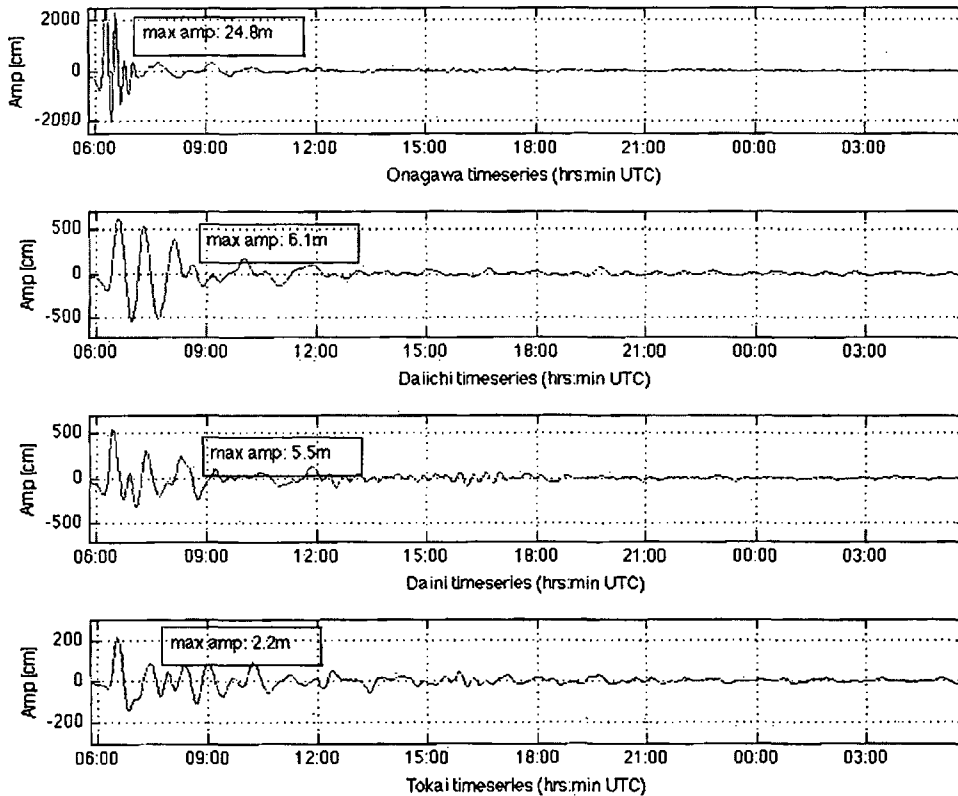


Plot of Tsunami Wave Heights at the Japanese Plants (unofficial from NOAA)

The below plots were developed for NRC seismic staff a few hours after the earthquake and tsunami by the PMEL group of NOAA. This group is responsible for scientific development of the models and tools used by the US tsunami warning system, as well as notification elements of system itself.

On 3/16/11, the PMEL NOAA team informed NRC staff that additional analyses have generally confirmed the below estimates and so they don't expect the final official numbers at the plant locations to change much.

Offshore wave amplitudes, scaled to the coastline



Additional Information: Fact Sheets

Fact Sheet: Summarization of the NRC's Regulatory Framework for Seismic Safety

Draft: under review by Meena, Kamal, Goutam and Nilesh

Currently Operating Reactors (licensed prior to 1997):

The seismic regulatory basis for licensing of the currently operating nuclear power reactors is contained in the following regulations: 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," including the "General Design Criteria for Nuclear Power Plants," and 10 CFR Part 100 ("Seismic and Geologic Siting Criteria For Nuclear Power Plants") and Appendix A to that Part which describes general criteria that guide the evaluation of the suitability of proposed sites for nuclear power plants.

General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," in Appendix A requires that the structures, systems, and components (SSCs) important to safety be designed to withstand the effects of earthquakes, tsunamis, and seiches without loss of capability to perform their intended safety functions. The earthquake which could cause the maximum vibratory ground motion at the site is designated the **Safe Shutdown Earthquake (SSE)**.

Each plant is designed to a ground-shaking level (the SSE) that is appropriate for its location, given the possible earthquake sources that may affect the site and its tectonic environment. Ground shaking is a function of both the magnitude of an earthquake and the distance from the fault to the site. The magnitude alone cannot be used to predict ground motions. The existing plants were designed on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquake expected in the area around the plant based on an assessment of earthquakes that had occurred in the region historically. There is no specification of frequency of occurrence in the deterministic approach. GDC 2 and other design criteria require that the design include sufficient margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. There is no requirement for a periodic reassessment of the seismic design basis.

Proposed New Reactors (submitted after 1997):

In 1997 new rules governing reactor siting were established. 10 CFR Part 50, 100.23 and Appendix S establish the seismic design basis for plants licensed after January 10, 1997. Similar to pre-1997, Appendix S defines the SSE as "*the Safe-shutdown earthquake ground motion is the vibratory ground motion for which certain structures, systems, and components must be designed to remain functional.*" 10 CFR Part 100.23 "Geologic and Seismic Siting Criteria" requires that the applicant determine the SSE **and its uncertainty**, the potential for surface tectonic and nontectonic deformations. Regulatory Guide 1.165 (and subsequently Regulatory Guide 1.208) provides guidance on satisfying 10 CFR Part 100.23, one of which is performing a probabilistic seismic hazard assessment (PSHA).

Appendix S to 10 CFR Part 50 requires for SSE ground motions, SSCs will remain functional and within applicable stress, strain, and deformation limits. The required safety functions of SSCs must be assured during and after the vibratory ground motion through design, testing, or qualification methods. The evaluation must take into account soil-structure interaction effects and the expected duration of the vibratory motions. Appendix S also requires that the horizontal component of the SSE ground motion in

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the free field at the foundation elevation of structures must be an appropriate response spectrum with a peak ground acceleration (PGA) of at least 0.10g. Design basis loads for nuclear power plant structures, important to safety, include combined loads for seismic, wind, tornado, normal operating conditions (pressure and thermal), and accident conditions. Codes and standards, such as the American Institute of Concrete (ACI-349) and the American Institute of Steel Construction (AISC N690), are used in the design of nuclear power plant structures to ensure a conservative, safe design under design basis loads.

In contrast to the deterministic approach used prior to 1997, the probabilistic method is used and explicitly accounts for possible earthquakes of various magnitudes that come from all plausible potential sources (including background seismicity) and the likelihood that each particular hypothetical earthquake occurs. The PSHA process provides a complete characterization of the ground motion and comprehensively addresses uncertainties in nuclear power plant seismic demands. The PSHA results are major input to seismic risk evaluation using either SPRA or SMA approaches. As for plants licensed prior to 1997, there is no requirement for a periodic reassessment of the seismic design basis.

In addition to the nominal seismic design, all new generation reactors have to demonstrate a **Seismic margin of 1.67** relative to the site-specific seismic demands. These designs are required to perform a Probabilistic Risk Assessment (PRA) based seismic margins analysis (SMA) to identify the vulnerabilities of their design to seismic events. The minimum high confidence, low probability of failure (HCLPF) for the plant should be at least 1.67 times the ground motion acceleration of the design basis safe-shutdown earthquake (SSE).

The Standard Review Plan (NUREG-0800), Regulatory Guides and Interim Staff Guidance provide the basis for staff reviews of existing reactors and new license applications.

Fact Sheet: Summarization of Seismological Information from Regional Instrumentation

Placeholder: to be developed.

Fact Sheet: Protection of Nuclear Power Plants against Tsunami Flooding

Nuclear power plants are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions. The word tsunami literally means harbor wave. Tsunamis can be generated by large offshore earthquakes (usually greater than magnitude 6.5), submarine or on shore land slides or volcanoes. Some large onshore earthquakes close to the shoreline can generate tsunamis. The Nuclear Regulatory Commission (NRC) requires all nuclear power plants to be protected against earthquakes, tsunamis and other natural hazards.

Background

Protection against tsunami effects was required for all operating plants and is required for all new reactors. Following the Indian Ocean tsunami on December 26, 2004, the President moved to protect lives and property by launching an initiative to improve domestic tsunami warning capabilities. This plan was placed under the auspices of the National Science and Technology Council through the President's initiative in July 2005 in the context of a broad national effort of tsunami risk reduction, and United States participated in international efforts to reduce tsunami risk worldwide. In response to the president's initiative, the NRC reviewed its licensing criteria and conducted independent studies and participated in international forums under the auspices of the International Atomic Energy Agency with many participating countries including India and Japan. The final report of the study was published in April 2009 as NUREG/CR 6966, "Tsunami Hazard Assessment at Nuclear Power Plant Sites in the United States of America," ADAMS Accession # ML0915901933. NRC revised its Standard Review Plan for conducting safety reviews of nuclear power plants in 2007. Section 2.4.6 specifically addresses tsunamis. The Office of Nuclear Regulatory Research is conducting tsunami studies in collaboration with the United States Geological Survey and has published a report on tsunami hazard in the Atlantic, Gulf and Pacific coastal areas. Selected nuclear power plants now get tsunami warning notification. The agency requires plant designs to withstand the effects of natural phenomena including effects of tsunamis. The agency's requirements, including General Design Criteria for licensing a plant, are described in Title 10 of the *Code of Federal Regulations* (10 CFR). These license requirements consist of incorporating margins in the initiating hazard and additional margins are due to traditional engineering practices such as "safety factors." Practices such as these add an extra element of safety into design, construction, and operations.

The NRC has always required licensees to design, operate, and maintain safety-significant structures, systems, and components to withstand the effects of natural hazards and to maintain the capability to perform their intended safety functions. The agency ensures these requirements are satisfied through the licensing, reactor oversight, and enforcement processes.

Tsunami Hazard Evaluation

Tsunami hazard evaluation is one component of the complete hydrological review requirements provided in the Standard Review Plan under Chapter 2.4. The safety determination of reactor sites require consideration of major flood causing events, including consideration of combined flood causing conditions. These conditions include Probable Maximum Flood (PMF) on Streams and Rivers, Potential Dam Failures, Probable Maximum Surge and Seiche Flooding and Probable Maximum Tsunami Hazards, among others. The most significant flooding event is called the design basis flood and flooding protection requirements are correlated to this flood level in 2.4.10.

The Probable Maximum Tsunami (PMT) is defined as that tsunami for which the impact at the site is derived from the use of best available scientific information to arrive at a set of scenarios reasonably expected to affect the nuclear power plant site taking into account (a) appropriate consideration of the most severe of the natural phenomena that have been historically reported or determine from geological and physical data for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (b) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (c) the importance of the safety functions to be performed.

Site-specific tsunami data are collected from historical tsunami records, paleotsunami evidence, regional tsunami assessments, site-specific tsunami mechanisms, site-specific data, such as submarine survey of

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sea bed and approach channel geometry. Effects of tsunami on a nuclear power plant can be flooding due to water run up, hydro-dynamic pressure on exterior walls of structures, impact of floating debris, and foundation scouring. In addition, tsunami can draw down water from the intake source of plant cooling water.

The tsunami database is available for interactive search and downloads on the internet at <http://www.ngdc.noaa.gov/hazard/tsu.shtml>.

Tsunami Safety Assessment

The licensing bases for existing nuclear power plants are based on historical data at each site. This data is used to determine probable maximum tsunami and the tsunami effects are evaluated for each site with potential for tsunami flooding. The potential for tsunami hazard is determined on a hierarchical analysis process that can identify tsunami potential based primarily on distance from tsunami source and site elevation. The NRC also required existing plants to assess their potential vulnerability to external events, as part of the Individual Plant Examination of External Events Program. This process ensured that existing plants are not vulnerable to tsunami hazard, and they continue to provide adequate public health and safety.

Today, the NRC utilizes a risk-informed regulatory approach, including insights from probabilistic assessments and traditional deterministic engineering methods to make regulatory decisions about existing plants (e.g., licensing amendment decisions). Any new nuclear plant the NRC licenses will use a probabilistic, performance-based approach to establish the plant's seismic hazard and the seismic loads for the plant's design basis.

Operating Plants

The NRC is fully engaged in national international tsunami hazard mitigation programs, and is conducting active research to refine the tsunami sources in the Atlantic, Gulf Coast and Pacific Coast areas. Diablo Canyon (DC) and San Onofre (SONGS) are two nuclear plant sites that have potential for tsunami hazard. Both the DC (main plant) and SONGS are located above the flood level associated with tsunami. However, the intake structures and Auxiliary Sea Water System at DC are designed for combination of tsunami-storm wave activity to 45 ft msl. SONGS has a reinforced concrete cantilevered retaining seawall and screen well perimeter wall designed to withstand the design basis earthquake, followed by the maximum predicted tsunami with coincident storm wave action, designed to protect at approximately 27 ft msl. These reactors are adequately protected against tsunami effects. Distant tsunami sources for DC include the Aleutian area, Kuril-Kamchatka region, and the South American coast (for Songs the Aleutian area). Distant sources for SONGS is limited by the presence of a broad continental shelf. Local or near sources for DC include the Santa Lucia Bank and Santa Maria Basin Faults (for Songs the Santa Ana wind).

Additional Information

To read more about risk-related NRC policy, see the fact sheets on Probabilistic Risk Assessment (<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/probabilistic-risk-asses.html>) and Nuclear Reactor Risk (<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/reactor-risk.html>). Each provides more information on the use of probability in evaluating hazards (including earthquakes) and their potential impact on plant safety margins. Other regulatory framework includes General Design Criterion 2, 10 CFR Part 100.23, Regulatory Guide 1.102 "Flood Protection for Nuclear Power Plants", Rev. 1 1976, Regulatory Guide 1.59 "Design Basis for Nuclear Power Plants" Rev. 2 1977 (update in progress), and USNRC Standard Review Plan "Probable Maximum Tsunami Flooding" Section 2.4.6, Rev. 2.

March 2011

INFORMATION FROM RES STILL NEEDS TO BE ADDED

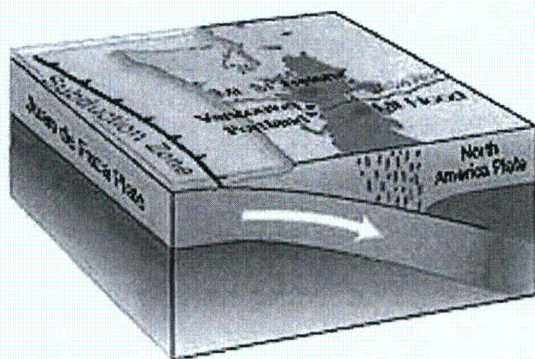
Fact Sheet: Seismicity of the Central and Eastern US

Key Points:

- To date, very large earthquakes (Magnitudes greater than 8.25) have only occurred in specific geological settings, in particular the interfaces between tectonic plates in major **subduction zones**. The only subduction zone that potentially impacts the continental US is the Cascadia zone off the coast of northern California, Oregon and Washington.
- Recent analyses of the magnitudes of the largest earthquakes **not associated** with subduction zones indicates magnitudes are less than ~8.25.
- The size (magnitude) of earthquakes is proportional to the fault area that slips in a given earthquake. The prediction of earthquake magnitudes for a specific fault considers the dimensions of the fault. Extremely large earthquakes do not occur on small faults.
- Nuclear power plants are licensed based on vibratory ground shaking, not earthquake magnitude. The ground shaking (accelerations) are used to estimate forces which are used in the seismic design process. In many cases smaller magnitude earthquakes closer to a site produce more severe ground shaking than larger, more distant earthquakes. Hence it is important to consider all potential earthquake sources regardless of magnitude.

Discussion: Earthquakes with very large magnitudes such as the March 2011 earthquake off the northeast coast of the Japanese island of Honshu occur within subduction zones, which are locations where one of the earth's tectonic plates is subducting beneath (being thrust under) another. The fault that defines the Japan Trench plate boundary dips to the west, i.e., becomes deeper towards the coast of Honshu. Large offshore earthquakes have historically occurred in the same subduction zone (in 1611, 1896, and 1933) all of which produced significant tsunami waves. The magnitudes of these previous large earthquakes have been estimated to be between 7.6 and 8.6. Prior to March 2011, the Japan Trench subduction zone has produced nine earthquakes with magnitudes greater than 7 just since 1973.

The only subduction zone that is capable of directly impacting the continental US is the Cascadia subduction zone, which lies off of the coast of northern California, Oregon, and Washington. The fault surface defined by this interface dips to the east (becomes deeper) beneath the coast. The Cascadia subduction zone is capable of producing very large earthquakes if all or a large portion of the fault area ruptures in a single event. However, the rate of earthquake occurrence along the Cascadia subduction zone is much less than has been observed along the Japan Trench subduction zone. The only operating nuclear power plant in that area is Columbia, which is far from the coast (~220 miles/350 km) and the Cascadia subduction zone. *The occurrence of earthquakes on the Cascadia subduction zone has been considered in the evaluation of the Columbia NPP.*



Schematic Illustration of the Cascadia Subduction Zone

The size (magnitude) of earthquakes is proportional to the surface area of a fault that slips in a given earthquake. Large earthquakes are associated with large (long) faults. Hence, the prediction of earthquake magnitudes for a specific fault considers the dimensions of the fault. Identification of fault size is usually based on geologic mapping or the evaluation of spatial patterns of small earthquakes. To provide **a point of comparison**, the length of the fault that slipped during the March 11, 2011 magnitude 9 Japanese earthquake was >620 km, the length of the fault(s) that slipped during the magnitude 7.3 1992 Landers, CA earthquake was ~90 km and the estimated length of the Hosgi fault near Diablo Canyon NPP is 140 km and a magnitude of 7.5 is assigned to that fault. A number of major crustal faults or fault zones (not associated with the Cascadia subduction zone) have been identified that have produced earthquakes of magnitude 7.5 to 8 in the continental US (including California). ***These fault sources have been identified and characterized in seismic hazard assessments.***

Seismic designs at US nuclear power plants are developed in terms of seismic ground motion spectra, which are called the Safe Shutdown Earthquake ground motion response spectra (SSE). Each nuclear power plant is designed to a ground motion level that is appropriate for the geology and tectonics in the region surrounding the plant location. Currently operating nuclear power plants developed their SSEs based on a "deterministic" or "scenario earthquake" basis that account for the largest earthquake expected in the area around the plant. Seismic activity in the regions surrounding US plants is much lower than that for Japan since **most US plants are located in the interior of the stable continental US**. The largest earthquakes within the continental US are the 1811-12 New Madrid sequence and the 1886 Charleston, SC, which were estimated to be between about magnitude 6.8 to 7.5. On the west coast of the US, the two nuclear power plants are designed to specific ground motions from earthquakes of about magnitude 7+ on faults located just offshore of the plants. The earthquakes on these faults are mainly strike-slip (horizontal motion on near vertical planes) type earthquakes, not subduction zone earthquakes. This fault geometry does not produce large tsunamigenic waves. Therefore, the likelihood of a significant tsunami from these faults is very remote.

Fact Sheet: US Portable Array Information

NOTE: This is provided because IRIS participants let us know that here was a discussion about the NRC's involvement in this program during a meeting with congressional staffers. We have been involved in this for the last couple years.



The Incorporated Research Institutions for Seismology is the Consortium of United States Universities with Major Research Programs in Seismology and Related Fields.

The Transportable Array: A Science Investment that Can Be Leveraged

IRIS is installing the Transportable Array – a set of 400 broadband seismic instruments – in each of more than 1600 sites across the contiguous United States. The instruments operate at each site for two years and then are removed and redeployed further east. Roughly 1100 stations have been installed since 2003, and instruments have been removed from more than 600 of those sites in the western United States.

The National Science Foundation is funding the full cost to “roll” the Transportable Array across the US, more than \$90,000,000 over ten years. Comparatively small incremental investments could add significant data that are relevant to the safety of nuclear power plants. These efforts would be uniquely cost effective, since NSF is already funding installation, and they would feed data into an existing, standardized and widely used data management system that already incorporates the vast majority of seismic data from US networks. But these opportunities are time constrained: the array will be fully installed in the contiguous 48 states by late 2013.

More Value from Longer Term Regional Observations

A dense, uniform seismic network is necessary for long-term, broad-area seismic monitoring of the central and eastern United States due to low event recurrence rates and the risk of significant earthquakes ($M > 5$) anywhere in the region. Monitoring seismicity in the central and eastern US can be improved by turning selected sites into permanent seismic stations. A total of more than 35 Transportable Array stations have already been “adopted” by several organizations, creating a permanent legacy, but only in the western United States.

A strategic “1-in-4” plan would involve “adoption” of systematically selected stations in the central and eastern United States – every other station in both the east-west and north-south directions, creating a uniform grid of some 250 stations. Long-term regional operation could be combined with two optional enhancements to create a unique observatory for the study of seismicity, source characteristics, attenuation, and local ground acceleration.

Enhancement 1: Acquire Higher Frequency Data

Crustal rigidity in the central and eastern US makes it desirable to record high frequency characteristics of local and regional earthquakes. The existing instruments could be reconfigured to record high frequencies but doing so would nearly triple the data flow, necessitating improvements to the communications infrastructure.

Enhancement 2: Add Strong Motion Sensors

Acquiring strong motion sensors and reconfiguring field computers that record and telemeter the data would help to measure unique effects of severe shaking. The design anticipated this augmentation, and several stations in California and Washington were operated that way. Upgrade would be more efficient at sites that have not yet been installed.

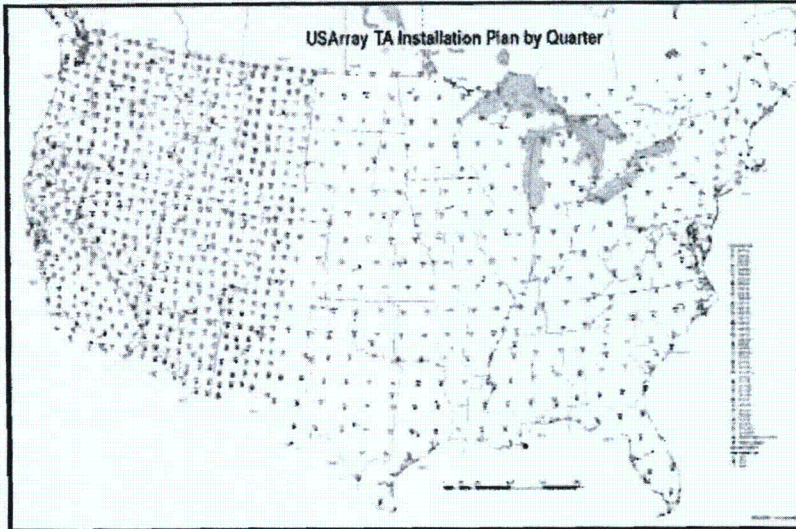
Estimate of annual acquisition and O&M costs for the 1-in-4, 250-station network in central and eastern US.

Year	Stations	Acquisition ¹	O&M ²	Total
2011	50	\$1,800,000	\$ 400,000	\$2,200,000
2012	50	\$1,800,000	\$ 800,000	\$2,600,000
2013	50	\$1,800,000	\$1,200,000	\$3,000,000
2014	50	\$1,800,000	\$1,600,000	\$3,400,000
2015	50	\$1,800,000	\$2,000,000	\$3,800,000
2016	—	—	\$2,000,000	\$2,000,000

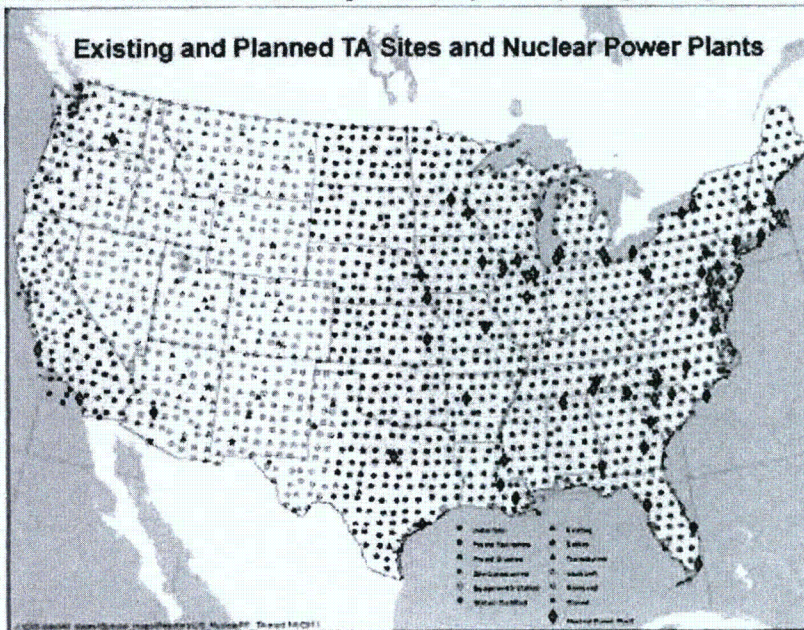
¹ Assumes upgrades to six channel data loggers with strong motion sensors.

² Assumes a conservative estimate of \$8,000/station/year.

The 1-in-4, 250-station network that could be created in the central and eastern US by "leaving behind" one out of every four Transportable Array stations during the years 2011 through 2015.



A large majority of nuclear power plants are located in the central and eastern parts of the US, where it is still possible to "leave behind" 1-in-4 Transportable Array stations for long-term regional observations.



Additional Information: Terms and Definitions

Annual exceedance frequency (AEF) – Number of times per year that a site's ground motion is expected to exceed a specified acceleration.

Active or seismogenic fault- need to add definition of active fault from

Capable Tectonic Source – A capable tectonic source is a tectonic structure that can generate both vibratory ground motion and tectonic surface deformation such as faulting or folding at or near the earth's surface in the present seismotectonic regime. It is described by at least one of the following characteristics:

- (1) presence of surface or near-surface deformation of landforms or geologic deposits of a recurring nature within the last approximately 500,000 years or at least once in the last approximately 50,000 years
- (2) a reasonable association with one or more moderate to large earthquakes or sustained earthquake activity that are usually accompanied by significant surface deformation
- (3) a structural association with a capable tectonic source that has characteristics of either item a or b (above), such that movement on one could be reasonably expected to be accompanied by movement on the other

In some cases, the geological evidence of past activity at or near the ground surface along a potential capable tectonic source may be obscured at a particular site. This might occur, for example, at a site having a deep overburden. For these cases, evidence may exist elsewhere along the structure from which an evaluation of its characteristics in the vicinity of the site can be reasonably based. Such evidence is to be used in determining whether the structure is a capable tectonic source within this definition. Notwithstanding the foregoing paragraphs, the association of a structure with geological structures that are at least pre-Quaternary, such as many of those found in the central and eastern regions of the United States, in the absence of conflicting evidence, will demonstrate that the structure is not a capable tectonic source within this definition.

Certified Seismic Design Response Spectra (CSDRS) – Site-independent seismic design response spectra that have been approved under Subpart B of 10 CFR Part 52 as the seismic design response spectra for an approved certified standard design nuclear power plant. The input or control location for the CSDRS is specified in the certified standard design.

Combined License – A combined construction permit and operating license with conditions for a nuclear power facility issued pursuant to Subpart C of 10 CFR Part 52.

Controlling Earthquakes – Earthquakes used to determine spectral shapes or to estimate ground motions at the site for some methods of dynamic site response. There may be several controlling earthquakes for a site. As a result of the probabilistic seismic hazard analysis (PSHA), controlling earthquakes are characterized as mean magnitudes and distances derived from a deaggregation analysis of the mean estimate of the PSHA.

Core damage frequency (CDF) – Expected number of core damage events per unit of time. *Core damage* refers to the uncovering and heat-up of the reactor core, to the point that prolonged oxidation and severe fuel damage are not only anticipated but also involve enough of the core to result in off-site

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public health effects if released. *Seismic core damage frequency* refers to the component of total CDF that is due to seismic events.

Cumulative Absolute Velocity (CAV) – For each component of the free-field ground motion, the CAV should be calculated as follows: (1) the absolute acceleration (g units) time-history is divided into 1-second intervals, (2) each 1-second interval that has at least 1 exceedance of 0.025g is integrated over time, and (3) all the integrated values are summed together to arrive at the CAV. The CAV is exceeded if the calculation is greater than 0.16 g-second. The application of the CAV in siting requires the development of a CAV model because the PSHA calculation does not use time histories directly.

Deaggregation – The process for determining the fractional contribution of each magnitude-distance pair to the total seismic hazard. To accomplish this, a set of magnitude and distance bins are selected and the annual probability of exceeding selected ground acceleration parameters from each magnitude-distance pair is computed and divided by the total probability for earthquakes.

Design basis earthquake or safe shutdown earthquake (SSE) – A *design basis earthquake* is a commonly employed term for the *safe shutdown earthquake (SSE)*; the SSE is the earthquake ground shaking for which certain structures, systems, and components are designed to remain functional. In the past, the SSE has been commonly characterized by a standardized spectral shape associated with a peak *ground acceleration* value.

Design Factor – The ratio between the site-specific GMRS and the UHRS. The design factor is aimed at achieving the target annual probability of failure associated with the target performance goals.

Early Site Permit – A Commission approval, issued pursuant to Subpart A of 10 CFR Part 52, for a site or sites for one or more nuclear power facilities.

Earthquake Recurrence – The frequency of occurrence of earthquakes as a function of magnitude. Recurrence relationships or curves are developed for each seismic source, and they reflect the frequency of occurrence (usually expressed on an annual basis) of magnitudes up to the maximum, including measures of uncertainty.

Frequency of Onset of Significant Inelastic Deformation (FOSID) – The annual probability of the onset of significant inelastic deformation (OSID). OSID is just beyond the occurrence of insignificant (or localized) inelastic deformation, and in this way corresponds to “essentially elastic behavior.” As such, OSID of a structure, system, or component (SSC) can be expected to occur well before seismically induced core damage, resulting in much larger frequencies of OSID than seismic core damage frequency (SCDF) values. In fact, OSID occurs before SSC “failure,” where the term failure refers to impaired functionality.

Ground acceleration – Acceleration produced at the ground surface by seismic waves, typically expressed in units of *g*, the acceleration of gravity at the earth’s surface.

Ground Motion Response Spectra (GMRS) – A site-specific ground motion response spectra characterized by horizontal and vertical response spectra determined as free-field motions on the ground surface or as free-field outcrop motions on the uppermost in-situ competent material using performance-based procedures. When the GMRS are determined as free-field outcrop motions on the uppermost in-situ competent material, only the effects of the materials below this elevation are included in the site response analysis.

Ground Motion Slope Ratio – Ratio of the spectral accelerations, frequency by frequency, from a seismic hazard curve corresponding to a 10-fold reduction in hazard exceedance frequency. (See Equation 3 in Regulatory Position 5.1.)

High confidence of low probability of failure (HCLPF) capacity – A measure of *seismic margin*. In *seismic risk* assessment, *HCLPF capacity* is defined as the earthquake motion level, at which there is high confidence (95%) of a low probability (at most 5%) of failure of a structure, system, or component.

In-column Motion – Motion that is within a soil column, as opposed to the motion at the surface or treated as if it is at the surface.

Intensity – The intensity of an earthquake is a qualitative description of the effects of the earthquake at a particular location, as evidenced by observed effects on humans, on human-built structures, and on the earth's surface at a particular location. Commonly used scales to specify intensity are the Rossi-Forel, Mercalli, and Modified Mercalli. The Modified Mercalli Intensity (MMI) scale describes intensities with values ranging from I to XII in the order of severity. MMI of I indicates an earthquake that was not felt except by a very few, whereas MMI of XII indicates total damage of all works of construction, either partially or completely.

Large early release frequency (LERF) – The expected number of large early releases per unit of time. A *large early release* is the rapid, unmitigated release of airborne fission products from the containment building to the environment, occurring before the effective implementation of off-site emergency response and protective actions, such that there is a potential for early health effects. *Seismic large early release frequency* refers to the component of total LERF that is due to seismic events.

Magnitude – An earthquake's magnitude is a measure of the strength of the earthquake as determined from seismographic observations and is an objective, quantitative measure of the size of an earthquake. The magnitude can be expressed in various ways based on seismographic records (e.g., Richter Local Magnitude, Surface Wave Magnitude, Body Wave Magnitude, and Moment Magnitude). Currently, the most commonly used magnitude measurement is the Moment Magnitude, M_w , which is based on the seismic moment computed as the rupture force along the fault multiplied by the average amount of slip, and thus is a direct measure of the energy released during an earthquake.

Maximum Magnitude – The maximum magnitude is the upper bound to earthquake recurrence curves.

Mean Site Amplification Function – The mean amplification function is obtained for each controlling earthquake, by dividing the response spectrum from the computed surface motion by the response spectrum from the input hard rock motion, and computing the arithmetic mean of the individual response spectral ratios.

Nontectonic Deformation – Nontectonic deformation is distortion of surface or near-surface soils or rocks that is not directly attributable to tectonic activity. Such deformation includes features associated with subsidence, karst terrain, glaciation or deglaciation, and growth faulting.

Response Spectrum – A plot of the maximum responses (acceleration, velocity, or displacement) of idealized single-degree-of-freedom oscillators as a function of the natural frequencies of the oscillators for a given damping value. The response spectrum is calculated for a specified vibratory motion input at the oscillators' supports.

Ring Area – Annular region bounded by radii associated with the distance rings used in hazard deaggregation (RG 1.208, Appendix D, Table D.1, "Recommended Magnitude and Distance Bins").

Safe Shutdown Earthquake Ground Motion (SSE) – The vibratory ground motion for which certain structures, systems, and components are designed, pursuant to Appendix S to 10 CFR Part 50, to remain functional. The SSE for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface.

Seismic hazard – Any physical phenomenon, such as ground motion or ground failure, that is associated with an earthquake and may produce adverse effects on human activities (such as posing a risk to a nuclear facility).

Seismic margin – The difference between a plant's capacity and its seismic design basis (*safe shutdown earthquake, or SSE*).

Seismic risk – The risk (frequency of occurrence multiplied by its consequence) of severe earthquake-initiated accidents at a nuclear power plant. A severe accident is an accident that causes core damage, and, possibly, a subsequent release of radioactive materials into the environment. Several risk metrics may be used to express seismic risk, such as seismic core damage frequency and seismic large early release frequency.

Seismic Wave Transmission (Site Amplification) – The amplification (increase or decrease) of earthquake ground motion by rock and soil near the earth's surface in the vicinity of the site of interest. Topographic effects, the effect of the water table, and basin edge wave-propagation effects are sometimes included under site response.

Seismogenic Source – A portion of the earth that is assumed to have a uniform earthquake potential (same expected maximum earthquake and recurrence frequency), distinct from that of surrounding sources. A seismogenic source will generate vibratory ground motion but is assumed to not cause surface displacement. Seismogenic sources cover a wide range of seismotectonic conditions, from a well-defined tectonic structure to simply a large region of diffuse seismicity.

Spectral Acceleration – Peak acceleration response of an oscillator as a function of period or frequency and damping ratio when subjected to an acceleration time history. It is equal to the peak relative displacement of a linear oscillator of frequency, f , attached to the ground, times the quantity $(2Bf)^2$. It is expressed in units of gravity (g) or $\text{cm}/\text{second}^2$.

Stable Continental Region (SCR) – An SCR is composed of continental crust, including continental shelves, slopes, and attenuated continental crust, and excludes active plate boundaries and zones of currently active tectonics directly influenced by plate margin processes. It exhibits no significant deformation associated with the major Mesozoic-to-Cenozoic (last 240 million years) orogenic belts. It excludes major zones of Neogene (last 25 million years) rifting, volcanism, or suturing.

Stationary Poisson Process – A probabilistic model of the occurrence of an event over time (or space) that has the following characteristics: (1) the occurrence of the event in small intervals is constant over time (or space), (2) the occurrence of two (or more) events in a small interval is negligible, and (3) the occurrence of the event in non-overlapping intervals is independent.

Target Performance Goal (PF) – Target annual probability of exceeding the 1 E-05 frequency of onset of significant inelastic deformation (FOSID) limit state.

Tectonic Structure – A large-scale dislocation or distortion, usually within the earth's crust. Its extent may be on the order of tens of meters (yards) to hundreds of kilometers (miles).

Uniform Hazard Response Spectrum (UHRS) – A plot of a ground response parameter (for example, spectral acceleration or spectral velocity) that has an equal likelihood of exceedance at different frequencies.

Within Motion – An earthquake record modified for use in a site response model. Within motions are developed through deconvolution of a surface recording to account for the properties of the overburden material at the level at which the record is to be applied. The within motion can also be called the "bedrock motion" if it occurs at a high-impedance boundary where rock is first encountered.

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What are the definitions of the SSE and OBE?

CLEAN UP BELOW information – and add above

From RG1.208 Safe Shutdown Earthquake Ground Motion (SSE). The vibratory ground motion for which certain structures, systems, and components are designed, pursuant to Appendix S to 10 CFR Part 50, to remain functional. The SSE for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface

Appendix S to 10 CFR Part 50 (3) has the following information: Required Plant Shutdown. If vibratory ground motion exceeding that of the Operating Basis Earthquake Ground Motion or if significant plant damage occurs, the licensee must shut down the nuclear power plant. If systems, structures, or components necessary for the safe shutdown of the nuclear power plant are not available after the occurrence of the Operating Basis Earthquake Ground Motion, the licensee must consult with the Commission and must propose a plan for the timely, safe shutdown of the nuclear power plant. Prior to resuming operations, the licensee must demonstrate to the Commission that no functional damage has occurred to those features necessary for continued operation without undue risk to the health and safety of the public and the licensing basis is maintained.

The ratio is provided in guidance as the ratio that the licensees can chose without additional analysis. The OBE mostly used to be half for existing plants, but now it's a 1/3 unless you do analyses to show why it should be 1/2.

Definition of Safe Shutdown Earthquake	The safe-shutdown earthquake (SSE) for the site is the ground motion response spectra (GMRS), which also satisfies the minimum requirement of paragraph IV(a)(1)(i) of Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," to Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the Code of Federal Regulations (10 CFR Part 50).
Definition of Operating Basis Earthquake:	To satisfy the requirements of paragraph IV(a)(2)(A) of Appendix S to 10 CFR Part 50, the operating-basis earthquake (OBE) ground motion is defined as follows: (iv) For the certified design portion of the plant, the OBE ground motion is one-third of the CSDRS. (v) For the safety-related noncertified design portion of the plant, the OBE ground motion is one-third of the design motion response spectra, as stipulated in the design certification conditions specified in design control document (DCD). (vi) The spectrum ordinate criterion to be used in conjunction with Regulatory Guide 1.166, "Pre-Earthquake Planning and Immediate Nuclear Power Plant Operator Post-earthquake Actions," issued March 1997, is the lowest of (i) and (ii).

List of Questions

Natural Hazards and Ground Shaking Design Levels	1
1) Did the Japanese underestimate the size of the maximum credible earthquake that could affect the plants?	1
2) Can a very large earthquake and tsunami happen here?	1
3) Has this changed our perception of earthquake risk?	1
4) What magnitude earthquake are US plants designed to?	1
5) How many US reactors are located in active earthquake zones (and which reactors)?	2
6) How many reactors are along coastal areas that could be affected by a tsunami (and which ones)?	2
7) If the earthquake in Japan was a larger magnitude than considered by plant design, why can't the same thing happen in the US?	2
8) What if an earthquake like the Sendai earthquake occurred near a US plant?	3
9) What would be the results of a tsunami generated off the coast of a US plant? (Or why are we confident that large tsunamis will not occur relatively close to US shores?)	3
10) Can this happen here (i.e., an earthquake that significantly damages a nuclear power plant)? Are the Japanese plants similar to US plants?	3
11) What level of earthquake hazard are the US reactors designed for?	3
12) Does the NRC consider earthquakes of magnitude 9?	4
13) What is the likelihood of the design basis or "SSE" ground motions being exceeded over the life of the plant?	4
14) What is magnitude anyway? What is the Richter Scale? What is intensity?	4
15) How do magnitude and ground motion relate to each other?	5
16) How are combined seismic and tsunami events treated in risk space? Are they considered together?	5
17) How are aftershocks treated in terms of risk assessment?	5
Design Against Natural Hazards & Plant Safety in the US	6
19) Are nuclear power plants designed for tsunamis?	6
20) What level of tsunami are we designed for?	6
21) Which plants are close to known active faults? What are the faults and how far away are they from the plants?	6
22) How was the seismic design basis for an existing nuclear power plant established?	6
23) Is there margin above the design basis?	7

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24) Are US plants safe? 7

25) Was the Japanese plant designed for this type of accident? Are US nuclear plants? 7

26) Why do we have confidence that US nuclear power plants are adequately designed for earthquakes and tsunamis? 7

27) Can this happen here (i.e., an earthquake that significantly damages a nuclear power plant)? Are the Japanese plants similar to US plants? 7

28) Could an accident like the one at Japan's Fukushima Daiichi nuclear plants happen in the US? 8

29) Should US nuclear facilities be required to withstand earthquakes and tsunamis of the kind just experienced in Japan? If not, why not? 8

30) Can you summarize the plant seismic design basis for the US plants? Are there any special issues associated with seismic design? 9

31) How do we know that the equipment in plants is safe in earthquakes? 9

32) How do we know equipment will work if the magnitude is bigger than expected, like in Japan? 9

33) Are US plants susceptible to the same kind of loss of power as happened in Japan? 9

34) How do we know that the emergency diesel generators in Diablo Canyon and SONGS will not fail to operate like in Japan?..... 10

35) Is all equipment at the plant vulnerable to tsunami?..... 10

36) What protection measures do plants have against tsunami? 10

37) Is there a risk of loss of water during tsunami drawdown? Is it considered in design?..... 10

38) Are nuclear buildings built to withstand earthquakes? What about tsunami?..... 10

39) Are aftershocks considered in the design of equipment at the plants? Are aftershocks considered in design of the structure? 10

40) Are there any special issues associated with seismic design at the plants? For example, Diablo Canyon has special requirements. Are there any others?..... 10

41) Is the NRC planning to require seismic isolators for the next generation of nuclear power plants? How does that differ from current requirements and/or precautions at existing US nuclear power plants? 10

42) Are there any US nuclear power plants that incorporate seismic isolators? What precautions are taken in earthquake-prone areas? 11

43) Do you think that the recent Japan disaster will cause any rethinking of the planned seismic isolation guidelines, particularly as it regards earthquakes and secondary effects such as tsunamis? 11

About Japanese Hazard, Design and Earthquake Impact..... 12

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- 44) Was the damage done to the plants from the earthquake or the tsunami?..... 12
- 45) What was the disposition of the plant during the time after the earthquake struck and before the tsunami arrived? Was there indication of damage to the plant solely from the earthquake (if so, what systems) and did emergency procedures function during this time..... 12
- 46) What magnitude earthquake was the plant designed to withstand? For example, what magnitude earthquake was the plant expected to sustain with damage but continued operation? And with an expected shutdown but no release of radioactive material?..... 12
- 47) Did this reactor sustain damage in the July 16, 2007 earthquake, as the Kashiwazaki power plant did? What damage and how serious was it? 12
- 48) Was the Fukushima power plant designed to withstand a tsunami of any size? What sort of modeling was done to design the plant to withstand either seismic events or tsunamis? What specific design criteria were applied in both cases?..... 13
- 49) What is the design level of the Japanese plants? Was it exceeded?..... 13
- 50) What are the Japanese S_1 and S_2 ground motions and how are they determined?..... 13
- 51) Did this earthquake affect the Kashiwazaki-Kariwa nuclear power plant? 14
- 52) How high was the tsunami at the Fukushima nuclear power plants? 14
- 53) Wikileaks has a story that quotes US embassy correspondence and some un-named IAEA expert stating that the Japanese were warned about this ... Does the NRC want to comment? 14

What Happened to US Nuclear Power Plants During the March 11, 2011, Japan Earthquake?15

- 54) Was there any damage to US reactors from either the earthquake or the resulting tsunami? 15
- 55) Have any lessons for US plants been identified? 15

Response and Future Licensing Actions..... 16

- 56) What is the NRC doing about the emergencies at the nuclear power plants in Japan? Are you sending staff over there?..... 16
- 57) With NRC moving to design certification, at what point is seismic capability tested – during design or modified to be site-specific? If in design, what strength seismic event must these be built to withstand? 16

Reassessment of US Plants and GI-199..... 17

- 58) Can we get the rankings of the plants in terms of safety? (Actually this answer should be considered any time GI-199 data is used to “rank” plants)..... 17
- 59) If the plants are designed to withstand the ground shaking why is there so much risk from the design level earthquake..... 17
- 60) Does the NRC have a position on the MSNBC article that ranked the safety of US plants? ..17

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- 61) Overall, how would the NRC characterize the CDF numbers? A quirk of numbers? A serious concern?..... 18
- 62) Describe the study and what it factored in – plant design, soils, previous quakes, etc. 18
- 63) Explain “seismic curve” and “plant level fragility curve”..... 18
- 64) Explain the “weakest link model”..... 18
- 65) What would constitute fragility at a plant? 19
- 66) The 1-in-18,868 risk for Limerick: What is the risk for? A jostling? A crack? Significant core damage leading to a meltdown? 19
- 67) Can someone put that risk factor into perspective, using something other than MSNBC’s chances of winning the lottery?..... 19
- 68) What, if anything, can be done at a site experiencing such a risk? (Or at Limerick in particular.)..... 19
- 69) Has anyone determined that anything SHOULD be done at Limerick or any of the other PA plants?19
- 70) I noted the language on Page 20 of the report: This result confirms NRR’s conclusion that currently operating plants are adequately protected against the change in seismic hazard estimates because the guidelines in NRR Office Instruction LIC-504 “Integrated Risk-Informed Decision Making Process for Emergent Issues” are not exceeded. Can someone please explain? 20
- 71) Is the earthquake safety of US plants reviewed once the plants are constructed? 20
- 72) Does the NRC ever review tsunami risk for existing plants? 20
- 73) Does GI-199 consider tsunami? 20
- 74) What is Generic Issue 199 about? 20
- 75) Where can I get current information about Generic Issue 199? 20
- 76) How was the seismic design basis for an existing nuclear power plant established?..... 21
- 77) Is there margin above the design basis?..... 21
- 78) Are all US plants being evaluated as a part of Generic Issue 199? 21
- 79) Are the plants safe? If you are not sure they are safe, why are they not being shut down? If you are sure they are safe, why are you continuing evaluations related to this generic issue?..... 21
- 80) What do you mean by “increased estimates of seismic hazards” at nuclear power plant sites? 22
- 81) Let's say there's an estimate expressed as "2.5E-06." (I'm looking at Table D-2 of the safety/risk assessment of August 2010.) I believe that this expression means the same as 2.5×10^{-06} , or 0.0000025, or 2.5 divided by one million. In layman's terms, that means an expectation, on average, of 2.5 events every million years, or once every 400,000 years. Similarly, "2.5E-05" would

be 2.5 divided by 100,000, or 2.5 events every 100,000 years, on average, or once every 40,000 years. Is this correct? 23

82) The GI-199 documents give updated probabilistic seismic hazard estimates for existing nuclear power plants in the central and eastern US What document has the latest seismic hazard estimates (probabilistic or not) for existing nuclear power plants in the western US? 23

83) The GI-199 documents refer to newer data on the way. Have NRC, USGS et al. released those? I'm referring to this: "New consensus seismic-hazard estimates will become available in late 2010 or early 2011 (these are a product of a joint NRC, US Department of Energy, US Geological Survey (USGS) and Electric Power Research Institute (EPRI) project). These consensus seismic hazard estimates will supersede the existing EPRI, Lawrence Livermore National Laboratory, and USGS hazard estimates used in the GI-199 Safety/Risk Assessment." 23

84) What is the timetable now for consideration of any regulatory changes from the GI-199 research?..... 24

Seismic Probabilistic Risk Assessment (SPRA)..... 25

85) The NRC increasingly uses risk-information in regulatory decisions. Are risk-informed PRAs useful in assessing an event such as this? 25

Plant-Specific Questions 26

San Onofre Nuclear Generating Station (SONGS) Questions 26

86) SONGS received a white finding in 2008 for 125VDC battery issue related to the EDGs that went undetected for 4 years. NRC issued the white finding as there was increased risk that one EDG may not have started due to a low voltage condition on the battery on one Unit (Unit 2). Aren't all plants susceptible to the unknown? Is there any assurance the emergency cooling systems will function as desired in a Japan-like emergency? 26

87) Has the earthquake hazard at SONGS been reviewed like Diablo Canyon nuclear power plant (DCNPP) is doing? Are they planning on doing an update before relicensing? 26

88) Is possible to have a tsunami at songs that is capable of damaging the plant? 26

89) Does SONGS have an emergency plan for tsunami? 26

90) Has evacuation planning at SONGS considered tsunami?..... 27

91) Is SONGS designed against tsunami and earthquake? 27

92) What is the height of water that SONGS is designed to withstand? 27

93) What about drawdown and debris? 27

94) Will this be reviewed in light of the Japan earthquake. 27

95) Could all onsite and offsite power be disrupted from SONGS in the event of a tsunami, and if that happened, could the plant be safely cooled down if power wasn't restored for days after? 27

96) Are there any faults nearby SONGS that could generate a significant tsunami? 28

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97) What magnitude or shaking level is SONGS designed to withstand? How likely is an earthquake of that magnitude for the SONGS site? 28

98) Could SONGS withstand an earthquake of the magnitude of the Japanese earthquake? 28

99) What about the evacuation routes at SONGS? How do we know they are reasonable?..... 28

100) Regarding tsunami at DCNPP and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami? 28

101) What is the design level flooding for DNCPP and SONGS? Can a tsunami be larger? 29

102) Is there potential linkage between the South Coast Offshore fault near SONGS and the Newport-Inglewood Fault system and/or the Rose Canyon fault? Does this potential linkage impact the maximum magnitude that would be assigned to the South Coast Offshore fault and ultimately to the design basis ground motions for this facility? 29

Diablo Canyon Nuclear Power Plant (DCNPP) Questions 30

103) Now after the Japan tragedy, will the NRC finally hear us (A4NR) and postpone DC license renewal until seismic studies are complete? How can you be sure that what happened there is not going to happen at Diablo with a worse cast earthquake and tsunami? 30

104) The evacuation routes at DCNPP see are not realistic. Highway 101 is small...and can you imagine what it will be like with 40K people on it? Has the evacuation plan been updated w/ all the population growth? 30

105) Are there local offshore fault sources capable of producing a tsunami with very short warning times?..... 30

106) Are there other seismically induced failure modes (other than tsunami) that would yield LTSBO? Flooding due to dam failure or widespread liquefaction are examples..... 30

107) Ramifications of beyond design basis events (seismic and tsunami) and potential LTSBO on spent fuel storage facilities? 30

108) Why did the Emergency Warning go out for a 'tsunami' that was only 6 ft (1.8 m) high? Do these guys really know what they're doing? Would they know it if a big one was really coming? Crying wolf all the time doesn't instill a lot of confidence. 30

109) How big did the Japanese think an earthquake and tsunami could be before March 11, 2011? Why were they so wrong (assuming this earthquake/tsunami was bigger than what they had designed the plant for)?..... 31

The Japanese were supposed to have one of the best tsunami warning systems around. What went wrong last week (both with the reactors and getting the people out...see #1, evacuation plan above)?..... 31

110) Regarding the tsunami at DCNPP and SONGS, is the tsunami considered separately from flooding in licensing? And from the design perspective, is the flood still the controlling event for those plants rather than the tsunami? 31

111) Shouldn't the NRC make licensees consider a Tsunami coincident with a seismic event that triggers the Tsunami? 31

112) Given that SSCs get fatigued over time, shouldn't the NRC consider after-shocks in seismic hazard analyses? 31

113) Did the Japanese also consider an 8.9 magnitude earthquake and resulting tsunami "way too low a probability for consideration"?..... 31

114) GI-199 shows that the scientific community doesn't know everything about the seismicity of CEUS. And isn't there a prediction that the West coast is likely to get hit with some huge earthquake in the next 30 years or so? Why does the NRC continue to license plants on the west coast? 32

115) Has industry done anything on tsunami hazards? Also, has anyone done work to look at the effect of numerous cycles of low amplitude acceleration following a larger event. I would expect we would have some information because how do we know a plant would be fit to start back up after an event? We cannot possibly do NDE on everything to determine if flaws have propagated to the point where they need to be replaced..... 32

Indian Point Questions..... 33

116) Why is Indian Point safe if there is a fault line so close to it?..... 33

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Nuclear Plants in the US Compared to the USGS National Seismic Hazard Maps..... 57

USGS US National Seismic Hazard Maps..... 57

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Fact Sheet: Summarization of Seismological Information from Regional Instrumentation 63
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From: Sheron, Brian
To: Uhle, Jennifer
Subject: Fw: contingency PRA analysis, note from Bob Budnitz
Date: Friday, March 18, 2011 7:19:35 AM

See below. This is not high on my priority list right now. If Chu decides to do this, do we have anyone we can spare?

From: Bob Budnitz <rjbudnitz@lbl.gov>
To: Holdren, John P. <(b)(6)>; SCHU <SCHU@hq.doe.gov>
Cc: Per F. Peterson <peterson@nuc.berkeley.edu>; Marcia K McNutt <mcnutt@usgs.gov>; Koonin, Steven <Steven.Koonin@science.doe.gov>; Adams, Ian <Ian.Adams@hq.doe.gov>; Aoki, Steven <Steven.Aoki@nnsa.doe.gov>; DAgostino, Thomas <Thomas.DAgostino@nnsa.doe.gov>; Dick Garwin <rlg2@us.ibm.com>; Garwin, Dick <(b)(6)>; Grossenbacher, John (INL) <john.grossenbacher@inl.gov>; Hurlbut, Brandon <Brandon.Hurlbut@hq.doe.gov>; Lyons, Peter <Peter.Lyons@Nuclear.Energy.gov>; Owens, Missy <Missy.Owens@hq.doe.gov>; Phillip.Finck@inl.gov <Phillip.Finck@inl.gov>; Poneman, Daniel <Daniel.Poneman@hq.doe.gov>; Fetter, Steve <(b)(6)>; Brinkman, Bill <Bill.Brinkman@science.doe.gov>; Jane.Lubchenco@noaa.gov <Jane.Lubchenco@noaa.gov>; JohnE.Kelly@nuclear.energy.gov <JohnE.Kelly@nuclear.energy.gov>; Sheron, Brian
Sent: Fri Mar 18 06:38:19 2011
Subject: contingency PRA analysis, note from Bob Budnitz

TO: Steve Chu & John Holdren

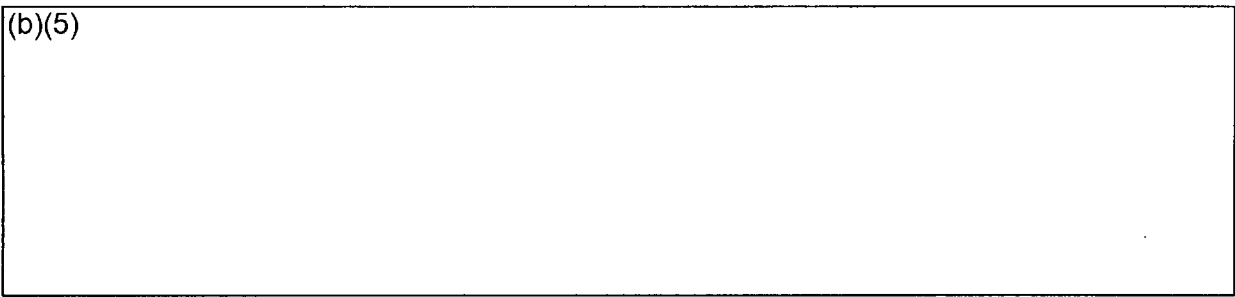
FROM: Bob Budnitz, LBNL

[I have put John Kelly DOE-NE and Brian Sheron NRC on distribution here. They should be getting all this stuff.]

(b)(5)

CH/95

(b)(5)

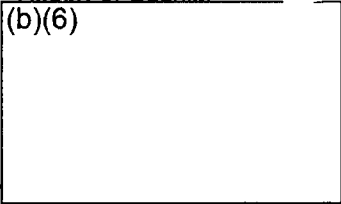


Bob Budnitz

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Robert J. Budnitz



From: Sheron, Brian
To: Borchardt, Bill; Weber, Michael; Uhle, Jennifer
Subject: Fw: contingency PRA analysis, note from Bob Budnitz
Date: Friday, March 18, 2011 7:31:57 AM

From: Jaczko, Gregory
To: (b)(6); (b)(6) SCHU@hq.doe.gov
<SCHU@hq.doe.gov>; Peter.Lyons@Nuclear.Energy.gov <Peter.Lyons@Nuclear.Energy.gov>;
'JohnE.Kelly@Nuclear.Energy.Gov' <JohnE.Kelly@Nuclear.Energy.Gov>; Sheron, Brian
Cc: Virgilio, Martin
Sent: Fri Mar 18 07:21:11 2011
Subject: Re: contingency PRA analysis, note from Bob Budnitz

We are in communication with doe(narac)/ge/inpo/naval reactors to develop strategies. I will make sure this recommendation gets to that team. If there are other people from doe you would like participating please have them contact our ops center

From: Holdren, John P. (b)(6)
To: SCHU <SCHU@hq.doe.gov>; Lyons, Peter <Peter.Lyons@Nuclear.Energy.gov>; Kelly, John E (NE) <JohnE.Kelly@Nuclear.Energy.Gov>; Sheron, Brian
Cc: Jaczko, Gregory
Sent: Fri Mar 18 07:12:09 2011
Subject: FW: contingency PRA analysis, note from Bob Budnitz

(b)(5)

JOHN P. HOLDREN
Assistant to the President for Science and Technology
and Director, Office of Science and Technology Policy
Executive Office of the President of the United States
email (b)(6)
direct phone (b)(6)
assistant Karrie Pitzer (b)(6)

From: Bob Budnitz [mailto:rjbudnitz@lbl.gov]
Sent: Friday, March 18, 2011 6:41 AM
To: Holdren, John P.
Subject: Fwd: contingency PRA analysis, note from Bob Budnitz

TO: Steve Chu & John Holdren

FROM: Bob Budnitz, LBNL

CH/ab

(b)(5)

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Robert J. Budnitz

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From: Valentin, Andrea
To: Sheron, Brian; Donaldson, Leslie; Okleson, Edward
Subject: FW: RIC Lessons Learned
Date: Friday, March 18, 2011 7:50:26 AM
Attachments: RES ONLY - RIC Lessons Learned.docx
RIC Lessons Learned 2011.docx

Leslie/Ed,

(b)(5)

Brian,

(b)(5)

Thanks,
Andrea

From: Bonaccorso, Amy
Sent: Thursday, March 17, 2011 6:39 PM
To: Valentin, Andrea; Donaldson, Leslie
Cc: Kardaras, Tom
Subject: RIC Lessons Learned

Good evening Leslie and Andrea:

Please find a consolidated list of RIC lessons learned attached to this email. I am not sure that Brian and Eric will be reviewing these as soon as we thought in light of the crisis, but I saw that Brian wanted this by Friday.

I have one comment about collaboration in the consolidated list that I'd appreciate you looking at and considering. I don't want to hammer NRR too hard on that point because Stephanie Coffin did speak with NRR management about it. If you want to take it out, you can. It's certainly an issue, but harping too much on it could produce more negativity than it is worth....so I wasn't quite sure about including it.

I am also including an internal lessons learned/comment sheet that is just for us (it says RES ONLY).

Thanks,

Amy

Amy Bonaccorso

GH/97

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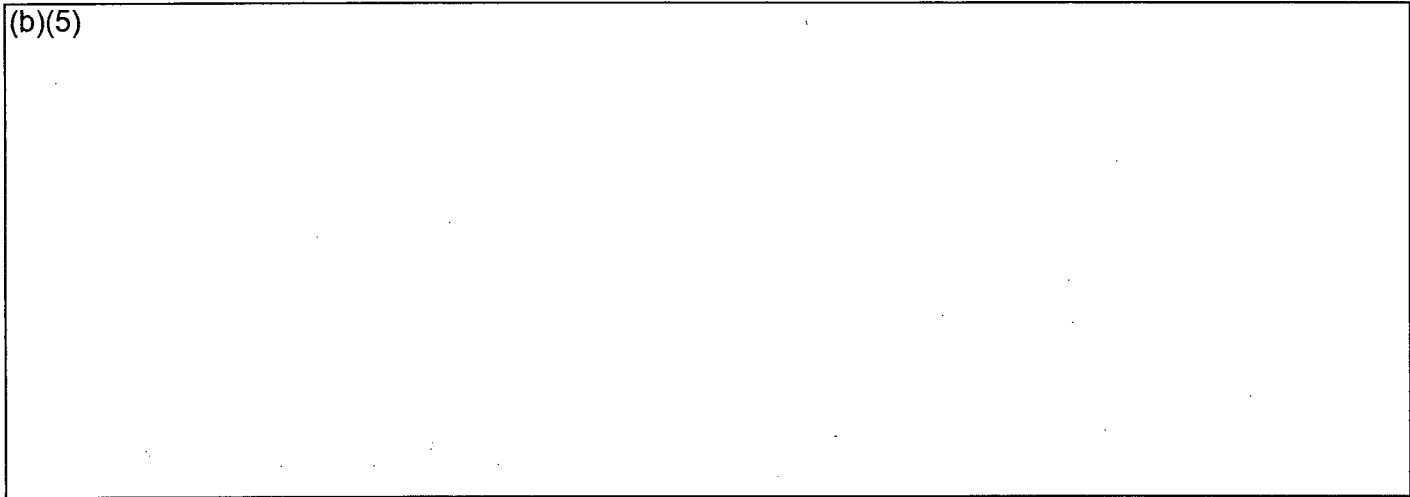
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From: Adams, Ian
To: Lyons, Peter; (b)(6); Aoki, Steven; Grossenbacher, John (INL); (b)(6);
 peterson@nuc.berkeley.edu; Phillip.Finck@inl.gov; RJBudnitz@lbl.gov; (b)(6);
 DAgostino, Thomas; Kelly, John E (NE); ronaldoszilard@inl.gov; McFarlane, Harold; Sheron, Brian; Koonin,
 Steven; SCHU; Owens, Missy; Hurlbut, Brandon
Subject: Japan Nuclear Meeting - attendees list
Date: Friday, March 18, 2011 9:10:54 AM

Good morning,

The list below contains the attendees of yesterday's Japan Nuclear Meeting, as well as those invited but unable to attend. This group is also copied in the address line of this email.

Regards,
 Ian

First	Last	Affiliation	Email
Pete	Lyons	DOE	Peter.Lyons@Nuclear.Energy.gov
John	Holdren	WH	(b)(6)
Steve	Aoki	NNSA	Steven.Aoki@nnsa.doe.gov
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Steven	Chu	DOE	schu@hq.doe.gov

Ian Adams
 Office of the Secretary
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 (202) 586-9585
 ian.adams@hq.doe.gov

CH/98

From: Gibson, Kathy
To: RST01 Hoc; HOO Hoc; PMT01 Hoc
Cc: Lee, Richard; Sheron, Brian; Uhle, Jennifer
Subject: POC for RES/DSA
Date: Friday, March 18, 2011 9:30:53 AM

This message is from Kathy Gibson, Division Director, RES.

Apparently we missed a conference call this morning at 8am on SFP issues via an email that went to individual staff members. Also our office director and deputy are making trips to Congress and other duties outside of the office so they have missed calls from the Ops Center.

To help facilitate communications between RES and the Ops Center, I have assigned Richard Lee (BC for severe accident research) as our POC with the Ops Center (24x7). I request that any support that you need from RES/DSA be sent to Richard and he will either get the answer or put the right person in contact with the appropriate team or person in the Ops Center. Richard's contact information is:

Office: 251-7526

BB: (b)(6)

Richard.Lee@nrc.gov

As a backup, please contact me:

Office: 251-7499

BB: (b)(6)

Kathy.Gibson@nrc.gov

Thank you!

CH/99

From: Droggitis, Spiros
To: Haney, Catherine; Leeds, Eric; Dorman, Dan
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Powell, Amy; Virgilio, Martin; Riley (OCA), Timothy; Belmore, Nancy; Schmidt, Rebecca; Johnson, Michael; Sheron, Brian; Borchardt, Bill
Subject: RE: Phone Congressional Liaison Team Briefing - Latest schedule
Date: Friday, March 18, 2011 9:53:30 AM

Here is what I have so far for the 3:00 pm Congressional briefings. I need a communicator for Saturday and Sunday. I understand the call can be made from home so there is not a need to come in for it. Let me know if you would prefer that we schedule with your Administrative Assistant. Thanks, Spiros

March 18 – Mike Johnson
March 19 –
March 20 –
March 21 – Brian Sheron
March 22 – Mike Johnson
March 23 – Brian Sheron
March 24 – Brian Sheron
March 25 –

I would appreciate if Cathy, Eric and Brian could give me slots that they would be able to cover for the calls so I can finalize the schedule. We'll provide the calling information later. Thanks for your help, Spiros

From: Schmidt, Rebecca
Sent: Thursday, March 17, 2011 3:31 PM
To: Johnson, Michael; Haney, Catherine; Borchardt, Bill; Sheron, Brian; Leeds, Eric
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan; Droggitis, Spiros; Powell, Amy; Virgilio, Martin
Subject: Phone Congressional Liaison Team Briefing

All—We had our first call to Congressional staffers at 1:30 today. The call lasted about 1 hour. We invited over 500 staffers to listen in and ask questions. Mike and his team did a great job. It was good to spend the extra time today providing background material to them, but I'm thinking that we will probably shorten our briefing and instead answer more questions in the future. Spiros will be contacting you to set the schedule for the next several days. We will be doing the call at 3:00 daily. This effort is different than the 2 briefings tomorrow on the Hill. Thanks for all your help! Becky

From: Johnson, Michael
Sent: Thursday, March 17, 2011 2:57 PM
To: Haney, Catherine; Borchardt, Bill; Schmidt, Rebecca; Sheron, Brian; Leeds, Eric
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan
Subject: Re:

I can't support before late afternoon. I am planning on supporting a call at 300 tomorrow. From my blackberry.

CH/100

From: Haney, Catherine
To: Borchardt, Bill; Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee; Flory, Shirley; Dorman, Dan
Sent: Thu Mar 17 13:47:00 2011
Subject: RE:

Seems to me that Brian might be the best candidate since he is already downtown. I tried calling him to discuss who would go. Shirley told me that Brian was at DOE (meeting doesn't end until 5 pm) and that his schedule on Friday was open. She tentatively put the 11:45 briefing on his schedule.

I'm happy to be a back up. If Brian can't do it, I'd like to go down and listen in on the 9:30 briefing.

Unfortunately, we might not have a firm answer until later this evening unless Mike J wants to volunteer in Brian's place.

As an aside, I'm scheduled to leave for France on Saturday afternoon. I spoke with Mike W last night about whether I should cancel. The view was I should continue with the trip. Of course, I can change plans up until I get on the plane. You might want to consider using Dan as a communicator next week. I will leave my "go to book" for him.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 1:00 PM
To: Schmidt, Rebecca; Sheron, Brian; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

Unfortunately this would conflict with the NRC all hands briefing. Can 1 of the 4 "communicators" handle the 11:45?

From: Schmidt, Rebecca
Sent: Thursday, March 17, 2011 12:48 PM
To: Sheron, Brian; Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Batkin, Joshua; HOO Hoc; Taylor, Renee
Subject: RE:

The House has now asked for the same briefing at 11:45. Bill are you available for that one too?

From: Sheron, Brian
Sent: Thursday, March 17, 2011 10:05 AM
To: Borchardt, Bill; Leeds, Eric; Haney, Catherine; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject: RE:

I should be able to attend. I'll meet you in the ops center around 7am.

From: Borchardt, Bill
Sent: Thursday, March 17, 2011 9:44 AM
To: Leeds, Eric; Haney, Catherine; Sheron, Brian; Johnson, Michael
Cc: Weber, Michael; Schmidt, Rebecca; Batkin, Joshua; HOO Hoc
Subject:

Senate EPW staff has requested a briefing Fri @9:30 (location TBD). I believe that Pete Lyons will be representing DOE. I am planning to represent NRC. I invite any of the 4 addressees of this email (the 4 new "Communicators") to come along to get a sense of what the hill is interested in, etc. It is totally your call. I plan to be in the ops center at 7am to get a last minute update and then take metro (7:45) downtown.

Please let me know whether you plan to attend or not.

Bill