

Bensi, Michelle *in year 1*

From: Burnell, Scott
Sent: Monday, March 21, 2011 3:32 PM
To: Kammerer, Annie; Munson, Clifford
Cc: Bensi, Michelle
Subject: RE: FAQ questions posted - Corrections to Answer #12

So bug the boss!!! Please.

From: Kammerer, Annie
Sent: Monday, March 21, 2011 3:31 PM
To: Burnell, Scott; Munson, Clifford
Cc: Bensi, Michelle
Subject: RE: FAQ questions posted - Corrections to Answer #12

OK, with me, but Cliff is the boss....

From: Burnell, Scott - *OAC*
Sent: Monday, March 21, 2011 3:23 PM
To: Munson, Clifford; Kammerer, Annie
Subject: RE: FAQ questions posted - Corrections to Answer #12
Importance: High

This version is acceptable????? We'd like to post the update today.

1) **What is the likelihood of the design basis or "SSE" ground motions being exceeded over the life of a nuclear plant?**

The ground motions that are used as seismic design bases at US nuclear plants are called the Safe Shutdown Earthquake ground motion (SSE). 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 nuclear plants in the US have adequate safety margins for withstanding earthquakes. Currently, the NRC is in the process of conducting GI-199 to again assess the resistance of US nuclear plants to earthquakes. Based on NRC's preliminary analyses to date, the mean probability of ground motions exceeding the SSE over the life of the plant for the plants in the Central and Eastern United States is less than about 1%.

It is important to remember that structures, systems and components are required to have "adequate margin," meaning that they must continue be able withstand shaking levels that are above the plant's design basis.

From: Munson, Clifford - *NRO*
Sent: Monday, March 21, 2011 12:15 PM
To: Kammerer, Annie; Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Ake, Jon; Burnell, Scott
Subject: FAQ questions posted - Corrections to Answer #12

My corrections to Answer #12

NW/71

12) What is the likelihood of the design basis or “SSE” ground motions being exceeded over the life of a nuclear plant?

The ground motions that are used as seismic design bases at US nuclear plants are called the Safe Shutdown Earthquake ground motion (SSE). 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 nuclear plants in the US have adequate safety margins for withstanding earthquakes. Currently, the NRC is in the process of conducting GI-199 to again assess the resistance of US nuclear plants to earthquakes. Based on NRC’s preliminary analyses to date, the mean probability of ground motions exceeding the SSE over the life of the plant for the plants in the Central and Eastern United States is less than about 1%, with values ranging from a low of 0.1% to a high of 6%.

It is important to remember that structures, systems and components are required to have “adequate margin,” meaning that they must continue be able withstand shaking levels that are above the plant’s design basis.

From: Munson, Clifford
Sent: Monday, March 21, 2011 12:05 PM
To: Kammerer, Annie; Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Ake, Jon; Burnell, Scott
Subject: FAQ questions posted

The edits that were made to Question 12) in the Public FAQ now make the answer inaccurate. I will see if I can fix it.

Cliff
Clifford Munson, Ph.D.
Senior Level Advisor
U.S. NRC - Office of New Reactors
Division of Site and Environmental Reviews
301-415-6947
clifford.munson@nrc.gov

From: Kammerer, Annie
Sent: Sunday, March 20, 2011 10:11 PM
To: Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Munson, Clifford; Ake, Jon; Burnell, Scott
Subject: RE: FAQ questions posted

I just saw a second document entitled, “Frequently Asked Questions About the Japan Nuclear Crisis: “Can It Happen Here?”

There is an error in the question:

Are nuclear power plants along the coasts vulnerable to tsunami?

Large tsunami such as the one that hit Japan typically are caused by “subduction” faults, where one tectonic plate slides under another. There is only one such fault near the U.S. coastline – off the northern part of the West Coast, from northern California up past Oregon and Washington. There are no coastal nuclear power plants in this region. The closest plant, in southern California, is well protected against tsunami.

Along the Gulf Coast and the Atlantic Coast, storm surge from hurricanes poses a greater threat than tsunami to nuclear power plants. The plants in these regions are well protected against hurricane storm surge.

The closest plant is Diablo canyon. Most people from California (myself included) would not call the region that Diablo is in "southern California", but rather the central California coast. SONGS is in So. Cal. We can't really say that SONGS is "well protected against tsunami"...it's adequately protected. Also, this makes it seem like hurricanes are always a greater threat than tsunami. The NRC's tsunami research program is showing that this is not true on the north Atlantic coast. As you get toward the moderate seismic zone in coastal Canada, the tsunami exceeds the storm surge due to the potential for large local tsunami from seismically-induced landslides.

A better answer is:

Large tsunami such as the one that hit Japan typically are caused by faults located in "subduction" zones, where one tectonic plate slides under another. There is only one such fault near the U.S. coastline – off the northern part of the West Coast, from northern California up past Oregon and Washington. There are no coastal nuclear power plants in this region. The closest coastal plant, located along the central California coastline is the Diablo Canyon nuclear plant. This nuclear plant is well protected against tsunami. Along the Gulf Coast and the Atlantic Coast, storm surge from hurricanes generally poses a greater threat to nuclear plants than tsunami. The plants in these regions are well protected against hurricane storm surge.

From: Harrington, Holly – OPA
Sent: Sunday, March 20, 2011 11:34 AM
To: Kammerer, Annie
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Munson, Clifford; Ake, Jon; Burnell, Scott
Subject: RE: FAQ questions posted

Thanks Annie.

Eliot/Beth: Do we think this can wait until Monday to be updated on the Web?

Holly

From: Kammerer, Annie
Sent: Sunday, March 20, 2011 11:31 AM
To: Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Munson, Clifford; Ake, Jon
Subject: RE: FAQ questions posted

Change it to this....

"Magnitude is measured on a log scale and so a magnitude 9 earthquake produces about ten times stronger shaking and releases about 31 times more energy than a magnitude 8 earthquake."

I was trying to keep things simple to be more user friendly. I thought that people would find this confusing a little. People feel wave amplitude, not energy...so I chose the thing that people could relate to. But engineers, like Christine, think about energy absorption in structures.

Anyway, just so you know, Christine is a good friend of mine and she is supported as full time staff (the project manager) on a major research project funded by NRC, DOE, EPRI and the USGS (called NGA-East). So, she's very protective of the NRC and is on the lookout for anything that may related to us and is inaccurate, or can be misinterpreted. She's one of the many people out there who have our backs when it comes to what is going out in the press.

Annie

P.S. This is straight from a USGS fact sheet. "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."

From: Harrington, Holly
Sent: Sunday, March 20, 2011 10:50 AM
To: Kammerer, Annie
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth
Subject: RE: FAQ questions posted

Please see comment below. Please let me know if this document needs to be changed.

From: Christine Goulet [<mailto:goulet@berkeley.edu>]
Sent: Saturday, March 19, 2011 5:54 PM
To: OPA Resource
Subject: ERROR in your answers to faqs related to Japan document

Good afternoon,

I just opened your pdf at <http://www.nrc.gov/japan/faqs-related-to-japan.pdf> and found a **major error** in the answer to question 1.

At the bottom of the answer, "ten times" should be replaced by "approximately 32 times":

"Magnitude is measured on a log scale and so a magnitude 9 earthquake is ten times larger than a magnitude 8 earthquake."

I hope this can be corrected soon!

Sincerely,

Christine Goulet, PhD
Assistant Researcher
NGA East TI team co-chair
Pacific Earthquake Engineering Research Center (PEER),
University of California, Berkeley

Tel (510) 374-4620
goulet@berkeley.edu

From: Kammerer, Annie
Sent: Saturday, March 19, 2011 5:25 PM
To: Kammerer, Annie; Hiland, Patrick; Skeen, David; Case, Michael; RST01 Hoc
Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Giitter, 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, Jeffry; 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;
'FOIAResource.hoc@nrc.gov'
Subject: FAQ questions posted

All,

For your reading enjoyment, and in anticipation of the end of cycle meetings in the regions next week, the NRC has issued a press release announcing a publically available set of FAQs on the earthquake and tsunami.

I hope people find it helpful!

Cheers,
Annie

PS special thanks to Jennifer Uhle who stayed after her overnight shift in the Ops Center to review and provide outstanding comments that really improved the document.

From: Kammerer, Annie

Sent: Saturday, March 19, 2011 9:00 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; 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, Jeffry; 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; FOIAResource.hoc@nrc.gov

Subject: Seismic Q&As March 19th 8am update

All,

Here is today's updated version. Lot of new fact sheets have been prepared for various briefings and for Monday's public meeting!

However, the big news of the day is that we just sent off a 6 page, 22 question, much better edited version for a public Q&A set. It's all in OPA's capable hands now. I think it's pretty good...but then I'm biased.

Cheers,
Annie

From: Kammerer, Annie

Sent: Friday, March 18, 2011 6:51 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; 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, Jeffry; 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

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; Giitter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Giitter, 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, Jeffry; 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...

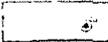
<http://portal.nrc.gov/edo/nrr/NRR%20TA/FAQ%20Related%20to%20Events%20Occuring%20in%20Japan/Forms/AllItems.aspx>

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 ☺

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
Senior Seismologist and Earthquake Engineer
US Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington DC 20555

(b)(6) mobile } Ex 76
(b)(6) BB }

From: Kammerer, Annie
Sent: Tuesday, March 15, 2011 3:41 AM
To: Hiland, Patrick; Skeen, David
Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Giitter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Kammerer, Annie; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Giitter, 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
Senior Seismologist and Earthquake Engineer
US Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington DC 20555

(b)(6) mobile
(b)(6) BB

From: Karwoski, Kenneth *MRK*
To: Thomas, Eric
Cc: Taylor, Robert; Lubinski, John
Subject: FW: Timeline of the Fukushima Event
Date: Monday, March 21, 2011 5:47:41 AM
Attachments: RowleyC-Wikipedia - Timeline of the Fukushima nuclear accidents - 2011-03-17.doc

Just glanced at this - it is dated, but it appears to be a more comprehensive timeline of the events than I have seen. Accuracy???

Ken

-----Original Message-----
From: (b)(6)] EG
Sent: Thursday, March 17, 2011 3:32 PM
To: Karwoski, Kenneth
Subject: Timeline of the Fukushima Event

Gentlemen,

The son of Glen Palmer (VChmn of O&M Committee) observed that Wikipedia has an extensive timeline of the event with footnotes as to where the information came from. See below web address:
http://en.wikipedia.org/wiki/Timeline_of_the_Fukushima_nuclear_accidents

Attached is that excerpted timeline as of today at noon (MST). This is excellent information (all 25 pages).

Best Regards / Wes

=====
C. W. Rowley, PE
Vice President / The Wesley Corporation P. O. Box 747, Green Valley, AZ 85622 Office 520-777-8941 /
Fax 520-777-8942 Cell (b)(6)] EG
=====

This email was brought to you through the ASME Volunteer Contact Center by C. Wesley Rowley , PE.

Committee Distribution List:
Board on Nuclear Codes and Standards

Committee cc Distribution List:
None

Member Distribution List:
None

Member cc Distribution List:
None

WV/7a

Attachment RowleyC-Wikipedia - Timeline of the Fukushima .doc (826368 Bytes) cannot be converted to PDF format.

Bensi, Michelle

From: Kammerer, Annie
Sent: Tuesday, March 22, 2011 6:47 PM
To: Bensi, Michelle
Subject: FW: Earthquake info
Attachments: SONGS Q&As.docx

Here is SONGS...

From: Kammerer, Annie
Sent: Tuesday, March 22, 2011 6:47 PM
To: Schmidt, Rebecca
Cc: Powell, Amy; Dricks, Victor; Uselding, Lara
Subject: RE: Earthquake info

Here's my best shot. I am not nearly as involved with SONGS, but I got some good info from the resident inspectors.

Can RIV PA, please take a look.

Annie

From: Schmidt, Rebecca
Sent: Tuesday, March 22, 2011 4:48 PM
To: Kammerer, Annie
Subject: Re: Earthquake info

We can try

From: Kammerer, Annie
To: Schmidt, Rebecca; Sheron, Brian
Cc: Powell, Amy; Dricks, Victor; Uselding, Lara
Sent: Tue Mar 22 16:35:29 2011
Subject: RE: Earthquake info

Becky,

I apologize for the delay. This is not a document that existed and the information about everything that we have done in terms of reassessing seismic tsunami hazard at these sites is mostly in my head and files.

There are two things. First, please see the note highlighted. I'm not sure what became of that communication back and forth with Capps since I got dropped out of the loop. This relates to the 3D seismic stuff that the Senators staff was discussing with Josh.

Also you may want to note the very last item at SONGS. There is a new "shoreline fault" showing up in literature discussing seismology of the region around SONGS (sound familiar?). I'm almost scared to bring it up, but we are on top of it and are trying to get information about it.

A lot of what we are doing with regard to SONGS is keeping an eye on things...but not formal actions yet, since it isn't part of relicensing. Of course everyone uses the SAMA to bring up other issues, and we expect this for SONGS as well and are preparing.

NN/73

Please have someone read through this before sending it on. I tried to brainstorm everything that is outside of the stuff I can't talk about (legal actions).

I hope this is what you need. Please call me with any questions

(b)(6)

Also, I didn't realize the senator was going to SONGS today as well. (that's quite the tour). If I can get a fact sheet done in an hour, would it be too late? I had already started at Victor's request this morning...and may be able to pull it off.

Annie

What does the Japanese Earthquake Mean to San Onofre?

1) Could an earthquake and tsunami the size of the one in Japan happen at San Onofre?

No. This earthquake occurred on a "subduction zone", which is the type of tectonic region that produces the largest magnitude earthquake. A subduction zone is a tectonic plate boundary where one tectonic plate is pushed under another plate. Subduction zone earthquakes are also required to produce the kind of massive tsunami seen in Japan. In the continental US, the only subduction zone is the Cascadia subduction zone which lies off the coast of far northern California, Oregon and Washington. So, a continental earthquake and tsunami as large as in Japan could only happen there. Outside of the Cascadia subduction zone, earthquakes are not expected to exceed a magnitude of approximately 8.25; and that would only occur on the largest fault lines, such as the San Andreas fault, which is 50 miles away onshore.

2) What magnitude earthquake are currently operating US nuclear plants such as SONGS designed to?

Each reactor is designed for a different ground motion that is determined on a site-specific basis. Ground motion is a function of both the magnitude of an earthquake and the distance from the fault to the site; and it is ground motion that causes damage. So, Nuclear plants, and in fact all engineered structures, are actually designed based on ground motion levels, not earthquake magnitudes. The existing nuclear plants were designed based on a "deterministic" or "scenario earthquake" basis that accounted for the largest earthquakes expected in the area around the plant. The scenario earthquake at SONGS is a magnitude 7 approximately 5 miles from the main plant. This earthquake results in a ground motion that has a peak ground acceleration of 0.67g, that is 67% of the acceleration of gravity.

3) Could San Onofre withstand an earthquake of the magnitude of the Japanese earthquake?

It could withstand the ground shaking experienced by the Japanese nuclear plants. As discussed above, it is actually ground motions that structures, systems, and components "feel". We do not have direct recordings of ground motion at the Japanese reactors. However, we do have estimates of shaking that come from a ShakeMap produced by the K-NET system. The ground motion at the Japanese nuclear reactors is believed to be somewhat on the order of the 0.67g, or possibly slightly higher, that San Onofre peak ground acceleration has been analyzed to. However, US nuclear plants have additional seismic margin, as demonstrated by the result of the Individual Plant Examination of External Events program carried out by the NRC in the mid-90s.

It should be noted that, the Fukushima plant also withstood the earthquake. In the hour or so after the earthquake the Fukushima plant's safety systems, including the diesel generators, performed as expected and effectively shut down the reactor. The cause of the problems at the plant stemmed from the loss of emergency power that appears to be the direct result of the subsequent tsunami, which far exceeded the design basis tsunami for the Fukushima plant.

4) Is possible to have a tsunami at San Onofre that is capable of damaging the plant?

The San Onofre Units 2 and 3 plant grade is elevation +30.0 feet MLLW. San Onofre 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. 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 larger than this is extremely unlikely.

5) Has the earthquake hazard at San Onofre been reviewed like Diablo Canyon nuclear power plant is doing? Are they planning on doing an update before relicensing?

Relicensing does not evaluate seismic hazard or other siting issues. Seismic safety is part of NRC's ongoing licensing activities. If an immediate safety concern emerged, the issue would be addressed as part of NRC's response, regardless of relicensing status.

The closest active fault is approximately five miles offshore from San Onofre, a system of folds and faults exist called the offshore zone of deformation (OZD). The OZD includes the Newport-Inglewood-Rose Canyon fault system. 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 earthquakes in the OZD for San Onofre.

Notwithstanding the above, the NRC is considering extending the Generic Issue 199 program to all operating reactors. This would require a reassessment of hazard for San Onofre using the latest probabilistic seismic hazard assessment approaches. Based on a preliminary assessment using the source model developed by the USGS for the national seismic hazard maps, the annual probability of occurrence of a 0.67g ground motion at the San Onofre site is only slightly higher than is than the annual probability of occurrence that is recommended for new nuclear plants.

6) How do we know that the emergency diesel generators in San Onofre will not fail to operate like in Japan?

Emergency Diesel Generators (EDGs) are installed in a seismically qualified structure and are seismic Category I equipment. Even if these EDGs did fail, plants can safely shutdown using station blackout power source law 10 CFR 50.63. In 1988 the NRC concluded that additional regulatory requirements were justified in order to provide further assurance that a loss of both offsite and onsite emergency ac power systems would not adversely affect public health and safety and the station blackout rule was enacted. Studies conducted by the NRC since this rule has been in effect confirms that the hardware and procedures that have been implemented to meet the station blackout requirements have resulted in significant risk reduction and have further enhanced defense-in-depth. However, we plan to carefully evaluate the lessons learned from the events in Japan to determine if enhancements to the station blackout rule are warranted.

7) Was there any damage to San Onofre from either the earthquake or the resulting tsunami?

There was no damage at the San Onofre nuclear plant from either the earthquake or tsunami.

8) What about emergency planning for San Onofre. Does it consider tsunami?

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 San Onofre. The next such exercise is planned for April 12, 2011.

The San Onofre emergency plan initiates the emergency response organization and results in declaration of emergency conditions via their Emergency Action Levels. 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 San Onofre. The consideration of tsunami would be contained in the State and local (City, County) emergency plans, which are reviewed by FEMA.

Bensi, Michelle

From: Munson, Clifford *NRO*
Sent: Tuesday, March 22, 2011 9:54 AM
To: Burnell, Scott; Kammerer, Annie
Cc: Bensi, Michelle
Subject: RE: FAQ questions posted - Corrections to Answer #12

Scott – I made the corrections yesterday. So please make the changes to the FAQ.

Thanks,
Cliff

From: Burnell, Scott - *OAC*
Sent: Tuesday, March 22, 2011 9:53 AM
To: Kammerer, Annie; Munson, Clifford
Cc: Bensi, Michelle
Subject: RE: FAQ questions posted - Corrections to Answer #12

Still waiting to hear that Cliff's OK with this language (apologies if I've missed an e-mail somehow). Thanks.

From: Kammerer, Annie
Sent: Monday, March 21, 2011 3:31 PM
To: Burnell, Scott; Munson, Clifford
Cc: Bensi, Michelle
Subject: RE: FAQ questions posted - Corrections to Answer #12

OK, with me, but Cliff is the boss....

From: Burnell, Scott —
Sent: Monday, March 21, 2011 3:23 PM
To: Munson, Clifford; Kammerer, Annie
Subject: RE: FAQ questions posted - Corrections to Answer #12
Importance: High

This version is acceptable???? We'd like to post the update today.

1) What is the likelihood of the design basis or "SSE" ground motions being exceeded over the life of a nuclear plant?

The ground motions that are used as seismic design bases at US nuclear plants are called the Safe Shutdown Earthquake ground motion (SSE). 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 nuclear plants in the US have adequate safety margins for withstanding earthquakes. Currently, the NRC is in the process of conducting GI-199 to again assess the resistance of US nuclear plants to earthquakes. Based on NRC's preliminary analyses to date, the mean probability of ground motions exceeding the SSE over the life of the plant for the plants in the Central and Eastern United States is less than about 1%.

It is important to remember that structures, systems and components are required to have "adequate margin," meaning that they must continue be able withstand shaking levels that are above the plant's design basis.

NN/74

From: Munson, Clifford
Sent: Monday, March 21, 2011 12:15 PM
To: Kammerer, Annie; Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Ake, Jon; Burnell, Scott
Subject: FAQ questions posted - Corrections to Answer #12

My corrections to Answer #12

12) What is the likelihood of the design basis or "SSE" ground motions being exceeded over the life of a nuclear plant?

The ground motions that are used as seismic design bases at US nuclear plants are called the Safe Shutdown Earthquake ground motion (SSE). 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 nuclear plants in the US have adequate safety margins for withstanding earthquakes. Currently, the NRC is in the process of conducting GI-199 to again assess the resistance of US nuclear plants to earthquakes. Based on NRC's preliminary analyses to date, the mean probability of ground motions exceeding the SSE over the life of the plant for the plants in the Central and Eastern United States is less than about 1%, with values ranging from a low of 0.1% to a high of 6%.

It is important to remember that structures, systems and components are required to have "adequate margin," meaning that they must continue be able withstand shaking levels that are above the plant's design basis.

From: Munson, Clifford — NRO
Sent: Monday, March 21, 2011 12:05 PM
To: Kammerer, Annie; Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Ake, Jon; Burnell, Scott
Subject: FAQ questions posted

The edits that were made to Question 12) in the Public FAQ now make the answer inaccurate. I will see if I can fix it.

Cliff
Clifford Munson, Ph.D.
Senior Level Advisor
U.S. NRC - Office of New Reactors
Division of Site and Environmental Reviews
301-415-6947
clifford.munson@nrc.gov

From: Kammerer, Annie
Sent: Sunday, March 20, 2011 10:11 PM
To: Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Munson, Clifford; Ake, Jon; Burnell, Scott
Subject: RE: FAQ questions posted

I just saw a second document entitled, "Frequently Asked Questions About the Japan Nuclear Crisis: "Can It Happen Here?"

There is an error in the question:

Are nuclear power plants along the coasts vulnerable to tsunami?

Large tsunami such as the one that hit Japan typically are caused by "subduction" faults, where one tectonic plate slides under another. There is only one such fault near the U.S. coastline – off the northern part of the West Coast, from northern California up past Oregon and Washington. There are no coastal nuclear power plants in this region. The closest plant, in southern California, is well protected against tsunami.

Along the Gulf Coast and the Atlantic Coast, storm surge from hurricanes poses a greater threat than tsunami to nuclear power plants. The plants in these regions are well protected against hurricane storm surge.

The closest plant is Diablo canyon. Most people from California (myself included) would not call the region that Diablo is in "southern California", but rather the central California coast. SONGS is in So. Cal. We can't really say that SONGS is "well protected against tsunami"...it's adequately protected. Also, this makes it seem like hurricanes are always a greater threat than tsunami. The NRC's tsunami research program is showing that this is not true on the north Atlantic coast. As you get toward the moderate seismic zone in coastal Canada, the tsunami exceeds the storm surge due to the potential for large local tsunami from seismically-induced landslides.

A better answer is:

Large tsunami such as the one that hit Japan typically are caused by faults located in "subduction" zones, where one tectonic plate slides under another. There is only one such fault near the U.S. coastline – off the northern part of the West Coast, from northern California up past Oregon and Washington. There are no coastal nuclear power plants in this region. The closest coastal plant, located along the central California coastline is the Diablo Canyon nuclear plant. This nuclear plant is well protected against tsunami. Along the Gulf Coast and the Atlantic Coast, storm surge from hurricanes generally poses a greater threat to nuclear plants than tsunami. The plants in these regions are well protected against hurricane storm surge.

From: Harrington, Holly - OPA
Sent: Sunday, March 20, 2011 11:34 AM
To: Kammerer, Annie
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Munson, Clifford; Ake, Jon; Burnell, Scott
Subject: RE: FAQ questions posted

Thanks Annie.

Eliot/Beth: Do we think this can wait until Monday to be updated on the Web?

Holly

From: Kammerer, Annie
Sent: Sunday, March 20, 2011 11:31 AM
To: Harrington, Holly
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth; Munson, Clifford; Ake, Jon
Subject: RE: FAQ questions posted

Change it to this....

"Magnitude is measured on a log scale and so a magnitude 9 earthquake produces about ten times stronger shaking and releases about 31 times more energy than a magnitude 8 earthquake."

I was trying to keep things simple to be more user friendly. I thought that people would find this confusing a little. People feel wave amplitude, not energy... so I chose the thing that people could relate to. But engineers, like Christine, think about energy absorption in structures.

Anyway, just so you know, Christine is a good friend of mine and she is supported as full time staff (the project manager) on a major research project funded by NRC, DOE, EPRI and the USGS (called NGA-East). So,

she's very protective of the NRC and is on the lookout for anything that may related to us and is inaccurate, or can be misinterpreted. She's one of the many people out there who have our backs when it comes to what is going out in the press.

Annie

P.S. This is straight from a USGS fact sheet. "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."

From: Harrington, Holly - OPA
Sent: Sunday, March 20, 2011 10:50 AM
To: Kammerer, Annie
Cc: McIntyre, David; Brenner, Eliot; Hayden, Elizabeth
Subject: RE: FAQ questions posted

Please see comment below. Please let me know if this document needs to be changed.

From: Christine Goulet [mailto:goulet@berkeley.edu]
Sent: Saturday, March 19, 2011 5:54 PM
To: OPA Resource
Subject: ERROR in your answers to faqs related to Japan document

Good afternoon,

I just opened your pdf at <http://www.nrc.gov/japan/faqs-related-to-japan.pdf> and found a **major error** in the answer to question 1.

At the bottom of the answer, "ten times" should be replaced by "approximately 32 times":

"Magnitude is measured on a log scale and so a magnitude 9 earthquake is ten times larger than a magnitude 8 earthquake."

I hope this can be corrected soon!

Sincerely,

Christine Goulet, PhD
Assistant Researcher
NGA East TI team co-chair
Pacific Earthquake Engineering Research Center (PEER),
University of California, Berkeley

Tel (510) 374-4620
goulet@berkeley.edu

From: Kammerer, Annie
Sent: Saturday, March 19, 2011 5:25 PM
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, Jeffry; 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; Mañoly, Kamal; Khanna, Meena; Screnci, Diane; Thomas, Eric; Nguyen, Quynh; Meighan, Sean;
'FOIAResource.hoc@nrc.gov'

Subject: FAQ questions posted

All,

For your reading enjoyment, and in anticipation of the end of cycle meetings in the regions next week, the NRC has issued a press release announcing a publically available set of FAQs on the earthquake and tsunami.

I hope people find it helpful!

Cheers,
Annie

PS special thanks to Jennifer Uhle who stayed after her overnight shift in the Ops Center to review and provide outstanding comments that really improved the document.

From: Kammerer, Annie

Sent: Saturday, March 19, 2011 9:00 AM

To: Kammerer, Annie; Hiland, Patrick; Skeen, David; Case, Michael; RST01 Hoc

Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Giitter, 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, Jeffry; 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;
FOIAResource.hoc@nrc.gov

Subject: Seismic Q&As March 19th 8am update

All,

Here is today's updated version. Lot of new fact sheets have been prepared for various briefings and for Monday's public meeting!

However, the big news of the day is that we just sent off a 6 page, 22 question, much better edited version for a public Q&A set. It's all in OPA's capable hands now. I think it's pretty good...but then I'm biased.

Cheers,
Annie

From: Kammerer, Annie

Sent: Friday, March 18, 2011 6:51 AM

To: Kammerer, Annie; Hiland, Patrick; Skeen, David; Case, Michael; RST01 Hoc

Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Giitter, 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, Jeffry; 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
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; Giitter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Giitter, 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%20TA/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 ☺

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
Senior Seismologist and Earthquake Engineer
US Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington DC 20555

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(b)(6) BB

Ex 6

From: Kammerer, Annie
Sent: Tuesday, March 15, 2011 3:41 AM
To: Hiland, Patrick; Skeen, David
Cc: Howe, Allen; Nelson, Robert; Stutzke, Martin; Giitter, Joseph; Rihm, Roger; McDermott, Brian; Hasselberg, Rick; Kammerer, Annie; Chokshi, Nilesh; Munson, Clifford; Cook, Christopher; Flanders, Scott; Ross-Lee, MaryJane; Brown, Frederick; Giitter, 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
Senior Seismologist and Earthquake Engineer
US Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington DC 20555

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Ex 6

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Ex 6

Bensi, Michelle

From: Kammerer, Annie
Sent: Tuesday, March 22, 2011 11:40 AM
To: Hall, Randy
Cc: Bensi, Michelle
Subject: RE: question on spent fuel pools

Does the below Q&A look OK, or would you suggest edits?

Q. Are Independent Spent Fuel Storage Installations (ISFSIs) required to withstand the same ground shaking as the reactor.?

A. Dry cask storage facilities at reactor sites use the same Safe Shutdown Earthquake (SSE) ground motion developed for the nuclear plant site for the design basis for the ISFSI. Some reactor licensees have separate Part 72 site-specific licenses for their independent spent fuel storage installations (ISFSIs), while other reactor licensees have ISFSIs under the general license provisions of Part 72. Among ISFSIs with a site-specific Part 72 license (e.g., Diablo), all used the Part 50 reactor SSE for their design basis earthquake [in accordance with 10 CFR 72.102(f)(1), which requires that the SSE be used for sites that have been evaluated under 10 CFR Part 100, Appendix A; (i.e., reactor sites)]. ISFSIs under the general license of 72.210 (e.g., SONGS) are similarly required to apply the design bases for the Part 50 license to the ISFSI design [in accordance with 72.212(b)(3)].

Thanks,
Annie

From: Hall, Randy - *NR*
Sent: Tuesday, March 22, 2011 9:16 AM
To: Kammerer, Annie
Subject: RE: question on spent fuel pools

Annie,

I forwarded the part of the question on SFPs to Mike Markley, who sent it on to Meena and Kamal.

As far as dry cask storage facilities at reactor sites, the SSE for the site is used as the design basis for the ISFSI, as discussed below.

Some reactor licensees have separate Part 72 site-specific licenses for their independent spent fuel storage installations (ISFSIs), and some reactor licensees have ISFSIs under the general license provisions of Part 72.

For ISFSIs with a site-specific Part 72 licenses (e.g., Diablo), all used the Part 50 reactor SSE for their design basis earthquake (10 CFR 72.102(f)(1) requires that the SSE be used for sites that have been evaluated under 10 CFR Part 100, Appendix A; i.e., reactor sites).

ISFSIs under the general license of 72.210 (e.g., SONGS) are similarly required to apply the design bases for the Part 50 license to the ISFSI design [in accordance with 72.212(b)(3)].

Randy

From: Kammerer, Annie
Sent: Tuesday, March 22, 2011 8:05 AM

NN/75

To: Hall, Randy

Subject: question on spent fuel pools

Hi Randy,

I need your help on a question. In the recent information for the commissioner's briefing, it says that spent fuel pools are designed to the same seismic design criteria (SSE) as the reactor. However, I recently heard that that is not universally true. Can you please provide me with an answer for the Seismic Q&A document (latest attached, in case you aren't on the distribution list). What about other types of spent fuel storage?

Marty Virgilio asked me this question because he also seemed to think that not all SPF's were designed to SSE, and I'd like to give him (and the rest of the NRC) a reliable answer in the Q&A documents. Also, any other Q&As that you would like to provide me for inclusion would be most appreciated.

Thanks,
Annie

Dr. Annie Kammerer, PE
Senior Seismologist and Earthquake Engineer
US Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington DC 20555

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Yarsky, Peter

From: Yarsky, Peter *PES*
Sent: Tuesday, March 22, 2011 12:20 AM
To: Carlson, Donald; Scott, Harold
Cc: Elkins, Scott
Subject: RE: TEPCO meeting at the US Embassy Monday.

Don,

Here are my notes and thoughts from the call. First, thanks for including me, I found it very enlightening and appreciated the opportunity to be of some use (albeit not too much).

(1) salt accumulation

I think that Sam Miranda best described this phenomenon when he tried to draw a distinction between distillation and precipitation, but I do think that resulted in more confusion overall. The salt concentration builds up in the vessel because inventory loss is purely through boil-off whereas the supply of coolant is at a constant salt concentration leading to an ever increasing concentration in the vessel. As the concentration increases beyond the saturation limit at the current pressure/temperature in the vessel precipitation will occur. I concur with the participants that we would expect the salt to fall out of solution and build up in the lower head.

As for the core coolability criterion that TEPCO is trying to set (which dictates the time-til-loss-of-cooling), I was a little concerned that a steady build up of solid salt in the RPV lower head may lead to an interruption of flow when this level reaches the bottom of the shroud skirt for those units with recirculation line injection (that is entirely conjectural, however, since I do not know the flow conditions, etc.). From the call it would seem that TEPCO considered this in their assessment.

I was curious to hear for a call for suggestions to remove the salt. Sweeping in a pure liquid environment I do not think to be a prudent strategy (while that would work for a PWR - is not tenable for a BWR - I imagine even successful attempts at this strategy would result in suppression pool overfill).

Don, I was hoping you could communicate with the RST and see if bottom drain line suction and additional FWCI makeup might be a useful suggestion for evaluation. Since the RPV lower head will have high concentration taking suction from here might at least provide additional time before core cooling is potentially compromised.

(2) recriticality and hydrogen explosion

I heard on the call that neutron flux measurements were made as water was restored to the vessel. From that, one could actually infer (or at least get a good estimate) of core k-eff using the subcritical multiplying medium equation, since flux levels remained low throughout restoration of level that would appear to indicate the continued presence of strong neutron absorber (rods) in the core. If level is continuing to be maintained to provide steam cooling, I generally concur with TEPCO's assessment. Some additional data regarding the timing of seawater injection and specific neutron flux indications could be used to establish an estimate of the control inventory prior to injection. This would give a more rigorous yes or no to the question of blade melt.

As far as to the question of hydrogen explosion, I don't understand the nature of the topic here. I was a bit confused as to whether the concerns were in regard to the vessel or containment. Rapid increase in in vessel hydrogen would be expected once AC power is restored and significant injection takes place.

I think I heard some talk about consideration of alternative injection lines. In that case, I would wonder about: condensate line, RWCU and CRD cooling.

I dropped off the call after these topics.

Thanks

Pete

From: Carlson, Donald *NCO*
Sent: Monday, March 21, 2011 11:46 PM
To: Scott, Harold
Cc: Yarsky, Peter
Subject: RE: TEPCO meeting at the US Embassy Monday.

Harold,

The meeting focused almost entirely on the question of when precipitating seasalt might accumulate in the lower head to the point where core cooling becomes seriously compromised.

Hossein Esmaili is very active on the RST and made some good observations with team members in the background. So far, as indicated in their slides, TEPCO believes salt accumulation in the bottom of the RPV might cause flow obstruction when it reaches the nominal level of the bottom of the fuel, which is estimated to happen around the end of the month. Len Ward discussed analogies with boric acid precipitation in PWRs. Pete Yarsky (on Cc) asked some good clarifying questions and suggested a potential for earlier core cooling obstruction when salt reaches the shroud skirt.

Recriticality was only briefly mentioned. TEPCO seems to be assuming that the control blades and fuel are still geometrically intact. So their stated concern seems to be about recriticality should control blades melt first when/if core cooling is obstructed. So far we've said almost nothing on this. There will be more phone calls tomorrow and Wednesday nights. Everyone is glad I got Pete involved.

Tony Ulses was not on the call and the RST members don't seem to know what he's been up to.

Thanks again,
Don

From: Scott, Harold
Sent: Monday, March 21, 2011 8:23 PM
To: Carlson, Donald
Subject: RE: TEPCO meeting at the US Embassy Monday.

Document Title

NUREG/CR-6042, Rev. 2, "Perspectives on Reactor Safety".

see chapter 3.7

<http://adamswebsearch2.nrc.gov/IDMWS/ViewDocByAccession.asp?AccessionNumber=ML091250169>

From: Carlson, Donald
Sent: Monday, March 21, 2011 8:09 PM
To: RST01 Hoc; Yarsky, Peter; Ward, Leonard
Cc: RST07 Hoc; RST02 Hoc; Scott, Harold
Subject: RE: TEPCO meeting at the US Embassy Monday.

All,

I just found my hardcopy of the 1990 PNL study for RES, NUREG/CR-5653, "Recriticality in a BWR Following a Core Damage Event." Harold Scott and I are still hunting for an electronic copy.

The abstract says:

"Based on a conservative bounding analysis, this report concludes that there is a potential for recriticality in BWRs if core reflood occurs after control blade melting has begun but prior to significant fuel rod melting. However, a recriticality event will most likely not generate a pressure pulse significant enough to fail the vessel. Instead, a quasi-steady power level would result and the containment pressure and temperature would increase until the containment failure pressure is reached, unless actions are taken to terminate the event.

Two strategies are identified that would aid in regaining control of the reactor and terminate the recriticality event before containment failure pressures are reached. The first strategy involves initiating boration injection at or before the time of core reflood. The second strategy involves initiating residual heat removal suppression pool cooling to remove the heat load generated by the recriticality event and thus extend the time available for boration."

Also, I had just found the attached 1992 follow-up paper by ORNL when Pete Yarsky sent me the corresponding ORNL report, NUREG/CR-5869. See Pete's excellent message attached.

Actually, Tony Ulises probably knows quite a lot about all this. But he is on the ground in Japan.

Don

Cell: (b)(6)

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

From: RST01 Hoc
Sent: Monday, March 21, 2011 7:06 PM
To: Yarsky, Peter; Ward, Leonard; Carlson, Donald
Cc: RST07 Hoc; RST02 Hoc
Subject: FW: TEPCO meeting at the US Embassy Monday.

Call into the HOO for the call:

1) 301-816-5100

2) Transfer to the Reactor Safety Team (RST) Bridge

>

> Phone:+81-240-32-2486

> Fax.:+81-240-32-3881

> E-mail:kawano.akira@tepcoco.jp

> URL:<http://www.tepcoco.jp/fukushima1-np/index-j.html>

>

From: OPA Resource
To: Couret, Ivonne; Deavers, Ron; Bonaccorso, Amy
Subject: FW: Events in Japan
Date: Wednesday, March 23, 2011 5:07:41 PM

Something nice for a change!

From: Mary Lariviere (b)(6)
Sent: Wednesday, March 23, 2011 2:27 AM
To: OPA Resource
Subject: Events in Japan

Good Morning!

I would just like to thank you for all of the help you are giving us here in Japan during these very trying times! It is very much appreciated!

Thank You!

V/R,
Mary

MM/17

From: Mike
To: Bonaccorso, Amy
Subject: Re: REPLY: Japan meltdown
Date: Wednesday, March 23, 2011 10:34:29 PM

Amy

Thank you for the quick reply and link to more info. In watching your chief (sorry I dont remember his name) deflect questions regarding how US reactors safety measures are in one way better than Japans I was interested in one specific statement he made regarding a fourth backup to the water cooling failures Japan experienced. Excuse me if I misunderstood but I thought he said we have some portable systems that are available to react to the loss of cooling. Can you explain what that system is? I assume a trailer with generator, pumps and heat exchangers? If we have such systems why have they not been offered to assist Japan?

Sounded like a good backup?

Best Regards

Mike

From: "Bonaccorso, Amy" <amy.Bonaccorso@nrc.gov>
To: (b)(6)
(b)(6) rs, Ron" <Ron.Deavers@nrc.gov>
, March 16, 2011 12:53:19 PM
Subject: REPLY: Japan meltdown

Dear Mr. Tracey:

At this time, the NRC does not believe protective measures are necessary in the United States. If the event circumstances change, U.S. residents should listen to the protective action decisions of their states and counties. These protective action decisions could include actions such as sheltering, evacuation, or taking potassium iodide. The NRC will provide technical assistance to the states should they request it. Unites States citizens in Japan are encouraged to follow the protective measures recommended by the Japanese government.

The NRC continues to monitor information regarding wind patterns near the Japanese nuclear power plants. Nevertheless, given the distance between the Japan and Hawaii, Alaska, the U.S. Territories and the U.S. West Coast we are not expected to experience any harmful levels of radioactivity. The EPA has publicly stated its agreement with the NRC's assessment that we do not expect to see radiation at harmful levels reaching the U.S. from damaged Japanese nuclear power plants.

I am sorry that we can't spend more time answering your questions about spent fuel storage and cooling systems, but information on this page (link below) may help you.

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/>

Thank you,

Amy

From: Mike [mailto:mjtct@yahoo.com]

NN/78

Sent: Tuesday, March 15, 2011 10:53 PM
To: OPA1 RESOURCE; OPA1 RESOURCE
Subject: Japan meltdown

Hi

I am hoping the NRC will take lessons learned from what is occurring in Japan. I would like to know why spent fuel is stored at the reactors? I imagine it is a cost reason and nobody else wants it. You need to get a solution that cannot be compromised as may be the case in Japan i.e. offsite storage.

I realize the odds of such a situation in Japan are slim but the severity is high. Why cant the cooling system rely on a gravity system backup? Where are they dumping that seawater?

Im sure scientists have thought of it all but it sure doesnt seem that way over the past week.

Also people are left to find there own ways to obtain potassium iodide. And guess what you cant buy it anywhere. You need to take it before exposure. By the time the meltdown release reaches the US - the levels will be safe right. Think about it - they have three to five reactors on the edge of out of control and a spent fuel pool compromised.

Is this the responsibility of the NRC or will be Obamas fault? Your expertise is key - show leadership.

Sorry but thats my perspective. I am very concerned.

Mike Tracey

(b)(6)

From: Deavers, Ron
To: (b)(6)
Subject: RE: REPLY West Coast radioactive contamination
Date: Wednesday, March 23, 2011 3:52:40 PM

We understand your concern.

As the Nuclear Regulatory Commission has said, we do not expect to see radiation at harmful levels reaching the U.S. from damaged Japanese nuclear power plants.

As part of the federal government's continuing effort to make our activities and science transparent and available to the public, the Environmental Protection Agency (EPA) will continue to keep all RadNet data available in the current online database. In addition, EPA plans to work with its federal partners to deploy additional monitoring capabilities to parts of the western U.S. and U.S. territories.

As always, EPA is utilizing this existing nationwide radiation monitoring system, RadNet, which continuously monitors the nation's air and regularly monitors drinking water, milk and precipitation for environmental radiation. The RadNet online searchable database contains historical data of environmental radiation monitoring data from all fifty states and U.S. territories.

The Food and Drug Administration (FDA) and U.S. Department of Agriculture continues to ensure all our imported food remains safe as they do every day.

At this time, the NRC does not believe protective measures are necessary in the United States. In the event circumstances change, U.S. residents should listen to the protective action decisions of their states and counties. These protective action decisions could include actions such as sheltering, evacuation, or taking potassium iodide. The NRC will provide technical assistance to the states should they request it.

The FDA, U.S. Postal Service, and Customs and Border Patrol are of course closely monitoring the situation in Japan and all are working with other U.S. agencies and or the Japanese government to continue to ensure that imported food, mail, and airplanes remains safe.

From: Frank Valerga (b)(6)
Sent: Wednesday, March 23, 2011 3:28 PM
To: OPA Resource
Subject: West Coast radioactive contamination

I am very concerned over the radioactive contamination from Japan. The first of the cloud already hit the west coast last Friday.

I know the the level is very low but it is still there. Radiation causes cancer and a little radiation causes a little cancer.

Is there a way to mitigate contamination from water? Will a activated charcoal filter reduce or eliminate the heavy metal radioactive isotopes that are being released?

Is the contamination from crops absorbed into the plant or can they be washed off? Are products from South East Asia (Japan, Korea, and other South East Asia countries)

being monitored to prevent radioactive particles from being introduced into this country? I am especially concerned

NN/79

with plastics (children's toys and other injected or molded products)
and with imported cars from those areas. Please release any information on reducing contamination and
immediately start to monitor products.

I know that this is a very politically charged topic. I also know that hundreds if not thousands of lives depend on
your decisions including your own children and grandchildren.

God be with you on these momentous decisions!

From: [Deavers, Ron](#)
To: [Deavers, Ron](#); [Bonaccorso, Amy](#)
Subject: RE: REPLY Public - Question
Date: Wednesday, March 23, 2011 3:33:08 PM

Provided the epa mail resource: radiation.questions@epa.gov

From: Royer, Deanna
Sent: Wednesday, March 23, 2011 3:25 PM
To: Deavers, Ron
Subject: RE: Public - Question

Sorry (b)(6)

From: Deavers, Ron
Sent: Wednesday, March 23, 2011 3:23 PM
To: Royer, Deanna; Bonaccorso, Amy
Subject: RE: Public - Question

Phone number correct? Should I try 240 for the area code?

From: Royer, Deanna
Sent: Wednesday, March 23, 2011 3:20 PM
To: Deavers, Ron; Bonaccorso, Amy
Subject: Public - Question

Steve Petrak
(b)(6)

Re: Exposure risks in Japan from water contamination.

Deanna Royer
Contract Secretary
Division of New Reactor Licensing
(301) 415-7158
Deanna.Royer@nrc.gov

MM/80

Bonaccorso, Amy

From: (b)(6)
Sent: Wednesday, March 23, 2011 4:01 PM
To: Bonaccorso, Amy
Subject: Re: reply to your email
Attachments: reply to email.jpg

Amy,

Namon sent a reply to your email in the attachment.

Thanks,

Kenny

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

From: Bonaccorso, Amy <amy.Bonaccorso@nrc.gov>
To: (b)(6)
Sent: Mon, Mar 21, 2011 9:33 am
Subject: REPLY: radiation control

Hello Mr. Hawthorne and Mr. Wilson:

Thank you for sending your ideas, especially in light of your experience. We appreciate suggestions that work toward resolving the situation in Japan; it's reassuring to see how helpful and dedicated private citizens have been in light of this disaster.

Please understand that the NRC has some of the most expert people in the world available to assist the Japanese authorities in whatever way they request. We are fully staffed in all our response teams at this time and working 24-hours a day.

Thank you,

Amy

From: Ray Wilson (b)(6)
Sent: Monday, March 21, 2011 3:42 AM
To: OPA Resource
Cc: (b)(6) Darrin Brady
Subject: radiation control

To Interested parties,

Attached are 3 files addressing the nuclear power plant catastrophe in Japan. The 1st and 3rd files address the scope and potential dangers of the Japanese problem. The 2nd file is a compilation of some of the tests which have been conducted on our equipment.

We believe these reports will show how our equipment will be useful in helping to bring these challenges under control. We know that this is a relatively unknown technology and are ready for it to be tested to verify our previous tests results.

Our web site is currently under construction, but you may find some more helpful information here. www.behairtech.com

We are ready to answer any questions and may be contacted at the following e-mail and phone numbers.

Namon Hawthorne: Inventor-Designer of technologies

(b)(6)

NN/81

cell

(b)(6)

Ray Wilson

(b)(6)

(b)(6)



Namon Hawthorne

505 NW 30th,
Miami, OK 74354

(b)(6)

918.541.9700

fax 918.542.7176

cell (b)(6)

Tuesday, March 22, 2011

**Ref.: Reply to E-Mail by NRC Representative Amy Bonaccorso
"Radiation Control"**

Ms Amy Bonaccorso,

Thank you for answering our letter of Monday 21, 2011. There are a couple of items, which must be cleared up to be sure we are addressing the same subject. Our company is not attempting to obtain employment in NRC as none of us are "world renown experts in nuclear physics" but rather, the intent was to inform NRC of our capabilities in stopping the disintegration of radioactive isotopes. There seems to be no interest in knowing this, especially this data being presented from the lower scale of intellectual understanding.

Apparently, NRC has a very busy schedule working 24-hour per day and such a workload will not allow for anyone from NRC to attend the next demonstrations of our technologies for some U.S. Senators and newsagents using our mobile systems.

What is difficult to understand is why the experts have not come up with a method to stop the disintegration of radioactive isotopes? If you can stop the disintegration of radioactive isotopes, perhaps we failed to understand the intellectual desire to withhold information and lifesaving technologies, since those in need are simply private citizens.

Our intentions are very simple, if our equipment and processed water does what we say it will do, we would like to make contract with a responsible party in Japan to sell them drinking water, and lease or operate our equipment as required.

We understand that we do not compare to the intellectual status of your employees, however, I have employees I am very proud of, dedicated, and fine family people. The insinuation that because we are not experts in nuclear physics we fall into some second rate private citizen category is simply an incorrect assumption.

If after demonstrating and testing our equipment and water, we find that it does not work, we simply go home.

Thank you!


Namon A. Hawthorne

From: (b)(6)
To: Bonaccorso, Amy
Subject: Re: reply to your email
Date: Wednesday, March 23, 2011 4:02:29 PM
Attachments: reply_to_email.jpg

Amy,

Namon sent a reply to your email in the attachment.

Thanks,

Kenny

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

From: Bonaccorso, Amy <amy.Bonaccorso@nrc.gov>
To: (b)(6)
Sent: Mon, Mar 21, 2011 9:33 am
Subject: REPLY: radiation control

Hello Mr. Hawthorne and Mr. Wilson:

Thank you for sending your ideas, especially in light of your experience. We appreciate suggestions that work toward resolving the situation in Japan; it's reassuring to see how helpful and dedicated private citizens have been in light of this disaster.

Please understand that the NRC has some of the most expert people in the world available to assist the Japanese authorities in whatever way they request. We are fully staffed in all our response teams at this time and working 24-hours a day.

Thank you,

Amy

From: Ray Wilson (b)(6)
Sent: Monday, March 21, 2011 3:42 AM
To: OPA Resource
Cc: (b)(6) Darrin Brady] -
Subject: radiation control

To Interested parties,

Attached are 3 files addressing the nuclear power plant catastrophe in Japan. The 1st and 3rd files address the scope and potential dangers of the Japanese problem. The 2nd file is a compilation of some of the tests which have been conducted on our equipment.

We believe these reports will show how our equipment will be useful in helping to bring these challenges under control. We know that this is a relatively unknown technology and are ready for it to be tested to verify our previous tests results.

Our web site is currently under construction, but you may find some more helpful information here.
www.behairtech.com

ANN/82

We are ready to answer any questions and may be contacted at the following e-mail and phone numbers.

Namon Hawthorne; Inventor-Designer of technologies

(b)(6)

cell (b)(6)

Ray Wilson

(b)(6)

(b)(6)

[Handwritten mark]

From: Deavers, Ron
To: Bonaccorso, Amy; Deavers, Ron
Subject: RE: REPLY Info-Citizen
Date: Wednesday, March 23, 2011 4:28:19 PM

Provided #1 and #4 on the Fact Sheet

From: Akstulewicz, Brenda
Sent: Wednesday, March 23, 2011 4:13 PM
To: Deavers, Ron
Subject: Info-Citizen

Emily Goldberg
(b)(6)
(b)(6)
Safe to travel to (b)(6)

Brenda Akstulewicz
Administrative Assistant
Office of Public Affairs
301-415-8209
brenda.akstulewicz@nrc.gov



AM/83

From: [Bonaccorso, Amy](#)
To: [Harrington, Holly](#)
Subject: Re: Request for information
Date: Wednesday, March 23, 2011 4:40:11 PM

I think I saw some email traffic on this earlier today- will check tomorrow.

On my way back for my car. I almost finished the newsletter today, but then it would not save anywhere. CSC could not help- so I lost it. So painful!

From: Harrington, Holly
To: Bonaccorso, Amy
Sent: Wed Mar 23 16:25:04 2011
Subject: FW: Request for information

Can you get this request to the right person in Research?

From: Albert, Thomas [<mailto:Thomas.Albert@dhs.gov>]
Sent: Wednesday, March 23, 2011 4:00 PM
To: Harrington, Holly
Subject: RE: Request for information

The National Academies issued a report in 2005 on "Safety and Security of Commercial Spent Nuclear Fuel Storage" The report considers the risk of terrorist attacks on Spent Fuel Storage and therefore is of interest to DNDO. The public report references a classified report, so I am interested in reviewing the classified report if possible. I contacted a colleague of mine at the National Academies who informed me that the classified report was sponsored by the US NRC Office of Nuclear Regulatory Research so I would need to request the report from the sponsor. So I contacted another former colleague in the Office of Regulatory Research to inquire about the existence of the classified report and how I might request a copy. This inquiry has now apparently landed on your desk.

I'm not sure what the proper channels for requesting a NRC classified report. I'm certainly not attempting to circumvent proper channels, just trying to identify what is the proper channel.

The request is not urgent, but is relevant to current events.

Please advise how I should proceed.

Thomas E. Albert, Ph.D.
Chief Scientist
Domestic Nuclear Detection Office (DNDO)
Department of Homeland Security
Office: 202.254.7102

Fax: 202.254.7747

Mobile: (b)(6)

E-mail: Thomas.Albert@dhs.gov

60
NY/84

Thomas.Albert@dhs.gov

From: prvs=05658b5e4=Holly.Harrington@nrc.gov [mailto:prvs=05658b5e4=Holly.Harrington@nrc.gov]
On Behalf Of Harrington, Holly
Sent: Wednesday, March 23, 2011 3:10 PM
To: Thomas.Albert@dhs.gov
Subject: Request for information

Dr. Albert – we have a long, somewhat garbled e-mail string that indicates you are seeking some information from us. It's unclear to me what you are seeking, so if you wouldn't mind providing me the specifics, as well as your timeframe, I will see what I can do to meet your needs.

If you have a regular contact person in the NRC who handles these requests from DHS, that might be a quicker route to go in light of current events the NRC is handling. If not, however, I will do my best to help you.

Holly Harrington
Office of Public Affairs
NRC

From: Wilson, George *NR*
To: Taylor, Robert
Subject: FW: Query: Electrical System Design for Japanese Plants
Date: Wednesday, March 23, 2011 9:30:06 AM
Attachments: image001.png

This is the info we need R

From: Nelson, Robert *NR*
Sent: Wednesday, March 23, 2011 9:14 AM
To: LIA06 Hoc
Cc: Hiland, Patrick; Wilson, George; Skeen, David; Thomas, Eric; Mathew, Roy
Subject: Query: Electrical System Design for Japanese Plants

Can you assist in this matter? Please respond directly to Roy Mathew, with me on cc.

Robert A. Nelson

Robert A. Nelson
NRR External Communications Coordinator, Japan Events
Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation R



E-mail: robert.nelson@nrc.gov | Office: (301) 415-1453 | Cell: ^{EG} (b)(6) | Fax: (301) 415-2102

From: Mathew, Roy *NR*
Sent: Wednesday, March 23, 2011 9:10 AM
To: Nelson, Robert
Cc: Hiland, Patrick; Wilson, George; Skeen, David; Thomas, Eric
Subject: Electrical System Design for Japanese Plants

EEEEB is preparing for a Commission meeting in April 28, 2011, to discuss the status of Japanese event and to provide an overview of the SBO rule.

Presently, we do not have any insights on the Japanese electrical power system design. If possible, we would like to get the following information through the NRC team in Japan.

1. How many offsite power circuits are provided to the safety buses? Are they independent and redundant and have sufficient capacity and capability to support cold shutdown capability for all postulated events at the plant?. How many of these sources are immediately available after a unit trip?. Are the offsite circuits shared with adjacent units?
2. How many loss of offsite power events have occurred in the last 20 years at each plant? What is the duration of loss of offsite power? How many loss of power

NR 85R

events to one safety bus have occurred at the plant? In the last 20 years, has there been a station blackout event at any plants?

3. How many standby power sources (diesel generators or other power sources) are provided for each unit? How many are required as a minimum to support safe shutdown of the unit? What is the reliability of the standby power source?
 4. Are standby power systems including the support systems (fuel oil, cooling water, switchgear, control power, raceways, cables etc.) protected from natural phenomena such as tsunami, flood, and earthquakes?
 5. Are AC and DC power sources shared between units at a site?
6. DC System (Class 1E)
- How many battery systems are provided per unit?
 - Are they redundant and independent?
 - What are the duty cycle (s) ? Provide manufacturer name and the types of batteries used (e.g., lead acid)
 - How often is the battery capacity test performed?
 - What is the amp-hour and nominal voltage rating of the batteries?
 - Is there load shedding required if the DC system has to be used for loss of all AC events? If yes, what percentage of the loads are shed?

Are there any regulatory requirements to withstand and recover from a station blackout event? (loss of all offsite and onsite Class 1E AC power sources with turbine trip).

If there are requirements, Is AC independent system used (DC) or Alternate AC power source used for coping with station blackout? Are these power sources protected from natural phenomena such as tsunami, flood, and earthquakes? Is there any specific analysis required by the licensees and do they have to update the analysis if assumptions change? What are the typical coping time(s)? How is the coping duration determined? Are there plant procedures and operator training provided for a station blackout scenario? Is station blackout assumed to occur in more than one unit at a multi-unit site?

WORLD NUCLEAR REGULATORY BOARD

United States Nuclear Regulatory Commission

Informing People and the Environment

Weaver, Tonna

From: McIntyre, David *10PA*
Sent: Wednesday, March 23, 2011 10:55 AM
To: Jones, Steve; Mitlyng, Viktoria
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask.

Thanks, Steve!

Vika – I hope this answers your questions from the Star-Trib.

From: Jones, Steve *NRRC*
Sent: Wednesday, March 23, 2011 10:36 AM
To: McIntyre, David
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask.

Dave,

The attached files are the only 2.206 petition and director's decisions I know of related to the 2003 Alvarez paper. They are publically available at the accession number included in the file name. Basically, the staff was looking at SFP issues already, and the staff determined the actions the NRC had taken by 2005 reasonably addressed the petition. The director's decision references other publically available documents, such as letters to Congress and the National Academy of Sciences report on spent fuel pool safety (public summary attached).

By the way, please keep Bob Nelson, the NRR Communications Lead for Japan, in the loop.

Thanks!

Steve

Steven R. Jones
Sr. Reactor Systems Engineer
NRR/DSS/SBPB
301-415-2712

From: McIntyre, David *10PA*
Sent: Wednesday, March 23, 2011 9:17 AM
To: Jones, Steve
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Steve – are you familiar with the attached paper and whatever became of it?

Thanks,
Dave

From: Mitlyng, Viktoria *Y111*
Sent: Tuesday, March 22, 2011 6:53 PM

NN/86

To: McIntyre, David

Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Dave,

Can you give me a contact for finding out if the attached report on spent fuel pool safety was submitted to the NRC as a 2.206 petition in 2003? Or, at least, tell me where to start. It's for the same Minneapolis Star Tribune Inquiry. The reporter is digging pretty deep on spent fuel pools and getting an ear full from the authors of this report. Now, he wants to understand the NRC's perspective and position relative to their statements. His deadline is Wednesday and I am hoping to get on this early AM. Thank you. Can't promise a good bottle of wine since you have them all... You'll have to do with a hug next time I see you.

Vika

From: Shaffer, David [<mailto:David.Shaffer@startribune.com>]

Sent: Tuesday, March 22, 2011 4:13 PM

To: Mitlyng, Viktoria

Subject: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Viktoria,

Here is the 2003 paper. The authors said NRC never formally responded.

David Shaffer

Reporter/Editor, Business news

Minneapolis Star Tribune

612-673-7090 (desk) (b)(6)

(cell)

From: Ghneim, Munira
To: Bonaccorso, Amy
Subject: Dale Robert Moore -Citizen
Date: Wednesday, March 23, 2011 10:08:03 AM

Good Morning Amy,

Dale would like to take to someone about the precautionary steps he can take when receiving shipments from Japan. Dale may be reached at (b)(6)

(b)(6)

Thank You
Munira Ghneim
Contract Secretary
Office of Information Services
301-415-1170

MM/87

From: Deavers, Ron
To: Anna Deusterman
Cc: PDR Resource
Subject: RE: Nuclear Power Plant in Minnesota
Date: Wednesday, March 23, 2011 10:14:36 AM

Anna,

The information about the decommissioned plant at Elk River is available from our Public Document Room (cc'd on this message) at Accession numbers: 7907190703, 8301100006. 8303160012.

Please contact our Public Document Room at 1-800-397-4209 or the email in the cc to this message.

Ron Deavers

From: Anna Deusterman (b)(6)
Sent: Wednesday, March 23, 2011 12:41 AM
To: Deavers, Ron
Subject: Re: Nuclear Power Plant in Minnesota

Thank you for your reply. I am inquiring about the decommissioned nuclear plant in Elk River, Minnesota. I would like to know if radioactive waste was stored on site and/or where it was transported to.

Thanks,

Anna

On Tue, Mar 22, 2011 at 2:50 PM, Deavers, Ron <Ron.Deavers@nrc.gov> wrote:
We understand you are concerned about the nuclear plant in Minnesota. You are getting ready to move there and would like some questions answered before you do move. Most of our Nuclear Power Plants store some nuclear waste at the plant sites. We have two sites in Minnesota. The Monticello site is 35 miles north west of Minneapolis and information about the site is available at <http://www.nrc.gov/info-finder/reactor/mont.html>. The Prairie Island site is located 28 miles south east of Minneapolis and information about the site is available at <http://www.nrc.gov/info-finder/reactor/prai1.html> and <http://www.nrc.gov/info-finder/reactor/prai2.html>.

NN/88

Bonaccorso, Amy

From: Hayden, Elizabeth
Sent: Wednesday, March 23, 2011 10:09 AM
To: Donaldson, Leslie
Subject: RE: request for assistance

We would estimate 3 weeks until April 15. Is that workable?

Beth Hayden
Senior Advisor
Office of Public Affairs
U.S. Nuclear Regulatory Commission
— Protecting People and the Environment
301-415-8202
elizabeth.hayden@nrc.gov

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

From: Donaldson, Leslie
Sent: Tuesday, March 22, 2011 9:50 PM
To: Hayden, Elizabeth
Cc: Valentin, Andrea
Subject: FW: request for assistance

Hi Beth -

In light of Brian and Eliot's recent exchange re. Amy (see below), wanted to check w/you re. how long you estimate you will need Amy to provide assistance to OPA. I know it's been a very hectic, stressful week and a half, so definitely imperative that everyone provide support in any possible manner. To that end, we have relieved Amy of many of her workload responsibilities so she can focus on providing assistance to your office during this time. The only real commitment she has is the planning of the Chernobyl Seminar, scheduled for 4/26. However, as Brian indicates in his exchange w/Eliot, RES is stretched pretty thin with staff presently, so it would be most helpful if we could have some idea of when Amy might be able to return to RES. I believe the Ops Center is projecting they will need their volunteers until 4/15. One other thought is providing Amy work that is portable, if her assistance w/the phones is not needed every day, so she could physically return to RES.

Look forward to hearing from you.

Thanks so much, Leslie

From: Sheron, Brian
Sent: Monday, March 21, 2011 9:19 PM
To: Brenner, Eliot
Cc: Valentin, Andrea; Kardaras, Tom; Donaldson, Leslie
Subject: RE: request for assistance

I will check with Andrea tomorrow. If Amy has any time that we can spare her, I will gladly make her available to you. I just don't want to make a binding commitment at this time.

From: Brenner, Eliot
Sent: Monday, March 21, 2011 6:54 PM
To: Sheron, Brian
Subject: RE: request for assistance

MM/89

Ok. Never hurts to ask. Thanks muchly for even considering it.

Eliot

From: Sheron, Brian
Sent: Monday, March 21, 2011 6:38 PM
To: Brenner, Eliot
Subject: RE: request for assistance

Eliot, I hate saying no, but we are getting overwhelmed and drained of staff.

I haven't seen my deputy or two of my division directors for several days, because they are all on graveyard shift IRC duty. I don't have a 3rd division director because Commissioner Apostolakis took Chris Lui and Rich Correia won't start here until 3/28. One of my deputy division directors and an SL just got sent to Japan to be part of Casto's team. I have several staff working in the IRC, and I'm running around doing weekend duty as the IRC ET Director, briefing congressional staff, and interacting with DOE Secretary Chu and his swat team.

From: Brenner, Eliot
Sent: Monday, March 21, 2011 6:17 PM
To: Sheron, Brian
Subject: request for assistance

Brian: we are more than a little snowed under with media and public inquiry because of the Japan quake. That doesn't make us too much different than the rest of the agency, but ...

The focus is beginning to shift to the agency and our regulatory regime will be under a real spotlight going forward, not to mention that the task force Jaczko is going to have assembled will require a fair amount of OPA support.

I wonder if you could lend me Amy Bonoccorso for a month with the proviso that when she is not helping me she gets the most important parts of her RES work accomplished. Given my druthers, I'd really like to ask for 90 days, but I don't want to seem overly greedy. I can always plead poverty again later!

Any chance I can steal her for a bit? I promise no banjo jokes as long as I have her services.

Eliot

Eliot Brenner
Director, Office of Public Affairs
Nuclear Regulatory Commission
Rockville, Md.

O: 301-415-8200
E: (b)(6)

From: Bonaccorso, Amy
To: (b)(6)
Bcc: Deavers, Ron
Subject: REPLY: Dale Robert Moore -Citizen
Date: Wednesday, March 23, 2011 10:27:00 AM

Hello Mr. Moore:

I heard you called to inquire about pre-cautionary steps you could take when receiving shipments from Japan.

I don't think we have information on that but I have referred people to the FDA who have called, asking about imported products. They have a website set up with general information:

<http://www.fda.gov/NewsEvents/PublicHealthFocus/ucm247403.htm>

We also have a contact at the Department of Homeland Security who has been fielding questions about shipments coming into the U.S. via the airports. Helen Sterling at (202-344-2433) is with DHS/Customs and Border Protection and taking phone calls.

I hope this helps.

Thank you,

Amy

MM/90

From: [Bonaccorso, Amy](#)
To: [Tobin, Jennifer](#)
Cc: [Deavers, Ron](#)
Subject: FW: Request for information
Date: Wednesday, March 23, 2011 10:29:00 AM

Jenny – I'm dizzy already....

We are telling people that the information the calculations are based off of is not publicly available, right?

Thanks,

Amy

From: Janbergs, Holly **On Behalf Of** OPA Resource
Sent: Wednesday, March 23, 2011 7:33 AM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: Request for information

From: John Wheeler (b)(6)
Sent: Tuesday, March 22, 2011 6:45 PM
To: OPA Resource
Subject: Request for information

Please provide me with the assumptions used when calculating the 50 mile evacuation for Americans near the Fukushima reactors in March of 2011 as described here:

http://www.nrc.gov/reading-rm/doc-collections/news/2011/11-050_Atchmt.pdf

The document referenced above provide results and a basic description of the scenario, but does NOT provide sufficient details to reproduce the calculation.

Thank you,

John Wheeler
(b)(6)

[John's Google Profile](#)

John's podcast: "[This Week in Nuclear](#)", a podcast about the peaceful uses of nuclear energy.

[Follow John on Twitter](#)

NW/91

From: [Bonaccorso, Amy](#)
To: [Tobin, Jennifer](#)
Cc: [Deavers, Ron](#)
Subject: RE: NRC vs State question
Date: Wednesday, March 23, 2011 11:41:00 AM

Okay - thanks.

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

From: Tobin, Jennifer
Sent: Wednesday, March 23, 2011 11:39 AM
To: Bonaccorso, Amy
Cc: Deavers, Ron
Subject: RE: NRC vs State question

I would refer this to lawyers. It's a legal issue and it sounds like the gentleman is well aware of both sides. I wouldn't want to mis-state our position.

From: Bonaccorso, Amy
Sent: Wednesday, March 23, 2011 10:35 AM
To: Tobin, Jennifer
Cc: Deavers, Ron
Subject: FW: NRC vs State question

Jenny:

I just read about state officials from NY meeting with the NRC to discuss the safety of Indian Point – and it was not clear to me what level of authority the state has vs. NRC. Do you know enough about this to answer this question?

Thanks,

Amy

From: Janbergs, Holly On Behalf Of OPA Resource
Sent: Wednesday, March 23, 2011 7:32 AM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: NRC vs State question

From: N. Todd Pritsky (b)(6)
Sent: Tuesday, March 22, 2011 6:52 PM
To: OPA1 RESOURCE
Cc: OPA Resource
Subject: NRC vs State question

Hi there,

I live in (b)(6) and now that the NRC has relicensed Vermont Yankee, I'm just curious about the extent your organization's regulatory power. Is it the case that a plant couldn't operate in Vermont if you didn't approve its application, but if your approval doesn't necessarily mean it can operate if the state/people decide to shut it down? In other words, the NRC's authority to license doesn't trump the state's authority to decommission, right?

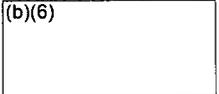
I hope that makes sense.

Thank you in advance,

NN/92

Todd Pritsky

(b)(6)

A rectangular box with a black border, used to redact information. It is positioned directly below the text "(b)(6)".

From: [Harrington, Holly](#)
To: [Bonaccorso, Amy](#)
Cc: [Deavers, Ron](#)
Subject: RE: NRC vs State question
Date: Wednesday, March 23, 2011 11:44:23 AM

WE will handle. We're sending to Region 1

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

From: Bonaccorso, Amy
Sent: Wednesday, March 23, 2011 11:42 AM
To: Harrington, Holly
Cc: Deavers, Ron
Subject: FW: NRC vs State question

Holly:

Jenny thinks this one is for the lawyers. I don't know who to send it to.

Thanks,

Amy

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

From: Tobin, Jennifer
Sent: Wednesday, March 23, 2011 11:39 AM
To: Bonaccorso, Amy
Cc: Deavers, Ron
Subject: RE: NRC vs State question

I would refer this to lawyers. It's a legal issue and it sounds like the gentleman is well aware of both sides. I wouldn't want to mis-state our position.

From: Bonaccorso, Amy
Sent: Wednesday, March 23, 2011 10:35 AM
To: Tobin, Jennifer
Cc: Deavers, Ron
Subject: FW: NRC vs State question

Jenny:

I just read about state officials from NY meeting with the NRC to discuss the safety of Indian Point – and it was not clear to me what level of authority the state has vs. NRC. Do you know enough about this to answer this question?

Thanks,

Amy

From: Janbergs, Holly On Behalf Of OPA Resource
Sent: Wednesday, March 23, 2011 7:32 AM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: NRC vs State question

From: N. Todd Pritsky (b)(6)
Sent: Tuesday, March 22, 2011 6:52 PM

NY 93

To: OPA1 RESOURCE
Cc: OPA Resource
Subject: NRC vs State question

Hi there,

I live in: (b)(6) and now that the NRC has relicensed Vermont Yankee, I'm just curious about the extent your organization's regulatory power. Is it the case that a plant couldn't operate in Vermont if you didn't approve its application, but if your approval doesn't necessarily mean it can operate if the state/people decide to shut it down? In other words, the NRC's authority to license doesn't trump the state's authority to decommission, right?

I hope that makes sense.

Thank you in advance,
Todd Pritsky

(b)(6)

From: Bonaccorso, Amy
To: (b)(6)
Bcc: Deavers, Ron
Subject: REPLY: Request for information
Date: Wednesday, March 23, 2011 12:09:00 PM

Hello Mr. Wheeler:

Unfortunately, the data and calculations you requested are not publicly available.

What we have available on the crisis in Japan can be found on the public website:
<http://www.nrc.gov/japan/japan-info.html>

Thank you,

Amy

NW/94

From: Bonaccorso, Amy
To: Deavers, Ron
Subject: RE: Info
Date: Wednesday, March 23, 2011 1:19:00 PM

That was interesting!

He wanted to know when the situation would resolve itself in Japan, when Disney would reopen, and if we knew how Tokyo was being affected. I said it was not within the 50 mile radius – and other than that, we could not project what the future for Disney Tokyo would be. He was an upset stockholder.

From: Akstulewicz, Brenda
Sent: Wednesday, March 23, 2011 12:30 PM
To: Bonaccorso, Amy
Subject: Info

Terry

(b)(6)

(b)(6)

Questions regarding closing/reopening of Disney in Tokyo

Brenda Akstulewicz
Administrative Assistant
Office of Public Affairs
301-415-8209
brenda.akstulewicz@nrc.gov



MM/95

From: [Harrington, Holly](#)
To: [Deavers, Ron](#)
Cc: [Bonaccorso, Amy](#)
Subject: RE: Here is my contact info
Date: Wednesday, March 23, 2011 1:38:44 PM

No problem. I'll handle

From: Deavers, Ron
Sent: Wednesday, March 23, 2011 1:32 PM
To: Harrington, Holly
Cc: Bonaccorso, Amy
Subject: FW: Here is my contact info

Holly,

This one is not public and if the study is really classified, we would not be able to find it any way.

Ron

From: Siu, Nathan
Sent: Wednesday, March 23, 2011 10:29 AM
To: Deavers, Ron
Cc: Thomas.Albert@dhs.gov; Coe, Doug
Subject: FW: Here is my contact info

Ron –

I've received a telephone call from a DHS staffer – contact information below – requesting information regarding Fukushima (specifically, the existence of a PRA for the plant and the availability of an RES-sponsored classified study by the National Academy of Sciences on the safety and security of spent fuel pools). Per my management and OPA, I've been asked to forward this request to you. Please feel free to contact me if you have any questions.

Nathan Siu
U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
21 Church Street, Room 4B05
Rockville, MD 20852
301-251-7583 (phone)
301-251-7424 (fax)
Nathan.Siu@nrc.gov

From: Albert, Thomas [<mailto:Thomas.Albert@dhs.gov>]
Sent: Wednesday, March 23, 2011 10:12 AM

AM/96

To: Siu, Nathan

Subject: Here is my contact info

Thomas E. Albert, Ph.D.

Senior Scientist

Domestic Nuclear Detection Office (DNDO)

Department of Homeland Security

Office: 202.254.7102

Fax: 202.254.7747

Mobile: (b)(6)

E-mail: Thomas.Albert@dhs.gov

Thomas.Albert@dhs.sgov.gov

From: John Wheeler
To: Bonaccorso, Amy
Subject: Re: REPLY: Request for information
Date: Wednesday, March 23, 2011 1:44:49 PM

Ms. Sealing,

This is a request for information under the Freedom of Information Act.

I request the following information from the Nuclear Regulatory Commission:

"Please provide a detailed list of assumptions which were used in calculating radioactive release rates, the details of the hypothetical dose rate profile for the 2, 5, 10 and 50 mile radius around the Fukushima nuclear plant, and other factors that were considered by the Commission in making the 50 mile evacuation recommendation (in March 2011)."

I have attempted to obtain this information using information on the NRC web site, and I was informed by Ms Amy Bonaccorso of the NRC that this information is not available to the public. As I said to Ms. Bonaccorso, I am surprised the NRC has elected not to readily share this information as it would be insightful and informative to understand the fundamental assumptions used in the commission's 50 mile evacuation recommendation in Japan. I believe access to this information and gaining an understanding of the process used and underlying assumptions will lead to increased public safety in the future.

Sincerely,

John Wheeler

----- Forwarded Message -----

From: FOIA <FOIA@fcc.gov>
To: (b)(6)
Cc: Patricia Quartey <Patricia.Quartey@fcc.gov>; Shoko Hair <Shoko.Hair@fcc.gov>
Sent: Tue, March 22, 2011 10:10:40 AM
Subject: RE: Electronic FOIA (E-FOIA) Request Form

Dear Mr. Wheeler:

This is in response to your Freedom of Information Act (FOIA) request submitted electronically on March 21, 2011 to the Federal Communications Commission.

The Federal Communications Commission is a regulatory agency which is responsible for regulating interstate and foreign communications. Thus, the records that you seek are not within the Commission's jurisdiction.

Please note also that there is no central office in the government that processes FOIA requests for all federal agencies. Each agency responds to requests for its own records. The records that you seek may be in

NW/97

the possession of the U.S. Nuclear Regulatory Commission.

You can usually access the website for a federal agency by typing in the agencies initials followed by gov.

For your convenience, I have provided below the principal FOIA contact for the office which may possess the records that you seek. Please direct your inquiry accordingly.

Nuclear Regulatory Commission

Donna Sealing
FOIA/PA Officer
Mailstop: T-5 F09
Washington, DC 20555-0001
Telephone: (301) 415-7169
Fax: (301) 415-5130
E-mail: foia@nrc.gov

I hope this response proves to be informative and helpful.

FCC
FOIA Office

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

From: John Wheeler (b)(6)
Sent: Monday, March 21, 2011 5:20 PM
To: FOIA
Subject: Electronic FOIA (E-FOIA) Request Form

John Wheeler

(b)(6)

(b)(6)

(b)(6)

Phone Number (b)(6)

Fax Number (b)(6)

Email Address (b)(6)

Date of Request: 21 March 2011

John Wheeler Requests:

I request the detailed technical basis for the Nuclear Regulatory Commission's recommendation on or about March 17, 2011 that urged Americans in Japan to evacuate to a distance of at least 50 miles from the damaged Fukushima nuclear plant. This recommendation was communicated by the NRC Chairman to the US House Energy & Commerce Committee on 3/17/2011, as described in <http://www.nrc.gov/about-nrc/organization/commission/comm-gregory-jaczko/0317nrc-transcript-jaczko.pdf>

Specifically, I would like to know precisely what assumptions were used

in calculating radioactive release rates; the details of the hypothetical dose rate profile for the radius around the nuclear plant, and other factors that were considered in making the 50 mile evacuation recommendation

Nuclear, Fukushima, NRC, Jaczko, Emergency Preparedness

Maximum Fee: 30

Is the requester entitled to a restricted fee assessment? No.
If Yes Give Reasons for Inspection:

Any Additional Information and/or Comments:

Server protocol: HTTP/1.1

Remote host: (b)(6)

Remote IP address: (b)(6)

Weaver, Tonna

From: Jones, Steve | *NRK*
Sent: Wednesday, March 23, 2011 10:36 AM
To: McIntyre, David
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask
Attachments: 2_206 Petition Nuclear Coalition ML042370023.pdf; Directors Decision Nuclear Coalition 2_206 ML051960343.pdf; Natl Acad Sci Exec Summary_ SFP Report.pdf

Dave,

The attached files are the only 2.206 petition and director's decisions I know of related to the 2003 Alvarez paper. They are publically available at the accession number included in the file name. Basically, the staff was looking at SFP issues already, and the staff determined the actions the NRC had taken by 2005 reasonably addressed the petition. The director's decision references other publically available documents, such as letters to Congress and the National Academy of Sciences report on spent fuel pool safety (public summary attached).

By the way, please keep Bob Nelson, the NRR Communications Lead for Japan, in the loop.

Thanks!

Steve

Steven R. Jones
Sr. Reactor Systems Engineer
NRR/DSS/SBPB
301-415-2712

From: McIntyre, David | *OPA*
Sent: Wednesday, March 23, 2011 9:17 AM
To: Jones, Steve
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Steve – are you familiar with the attached paper and whatever became of it?

Thanks,
Dave

From: Mitlyng, Viktoria | *NRK*
Sent: Tuesday, March 22, 2011 6:53 PM
To: McIntyre, David
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Dave,

Can you give me a contact for finding out if the attached report on spent fuel pool safety was submitted to the NRC as a 2.206 petition in 2003? Or, at least, tell me where to start. It's for the same Minneapolis Star Tribune Inquiry. The reporter is digging pretty deep on spent fuel pools and getting an ear full from the authors of this report. Now, he wants to understand the NRC's perspective and position relative to

NRK/98

their statements. His deadline is Wednesday and I am hoping to get on this early AM. Thank you. Can't promise a good bottle of wine since you have them all... You'll have to do with a hug next time I see you.

Vika

From: Shaffer, David [mailto:David.Shaffer@startribune.co]

Sent: Tuesday, March 22, 2011 4:13 PM

To: Mitlyng, Viktoria

Subject: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Victoria,

Here is the 2003 paper. The authors said NRC never formally responded.

David Shaffer

Reporter/Editor, Business news

Minneapolis Star Tribune

612-673-7090 (desk) (b)(6) (cell)

EDO Principal Correspondence Control

FROM: DUE: 09/15/04

EDO CONTROL: G20040549
DOC DT: 08/10/04
FINAL REPLY:

Deb Katz, Citizens Awareness Network
Paul Gunter, Nuclear Infor. & Resource Serv.
Jim Riccio, Greenpeace
Wenonah Hauter, Critical Mass Energy & Envir.
Gordon Thompson, Inst. for Resource &
Security Studies
David Lochbaum, Union of Concerned Scientists

TO:

Reyes, EDO

FOR SIGNATURE OF :

** GRN **

CRC NO:

Dyer, NRR

DESC:

ROUTING:

2.206 - Actions to Provide Stronger Defenses of
Boiling-Water Reactors with Mark I & II
Containments and their Spent Fuel

Reyes
Virgilio
Kane
Merschhoff
Norry
Dean
Burns
Paperiello, RES
Zimmerman, NSIR
Collins, RI
Travers, RII
Caldwell, RIII
Mallett, RIV
Cyr, OGC

DATE: 08/11/04

ASSIGNED TO:

CONTACT:

NRR

Dyer

SPECIAL INSTRUCTIONS OR REMARKS: **

Coordinate response with RES/NSIR.

Template: EDO-001

E-RIDS: EDO-01

NUCLEAR SECURITY COALITION
c/o Citizens Awareness Network
Box 83, Shelburne Falls, Massachusetts 01370
Phone: 413-339-5781 Email: can@nukebusters.org
Contact Person: Deb Katz

August 10, 2004

Luis Reyes
Office of the Executive Director of Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555

By FAX (301) 415-2700

**PETITION TO THE U.S. NUCLEAR REGULATORY COMMISSION
REQUESTING ACTIONS TO PROVIDE STRONGER DEFENSES OF
BOILING-WATER REACTORS WITH MARK I & II CONTAINMENTS
AND THEIR SPENT FUEL**

Dear Mr. Reyes:

The Nuclear Security Coalition, a consortium of independent organizations that serve the public interest, submits this Petition to the US Nuclear Regulatory Commission (NRC). An accompanying document, the Annex, provides supporting information and is part of the Petition.

Member organizations of the Nuclear Security Coalition are, collectively, the Petitioners. Names of these organizations, and of the individual designated to represent each organization, are provided below.

This Petition is submitted pursuant to NRC Regulations 10 CFR Part 2, Subpart B, whereby any person may request the NRC to institute a proceeding to impose requirements by order, to modify, suspend or revoke a license, or to take such other action as may be proper.

The NRC is obligated by the Atomic Energy Act of 1954, as amended, to take actions of the type requested in this Petition. The Act states in Title I, Chapter 1, Section 2(d):

"The processing and utilization of source, byproduct, and special nuclear material must be regulated in the national interest and in order to provide for the common defense and security and to protect the health and safety of the public."

Pursuant to House Appropriations Committee Report 108-554 (June 18, 2004), NRC is required to take "immediate steps" to upgrade spent fuel pool safety and security, to conduct further analyses of pool vulnerabilities, and to report back to the committee within 90 days, in response to the National Academy of Sciences (NAS) report on fuel pool vulnerabilities to

Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Page 2

be released later this month. This petition supports the concerns raised by the NAS and the Appropriations Committee.

This Petition discusses potential destructive attacks on nuclear facilities, attacks that could cause great public harm. No information is contained in the Petition, including its Annex, that could assist the perpetrator of such an attack. Accordingly, this Petition is appropriate for general distribution.

The facts and arguments set forth in the accompanying Annex establish the following points:

- (i) nuclear power plants are key national assets and prime targets for attack;
- (ii) defending nuclear power plants is a national-security imperative;
- (iii) the NRC requires only a light defense of nuclear power plants;
- (iv) nuclear power plants and their spent fuel are vulnerable to attack;
- (v) boiling-water reactors (BWRs) with Mark I & II containments have a particular vulnerability to attack;
- (vi) options are available for stronger defense of Mark I & II BWRs; and
- (vii) the public should be involved in developing stronger defenses.

Accordingly, the Petitioners request that the NRC takes the following enforcement actions:

- (i) issue a Demand For Information to the licensees for all Mark I and II BWRs and conduct a 6-month study of options for addressing structural vulnerabilities;
- (ii) present the findings of the study at a national conference attended by all interested stakeholders, providing for transcribed comments and questions;
- (iii) develop a comprehensive plan that accounts for stakeholder concerns and addresses structural vulnerabilities of all Mark I and II BWRs within a 12-month period;
- (iv) issue Orders to the licensees for all Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures, including structural protections; and
- (v) make future operation of each Mark I and II BWR contingent on addressing their structural vulnerability with participation and oversight by a panel of local stakeholders.

The Demand For Information will require the licensees to provide answers to the following questions:

1. What is the current licensed capacity and inventory for spent fuel assembly storage in the spent fuel pool?
2. What is the projected number of spent fuel assemblies to be discharged from the reactor core in the next five and ten years?
3. What is the calculated decay heat load on the spent fuel pool from the current inventory and licensed capacity of spent fuel assemblies?
4. What is the calculated decay heat load on the spent fuel pool from the inventory of spent fuel assemblies projected to be discharged from the reactor core in the next five and ten years?

Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Page 5

5. What is the radionuclide inventory of the spent fuel pool at its design basis loading?
6. What is the water volume of the spent fuel pool?
7. What is the design heat removal capacity of the spent fuel pool cooling system?
8. Is the facility licensed for onsite dry storage of spent fuel? If so, how many spent fuel assemblies are currently in dry storage?
9. What are the spent fuel pool water makeup capabilities (sources and flow rates)?
10. What are the results from studies, evaluations, and/or analyses conducted on the vulnerability of the spent fuel pool to (a) aircraft, (b) tornado-generated missiles, and (c) fires?

Sincerely,

Deb Katz, Executive Director
Citizens Awareness Network
P.O. Box 83
Shelburne Falls, MA 01370
Tel 413 339 5781
Email: deb@nukebusters.org

Paul Gunter
Nuclear Information & Resource Service
1424 16th St, NW, #404
Washington, DC 20036
Tel. 202 328 0002
Email: pgunter@nirs.org

Jim Riccio
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702 H Street, NW
Washington, DC 20001
Tel 202 319 2487
Email: jim.riccio@wvdc.greenpeace.org

Wenonah Hauter, Director
Critical Mass Energy and Environment
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Public Citizen
215 Pennsylvania Ave, SE
Washington, DC 20003
Tel 202 546 4996
mboyd@citizen.org

Gordon Thompson
Institute for Resource & Security Studies
27 Ellsworth Avenue
Cambridge, MA 02139
Tel 617 491-5177
Email: irss@igc.org

David Lochbaum
Union of Concerned Scientists
Washington, DC
Tel 202 223 6133
Email: dlochbaum@ucsusa.org

Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Page 4

David Agnew, Director
Cape Downwinders
173 Morton Rd.
South Chatham, MA 02659
Tel 508 432 1718

Eric J. Epstein, Coordinator
EFMR Monitoring
213 South Union Street
Middletown, PA 17057
Tel 717 944 3007

Tim Judson
Central New York-Citizens Awareness
Network
P.O. Box 3123
Oswego, NY 13126
Tel 315 425 0430
Email: cnvcan@nukebusters.org

Jed Thorp
Energy Campaign Organizer
Clean Water Action
36 Bromfield St., Suite 204
Boston, MA 02108
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FAX 617 338 6449
Email: jthorp@cleanwater.org

Adrienne Esposito, Executive Director
Citizens Campaign for the Environment
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Email: aesposito@citizenscampaign.org

Sal Mangiagli
Connecticut-Citizens Awareness Network
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FAX 518 465 8349
Email: ceckathy@ige.org

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Email: jemsun@juno.com

Geri Winslow
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Tel (860) 442-6536

Judith Johnsrud
Environmental Coalition on Nuclear
Pollution
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Email: johnsrud@uplink.net

Michael Keegan
Citizens Resistance at Fermi Two
Monroe, MI 48161
Tel 734 735 6373
Email: mkeeganj@comcast.net

Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Page 5

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Finger Lakes Citizens for the
Environment
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Tel 315 539 5607
Email: lsocls@localnet.com

Glenn Carroll
Georgians Against Nuclear Energy
Tel 404 378 9542
Email: atom.girl@mindspring.com

Gerald Pollet, Executive Director
Heart of America Northwest
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Seattle, WA 98101
Tel 206 382 1014
FAX 206 382 1148
Email:
office@heartofamericanorthwest.org

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& Activism Network
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Email: rmille29@twcny.rr.com

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Wolcott, NY 14590
Tel 315 594 1906
Email: susan@silverwaters.com

Kate Harris, Organizer
Massachusetts-Citizens Awareness
Network
Email: kate@earthlovers.org

Frank Gorke, Energy Advocate
Massachusetts-PIRG
44 Winter Street, 4th floor
Boston, MA 02108
Tel 617 747 4316
FAX 617 292 8057
Email: frank@masspirg.org

Tim Rinne, State Coordinator
Nebraskans for Peace
941 'O' Street, Suite 1026
Lincoln, NE 68508
Tel 402 475 4620
FAX 402 475 4624
Email: nfpstate@redjellvfish.net

Peter Alexander
New England Coalition on Nuclear
Pollution
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Brattleboro, VT 05302
Tel 802 257 0336
FAX 802 257 0336
Email: necnp@necnp.org

Emily Rusch, Energy Advocate
New Jersey Public Interest Research
Group
11 N. Willow St.
Trenton, NJ 08608
Tel 609 394 8155
Email: erusch@njpirg.org
Jason Babbie
Environmental & Energy Policy Analyst

Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Page 6

New York-Public Interest Research
Group
9 Murray Street, Floor 3
New York, NY 10007-2223
Tel 212 349 6460
FAX 212 349 1366
Email: jkb@nypirg.org

Vicki Baker
People's Environmental Network of New
York (pENNY)
4432 South St
Jamesville, NY 13078
Tel 315 469 5347
Email: ennewyork@hotmail.com

George Crocker
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**PETITION TO
THE U.S. NUCLEAR REGULATORY COMMISSION
REQUESTING EMERGENCY ENFORCEMENT ACTIONS
TO ADDRESS STRUCTURAL VULNERABILITY OF
BOILING-WATER REACTORS
WITH MARK I & II CONTAINMENTS
AND THEIR IRRADIATED FUEL POOLS**

Annex to the Petition

August 2004

Preface

The Nuclear Security Coalition, a consortium of independent organizations that serve the public interest, submits an accompanying Petition to the US Nuclear Regulatory Commission (NRC). This document, the Annex to the Petition, provides supporting information and is part of the Petition.

The Petition is submitted pursuant to NRC Regulations 10 CFR Part 2, Subpart B, whereby any person may request the NRC to institute a proceeding to impose requirements by order to modify, suspend or revoke the license of all GE Mark I and Mark II operators as necessary.

The NRC is obligated by the Atomic Energy Act of 1954, as amended, to take actions of the type requested in this Petition. The Act states in Title I, Chapter 1, Section 2(d):

"The processing and utilization of source, byproduct, and special nuclear material must be regulated in the national interest and in order to provide for the common defense and security and to protect the health and safety of the public."

This Petition discusses potential destructive attacks on nuclear facilities, attacks that could cause great public harm. All information contained in this Petition was taken from publicly available documents. No information is contained in the Petition, including this Annex, which could assist the perpetrator of such an attack. Accordingly, this Petition and Annex are appropriate for general distribution.

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1. Introduction

The Petition that includes this Annex addresses a particular class of commercial nuclear reactors – boiling water reactors (BWRs) with Mark I and II containments. The relevant reactors are listed in the Appendix to this Annex. In the USA, 103 operational commercial reactors operate at 65 sites in 31 states.¹ Of these 104 reactors, 69 are pressurized-water reactors (PWRs), 9 with ice-condenser containments and 60 with dry containments. The remaining 34 reactors are BWRs, 22 with Mark I containments, 8 with Mark II containments and 4 with Mark III containments. In addition there are 27 previously-operating commercial reactors in various stages of storage or decommissioning. As of December 2000, all but 2 of the 103 operating reactors had been in service for at least 9 years, and 55 reactors had been in service for at least 19 years.² The nominal duration of a reactor operating license is 40 years.

All of the 103 operating reactors are vulnerable to accidents or acts of malice or insanity. Such an event could lead to a substantial release of radioactive material from a reactor to the environment. A similar release could occur from spent nuclear fuel stored in a pool adjacent to a reactor, or stored in an independent spent fuel storage installation (ISFSI).

The Mark I and II BWRs have a particular vulnerability that is explained in Section 6, below. This Petition calls for actions that address this class of reactors. In focusing on Mark I and II BWRs, the Petitioners do not imply that the vulnerability of other commercial reactors is less deserving of attention.

This Annex to the Petition provides important background information in Sections 2 through 5, below. Then, in Section 6, it explains the particular vulnerability of Mark I and II BWRs. Options to address structural vulnerabilities of these reactors and their irradiated fuel to terrorist attack are described in Section 7. The need to involve the public in addressing these vulnerabilities is described in Section 8. Actions sought by this Petition are set forth in Section 9, and a bibliography is provided in Section 10.

¹ In addition, Browns Ferry Unit 1, a BWR with a Mark I containment, is nominally operational. However, the reactor is defueled and operation under Administrative Hold. The irradiated fuel pool is still operational, however.

² Data from the NRC website (www.nrc.gov), accessed on 24 April 2002.

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2. Nuclear Power Plants are Critical National Infrastructure and Prime Targets

As the regulator of nuclear power plants and their spent fuel, the US Nuclear Regulatory Commission (NRC) bears a heavy responsibility for homeland security. The National Strategy for The Physical Protection of Critical Infrastructures and Key Assets (hereafter, the National Strategy), which was published in February 2003, identifies nuclear power plants as key assets, defined as follows:³

"Key assets represent individual targets whose destruction could cause large-scale injury, death, or destruction of property, and/or profoundly damage our national prestige, and confidence".

President Bush, in his preface to the National Strategy, stated that the Strategy "establishes a foundation for building and fostering a cooperative environment in which government, industry, and private citizens can work together to protect our critical infrastructures and key assets".⁴ The Petitioners share the conviction that broad cooperation is an essential ingredient of homeland security, and present this Petition in that spirit.

In a January 2004 speech, the Chairman of the National Intelligence Council, Robert Hutchings, commented on the potential for attacks on nuclear power plants and for deliberate release of radioactive material.⁵ Hutchings stated:

"Targets such as nuclear power plants, water treatment facilities, and other public utilities are high on al-Qa'ida's targeting list as a way to sow panic and hurt our economy"..... "Just this past year, al-Qa'ida attacks in Kenya, Saudi Arabia, and Turkey have demonstrated the group's impressive expertise to build truck bombs, and we are concerned it will try to marry this capability to toxic or radioactive material to increase the damage and psychological impact of an attack"..... "I have already detailed the terrorist threat and feel it is important to point out that according to State Department statistics, more businesses are targeted in terrorist attacks than all other types of facilities combined. US interests both abroad and at home, as well as US citizens working abroad, are prime targets for terrorist groups seeking to damage the US economy and affect our way of life. High-profile facilities such as nuclear power plants, oil and gas production, and export and receiving facilities remain at risk; moreover al-Qa'ida and other terrorist groups' targets and methods may be evolving".

Nuclear power plants and their irradiated fuel are especially likely to be targeted in a future attack on the US homeland, for symbolic and practical reasons. These facilities have a symbolic connection with nuclear weapons. The US government flaunts its superiority in

³ White House, 2003, page 7.

⁴ *ibid*, page iii.

⁵ Hutchings, 2004.

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nuclear weapons and rejects any constraint on these weapons through international law.⁶ Yet, the government justified its invasion of Iraq in large part by the possibility that the Iraqi government might acquire a nuclear weapon. It would be prudent to assume that this situation will motivate terrorist groups to search for ways to attack US nuclear facilities. Also, nuclear power plants and Independent Spent Fuel Storage Installations (ISFSI) are large, fixed targets that are, at present, lightly defended. In the eyes of an enemy, they can be regarded as pre-deployed radiological weapons that could release large amounts of radioactive material.

3. Addressing the Structural Vulnerability of Nuclear Power Plants is a National-Security Imperative

An attack on a US nuclear facility would be either an act of insanity or an act of malice. If malicious, the attack would support the political objectives of a domestic or foreign constituency. Currently, concern about attack is focused on foreign enemies and their domestic sympathizers. These groups are not the only sources of threat, but they deserve special consideration because, in opposing them, the nation must balance the costs and benefits of offensive and defensive actions.

The need for a balance between offensive and defensive actions was recognized by a task force convened by the Council on Foreign Relations. In an October 2002 report, this group stated:⁷

"Homeland security measures have deterrence value: US counterterrorism initiatives abroad can be reinforced by making the US homeland a less tempting target. We can transform the calculations of would-be terrorists by elevating the risk that (1) an attack on the United States will fail, and (2) the disruptive consequences of a successful attack will be minimal. It is especially critical that we bolster this deterrent now since an inevitable consequence of the US government's stepped-up military and diplomatic exertions will be to elevate the incentive to strike back before these efforts have their desired effect".

By requiring only a light defense for civilian nuclear facilities, the NRC is, in effect, rejecting the advice of the Council on Foreign Relations' task force. An explicit rejection of this type of advice was articulated by the former NRC chairman, Richard Meserve, in late 2002:⁸

"If we allow terrorist threats to determine what we build and what we operate, we will retreat into the past – back to an era without suspension bridges, harbor tunnels, stadiums, or hydroelectric dams, let alone skyscrapers, liquid-natural-gas terminals, chemical factories, or nuclear power plants. We cannot eliminate the terrorists' targets, but instead we must eliminate the terrorists themselves. A strategy of risk

⁶ Deller, 2002; Scarry, 2002.

⁷ Hart et al, 2002, pp 14-15.

⁸ Meserve, 2002a, page 22.

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avoidance – the elimination of the threat by the elimination of potential targets – does not reflect a sound response.”

In this statement, Meserve offers a false choice. To deter attack, the nation need not scrap every modern technology or infrastructure asset. Instead, the more attractive and vulnerable targets could receive a level of defense that substantially reduces the likelihood of a successful attack and the consequences of an attack. Replacement of the target with a more robust alternative would be an option if the cost of a stronger defense were prohibitive. However, the petitioners also regard reactor closure and dismantlement of these potential nuclear targets as a viable option to reduce, remove or harden its collaterally destructive profile and public safety threat.

Without any public debate, and apparently without any analysis of strategic risks, the NRC has chosen to rely primarily on US offensive capabilities to protect civilian nuclear facilities.

4. The NRC Requires Only a Light Defense of Nuclear Power Plants

The NRC's basic policy on the protection of nuclear facilities from attack is laid down in the regulation 10 CFR 50.13. This regulation was promulgated in September 1967 by the US Atomic Energy Commission (AEC) – which preceded the NRC – and was upheld by the US Court of Appeals in August 1968. It states:⁹

“An applicant for a license to construct and operate a production or utilization facility, or for an amendment to such license, is not required to provide for design features or other measures for the specific purpose of protection against the effects of (a) attacks and destructive acts, including sabotage, directed against the facility by an enemy of the United States, whether a foreign government or other person, or (b) use or deployment of weapons incident to US defense activities.”

The AEC was motivated to introduce this regulation by the intervention of a citizen – Paul Siegel – in the construction-license proceeding for the Turkey Point nuclear power plants in Florida. Mr. Siegel argued that these plants might be attacked from Cuba. The AEC preempted any consideration of this issue during the license proceeding by initiating the rulemaking process that led to 10 CFR 50.13.

Although 10 CFR 50.13 limits a licensee's responsibility for defending a nuclear facility, this regulation does not prevent the US government from providing a stronger, supplementary defense. This point was discussed by Richard Meserve, then chairman of the NRC, in an essay published in late 2002.¹⁰ Meserve stated:¹¹

“Although NRC licensees must defend nuclear power plants against the DBT [design basis threat], September 11 revealed a type of attack that neither the NRC nor other agencies anticipated. Thus, the attacks demanded that the NRC and its

⁹ Federal Register, Vol. 32, No. 186, 26 September 1967, page 13445.

¹⁰ Meserve, 2002a.

¹¹ *ibid*, page 22.

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licensees reevaluate the scope of potential assaults. There are limits, however, to what should be expected from a private guard force. For example, if it were determined that nuclear plants should be defended against aircraft attack, society would not expect licensees to acquire and operate anti-aircraft weaponry. Rather, this type of defense is better suited to the military."

Experience has forced the NRC to increase licensees' obligations to defend nuclear facilities. A series of events, including the 1993 bombing of the World Trade Center in New York, forced the NRC to introduce, in 1994, regulations requiring licensees to defend nuclear power plants against vehicle bombs. The terrorist events of 11 September 2001 forced the NRC to require additional measures. Nevertheless, present NRC regulations require only a light defense of nuclear facilities.

NRC Regulations for Site Security

Present NRC regulations for the defense of nuclear facilities are focused primarily on site security, which the NRC discusses under the heading "physical protection". As described in Section 7, below, site security is one of four types of measure that, taken together, could provide a defense in depth against acts of malice or insanity. The other three types of measure are, with some limited exceptions, ignored in present NRC requirements for facility defense.¹²

At a nuclear power plant or an ISFSI, the NRC requires the licensee to implement a set of physical protection measures. According to the NRC, these measures provide defense in depth by taking effect within defined areas with increasing levels of security. Within the outermost physical protection area, known as the Exclusion Area, the licensee is expected to control the area but is not required to employ fences and guard posts for this purpose. Within the Exclusion area is a Protected Area encompassed by physical barriers including one or more fences, together with gates and barriers at points of entry. Authorization for unescorted access within the Protected Area is based on background and behavioral checks. Within the Protected Area are Vital Areas and Material Access Areas that are protected by additional barriers and alarms; unescorted access to these locations requires additional authorization.

Associated with the physical protection areas are measures for detection and assessment of an intrusion, and for armed response to an intrusion. Measures for intrusion detection include guards and instruments whose role is to detect a potential intrusion and notify the site security force. Then, security personnel seek additional information through means such as direct observation and closed-circuit TV cameras, to assess the nature of the intrusion. If judged appropriate, an armed response to the intrusion is then mounted by the site-security force, potentially backed up by local law-enforcement agencies and the FBI.

The Design Basis Threat

¹²For information about the NRC's present regulations and requirements for nuclear-facility defense, see: the NRC website (www.nrc.gov), accessed on 23 May 2003; Markey, 2002; Meserve, 2002b; Meserve, 2003; and NRC, 2002.

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The design of physical protection areas and their associated barriers, together with the design of measures for intrusion detection, intrusion assessment and armed response, is required to accommodate a "design basis threat" (DBT) specified by the NRC. At a nuclear power plant, the dominant sources of hazard are the reactor and the spent-fuel pool(s). In theory, both of these items receive the same level of protection, but in practice the reactor has been the main focus of attention. The DBT for an ISFSI is less demanding than that for a nuclear power plant.

In April 2003 the DBT for a nuclear power plant was revised, but the NRC announced that the features of the revised DBT would not be published. The previously-applicable DBT had the following features:¹³

"(i) A determined violent external assault, attack by stealth, or deceptive actions, of several persons with the following attributes, assistance and equipment: (A) Well-trained (including military training and skills) and dedicated individuals, (B) inside assistance which may include a knowledgeable individual who attempts to participate in a passive role (e.g., provide information), an active role (e.g., facilitate entrance and exit, disable alarms and communications, participate in violent attack), or both, (C) suitable weapons, up to and including hand-held automatic weapons, equipped with silencers and having effective long range accuracy, (D) hand-carried equipment, including incapacitating agents and explosives for use as tools of entry or for otherwise destroying reactor, facility, transporter, or container integrity or features of the safeguards system, and (E) a four-wheel drive land vehicle used for transporting personnel and their hand-carried equipment to the proximity of vital areas, and

(ii) An internal threat of an insider, including an employee (in any position), and

(iii) A four-wheel drive land vehicle bomb."

For an ISFSI, the DBT was the same as for a nuclear power plant except that it did not include the use of a four-wheel-drive land vehicle, either for transport of personnel and equipment or for use as a vehicle bomb. This was true whether the ISFSI was at a new site or an old reactor site. Thus, an ISFSI at a reactor site would be less protected than the reactor(s) and irradiated fuel pool(s) at that site. At a reactor site or a new site, an ISFSI would be vulnerable to attack by a vehicle bomb.

Evolution of the DBT

After the events of 11 September 2001, the NRC concluded that its requirements for nuclear facility security were inadequate. Accordingly, the NRC issued an order to licensees of operating plants in February 2002, and similar orders to licensees of decommissioning plants in May 2002 and reactor-site ISFSI licensees in October 2002, requiring "certain compensatory measures", also described as "prudent, interim measures", whose purpose was

¹³ 10 CFR 73.1, Purpose and Scope, from the NRC web site (www.nrc.gov), accessed on 2 September 2002.

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to "provide the Commission with reasonable assurance that the public health and safety and common defense and security continue to be adequately protected in the current generalized high-level threat environment".¹⁴ The additional measures required by these orders were not publicly disclosed, but the NRC Chairman stated that they included:¹⁵

- (i) increased patrols;
- (ii) augmented security forces and capabilities;
- (iii) additional security posts;
- (iv) vehicle checks at greater stand-off distances;
- (v) enhanced coordination with law enforcement and military authorities;
- (vi) additional restrictions on unescorted access authorizations;
- (vii) plans to respond to plant damage from explosions or fires; and
- (viii) assured presence of Emergency Plan staff and resources.

In addition to requiring these additional security measures, the NRC established a Threat Advisory System that warns of a possible attack on a nuclear facility. This system uses five color-coded threat conditions ranging from green (low risk of attack) to red (severe risk of attack). These threat conditions conform with those used by the Department of Homeland Security.

The NRC has described its new, revised DBT for nuclear power plants as follows:¹⁶

"The Order that imposes revisions to the Design Basis Threat requires power plants to implement additional protective actions to protect against sabotage by terrorists and other adversaries. The details of the design basis threat are safeguards information pursuant to Section 147 of the Atomic Energy Act and will not be released to the public. This Order builds on the changes made by the Commission's February 25, 2002 Order. The Commission believes that this DBT represents the largest reasonable threat against which a regulated private security force should be expected to defend under existing law. It was arrived at after extensive deliberation and interaction with cleared stakeholders from other Federal agencies, State governments and industry."

Inferred Characteristics of the New DBT

Although the new DBT for nuclear power plants was not published, its general characteristics can be inferred with reasonable confidence. Four major considerations support such an inference. First, the new DBT must be consistent with 10 CFR 50.13. Second, the DBT will not exceed the capabilities of a "regulated private security force". Third, there is a well-documented history over the past two decades, showing vigorous

¹⁴ The quoted language is from page 2 of the NRC's order of 25 February 2002 to all operating power reactor licensees. Almost-identical language appears in the NRC's orders of 23 May 2002 to all decommissioning power reactor licensees and 16 October 2002 to all ISFSI licensees who also hold 10 CFR 50 licenses.

¹⁵ Meserve, 2002b.

¹⁶ NRC Press Release No. 03-053, 29 April 2003.

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resistance by the nuclear industry to measures that enhance site security, and reluctance by the NRC to contest that resistance.¹⁷ Fourth, available information shows no marked change in prevailing practices of site security.¹⁸

Thus, it can be inferred that the new DBT remains focused on a ground assault by a comparatively small group of lightly-armed attackers. The most destructive instrument included in the DBT is probably a vehicle bomb. The new DBT probably does not allow for aerial or multi-modal attack by a commando-type force. It probably does not allow for an attack by water or submerged charge targeting the cooling water intake. It probably does not allow for antitank missiles or lethal chemical weapons. There is probably no provision for an attack using a commercial or general-aviation aircraft, with or without a load of fuel or explosive. There is no provision for attack using a nuclear weapon. The insider threat probably does not include carefully-planned, sophisticated interventions by key employees. Also, the new DBT does not apply to ISFSIs, so it can be assumed that ISFSIs continue to receive a lesser degree of protection than nuclear power plants. Finally, backup for the licensee's site-security force continues to be provided by local law-enforcement agencies and the FBI, rather than the US military.

¹⁷ Hirsch et al, 2003.

¹⁸ POGO, 2002; Brian, 2003.

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5. Nuclear Power Plants and Irradiated Fuel are Vulnerable to Attack

It is not appropriate to publish a detailed discussion of scenarios whereby a nuclear power plant or an ISFSI might be successfully attacked. However, it must be assumed that attackers are technically sophisticated and possess considerable knowledge about individual nuclear facilities. For decades, engineering drawings, photographs and technical analyses have been openly available for every civilian nuclear facility in the USA. This material is archived at many locations around the world. Thus, a public discussion, in general terms, of potential modes and instruments of attack will not assist attackers. Indeed, such a discussion is needed to ensure that appropriate measures are taken to address structural vulnerabilities of reactor containments and irradiated fuel storage.¹⁹

Safety Systems and their Vulnerability

The safe operation of a US commercial reactor and its associated irradiated fuel pool(s) depends upon the fuel in the reactor and the pool(s) being immersed in water. Moreover, that water must be continually cooled to remove fission heat or radioactive decay heat generated in the fuel. A variety of systems are used to ensure that water is available and is cooled, and that other safety-related functions -- such as shutdown of the fission reaction when needed -- are performed. Some of the relevant systems -- such as the electrical switchyard -- are highly vulnerable to attack. Other systems are located inside reinforced-concrete structures -- such as the reactor auxiliary building -- that provide some degree of protection against attack. The reactor itself is inside a containment structure. At some plants, but not all, the reactor containment is a concrete structure that is highly reinforced and comparatively robust. Irradiated fuel pools have thick concrete walls but are typically covered by lightweight structures.

Attack through Brute Force or Indirectly?

A group of attackers equipped with highly-destructive instruments could take a brute-force approach to attacking a reactor or an irradiated fuel pool. Such an approach would aim to directly breach the reactor containment and primary cooling circuit, or to breach the wall or floor of an irradiated fuel pool. Alternatively, the attacking group could take an indirect approach, and many such approaches will readily suggest themselves to technically-informed attackers. Insiders, or outsiders who have taken over the plant, could obtain a release of radioactive material without necessarily employing destructive instruments. Some attack scenarios will involve the disabling of plant personnel, which could be accomplished by armed attack, use of lethal chemical weapons, or radioactive contamination of the site by an initial release of radioactive material.

¹⁹ For a more detailed discussion of nuclear-facility vulnerability, see: Thompson, 2003.

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Vulnerability of ISFSIs

Dry-storage ISFSIs differ from reactors and irradiated fuel pools in that their operation is entirely passive. Thus, each dry-storage container in an ISFSI must be attacked directly. To obtain a release of radioactive material, the wall of the fuel container must be penetrated from the outside, or the container must be heated by an external fire to such an extent that the containment envelope fails. The attack could also exploit stored chemical energy in the zirconium cladding of the spent fuel. Combustion of this cladding in air, if initiated, would generate heat that could liberate radioactive material from the fuel to the outside environment. A knowledgeable attacker could combine penetration of the fuel container with the initiation of combustion.

Requirements for a Vulnerability Study

Every US commercial reactor has been subjected to a probabilistic risk assessment (PRA) or equivalent study.²⁰ This analysis examined the reactor's potential to experience accidents due to human error, equipment failure or natural forces (e.g., earthquake), but did not consider acts of malice or insanity. Few irradiated fuel pools or ISFSIs have been subjected to a PRA-type study or a study of its vulnerability to acts of malice or insanity. Indeed, there has never been a comprehensive study of the vulnerability of any US nuclear facility to acts of malice or insanity. Spurred by the attacks on the World Trade Center and Pentagon in September 2001, the NRC has sponsored some secret studies on nuclear-facility vulnerability. However, available information shows that these studies are narrow in scope and will provide limited guidance regarding the overall vulnerability of nuclear facilities.²¹

A comprehensive study of a facility's vulnerability would begin by identifying a range of potential attacks on the facility. The probability of each potential attack would be qualitatively estimated, with consideration of the factors (e.g., international events, changing availability of instruments of attack) that could alter the probability over time. Site-specific factors affecting the feasibility and probability of attack scenarios include local terrain and the proximity of coastlines, airports, population centers and national symbols. A variety of modes and instruments of attack would be considered.

After identifying a range of potential attacks, a comprehensive study would examine the vulnerability of the subject facility to those attacks. This could be done by adapting and extending known techniques of PRA, with an emphasis on the logical structure of PRA rather than the numerical probabilities of events. The analysis would consider the potential for interactions among facilities at a site. For example, a potentially important interaction

²⁰ The state of the art for reactor PRAs is illustrated by: NRC, 1990.

²¹ The NRC's Office of Research Programs has stated (NRC, 2003, page 11): "During 2003 Research will complete the realistic engineering assessments of the vulnerability of nuclear power reactors to aircraft attack and the vulnerability of spent fuel pools to explosive attacks. Two pilot plant assessments are underway to assess the threats and identify any additional potential mitigation options." Although potentially useful, these assessments could yield only a fraction of the information that would be contained in a comprehensive assessment of vulnerability.

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could be the prevention of personnel access at one facility (e.g., an irradiated fuel pool) due to a release of radioactive material at another facility (e.g., a reactor). Attention would be given to the potential for "cascading" scenarios in which attacks at some parts of a nuclear-power-plant site (e.g., control room, switchyard, diesel generators) lead to releases from reactors and/or irradiated fuel pools that were not directly attacked.

Vulnerability of Irradiated Fuel Pools

The vulnerability of irradiated fuel pools deserves special mention for two reasons. First, each pool now contains an amount of long-lived radioactive material that is substantially larger than the amount in a reactor core. Second, loss of water from a pool will cause some or all of the fuel in the pool to self-ignite and burn, releasing a large amount of radioactive material to the atmosphere.²² The potential for a fire exists because the pools have been equipped with high-density racks. In the 1970s, the irradiated fuel pools of US nuclear power plants were typically equipped with low-density, open-frame racks. If water were partially or totally lost from such a pool, air or steam could circulate freely throughout the racks, providing convective cooling to the irradiated fuel. By contrast, the high-density racks that are used today have a closed structure. To suppress criticality, each fuel assembly is surrounded by solid, neutron-absorbing panels, and there is little or no gap between the panels of adjacent cells. In the absence of water, this configuration allows only one mode of circulation of air and steam around a fuel assembly -- vertically upward within the confines of the neutron-absorbing panels.

If water is totally lost from a high-density pool, air will pass downward through available gaps such as the gap between the pool wall and the outer faces of the racks, will travel horizontally across the base of the pool, will enter each rack cell through a hole in its base, and will rise upward within the cell, providing cooling to the irradiated fuel assembly in that cell. If the fuel has been discharged from the reactor comparatively recently, the flow of air may be insufficient to remove all of the fuel's decay heat. In that case, the temperature of the fuel cladding may rise to the point where a self-sustaining, exothermic oxidation reaction with air will begin. In simple terms, the fuel cladding -- which is made of zirconium alloy -- will begin to burn. The zirconium-alloy cladding can also enter into a self-sustaining, exothermic oxidation reaction with steam. Other exothermic oxidation reactions can also occur. For simplicity, the occurrence of one or more of the possible reactions can be referred to as a pool fire.

²² The NRC has published a variety of technical documents that address irradiated fuel-pool fires. The most recent of these documents is: Collins et al, 2000. For more recent analyses of irradiated fuel-pool fires, see: Alvarez et al, 2003; Thompson, 2003; and Thompson, 2002. The NRC Staff stated in March 2003 (NRC, 2003, page 10) that it has completed an "integral analysis of a spent fuel pool accident scenario", but this analysis has not been published.

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In many scenarios for loss of water from a pool, the flow of air that is described in the preceding paragraph will be blocked. For example, a falling object (e.g., a fuel-transfer cask) might distort rack structures, thereby blocking air flow. An attack might cause debris (e.g., from the roof of the fuel handling building) to fall into the pool and block air flow. The presence of residual water in the bottom of the pool would also block air flow. In most scenarios for loss of water, residual water will be present for significant periods of time. Falling debris from burning fuel assemblies could block air flow to nearby fuel assemblies that have not yet ignited. Blockage of air flow, for whatever reason, will lead to ignition of fuel that has been discharged from a reactor for long periods -- potentially 10 years or longer.

Modes and Instruments of Attack

A nuclear power plant or an ISFSI could be attacked using one or more of a variety of modes and instruments. Table 1, below, shows a selection of potential modes and instruments, summarizes their key characteristics, and describes the defenses that are currently mounted against them.

One of the potential instruments of attack shown in Table 1 is an explosive-laden smaller aircraft. In this connection, it is noteworthy that the US General Accounting Office (GAO) expressed concern, in September 2003 testimony to Congress, about the potential for malicious use of general-aviation aircraft.²³ The testimony stated:²⁴

"Since September 2001, TSA [the Transportation Security Administration] has taken limited action to improve general aviation security, leaving it far more open and potentially vulnerable than commercial aviation. General aviation is vulnerable because general aviation pilots are not screened before takeoff and the contents of general aviation planes are not screened at any point. General aviation includes more than 200,000 privately owned airplanes, which are located in every state at more than 19,000 airports. Over 550 of these airports also provide commercial service. In the last 5 years, about 70 aircraft have been stolen from general aviation airports, indicating a potential weakness that could be exploited by terrorists."

²³ Dillingham, 2003.

²⁴ *ibid*, page 14.

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Table 1
Potential Modes and Instruments of Attack on a Nuclear Power Plant²⁵

MODE OF ATTACK	CHARACTERISTICS	PRESENT DEFENSE
Commando-style attack	<ul style="list-style-type: none"> • Could involve heavy weapons and sophisticated tactics • Successful attack would require substantial planning and resources 	Alarms, fences and lightly-armed guards, with offsite backup
Commando-style by water	<ul style="list-style-type: none"> <input type="checkbox"/> Could involve heavy weapons/sophisticated tactics <input type="checkbox"/> Could target intake canal <input type="checkbox"/> Attack may be planned to coordinate with a land attack 	<ul style="list-style-type: none"> <input type="checkbox"/> 500 yard no entry zone – marked by buoys – simply, “no trespassing” signs <input type="checkbox"/> Periodic Coast Guard surveillance by boat or plane
Land-vehicle bomb	<ul style="list-style-type: none"> • Readily obtainable • Highly destructive if detonated at target 	Vehicle barriers at entry points to Protected Area
Anti-tank missile	<ul style="list-style-type: none"> • Readily obtainable • Highly destructive at point of impact 	None if missile launched from offsite
Commercial aircraft	<ul style="list-style-type: none"> • More difficult to obtain than pre-9/11 • Can destroy larger, softer targets 	None
Explosive-laden smaller aircraft	<ul style="list-style-type: none"> • Readily obtainable • Can destroy smaller, harder targets 	None
10-kilotonne nuclear weapon	<ul style="list-style-type: none"> • Difficult to obtain • Assured destruction if detonated at target 	None

A form of explosive that might be used in an attack on a nuclear power plant or an ISFSI is a shaped charge. These have many civilian and military applications, and have been used for decades. They are used, for example, as human-carried demolition charges or as warheads for anti-tank missiles. In illustration of their availability, a quick search of the Web identified a commercial supplier of military-surplus, shaped-charged warheads to licensed civilian users. A surplus warhead with a diameter of 14 cm and length of 21 cm was advertised as being capable of penetrating more than 65 cm of rolled homogeneous armor.

²⁵ Adapted from Table 1 of: Thompson, 2003.

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The largest known shaped charge was the German MISTEL, developed late in World War II. This warhead was 2 meters in diameter, weighed 3,500 kg and contained 1,700 kg of explosive. It was carried in the nose of an unmanned bomber aircraft. The Japanese used a smaller version of this device, the SAKURA bomb, for kamikaze attacks against US warships.²⁶

A US government laboratory has developed, and described in a published report, a shaped-charge warhead specifically intended to penetrate large thicknesses of rock or concrete. This warhead would be mounted in the nose of a cruise missile. The warhead has a diameter of 28 inches and a length of 28.5 inches. It weighs 900 pounds and contains 600 pounds of Octol explosive. When tested in November 2002, this device created a hole of 10 inches diameter in tuff rock to a depth of 19.5 feet.²⁷

6. Mark I & II BWRs Have a Particular Vulnerability to Attack

A Mark I or II BWR has its irradiated fuel pool mounted high above the ground. The outer wall of the pool is a few feet inside one of the outer faces of the reactor building. The surface of the pool and the remainder of the refueling floor of the reactor are covered by a lightweight roof and wall structure. This arrangement makes the pool vulnerable to attack from above, below or the side. If a pool is breached, there is no surrounding structure or backfill to inhibit the drainage of water. The reactor vessel, like the pool, is above ground. Its cooling systems and containment are vulnerable to attack at several points. The exterior configuration of the reactor building facilitates accurate aiming (e.g., of an explosive-laden aircraft) by a knowledgeable attacker. Taken together, these factors could make a Mark I or II BWR a comparatively attractive target of attack.

7. Options are Available for Stronger Defense of Mark I & II BWRs

Four categories of defensive measures, taken together, could provide a stronger defense of Mark I and II BWRs. The four categories are: (i) site security; (ii) facility robustness; (iii) damage control; and (iv) emergency response planning. The degree of protection provided by these measures would be greatest if they were integrated into the design of a nuclear plant before its construction. However, a comprehensive set of measures could provide significant protection at the existing Mark I and II BWRs.

²⁶ Walters, 2003.

²⁷ This citation is voluntarily withheld by the Petitioners.

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Site Security

Site-security measures are those that reduce the potential for implementation of destructive acts of malice or insanity at a nuclear site. Two types of measure fall into this category. Measures of the first type would be implemented at offsite locations, and the implementing agencies might have no direct connection with the site. Airline or airport security measures are examples of measures in this category. Measures of the second type would be implemented at or near the site. Implementing agencies would include the licensee, the NRC and other entities (e.g., National Guard).

The physical protection measures now required by the NRC, as discussed in Section 4, above, are examples of site-security measures of the second type. More stringent measures of this type could be introduced for consideration in the public debate and development of compensatory security measures, such as:

- (i) establishment of a mandatory aircraft-exclusion boundary around the site;
- (ii) deployment of an aircraft-detection system (e.g., Sentinel) that triggers a succession of security alerts as the exclusion boundary is approached and crossed;
- (iii) deployment of an automated system (e.g., Phalanx) to destroy aircraft at short range if they are closing on the plant;
- (iv) expansion of the DBT, beyond that now applicable to a nuclear power plant, to include additional intruders, heavy weapons, aircraft attack, lethal chemical weapons and more than one vehicle bomb; and
- (v) any ISFSI on the site to receive protection equivalent to that provided for a nuclear power plant.

Facility Robustness

Facility-robustness measures are those that improve the ability of a nuclear facility to experience destructive acts of malice or insanity without a significant release of radioactive material to the environment. In illustration, the PIUS reactor design, developed by the reactor vendor ASEA-Atom but never built, was intended to withstand aerial bombardment by 1,000-pound bombs without suffering core damage or releasing a significant amount of radioactive material to the environment.²⁸ A new reactor or ISFSI could be constructed with a similar degree of robustness.

At the existing Mark I and II BWRs, a variety of opportunities are available for enhancing robustness. As a high-priority example, spent-fuel pools could be re-equipped with low-density racks, so that irradiated fuel would not ignite if water were lost from a pool. As a second example, the reactor could be permanently shut down or could operate at reduced power, either permanently or at times of alert. If the reactor were shut down, its irradiated fuel could be transferred to an onsite ISFSI that employs hardened, dispersed, dry storage. Figure 1, below, shows a possible design for hardening of the storage modules used in such an ISFSI. To reduce the inventory in the pool, irradiated fuel could be transferred to an onsite ISFSI that employs hardened, dispersed, dry storage.

²⁸ Hannerz, 1983.

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to 1-301-415-2700

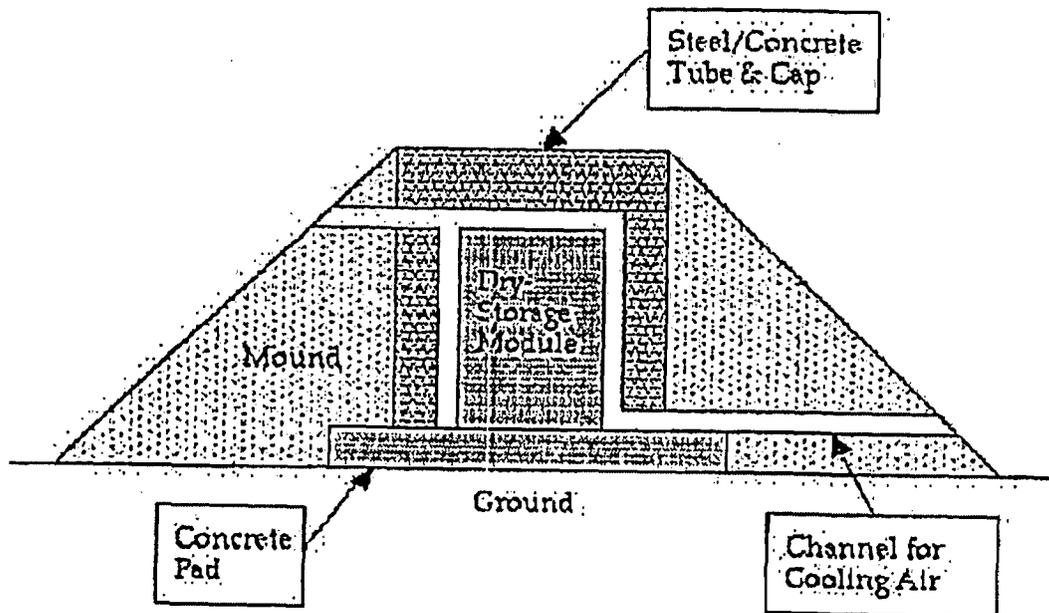
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Figure 1
Schematic View of a Possible Design for Hardened, Dry Storage of Irradiated Fuel²⁹



Notes

- (i) An ISFSI could employ a number of hardened storage modules in a dispersed configuration.
- (ii) Cooling channels would be inclined, to prevent pooling of jet fuel, and would be configured to preclude line-of-sight access to the dry-storage module.
- (iii) The tube, cap and pad surrounding the dry-storage module would be tied together with steel rods, and spacer blocks would prevent the module from moving inside the tube.
- (iv) The steel/concrete tube could be buttressed by several triangular panels connecting the tube and the base pad.

²⁹ Adapted from Figure 2 of: Thompson, 2003.

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If the reactor were not shut down, robustness of the plant could be enhanced by an integrated set of measures such as:

- (i) automated shutdown of the reactor upon initiation of a specified alert status at the plant, with provision for completion of the automated shutdown sequence if the control room is disabled;
- (ii) permanent deployment of diesel-driven pumps and pre-engineered piping to be available to provide emergency water supply to the reactor and the irradiated fuel pool;
- (iii) re-equipment of the irradiated fuel pool with low-density racks, excess fuel being stored in an onsite ISFSI; and
- (iv) construction of the ISFSI to employ hardened, dispersed, dry storage.

Damage Control

Damage-control measures are those that reduce the potential for a release of radioactive material following damage to a facility by destructive acts of malice or insanity. Measures of this kind could be ad hoc or pre-engineered. One illustration of a damage-control measure would be a set of arrangements for patching and restoring water to an irradiated fuel pool that has been breached. Other illustrations can be provided. It appears that the NRC has required licensees to undertake some planning for damage control following explosions or fires.³⁰ Additional measures could be appropriate, including:

- (i) establishment of a pre-planned damage-control capability at the site, using onsite personnel and equipment for first response and offsite resources for backup;
- (ii) periodic exercises of damage-control capability;
- (iii) establishment of a set of damage-control objectives -- to include patching and restoring water to a breached spent fuel pool, fire suppression at any ISFSI on the site, and provision of cooling to a reactor whose support systems and control room are disabled -- with accompanying detailed plans; and
- (iv) provision of equipment and training to allow damage control to proceed on a radioactively-contaminated site.

³⁰ Meserve, 2002b.

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Offsite Emergency Response

Emergency-response measures are those that reduce the potential for exposure of offsite populations to radiation, following a release of radioactive material from a nuclear facility. Measures in this category could accommodate releases attributable to acts of malice or insanity, or "accidental" releases arising from human error, equipment failure or natural forces (e.g., earthquake). However, there are two major ways in which malice- or insanity-induced releases might differ from accidental releases. First, a malice- or insanity-induced release might be larger and begin earlier than an accidental release.³¹ Second, a malice- or insanity-induced release might be accompanied by deliberate degradation of emergency response capabilities (e.g., the attacking group might block an evacuation route). Accommodating these differences could require additional measures of emergency response.

Overall, an appropriate way to improve emergency-response capability at a nuclear-power-plant site could be to implement a model emergency response plan that was developed by a team based at Clark University in Massachusetts.³² This model plan was specifically designed to accommodate radioactive releases from spent-fuel-storage facilities, as well as from reactors. That provision, and other features of the plan, would provide a capability to accommodate both accidental releases and malice- or insanity-induced releases. Major features of the model plan include:³³

- (i) structured objectives;
- (ii) improved flexibility and resilience, with a richer flow of information;
- (iii) precautionary initiation of response, with State authorities having an independent capability to identify conditions calling for a precautionary response³⁴;
- (iv) criteria for long-term protective actions;
- (v) three planning zones, with the outer zone extending to any distance necessary³⁵;
- (vi) improved structure for accident classification;
- (vii) increased State capabilities and power;
- (viii) enhanced role for local governments;
- (ix) improved capabilities for radiation monitoring, plume tracking and dose projection;
- (x) improved medical response;
- (xi) enhanced capability for information exchange;
- (xii) more emphasis on drills, exercises and training;
- (xiii) improved public education and involvement; and

³¹ Present plans for emergency response do not account for the potential for a large release of radioactive material from spent fuel, as would occur during a pool fire. The underlying assumption is that a release of this kind is very unlikely. That assumption cannot be sustained in the present threat environment.

³² Golding et al, 1992.

³³ *ibid*, pp 8-13.

³⁴ A security alert could be a condition calling for a precautionary response.

³⁵ The inner and intermediate zones would have radii of 5 and 25 miles, respectively. As an example of the planning measures in each zone, potassium iodide would be predistributed within the 25-mile zone and made generally accessible nationwide.

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(xiv) requirement that emergency preparedness be regarded as a safety system equivalent to in-plant systems.

8. The Public Should be Involved in Addressing the Structural Vulnerabilities of Reactor Containments and Irradiated Fuel

Determining the general type and level of defense to be provided at a commercial nuclear facility should be a matter for open, democratic debate. This matter is, albeit at a smaller scale, analogous to determining the type and level of defense for the nation. Experience shows clearly that an open, democratic debate on national defense is necessary to preserve the Republic and provide an effective, cost-efficient defense.

When defenses are being developed for a particular nuclear facility, some details of the defenses will not be appropriate for general distribution. However, designated representatives of local and state governments and citizen groups should be allowed access to these details, to ensure that defenses are deployed according to the general plan that has been approved through open, democratic debate. NRC regulations already contain provisions whereby, in the context of nuclear-licensing proceedings, intervenors' designated representatives can have access to safeguards information.

9. Actions Sought by this Petition

The Petitioners request that the NRC takes the following actions:

- (i) issue a Demand For Information to the licensees for all Mark I and II BWRs and conduct a 6-month study of options for addressing structural vulnerabilities;
- (ii) present the findings of the study at a national conference attended by all interested stakeholders, providing for transcribed comments and questions;
- (iii) develop a comprehensive plan that accounts for stakeholder concerns and addresses structural vulnerabilities of all Mark I and II BWRs within a 12-month period;
- (iv) issue Orders to the licensees for all Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures; and
- (v) make future operation of each Mark I and II BWR contingent on addressing their structural vulnerability with participation and oversight by a panel of local stakeholders.

The Demand For Information will require the licensees to provide answers to the following questions:

1. What is the current licensed capacity and inventory for spent fuel assembly storage in the spent fuel pool?
2. What is the projected number of spent fuel assemblies to be discharged from the reactor core in the next five and ten years?

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3. What is the calculated decay heat load on the spent fuel pool from the current inventory and licensed capacity of spent fuel assemblies?
4. What is the calculated decay heat load on the spent fuel pool from the inventory of spent fuel assemblies projected to be discharged from the reactor core in the next five and ten years?
5. What is the radionuclide inventory of the spent fuel pool at its design basis loading?
6. What is the water volume of the spent fuel pool?
7. What is the design heat removal capacity of the spent fuel pool cooling system?
8. Is the facility licensed for onsite dry storage of spent fuel? If so, how many spent fuel assemblies are currently in dry storage?
9. What are the spent fuel pool water makeup capabilities (sources and flow rates)?
10. What are the results from studies, evaluations, and/or analyses conducted on the vulnerability of the spent fuel pool to (a) aircraft, (b) tornado-generated missiles, and (c) fires?

11.

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U.S. Commercial Reactors with Elevated Irradiated Fuel Storage Ponds

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General Electric Boiling Water Reactor MARK I Containments (24 units)

Browns Ferry 1, 2 and 3	Decatur, AL
Brunswick 1 & 2	Southport, NC
Cooper	Brownville, NB
Dresden 2 & 3	Morris, IL
Duane Arnold	Palo, IA
Edwin Hatch 1 & 2	Baxley, GA
Ferni 2	Monroe, MI
Hope Creek	Artificial Island, NJ
Fitzpatrick	Scriba, NY
Millstone 1	Waterford, CT
Monticello	Monticello, MN
Nine Mile Point Unit 1	Scriba, NY
Oyster Creek	Lacey Township, NJ
Peach Bottom 2 & 3	Delta, PA
Pilgrim 1	Plymouth, MA
Quad Cities 1 & 2	Cordova, IL
Vermont Yankee	Vernon, VT

General Electric Boiling Water Reactor MARK II Containments (8 units)

LaSalle 1 & 2	Seneca, IL
Limerick 1 & 2	Pottstown, PA
Nine Mile Point Unit 2	Scriba, NY
Susquehanna 1 & 2	Berwick, PA
WNP-2 (Columbia)	Richland, WA

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Petition Sign-On Groups To Date July 22, 2004

National Groups	Greenpeace Institute for Resource and Security Studies Nuclear Information & Resource Service Public Citizen Union of Concerned Scientists
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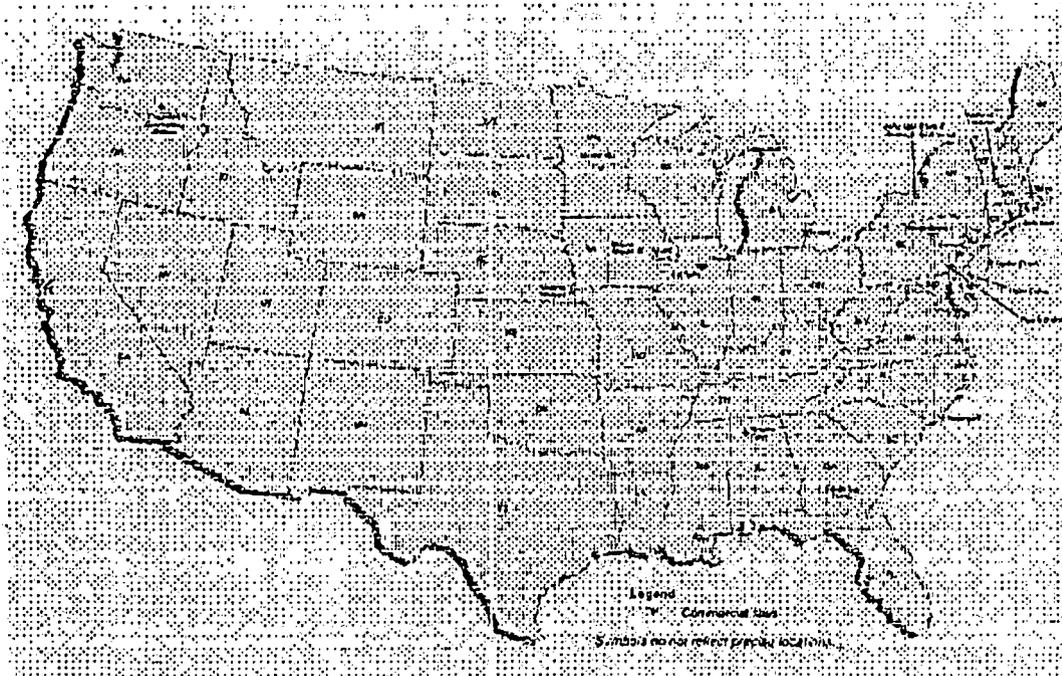
LOCAL/REGIONAL GROUPS	REACTORS
Cape Downwinders	Pilgrim
Citizens Awareness Network Central New York chapter Connecticut chapter Vermont chapter Massachusetts chapter	FitzPatrick Nine Mile Point 1 & 2 Millstone 1 Vermont Yankee Pilgrim Vermont Yankee
Citizens Campaign for the Environment	FitzPatrick Millstone 1 Nine Mile Point 1 & 2
Citizens' Environmental Coalition	FitzPatrick Nine Mile Point 1 & 2
Citizens' Regulatory Commission	Millstone 1
Citizens Resistance Against Fermi 2	Fermi 2
Clean Water Action	Pilgrim
Coalition for a Nuclear Free Great Lakes	Fermi 2
Coalition for Peace and Justice	Hope Creek
Don't Waste Michigan	Fermi 2
Earth Care	Duane Arnold
EFMR Monitoring Group	Peach Bottom 2 & 3
Environmental Coalition on Nuclear Pollution	Limerick 1 & 2 Peach Bottom 2 & 3 Susquehanna 1 & 2
Finger Lakes Citizens for the Environment	FitzPatrick Nine Mile Point 1 & 2
Georgians Against Nuclear Energy	Hatch 1 & 2
Heart of America Northwest	Columbia Generating Station
Independent Environmental Conservation & Activism Network	Duane Arnold Quad Cities 1 & 2
Justice Through Peace Initiative	FitzPatrick Nine Mile Point 1 & 2
Kids Against Pollution	FitzPatrick Nine Mile Point 1 & 2
Lakeshore Environmental Action	FitzPatrick Nine Mile Point 1 & 2

*Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Annex, Page 31*

Massachusetts-Public Interest Research Group	Pilgrim
Nebraskans for Peace	Cooper
New England Coalition	Vermont Yankee
New Jersey-Public Interest Research Group	Hope Creek Oyster Creek
New York-Public Interest Research Group	FitzPatrick Nine Mile Point 1 & 2
North American Water Office	Monticello
North Carolina-Waste Awareness and Reduction Network	Brunswick 1 & 2
Nuclear Energy Information Service	Dresden 2 & 3 LaSalle 1 & 2 Quad Cities 1 & 2
Nuclear Free Vermont	Vermont Yankee
People's Environmental Network of New York	FitzPatrick Nine Mile Point 1 & 2
Pilgrim Watch	Pilgrim
Plymouth County Nuclear Information Committee	Pilgrim
Southern Alliance for Clean Energy	Browns Ferry 1, 2, & 3 Hatch 1 & 2
Syracuse Peace Council	FitzPatrick Nine Mile Point 1 & 2
TMI Alert	Peach Bottom 2 & 3 Susquehanna 1 & 2
UNPLUG Salem Campaign	Hope Creek

Petition To Address Structural Vulnerabilities of Mark I & II BWRs and Their Irradiated Fuel
June 2004 Annex, Page 32

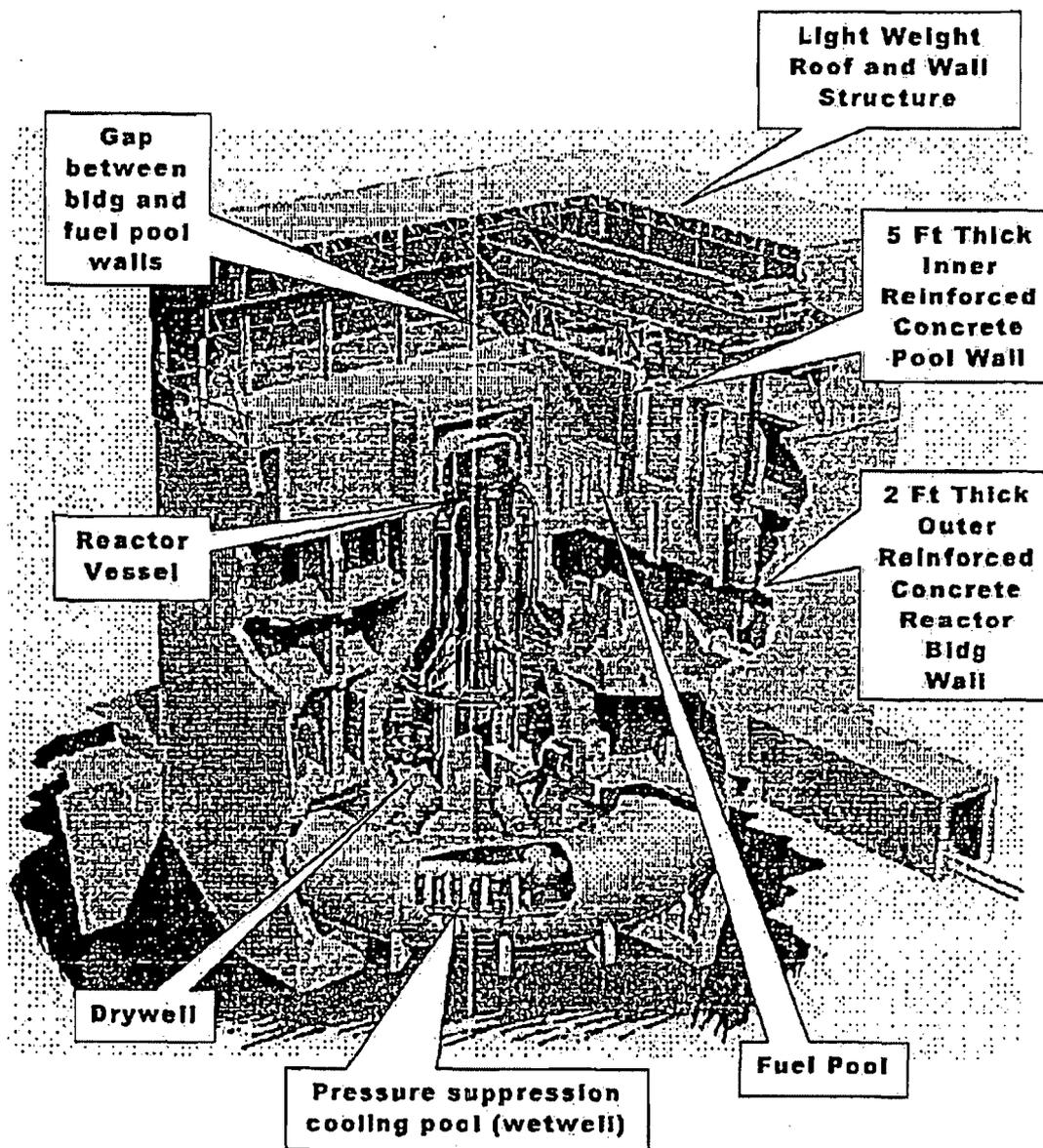
Map of U.S. Commercial Reactor Sites with
Mark I and/or Mark II Boiling Water Reactors



**Diagram of GE Mark I Reactor Building and
Elevated Irradiated Fuel Storage Pond**

"Mark I and Mark II secondary containments generally do not appear to have any significant structures that might reduce the likelihood of aircraft penetration, although a crash into 1 of 4 sides of a BWR secondary containment may be less likely to penetrate because other structures are in the way of the aircraft."

"Spent Fuel Pool Accident Risk Report," U.S. Nuclear Regulatory Commission, October 2000, Page 3-23



November 7, 2005

The Nuclear Security Coalition
c/o Ms. Deb Katz
Citizens Awareness Network
P.O. Box 83
Shelburne, MA 01370

Dear Ms. Katz:

This letter responds to the Petition that you filed on behalf of the Nuclear Security Coalition (the Petitioner) with Mr. Luis Reyes, Executive Director for Operations at the Nuclear Regulatory Commission (NRC), pursuant to Section 2.206 of Title 10 of the *Code of Federal Regulations* (10 CFR 2.206) on August 10, 2004, as supplemented by Paul Gunter of the Nuclear Information and Resource Service, who is a member of the Nuclear Security Coalition, on November 29, and December 6, 2004, and March 15, March 28, April 12, and April 19, 2005.

In its Petition, the Petitioner requested that the NRC take the following actions: (1) issue a demand for information to the licensees for all Mark I and II boiling-water reactors (BWRs) and conduct a 6-month study of options for addressing structural vulnerabilities; (2) present the findings of the study at a national conference attended by all interested stakeholders and transcribe comments and questions; (3) develop a comprehensive plan that accounts for stakeholder concerns and addresses structural vulnerabilities of all Mark I and II BWRs within a 12-month period; (4) issue orders to the licensees for all Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures, including structural protections; and (5) make future operation of each Mark I and II BWR contingent on addressing their structural vulnerability with participation and oversight by a panel of local stakeholders.

Representatives of the Petitioner met, in person and by telephone, with the Petition Review Board (PRB) to discuss the petition (the meeting summary, with the transcript enclosed, was issued on October 13, 2004). The PRB considered the results of that discussion when considering the Petitioner's request for action and determining the review schedule for the Petition.

In a letter dated October 19, 2004, the NRC staff informed you that the Petition was being treated pursuant to 10 CFR 2.206 of the NRC's regulations and that the requested actions were being reviewed jointly by the Offices of Nuclear Reactor Regulation, Nuclear Security and Incident Response, and Nuclear Regulatory Research for appropriate action.

The NRC staff sent a copy of the proposed Director's Decision (DD) to you for comment on June 29, 2005. On July 29, 2005, the NRC staff received comments from the Petitioner, the Nuclear Information and Resource Service, and the Pilgrim Security Watch. These comments were considered in the final DD (Enclosure 1). The staff's response to the comments are also enclosed (Enclosure 2). The final DD addresses the Petitioner's requested actions as follows: (1) NRC has granted, in effect, the proposed demand for all licensees of Mark I and II BWRs to conduct a 6-month study of options for addressing structural vulnerabilities; (2) NRC denies the proposed national conference to present the findings of the study; (3) NRC considers that it has granted the proposed development of a comprehensive plan to account for stakeholder

D. Katz

- 2 -

concerns and address structural vulnerabilities of all Mark I and II BWRs; (4) NRC denies the proposed issuance of orders to the licensees for all Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures; and (5) NRC denies the proposed requirement that future operations of all Mark I and II BWRs be contingent on licensees addressing the structural vulnerability of their reactors, with participation and oversight by a panel of local stakeholders.

A copy of the DD-05-04 will be filed with the Secretary of the Commission for the Commission to review in accordance with 10 CFR 2.206(c). As provided for by this regulation, the DD will constitute the final action of the Commission 25 days after the issue date of the DD unless the Commission, on its own motion, institutes a review of the DD within that time. The documents cited in this letter and the enclosed DD are available in NRC's Agencywide Documents Access and Management System (ADAMS) for inspection at the Commission's Public Document Room, located at One White Flint North, Public File Area O-1F21, 1 1555 Rockville Pike (first floor), Rockville, Maryland, and from the ADAMS Public Library component on the NRC Web site in the Electronic Reading Room <<http://www.nrc.gov>>.

I have also enclosed a copy of the notice of "Issuance of Director's Decision Under 10 CFR 2.206" that has been filed with the Office of the *Federal Register* for publication (Enclosure 3).

Please feel free to contact Mr. Peter S. Tam, petition manager, at 301-415-1451, to discuss any questions related to this petition.

Sincerely,

/RA/

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

Enclosures: 1. DD-05-04
2. Staff's Response to Comments
3. *Federal Register* Notice

D. Katz

- 2 -

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/RA/

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

- Enclosures: 1. DD-05-04
- 2. Staff's Response to Comments
- 3. *Federal Register* Notice

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Incoming: ML042370023

Letter and Decision Enclosure 1: ML051960343

Enclosure 2: ML052160353

Enclosure 3: ML052970437

Package: ML052970412

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DATE	10/12/05	10/27/05	8/5/05	10/24/05	10/24/05	10/18/05
OFFICE	PRB Chair	DLPM/DD	NRR/D			
NAME	HBerkow	CHaney	JDyer			
DATE	10/24/05	10/26/05	11/07/05			

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Actions to Provide Storage Defenses of Boiling-Water Reactor with Mark I and Mark II
Containment and their Spent Fuel - 2.206 Petition

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UNITED STATES OF AMERICA
 NUCLEAR REGULATORY COMMISSION
 OFFICE OF NUCLEAR REACTOR REGULATION

J. E. Dyer, Director

In the Matter of)	
)	
Boiling-Water Reactors of)	(10 CFR 2.206)
Mark I and II Design)	

DIRECTOR'S DECISION UNDER 10 CFR 2.206

I. Introduction

By letter dated August 10, 2004, addressed to Mr. Luis A. Reyes, Executive Director for Operations at the U.S. Nuclear Regulatory Commission (NRC), as supplemented in a meeting on September 23, 2004 (documented in a meeting summary dated October 13, 2004, Agencywide Document Access and Management System (ADAMS) Accession No. ML042870571), the Nuclear Security Coalition (the Coalition or the Petitioner) filed a Petition pursuant to Title 10 of the *Code of Federal Regulations*, Section 2.206 (10 CFR 2.206). Additional information was submitted by Paul Gunter of the Nuclear Information and Resource Service, who is a member of the Coalition, on November 29, 2004 (Accession No. ML043420386); December 6, 2004 (Accession No. ML043420423); March 15, 2005 (Accession No. ML050750005); March 28, 2005 (Accession No. ML050880013); April 12, 2005 (Accession No. ML 051170034); and April 19, 2005 (Accession No. ML051160159). The Coalition, comprised of 45 independent organizations, requested that the NRC take the following actions:

- (1) issue a Demand For Information to the licensees of all Mark I and II boiling-water reactors (BWRs) and conduct a 6-month study of options for addressing structural vulnerabilities;
- (2) present the findings of the study at a national conference attended by all interested stakeholders, providing for transcribed comments and questions;
- (3) within 12 months develop a comprehensive plan that accounts for stakeholder concerns and addresses structural

vulnerabilities of all Mark I and II BWRs; (4) issue orders to the licensees for all Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures, including structural protection measures; and (5) make future operation of each Mark I and II BWR contingent on licensees addressing their structural vulnerabilities with the participation and oversight of a panel of local stakeholders.

In addition to the five actions summarized above, the Coalition stated that the Petition supports the concerns raised by the National Academy of Sciences (NAS) in a "report on fuel pool vulnerabilities to be released this month." The Petitioner's letter of April 19, 2005, explained its agreement with the April 2005 public summary of the NAS report.

The Petitioner's representatives participated in a meeting and teleconference with the Petition Review Board (PRB) on September 23, 2004, to discuss the Petition. This interaction gave the Petitioner's representatives an opportunity to provide additional information and to clarify issues raised in the Petition. The results of this discussion were considered in the PRB's determination regarding the request for action and in establishing the schedule for reviewing the Petition.

In a letter dated October 19, 2004 (Accession No. ML042880346), the PRB notified the Petitioner that the PRB would treat this request pursuant to 10 CFR 2.206 of the Commission's regulations.

The aforementioned correspondence and a transcript of the September 23, 2004, teleconference are available in ADAMS for inspection at the Commission's Public Document Room (PDR) at One White Flint North, Public File Area 01 F21, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records are also accessible from the ADAMS Public Electronic Reading Room on the NRC Web site, <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or have problems in accessing

the documents located in ADAMS, should contact the NRC PDR reference staff by telephone at 1-800-397-4209 or 301-415-4737 or by e-mail to pdr@nrc.gov.

II. Discussion

As discussed in Section I, the Petitioner requested that the NRC take certain actions regarding Mark I and II BWRs. The specific requested actions are restated along with the Coalition's supporting assertions and discussed in the following sections.

As stated earlier, the Petitioner expressed support for the concerns raised by the NAS in its report on fuel pool vulnerabilities. In April 2005, the NAS published a public summary of its classified report. Prior to the release of this public summary, the NRC had responded to the NAS report (classified non-public version) in a letter from Chairman Nils J. Diaz to Senator Pete V. Domenici dated March 14, 2005 (Accession No. ML050280428). In that letter, the NRC stated that: (1) the NAS report reinforces the validity of recent NRC studies which indicate that spent fuel storage systems are safe and secure, and of NRC actions to improve the safety and security of such systems; (2) there are a number of areas of NRC disagreement with the NAS report; (3) some scenarios postulated by the NAS are unreasonable; and (4) some NAS recommendations lack a sound technical basis. Although the Petitioner endorsed the NAS report, and in its April 19, 2005, letter discussed the Petitioner's agreement with the public summary of the NAS report, the staff noted that the Petitioner did not provide any new information that could alter the position already expressed in Chairman Diaz's letter of March 14, 2005, to Senator Domenici. Accordingly, the technical matters discussed in Chairman Diaz's March 14, 2005, letter need no further elaboration in this Director's Decision. The NRC staff's response to the Coalition's five specific requested actions are as follows.

Requested Action 1 - Demand BWR I and II licensees to conduct a 6-month study of options for addressing structural vulnerabilities

A. *Petitioner's Concern*

The Petitioner requested that the NRC order the BWR Mark I and II licensees to conduct a full review of each facility's structural vulnerabilities. The Coalition's request was based on assertions that nuclear power plants are key national assets (i.e., prime targets for attacks) and that BWRs with Mark I and II containments are particularly vulnerable to air attack. Accordingly, defense of these assets is a national security imperative.

B. *NRC Staff's Response*

Nuclear plants incorporate structural features to protect against severe external events such as tornadoes, hurricanes, fires and floods. These structural features, supported by the deployment of effective and visible physical protection measures, provide a deterrent to terrorist activities. With respect to potential terrorist attacks by air, Federal efforts have increased substantially since September 11, 2001. Those efforts include enhanced airline passenger and baggage screening, strengthened cockpit doors, and the Federal Air Marshals program, among others. Federal law enforcement and intelligence agencies have increased efforts to identify and mitigate potential aircraft-related threats before they can be carried out. In more than one case, the Department of Defense and Federal Aviation Administration (FAA) have acted to protect airspace above nuclear power plants in response to threats which were later determined to be non-credible. These and other government-wide efforts have improved protection against air attacks on all industrial facilities, both nuclear and non-nuclear. Nonetheless, nuclear plant licensees have well established emergency procedures and severe accident management guidelines that provide a means to help mitigate the potential consequences of terrorist attacks should they occur.

With respect to spent fuel storage, the NRC issued new security requirements for both spent fuel pools and dry casks after September 11, 2001. The NRC continues to inspect each facility's performance to verify effective implementation of the associated security programs and mitigating strategies.

In addition, the NRC is continuing to study various pressurized-water reactor (PWR) and BWR plant systems, including spent fuel storage, to determine whether additional mitigating strategies are warranted. Specifically, the NRC completed detailed structural assessments at two spent fuel pools (SFPs), the results of which indicate that significant releases of radioactivity due to a terrorist attack on a SFP are very unlikely. The NRC is performing plant-specific inspections and assessments at all BWR Mark I and II spent fuel pools. The NRC staff is evaluating the adequacy of licensee measures to restore and maintain effective spent fuel cooling, if the pool were to be damaged. The NRC is also participating in a longer term international cooperative testing program to examine spent fuel heatup behavior in an air environment (i.e., loss of spent fuel pool cooling water inventory). The NRC's ongoing research has provided numerous additional insights that have been provided to licensees so they can develop additional mitigating actions and strategies as warranted.

In summary, the NRC, other agencies of the Federal government, the local governments, and the licensees have taken and continue to take extensive actions to enhance protection of these facilities in a manner consistent with NRC's defense-in-depth philosophy. These actions have significantly improved the safety and security of spent fuel storage. Therefore, the intent of the six-month study requested by the Petitioner has been achieved. Accordingly, the Petitioner's request has, in effect, been granted.

Requested Action 2 - Present the findings of the study at a national conference for all interested stakeholders, providing for transcribed comments and questions

A. *Petitioner's Concern*

The Petitioner asked that the NRC present the findings of the requested vulnerability study at a national conference for all interested stakeholders. The Petitioner's request was based on an assertion that the public should be involved in addressing the structural vulnerabilities of nuclear power plants and involved in developing stronger defenses for Mark I and II BWRs.

B. *NRC Staff's Response*

The NRC is committed to ensuring openness and obtaining public input in its decision-making. The NRC attempts to keep the public appropriately informed within the constraints of the law. As part of its mission to protect the public health and safety, common defense and security, and the environment, the NRC must ensure that sensitive information about the Nation's nuclear facilities does not fall into the hands of terrorists. Public release of information concerning physical security of nuclear facilities, known as Safeguards Information (SGI), which could potentially be exploited by an adversary would be contrary to the NRC's efforts to ensure protection of the Nation's nuclear infrastructure and to NRC's statutory duties. See Section 147 of the Atomic Energy Act of 1954, as amended, 42 USC. §2166, and 10 CFR 73.21(c). In addition, the NRC's assessments of BWR structural vulnerabilities, including both the methodology employed and the results, are classified as national security information pursuant to Executive Order 12958, as amended on November 1999 and March 2003. Public release of national security information is prohibited pursuant to 10 CFR 95.35. Since the information which the Petitioner wishes to discuss at a national conference of stakeholders is either safeguards or national security information, the Petitioner's request for a presentation of a

vulnerability study at a national conference of all interested stakeholders must be denied. The NRC notes, however, that some of this information has been declassified and is available in the public domain (e.g., Chairman Diaz's March 14, 2005, letter and the publicly available summary of the NAS report).

Requested Action 3 - Within 12 months develop a comprehensive plan that accounts for stakeholder concerns and addresses structural vulnerabilities of all Mark I and II BWRs

A. *Petitioner's Concerns*

The Petitioner requested that the NRC develop a comprehensive plan that accounts for stakeholder concerns and addresses structural vulnerabilities of all Mark I and II BWRs within 12 months. The Petitioner's request was based on assertions that BWRs with Mark I and II containments are particularly vulnerable to attacks and that the NRC requires only light defenses for commercial nuclear plants.

B. *NRC Staff's Response*

As indicated in the response to Requested Action 1, the NRC has already developed and implemented a comprehensive plan consistent with stakeholder concerns. Further, the NRC disagrees with the Petitioner's contention that NRC requires only light defense of commercial nuclear plants. To the contrary, the NRC, other agencies of the Federal government, local governments, and the licensees have implemented broad and comprehensive measures that more than meet the intent of the Petitioner's request for a comprehensive plan on security enhancement (see discussion under Requested Action 1).

Subsequent to September 11, 2001, NRC assessments (discussed under Requested Action 1) prompted the NRC to adjust its requirements for mitigation of a variety of potential terrorist attacks against nuclear facilities. As a result, on February 25, 2002, the NRC issued orders to all operating nuclear reactor facilities, requiring that interim compensatory security

measures be implemented beyond those called for by current regulations. Several additional security-related orders have been issued since then, most notably a supplemental design basis threat, that required additional security enhancements to be implemented at each nuclear plant site. See 68 FR 24517 (May 7, 2003).

The NRC also issued a letter on July 29, 2004, with a sensitive unclassified Safeguards Information enclosure specifying certain mitigative measures for licensees to take to enhance their ability to restore and maintain effective fuel cooling if the pool or the overlying structure were severely damaged. The NRC staff met with power reactor licensees in February 2005 on the NRC's spent fuel pool mitigation measures. At the end of February 2005, power reactor licensees were given until May 2005 to respond to the additional specific recommendations. The NRC staff is currently evaluating these responses to ensure they meet NRC's expectations. The NRC carried out its inspections in September and October of this year. A final report is due to the Commission in December.

Lastly, and as indicated previously, the NRC continues to conduct independent assessments of plant and system vulnerabilities (including SFP's) to terrorist attacks and to work with the nuclear industry and individual licensees to implement, as appropriate, additional plant-specific mitigation strategies. Accordingly, this request is considered to have been granted.

Requested Action 4 - Issue orders to Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures, including structural protection

A. *Petitioner's Concerns*

The Petitioner requested the NRC to issue orders to the licensees for all Mark I and II BWRs compelling incorporation of a comprehensive set of protective measures, including structural protection. The Petitioner's request was based on the assertion that, though

stronger defense options are available for Mark I and II BWRs, the NRC requires only light defenses for commercial nuclear facilities.

B. *NRC Staff's Response*

Nuclear power plants are among the best protected private sector facilities in the nation. Commercial nuclear power plants are protected by physical barriers, armed guards, intrusion detection systems, area surveillance systems, access controls, and access authorization requirements for personnel working inside the plants. Physical protection was further enhanced through a series of NRC orders issued after September 11, 2001. As a result, nuclear plant licensees have further strengthened their already well-protected facilities by providing additional security measures that add to the layered protective strategies established to defend against potential terrorist attacks. The NRC has also enhanced coordination among applicable Federal, State, and local agencies responsible for protecting the national critical infrastructure.

As indicated in the response to the petitioner's Requested Action 1, NRC studies to date indicate that significant releases of radioactive material due to a terrorist attack on a spent fuel pool are very unlikely. Therefore, additional protective measures relating to structural protection of Mark I and II BWRs are not considered necessary at this time.

In summary, the NRC staff has already achieved what the Petitioner has requested, although no additional order was issued specifically to Mark I and II BWR licensees. Therefore, this request for orders to compel incorporation of a comprehensive set of protective measures has been denied.

Requested Action 5 - Make future operation of each Mark I and II BWR contingent on addressing its structural vulnerabilities with participation and oversight of a panel of local stakeholders

A. *Petitioner's Concerns*

The Petitioner requested that the NRC make future operation of each Mark I and II BWR contingent on licensees addressing their plants' structural vulnerabilities with the participation and oversight of a panel of local stakeholders. The Petitioner's request was based on the premise that the public should be involved in examining vulnerabilities and developing security plans for BWRs with Mark I and II containment designs.

B. *Staff's Response*

The operation of power reactor plants is contingent on licensees' conducting their operations in accordance with NRC regulatory requirements and other conditions of their operating licenses. As stated previously, since September 11, 2001, the NRC has imposed by order numerous enhancements at all nuclear plants to protect against a range of threats. Effective licensee implementation of these requirements has been and continues to be the subject of independent NRC inspections. As such, and for all of the reasons stated in response to the other requested actions, the NRC finds no justification for imposing any new requirements specifically on BWR Mark I and II designs. Using the established regulatory framework, and when deemed appropriate and necessary based on risk insights from NRC's continued assessments of plant and system vulnerabilities, the NRC will take appropriate actions to ensure adequate protection of public health and safety, the environment, and the common defense and security. Accordingly, this part of the Petitioner's request is denied.

It is the NRC's policy to encourage public involvement in its regulatory activities. Public concerns and interests have always been, and will continue to be, a high priority for the

NRC. There are many ways for the public to be involved in almost all of the NRC's processes. With respect to security and safeguards, the NRC maintains close and continuous interaction with the Department of Homeland Security, the Federal Bureau of Investigation, the Central Intelligence Agency, and other government agencies to ensure that threat assessments and suspicious activities are vetted by the intelligence and law enforcement communities. Although there must be a close hold on sensitive information involving the details of security efforts, it should be clear that the NRC and licensees have been very actively pursuing security enhancements at nuclear power plants. In addition to its inspection and evaluation of licensee security programs and mitigation strategies, the NRC continues to perform its Congressionally-mandated responsibilities for security by confirming the effectiveness of security plans through the force-on-force testing and inspections pursuant to the Reactor Oversight Program. The public is free to comment on this and any aspect of the NRC's oversight process. Therefore, the request for the participation and oversight of a panel of stakeholders has also been denied.

As provided in 10 CFR 2:206(c), a copy of this Director's Decision will be filed with the Secretary of the Commission for the Commission to review. As provided for by this regulation, the decision will constitute the final action of the Commission 25 days after the date of the decision unless the Commission, on its own motion, institutes a review of the decision within that time.

Dated at Rockville, Maryland, this 7th day of November 2005.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

Free Executive Summary

Safety and Security of Commercial Spent Nuclear Fuel Storage: Public Report



Committee on the Safety and Security of Commercial Spent Nuclear Fuel Storage, National Research Council
ISBN: 978-0-309-09645-4, 126 pages, 8 1/2 x 11, (2006)

This free executive summary is provided by the National Academies as part of our mission to educate the world on issues of science, engineering, and health. If you are interested in reading the full book, please visit us online at <http://www.nap.edu/catalog/11263.html>. You may browse and search the full, authoritative version for free; you may also purchase a print or electronic version of the book. If you have questions or just want more information about the books published by the National Academies Press, please contact our customer service department toll-free at 888-624-8373.

At the request of the U.S. Congress, the National Academies assessed the safety and security of spent nuclear fuel stored in pools and dry casks at commercial nuclear power plants in the United States. The public report can be viewed on the National Academies Press website at <http://books.nap.edu/catalog/11263.html>.

This executive summary plus thousands more available at www.nap.edu.

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NOTE TO READERS

This report is based on a classified report that was developed at the request of the U.S. Congress with sponsorship from the Nuclear Regulatory Commission and the Department of Homeland Security. This report contains all of the findings and recommendations that appear in the classified report. Some have been slightly reworded and other sensitive information that might allow terrorists to exploit potential vulnerabilities has been redacted to protect national security. Nevertheless, the National Research Council and the authoring committee believe that this report provides an accurate summary of the classified report, including its findings and recommendations.

The authoring committee for this report examined the potential consequences of a large number of scenarios for attacking spent fuel storage facilities at commercial nuclear power plants. Some of these scenarios were developed by the Nuclear Regulatory Commission as part of its ongoing vulnerability analyses, whereas others were developed by the committee based upon the expertise of its members or suggestions from participants at the committee's open meetings. The committee focused its discussions about terrorist attacks on the concept of *maximum credible scenarios*. These are defined by the committee to be physically realistic classes of attacks that, if carried out successfully, would produce the most serious potential consequences within that class. In a practical sense they can be said to *bound* the consequences for a given type of attack. Such scenarios could in some cases be very difficult to carry out because they require a high level of skill and knowledge or luck on the part of the attackers. It was nevertheless useful to analyze these scenarios because they provide decision makers with a better understanding of the full range of potential consequences from terrorist attacks.

The committee uses the term *potential consequences* advisedly. It is important to recognize that a terrorist attack on a spent fuel storage facility would not necessarily result in the release of any radioactivity to the environment. The consequences of such an attack would depend not only on the nature of the attack itself, but also on the construction of the spent fuel storage facility; its location relative to surrounding features that might shield it from the attack; and the ability of the guards and operators at the facility to respond to the attack and/or mitigate its consequences. Facility-specific analyses are required to determine the potential vulnerability of a given facility to a given type of terrorist attack.

Congress asked the National Research Council for technical advice related to the vulnerability of spent fuel storage facilities to terrorist attacks. Congress, the Nuclear Regulatory Commission, and the Department of Homeland Security are responsible for translating this advice into policy actions. This will require the balancing of costs, risks, and benefits across the nation's industrial infrastructure. The committee was not asked to examine the potential vulnerabilities of other types of infrastructure to terrorist attacks or the consequences of such attacks. While such comparisons will likely be difficult, they will be essential for ensuring that the nation's limited resources are used judiciously in protecting its citizens from terrorist attacks.

SUMMARY FOR CONGRESS

The U.S. Congress asked the National Academies to provide independent scientific and technical advice on the safety and security of commercial spent nuclear fuel storage in the United States, specifically with respect to the following charges:

- Potential safety and security risks of spent nuclear fuel presently stored in cooling pools at commercial nuclear reactor sites.
- Safety and security advantages, if any, of dry cask storage versus wet pool storage at these reactor sites.
- Potential safety and security advantages, if any, of dry cask storage using various single-, dual-, and multi-purpose cask designs.
- The risks of terrorist attacks on these materials and the risk these materials might be used to construct a radiological dispersal device.

Congress requested that the National Academies produce a classified report that addresses these charges within 6 months and also provide an unclassified summary for unlimited public distribution. The first request was fulfilled in July 2004. This report fulfills the second request.

The highlights of the report are as follows:

- (1) Spent fuel pools are necessary at all operating nuclear power plants to store recently discharged fuel.
- (2) The committee judges that successful terrorist attacks on spent fuel pools, though difficult, are possible.
- (3) If an attack leads to a propagating zirconium cladding fire, it could result in the release of large amounts of radioactive material.
- (4) Additional analyses are needed to understand more fully the vulnerabilities and consequences of events that could lead to propagating zirconium cladding fires.
- (5) It appears to be feasible to reduce the likelihood of a zirconium cladding fire by rearranging spent fuel assemblies in the pool and making provision for water-spray systems that would be able to cool the fuel, even if the pool or overlying building were severely damaged.
- (6) Dry cask storage has inherent security advantages over spent fuel pool storage, but it can only be used to store older spent fuel.
- (7) There are no large security differences among different storage-cask designs.
- (8) It would be difficult for terrorists to steal enough spent fuel from storage facilities for use in significant radiological dispersal devices (dirty bombs).

The statement of task does not direct the committee to recommend whether the transfer of spent fuel from pool to dry cask storage should be accelerated. The committee judges, however, that further engineering analyses and cost-benefit studies would be needed before decisions on this and other mitigative measures are taken. The report contains detailed recommendations for improving the security of spent fuel storage regardless of how it is stored.

EXECUTIVE SUMMARY

In the Fiscal Year 2004 Energy and Water Development Conference Report, the U.S. Congress asked the National Academies to provide independent scientific and technical advice on the safety and security¹ of commercial spent nuclear fuel storage in the United States, specifically with respect to the following four charges:

- (1) Potential safety and security risks of spent nuclear fuel presently stored in cooling pools at commercial reactor sites.
- (2) Safety and security advantages, if any, of dry cask storage versus wet pool storage at these reactor sites.
- (3) Potential safety and security advantages, if any, of dry cask storage using various single-, dual-, and multi-purpose cask designs.
- (4) The risks of terrorist attacks on these materials and the risk these materials might be used to construct a radiological dispersal device.

Congress requested that the National Academies produce a classified report that addresses these charges within 6 months and also provide an unclassified summary for unlimited public distribution. The first request was fulfilled in July 2004. This report fulfills the second request.

Spent nuclear fuel is stored at commercial nuclear power plant sites in two configurations:

- In water-filled pools, referred to as *spent fuel pools*.
- In *dry casks* that are designed either for storage (single-purpose casks) or both storage and transportation (dual-purpose casks). There are two basic cask designs: bare-fuel casks and canister-based casks, which can be licensed for either single- or dual-purpose use, depending on their design.

Spent fuel pools are currently in use at all 65 sites with operating commercial nuclear power reactors, at 8 sites where commercial power reactors have been shut down, and at one site not associated with an operating or shutdown power reactor. Dry-cask storage facilities have been established at 28 operating, shutdown, or decommissioned power plants. The nuclear industry projects that up to three or four nuclear power plants will reach full capacity in their spent fuel pools each year for at least the next 17 years.

The congressional request for this study was prompted by conflicting public claims about the safety and security of commercial spent nuclear fuel storage at nuclear power plants. Some analysts have argued that the dense packing of spent fuel in cooling pools at nuclear power plants does not allow a sufficient safety margin in the event of a loss-of-pool-coolant event from an accident or terrorist attack. They assert that such events could result in the release of large quantities of radioactive material to the environment if the zirconium cladding of the spent fuel overheats and ignites. To reduce the potential for such fires, these

¹ In the context of this study, *safety* refers to measures that protect spent nuclear fuel storage facilities against failure, damage, human error, or other accidents that would disperse radioactivity in the environment. *Security* refers to measures to protect spent fuel storage facilities against sabotage, attacks, or theft.

analysts have suggested that spent fuel more than five years old be removed from the pool and stored in dry casks, and that the remaining younger fuel be reconfigured in the pool to allow more space for air cooling in the event of a loss-of-pool-coolant event.

The committee that was appointed to perform the present study examined the vulnerability of spent fuel stored in pools and dry casks to accidents and terrorist attacks. Any event that results in the breach of a spent fuel pool or a dry cask, whether accidental or intentional, has the potential to release radioactive material to the environment. The committee therefore focused its limited time on understanding two issues: (1) Under what circumstances could pools or casks be breached? And (2) what would be the radioactive releases from such breaches?

To address these questions, the committee performed a critical review of the security analyses that have been carried out by the Nuclear Regulatory Commission and its contractors, the Department of Homeland Security, industry, and other independent experts to determine if they are objective, complete, and credible. The committee was unable to examine several important issues related to these questions either because it was unable to obtain needed information from the Nuclear Regulatory Commission or because of time constraints. Details are provided in Chapters 1 and 2.

The committee's findings and recommendations from this analysis are provided below, organized by the four charges of the study task. The ordering of the charges has been rearranged to provide a more logical exposition of results.

CHARGE 4: RISKS OF TERRORIST ATTACKS ON THESE MATERIALS AND THE RISK THESE MATERIALS MIGHT BE USED TO CONSTRUCT A RADIOLOGICAL DISPERSAL DEVICE

The concept of *risk* as applied to terrorist attacks underpins the entire statement of task for this study. Therefore, the committee examined this final charge first to provide the basis for addressing the remainder of the task statement. The committee's examination of Charge 4 is provided in Chapter 2. On the basis of this examination, the committee offers the following findings and recommendations numbered according to the chapters in which they appear:

FINDING 2A: The probability of terrorist attacks on spent fuel storage cannot be assessed quantitatively or comparatively. Spent fuel storage facilities cannot be dismissed as targets for such attacks because it is not possible to predict the behavior and motivations of terrorists, and because of the attractiveness of spent fuel as a terrorist target given the well known public dread of radiation. Terrorists view nuclear power plant facilities as desirable targets because of the large inventories of radioactivity they contain. While it would be difficult to attack such facilities, the committee judges that attacks by knowledgeable terrorists with access to appropriate technical means are possible. It is important to recognize, however, that an attack that damages a power plant or its spent fuel storage facilities would not necessarily result in the release of *any* radioactivity to the environment. There are potential steps that can be taken to lower the potential consequences of such attacks.

FINDING 2B: The committee judges that the likelihood terrorists could steal enough spent fuel for use in a significant radiological dispersal device is small. Removal of a spent fuel assembly from the pool or dry cask would prove extremely difficult under almost any terrorist attack scenario. Attempts by a knowledgeable insider(s) to remove single rods and related debris from the pool might prove easier, but the amount of material that could be removed would be small. Moreover, superior materials could be stolen or purchased more easily from other sources. Even though the likelihood of spent fuel theft appears to be small, it is nevertheless important that the protection of these materials be maintained and improved as vulnerabilities are identified.

RECOMMENDATION: The Nuclear Regulatory Commission should review and upgrade, where necessary, its security requirements for protecting spent fuel rods not contained in fuel assemblies from theft by knowledgeable insiders, especially in facilities where individual fuel rods or portions of rods are being stored in pools.

FINDING 2C: A number of security improvements at nuclear power plants have been instituted since the events of September 11, 2001. However, the Nuclear Regulatory Commission did not provide the committee with enough information to evaluate the effectiveness of these procedures for protecting stored spent fuel. Surveillance and other human-factors related security procedures are just as important as the physical barriers in preventing and mitigating terrorist attacks. Although the committee did learn about some of the changes that have been instituted since the September 11, 2001, attacks, it was not provided with enough information to evaluate the effectiveness of procedures now in place.

RECOMMENDATION: Although the committee did not specifically investigate the effectiveness and adequacy of improved surveillance and security measures for protecting stored spent fuel, an assessment of current measures should be performed by an independent² organization.

CHARGE 1: POTENTIAL SAFETY AND SECURITY RISKS OF SPENT NUCLEAR FUEL STORED IN POOLS

The committee's examination of Charge 1 is provided in Chapter 3. On the basis of this examination, the committee offers the following findings and recommendations:

FINDING 3A: Pool storage is required at all operating commercial nuclear power plants to cool newly discharged spent fuel. Freshly discharged spent fuel generates too much decay heat to be passively air cooled. This fuel must be stored in a pool that has an active heat removal system (i.e., water pumps and heat exchangers) for at least one year before being moved to dry storage. Most dry storage systems are licensed to store fuel that has been out of the reactor for at least five years. Although spent fuel younger than five years could be stored in dry casks, the changes required for shielding and heat-removal

² That is, independent of the Nuclear Regulatory Commission and the nuclear industry.

could be substantial, especially for fuel that has been discharged for less than about three years.

FINDING 3B: The committee finds that, under some conditions, a terrorist attack that partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and the release of large quantities of radioactive materials to the environment. Details are provided in the committee's classified report.

FINDING 3C: It appears to be feasible to reduce the likelihood of a zirconium cladding fire following a loss-of-pool-coolant event using readily implemented measures. The following measures appear to have particular merit: Reconfiguring the spent fuel in the pools (i.e., redistribution of high decay-heat assemblies so that they are surrounded by low decay-heat assemblies) to more evenly distribute decay-heat loads and enhance radiative heat transfer; limiting the frequency of offloads of full reactor cores into spent fuel pools, requiring longer shutdowns of the reactor before any fuel is offloaded, and providing enhanced security when such offloads must be made; and development of a redundant and diverse response system to mitigate loss-of-pool-coolant events that would be capable of operation even if the pool or overlying building were severely damaged.

FINDING 3D: The potential vulnerabilities of spent fuel pools to terrorist attacks are plant-design specific. Therefore, specific vulnerabilities can be understood only by examining the characteristics of spent fuel storage at each plant. As described in Chapter 3, there are substantial differences in the designs of spent fuel pools that make them more or less vulnerable to certain types of terrorist attacks.

FINDING 3E: The Nuclear Regulatory Commission and independent analysts have made progress in understanding some vulnerabilities of spent fuel pools to certain terrorist attacks and the consequences of such attacks for releases of radioactivity to the environment. However, additional work on specific issues is needed urgently. The analyses carried out to date provide a general understanding of spent fuel behavior in a loss-of-pool-coolant event and the vulnerability of spent fuel pools to certain terrorist attacks that could cause such events to occur. The work to date, however, has not been sufficient to adequately understand the vulnerabilities and consequences of such events. Additional analyses are needed to fill in the knowledge gaps so that well-informed policy decisions can be made.

RECOMMENDATION: The Nuclear Regulatory Commission should undertake additional best-estimate analyses to more fully understand the vulnerabilities and consequences of loss-of-pool-coolant events that could lead to a zirconium cladding fire. Based on these analyses, the Commission should take appropriate actions to address any significant vulnerabilities that are identified. The committee provides details on additional analyses that should be carried out in its classified report. Cost-benefit considerations will be an important part of such decisions.

RECOMMENDATION: While the work described in the previous recommendation under Finding 3E, above, is being carried out, the Nuclear Regulatory Commission should ensure that power plant operators take prompt and effective measures to reduce the consequences of loss-of-pool-coolant

events in spent fuel pools that could result in propagating zirconium cladding fires. The committee judges that there are at least two such measures that should be implemented promptly:

- Reconfiguring of fuel in the pools so that high decay-heat fuel assemblies are surrounded by low decay-heat assemblies. This will more evenly distribute decay-heat loads, thus enhancing radiative heat transfer in the event of a loss of pool coolant.
- Provision for water-spray systems that would be able to cool the fuel even if the pool or overlying building were severely damaged.

Reconfiguring of fuel in the pool would be a prudent measure that could probably be implemented at all plants at little cost, time, or exposure of workers to radiation. The second measure would probably be more expensive to implement and may not be needed at all plants, particularly plants in which spent fuel pools are located below grade or are protected from external line-of-sight attacks by exterior walls and other structures.

The committee anticipates that the costs and benefits of options for implementing the second measure would be examined to help decide what requirements would be imposed. Further, the committee does not presume to anticipate the best design of such a system—whether it should be installed on the walls of a pool or deployed from a location where it is unlikely to be compromised by the same attack—but simply notes the demanding requirements such a system must meet.

CHARGE 3: POTENTIAL SAFETY AND SECURITY ADVANTAGES, IF ANY, OF DIFFERENT DRY CASK STORAGE DESIGNS

The third charge to the committee focuses exclusively on the safety and security of dry casks. The committee addressed this charge first in Chapter 4 to provide the basis for the comparative analysis between dry casks and pools as called for in Charge 2.

FINDING 4A: Although there are differences in the robustness of different dry cask designs (e.g., bare-fuel versus canister-based), the differences are not large when measured by the absolute magnitudes of radionuclide releases in the event of a breach. All storage cask designs are vulnerable to some types of terrorist attacks, but the quantity of radioactive material releases predicted from such attacks is relatively small. These releases are not easily dispersed in the environment.

FINDING 4B: Additional steps can be taken to make dry casks less vulnerable to potential terrorist attacks. Although the vulnerabilities of current cask designs are already small, additional, relatively simple steps can be taken to reduce them as discussed in Chapter 4.

RECOMMENDATION: The Nuclear Regulatory Commission should consider using the results of the vulnerability analyses for possible upgrades of requirements in 10 CFR 72 for dry casks, specifically to improve their resistance to terrorist attacks. The committee was told by

Nuclear Regulatory Commission staff that such a step is already under consideration.

CHARGE 2: SAFETY AND SECURITY ADVANTAGES, IF ANY, OF DRY CASK STORAGE VERSUS WET POOL STORAGE

In Chapter 4, the committee offers the following findings and recommendations with respect to the comparative component of Charge 2:

FINDING 4C: Dry cask storage does not eliminate the need for pool storage at operating commercial reactors. Under present U.S. practices, dry cask storage can only be used to store fuel that has been out of the reactor long enough (generally greater than five years under current practices) to be passively air cooled.

FINDING 4D: Dry cask storage for older, cooler spent fuel has two inherent advantages over pool storage: (1) It is a passive system that relies on natural air circulation for cooling; and (2) it divides the inventory of that spent fuel among a large number of discrete, robust containers. These factors make it more difficult to attack a large amount of spent fuel at one time and also reduce the consequences of such attacks. The robust construction of these casks prevents large-scale releases of radioactivity in all of the attack scenarios examined by the committee in its classified report.

FINDING 4E: Depending on the outcome of plant-specific vulnerability analyses described in the committee's classified report, the Nuclear Regulatory Commission might determine that earlier movements of spent fuel from pools into dry cask storage would be prudent to reduce the potential consequences of terrorist attacks on pools at some commercial nuclear plants. The statement of task directs the committee to examine the risks of spent fuel storage options and alternatives for decision makers, not to recommend whether any spent fuel should be transferred from pool storage to cask storage. In fact, there may be some commercial plants that, because of pool designs or fuel loadings, may require some removal of spent fuel from their pools. If there is a need to remove spent fuel from the pools it should become clearer once the vulnerability and consequence analyses described in the classified report are completed. The committee expects that cost-benefit considerations would be a part of these analyses.

IMPLEMENTATION ISSUES

Implementation of the recommendations in Chapters 2-4 will require action and cooperation by a large number of parties. The final chapter of the report provides a brief discussion of two implementation issues that the committee believes are of special interest to Congress: *Timing Issues*: Ensuring that high-quality, expert analyses are completed in a timely manner; and *Communications Issues*: Ensuring that the results of the analyses are communicated to relevant parties so that appropriate and timely mitigating actions can be taken. This discussion leads to the following finding and recommendation.

FINDING 5A: Security restrictions on sharing of information and analyses are hindering progress in addressing potential vulnerabilities of spent fuel storage to

terrorist attacks. Current classification and security practices appear to discourage information sharing between the Nuclear Regulatory Commission and industry. They impede the review and feedback processes that can enhance the technical soundness of the analyses being carried out; they make it difficult to build support within the industry for potential mitigative measures; and they may undermine the confidence that the industry, expert panels such as this one, and the public place in the adequacy of such measures.

RECOMMENDATION: The Nuclear Regulatory Commission should improve the sharing of pertinent information on vulnerability and consequence analyses of spent fuel storage with nuclear power plant operators and dry cask storage system vendors on a timely basis.

The committee also believes that the public is an important audience for the work being carried out to assess and mitigate vulnerabilities of spent fuel storage facilities. While it would be inappropriate to share all information publicly, more constructive interaction with the public and independent analysts could improve the work being carried out and also increase public confidence in Nuclear Regulatory Commission and industry decisions and actions to reduce the vulnerability of spent fuel storage to terrorist threats.

**SAFETY AND SECURITY
OF
COMMERCIAL
SPENT NUCLEAR FUEL STORAGE**

Public Report

Committee on the Safety and Security of Commercial Spent Nuclear Fuel Storage

Board on Radioactive Waste Management

Division on Earth and Life Studies

NATIONAL RESEARCH COUNCIL
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¹ Dr. Meserve did not participate in the oversight of this study.

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- Department of Homeland Security staff member Jon MacLaren, who also served as a liaison to the committee.
- Steve Kraft and John Vincent (deceased) of the Nuclear Energy Institute and staff of Energy Resources International for providing information about spent fuel storage practices in industry.
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- German organizations and individuals who helped organize a tour of spent fuel storage facilities in Germany. These organizations and individuals are explicitly acknowledged in Appendix C.
- Speakers (see Appendix A) and participants at committee meetings as well as those who sent written comments for providing their knowledge and perspectives on this important matter.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The content of the review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

John F. Ahearn, Sigma Xi and Duke University
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Frank N. von Hippel, Princeton University

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the report's conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Chris G. Whipple, ENVIRON International Corporation, and R. Stephen Berry, University of Chicago. Appointed by the National Research Council, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

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From: [Bonaccorso, Amy](#)
To: [Deavers, Ron](#)
Subject: FW: Vermont Yankee
Date: Wednesday, March 23, 2011 2:00:00 PM

Hey Ron:

I see it's 2:00pm, so I was hoping you could get this one.

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

From: Janbergs, Holly On Behalf Of OPA Resource
Sent: Wednesday, March 23, 2011 2:00 PM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: Vermont Yankee

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

From: Carl Kline (b)(6)
Sent: Wednesday, March 23, 2011 1:51 PM
To: OPA Resource
Subject: Vermont Yankee

I'm appalled and outraged that Vermont Yankee has been relicensed ... in the face of what has just happened in Japan and the order of the President to look again at plants in this country! The timing of the NRC is astonishing, especially when the people of Vermont were fundamentally opposed. It seems quite clear, from Duke Energy's "loan" to the DNC, and your outrageous decision, that our government continues to be purchased by principalities and powers to the detriment of the common person. We will be left, like the Japanese people, to worry about and ponder our future, and the prospect of cancer prone, if not mutant, grandchildren. (How much tritium leaked into the groundwater at Vermont Yankee? Will it impact that problem cell down river in my granddaughter? And will that plume from Japan, even measured in Iceland, affect that problematic cell in the body of my grandson?) Shame on you NRC!

And please don't tell me we need the energy. We're developing wind farms like crazy out here on the plains. Besides, what do we need energy for? Will you help people begin to ask that question? How much is waste? How much goes for waste "productivity" that ends up in our landfills or as the waste of war?

Shame on you NRC!

Rev. Carl Kline
(b)(6)

NW/99

From: Deavers, Ron
To: (b)(6)
Subject: RE: Vermont Yankee
Date: Wednesday, March 23, 2011 3:12:55 PM

Rev. Carl Kline,

We understand your concern. Thank you for your concise articulation of the issues at Vermont Yankee. As part of the comprehensive review of the safety of our Nuclear Power Plants that we will be undertaking in the near future, we will endeavor to address the issues you articulate in your email below and identify all other issues regarding the safety of the Vermont Yankee Nuclear Power Plant.

In addition, we offer the following information:

- The US Government will be studying every aspect of the Japanese disaster and the Japanese government's response, with the goal of learning as much as possible from that review.
- As the Nuclear Regulatory Commission has said, we do not expect to see radiation at harmful levels reaching the U.S. from damaged Japanese nuclear power plants. As part of the federal government's continuing effort to make our activities and science transparent and available to the public, the Environmental Protection Agency (EPA) will continue to keep all RadNet data available in the current online database. In addition, EPA plans to work with its federal partners to deploy additional monitoring capabilities to parts of the western U.S. and U.S. territories.
- As always, EPA is utilizing this existing nationwide radiation monitoring system, RadNet, which continuously monitors the nation's air and regularly monitors drinking water, milk and precipitation for environmental radiation. The RadNet online searchable database contains historical data of environmental radiation monitoring data from all fifty states and U.S. territories.
- The FDA and USDA continues to ensure all our imported food remains safe as they do everyday
- If there were to be a nuclear accident here, we are prepared to respond and FEMA and the Department of Homeland Security exercise these preparedness plans with the rest of the government and state and local officials as well. Release of radioactive materials can be accidental or intentional and we have a detailed plan to respond regardless of the cause. The Nuclear/Radiological Incident Annex to the National Response Framework outlines which department or agency would have the lead for the Federal response depending on the source and type of release. For example, the Nuclear Regulatory Commission (NRC) would coordinate a response to a release at nuclear power facilities licensed by the NRC. The Department of Energy would coordinate a response to a release involving nuclear weapons in DOE custody. The Department of Homeland Security would coordinate a response to a deliberate attack using improvised nuclear devices or radiological dispersal devices.
- Given the range of potential causes, from an earthquake to a terrorist attack, the plan provides the flexibility and agility we need to respond aggressively and effectively. In addition, state and local officials and nuclear facilities have detailed emergency plans that include specific protective actions, evacuation routes, and methods to alert the public of actions to take in the event of an emergency. There is a robust and active nuclear power plant accident exercise program that includes Federal, State, and local involvement to test plans and keep them current, and just last year we conducted such an exercise. Federal protective action guides are used at all nuclear power plants and are widely accepted and used in planning and exercises, and we will continue our efforts to plan and prepare for the safety and security of the American people.

-----Original Message-----
From: Carl Kline (b)(6)
Sent: Wednesday, March 23, 2011 1:51 PM
To: OPA Resource

AW/100

Subject: Vermont Yankee

I'm appalled and outraged that Vermont Yankee has been relicensed ... in the face of what has just happened in Japan and the order of the President to look again at plants in this country! The timing of the NRC is astonishing, especially when the people of Vermont were fundamentally opposed. It seems quite clear, from Duke Energy's "loan" to the DNC, and your outrageous decision, that our government continues to be purchased by principalities and powers to the detriment of the common person. We will be left, like the Japanese people, to worry about and ponder our future, and the prospect of cancer prone, if not mutant, grandchildren. (How much tritium leaked into the groundwater at Vermont Yankee? Will it impact that problem cell down river in my granddaughter? And will that plume from Japan, even measured in Iceland, affect that problematic cell in the body of my grandson?) Shame on you NRC!

And please don't tell me we need the energy. We're developing wind farms like crazy out here on the plains. Besides, what do we need energy for? Will you help people begin to ask that question? How much is waste? How much goes for waste "productivity" that ends up in our landfills or as the waste of war?

Shame on you NRC!

Rev. Carl Kline

(b)(6)

Weaver, Tonna

From: McIntyre, David *10/21*
Sent: Wednesday, March 23, 2011 10:59 AM
To: Jones, Steve
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Steve – by the way, as part of what we here in OPA are calling “the new normal,” we are expecting this pool issue to bedevil us for awhile. At some point I’d like to stop by your office, shake your hand and thank you for your help, and then ask you to teach me everything you know. (Well, maybe not everything.)

Bob – does your designation as Communications Lead for Japan extend into the lessons-learned stage and responses to public/media inquiries? If so, we’ll get to know each other even better than during your stint in NMSS.

Dave

From: Jones, Steve *NR*
Sent: Wednesday, March 23, 2011 10:36 AM
To: McIntyre, David
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Dave,

The attached files are the only 2.206 petition and director’s decisions I know of related to the 2003 Alvarez paper. They are publically available at the accession number included in the file name. Basically, the staff was looking at SFP issues already, and the staff determined the actions the NRC had taken by 2005 reasonably addressed the petition. The director’s decision references other publically available documents, such as letters to Congress and the National Academy of Sciences report on spent fuel pool safety (public summary attached).

By the way, please keep Bob Nelson, the NRR Communications Lead for Japan, in the loop.

Thanks!

Steve

Steven R. Jones
Sr. Reactor Systems Engineer
NRR/DSS/SBPB
301-415-2712

From: McIntyre, David *10/21*
Sent: Wednesday, March 23, 2011 9:17 AM
To: Jones, Steve
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Steve – are you familiar with the attached paper and whatever became of it?

Thanks,
Dave

From: Mitlyng, Viktoria *NRH*
Sent: Tuesday, March 22, 2011 6:53 PM
To: McIntyre, David
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Dave,

Can you give me a contact for finding out if the attached report on spent fuel pool safety was submitted to the NRC as a 2.206 petition in 2003? Or, at least, tell me where to start. It's for the same Minneapolis Star Tribune Inquiry. The reporter is digging pretty deep on spent fuel pools and getting an ear full from the authors of this report. Now, he wants to understand the NRC's perspective and position relative to their statements. His deadline is Wednesday and I am hoping to get on this early AM. Thank you. Can't promise a good bottle of wine since you have them all... You'll have to do with a hug next time I see you.

Vika

From: Shaffer, David [<mailto:David.Shaffer@startribune.com>]
Sent: Tuesday, March 22, 2011 4:13 PM
To: Mitlyng, Viktoria
Subject: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Victoria,

Here is the 2003 paper. The authors said NRC never formally responded.

David Shaffer
Reporter/Editor, Business news
Minneapolis Star Tribune
612-673-7090 (desk) (b)(6) cell

Weaver, Tonna

From: McIntyre, David *LOPA*
Sent: Wednesday, March 23, 2011 11:56 AM
To: Jones, Steve
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Steve – sorry to be a pest, but these refer to BWR Mark I issues, not fuel pool racking. Is there something specific on the racking/density issue?

Thanks,
Dave

From: Jones, Steve *NRR*
Sent: Wednesday, March 23, 2011 10:36 AM
To: McIntyre, David
Cc: Nelson, Robert
Subject: RE: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Dave,

The attached files are the only 2.206 petition and director's decisions I know of related to the 2003 Alvarez paper. They are publically available at the accession number included in the file name. Basically, the staff was looking at SFP issues already, and the staff determined the actions the NRC had taken by 2005 reasonably addressed the petition. The director's decision references other publically available documents, such as letters to Congress and the National Academy of Sciences report on spent fuel pool safety (public summary attached).

By the way, please keep Bob Nelson, the NRR Communications Lead for Japan, in the loop.

Thanks!

Steve

Steven R. Jones
Sr. Reactor Systems Engineer
NRR/DSS/SBPB
301-415-2712

From: McIntyre, David *LOPA*
Sent: Wednesday, March 23, 2011 9:17 AM
To: Jones, Steve
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Steve – are you familiar with the attached paper and whatever became of it?

Thanks,
Dave

NW/102

From: Mitlyng, Viktoria
Sent: Tuesday, March 22, 2011 6:53 PM
To: McIntyre, David
Subject: FW: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Dave,

Can you give me a contact for finding out if the attached report on spent fuel pool safety was submitted to the NRC as a 2.206 petition in 2003? Or, at least, tell me where to start. It's for the same Minneapolis Star Tribune Inquiry. The reporter is digging pretty deep on spent fuel pools and getting an ear full from the authors of this report. Now, he wants to understand the NRC's perspective and position relative to their statements. His deadline is Wednesday and I am hoping to get on this early AM. Thank you. Can't promise a good bottle of wine since you have them all... You'll have to do with a hug next time I see you.

Vika

From: Shaffer, David [mailto:David.Shaffer@startribune.com]
Sent: Tuesday, March 22, 2011 4:13 PM
To: Mitlyng, Viktoria
Subject: Paper from 2003 calling for NRC to stop allowing reracking, calling for 5 years from pool to cask

Victoria,

Here is the 2003 paper. The authors said NRC never formally responded.

David Shaffer
Reporter/Editor, Business news
Minneapolis Star Tribune
612-673-7090 (desk) (b)(6) (cell)

Weaver, Tonna

From: Ulses, Anthony *myrc*
Sent: Wednesday, March 23, 2011 6:24 PM
To: LIA03 Hoc
Subject: Re: Message from Executive Team

Passport number is (b)(6) It is a (b)(6) and my DOB is (b)(6) Name on passport is Anthony Patrick Ulses. Expiration date is (b)(6)

Tony

Sent from NRC BlackBerry
Anthony Ulses

(b)(6) *af6*

From: LIA03 Hoc
To: Ulses, Anthony; Trapp, James
Sent: Wed Mar 23 15:14:16 2011
Subject: RE: Message from Executive Team

Tony – we need your and Jim’s passport numbers, DOB, name as it appears on passport, whether official or personal passport and expiration date. Mary Carter cannot make your arrangements without this information.

From: Ulses, Anthony *myrc*
Sent: Sunday, March 13, 2011 10:33 AM
To: LIA03 Hoc
Subject: Re: Message from Executive Team

Thanks. I do not think it needs to be that formal, but you never know.

Tony

Sent from NRC BlackBerry
Anthony Ulses

(b)(6) *af6*

From: LIA03 Hoc
To: Ulses, Anthony
Sent: Sun Mar 13 10:31:44 2011
Subject: RE: Message from Executive Team

Tony –

Mike Tschiltz verbally authorized your transport. We will work on drafting a travel authorization for you so you have papers. Mike is leading the Liaison Team.

Brooke

From: Ulses, Anthony
Sent: Sunday, March 13, 2011 10:23 AM

NN/103

To: LIA03 Hoc
Subject: Re: Message from Executive Team

Brooke,

Thanks. Here is the deal. Military lift to Yakoto and then I need to grab a bus to Haneda followed by cab to the embassy. Got any better ideas?

Also, the military folks said I should ask you for either an e-mail (or my travel orders) to ensure that I can get on the plane.

Please advise.

Thanks,

Tony

Sent from NRC BlackBerry
Anthony Ulses

(b)(6)

etf

From: LIA03 Hoc
To: Ulses, Anthony
Cc: LIA02 Hoc
Sent: Sun Mar 13 10:12:55 2011
Subject: Message from Executive Team

Tony –

I wanted to pass along this message from the ET. They wanted you (and Jim) to be clear that your job in Japan is to provide technical advice and assistance to the US Ambassador and send information back to the NRC Ops Center. Your role is not to advise the Japanese Government. NRC's Office of International Programs is working on a statement. If I can, I will pass that on to you as additional guidance on how to view NRC's role in this situation.

Let me know if you need anything. I've provided your status to USAID and NRC's reps at USAID. Just trying to keep all bases covered.

Brooke

Weaver, Tonna

From: Peko, Damian [Damian.Peko@Nuclear.Energy.gov]
Sent: Wednesday, March 23, 2011 10:10 PM
To: Cherry, Ron; Duncan, Aleshia; Cook, William; Smith, Brooke; Casto, Chuck; Brown, Courtney M (NST); Duncan, Aleshia (State Dept); Howard, E. Bruce; Foster, Jack; Trapp, James; James Trapp (BB); Monninger, John; Foggie, Kirk; Mears, Jeremy M; Morales, Russell A; Devercelly, Richard; Nakanishi, Tony; Ulises, Anthony; Tokyo PolMil Unit; JapanEmbassy, TaskForce; (b)(6)
Cc: Wall, Marc M; Zumwalt, James P
Subject: RE: GOJ request for informal meeting on robotics

Ron

I will go.

NRC does not think they need to attend but I will bounce it off of Dan Dorman for a final answer.

Thanks

Damian

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

From: Cherry, Ron
Sent: Wednesday, March 23, 2011 10:00 PM
To: Duncan, Aleshia; Bill Cook; Brooke Smith; Chuck Casto; Brown, Courtney M (NST); Peko, Damian; Duncan, Aleshia (State Dept); Howard, E. Bruce; Jack Foster; James Trapp; James Trapp (BB); John Monninger; Kirk Foggie; Mears, Jeremy M; Morales, Russell A; Rick Devercelly; Tony Nakanishi; Tony Ulises; Tokyo PolMil Unit; JapanEmbassy, TaskForce; (b)(6)
Cc: Wall, Marc M; Zumwalt, James P
Subject: GOJ request for informal meeting on robotics

All: METI has asked to have an informal meeting with us at 4 pm today to give feedback on the DOE paper and discuss potential assistance.
Please let me know who can attend this meeting. Suggest at a minimum DOE, ECON, NRC, USFJ, DAO or MDAO.

GOJ participants will be

- Hiroyuki Hatada, Deputy Director, Aerospace and Defense Industry Division, METI
- Takayamai, Deputy Director General, Trade and Economic Cooperation Bureau, METI
- Noriaki Ozawa, Director, Office of Global Environment Technology, METI

Please advise soonest.

Thanks!

Ron

This email is UNCLASSIFIED

NN/104

From: [Deavers, Ron](#)
To: [Bonaccorso, Amy](#); [Deavers, Ron](#)
Subject: RE: Mr. Steven Mauld
Date: Thursday, March 24, 2011 3:37:21 PM

Called Mr. Mauld back and engaged in a long conversation about how to cool the reactors with dry ice as well as his accomplishments as an inventor.

From: Janbergs, Holly **On Behalf Of** OPA Resource
Sent: Thursday, March 24, 2011 1:47 PM
To: Bonaccorso, Amy; Deavers, Ron
Cc: Ghneim, Munira
Subject: FW: Mr. Steven Mauld

From: ROO hoc
Sent: Thursday, March 24, 2011 1:22 PM
To: OPA Resource
Cc: Simpson, Eric; Ghneim, Munira
Subject: RE: Mr. Steven Mauld

To Whom it May Concern in OPA:

Early in the NRC's response to the Japanese events last week, the Regional Operations Officers here in Region IV were helping out the HQ Operations Officers as a 'safety valve' for excess public inquiry calls prior to the OPA "Public Inquiry" line getting setup with continuous coverage. Eric Simpson is one of the Regional Operations Officers here and apparently took the call from Mr. Mauld.

When we were helping out in that matter, we generally were an open ear for the callers and then heavily suggested that the callers send an e-mail to the OPA.resource@nrc.gov inbox and/or call the 301-415-8200 line for follow-up on their suggestions.

Since the public inquiry line is more regularly staffed now, we would suggest that the OPA staff follow back up with Mr. Mauld in that the Operations Officers would really not be able to do much more for him than direct him to the OPA e-mail/phone number.

Thank you,
Region IV Operations Officers
817-860-277

From: Simpson, Eric
Sent: Thursday, March 24, 2011 11:34 AM
To: ROO hoc
Subject: FW: Mr. Steven Mauld

I'll call the guy (when I get back), unless one of y'all would like to.

From: Ghneim, Munira
Sent: Wednesday, March 23, 2011 1:01 PM
To: Simpson, Eric

NN/105

Subject: Mr. Steven Mauld

Good Afternoon Eric,

Mr. Steven Mauld called for you. He said that he had spoken to you last week regarding a new method for cooling reactors. Please give him a call back at (b)(6)

(b)(6)

Thank You
Munira Ghneim
Contract Secretary
Office of Public Affairs
415-1170

Bonaccorso, Amy

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 9:16 AM
To: Harrington, Holly
Cc: Deavers, Ron
Subject: FW: Here is my contact info
Attachments: Fukushima information

Holly:

This is a follow up on that inquiry you sent me yesterday – towards the end of the day...from Thomas Albert. This email is a record of what has happened so far. The request came to RES, Nathan Siu had a look at it, and it ended up back with Ron.

I'm with Ron in that I'm not sure how this kind of thing is handled. Should I call Nathan for more details on why he could not handle it? I can do that. From Nathan's email, it sounds like someone in OPA encouraged him to send it back to us.

Thanks,

Amy

From: Deavers, Ron
Sent: Wednesday, March 23, 2011 1:32 PM
To: Harrington, Holly
Cc: Bonaccorso, Amy
Subject: FW: Here is my contact info

Holly,

This one is not public and if the study is really classified, we would not be able to find it any way.

Ron

From: Siu, Nathan
Sent: Wednesday, March 23, 2011 10:29 AM
To: Deavers, Ron
Cc: Thomas.Albert@dhs.gov; Coe, Doug
Subject: FW: Here is my contact info

Ron –

I've received a telephone call from a DHS staffer – contact information below – requesting information regarding Fukushima (specifically, the existence of a PRA for the plant and the availability of an RES-sponsored classified study by the National Academy of Sciences on the safety and security of spent fuel pools). Per my management and OPA, I've been asked to forward this request to you. Please feel free to contact me if you have any questions.

Nathan Siu
U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
21 Church Street, Room 4B05
Rockville, MD 20852

NN/106

301-251-7583 (phone)
301-251-7424 (fax)
Nathan.Siu@nrc.gov

From: Albert, Thomas [<mailto:Thomas.Albert@dhs.gov>]
Sent: Wednesday, March 23, 2011 10:12 AM
To: Siu, Nathan
Subject: Here is my contact info

Thomas E. Albert, Ph.D.
Senior Scientist
Domestic Nuclear Detection Office (DNDO)
Department of Homeland Security
Office: 202.254.7102
Fax: 202.254.7747
Mobile: (b)(6)
E-mail: Thomas.Albert@dhs.gov
Thomas.Albert@dhs.gov
Thomas.Albert@dhs.gov

6

Bonaccorso, Amy

From: Floyd Rudmin (b)(6)
Sent: Thursday, March 24, 2011 8:05 AM
To: OPA Resource
Subject: concern about nuclear safety regulatory failures

Good afternoon,

Please consider the following nuclear safety concerns:

1) Japan did NOT have redundant power transmission lines to their reactors and thus lost cooling. If an event, like a plane crash, were to knock out a reactor's transmission lines AND your back-up power supply, do regulations require that there be redundant transmission lines to provide power from the grid? If not, please consider requiring such safety redundancy, for example, in underground conduits.

2) Do you require that there be security protection from a bomb inside a reactor's underwater piping that extends into a lake, river, or ocean? If not, please consider requiring such safety, for example, by a blow-out weak point in the piping, between the pipe opening and the reactor. That way, hydraulic back-pressure from an explosion at the pipe opening would not reach the reactor.

I know your PR job is to assure me that everything is fine and safe. But Tokyo Electric also had been assuring everybody that everything is fine and safe. In this instance, in addition to your assurance reply, please also pass my email up within your offices to some level where an engineer or responsible party will consider and act upon my concerns.

Sincerely,
Floyd Rudmin

NW/107

From: Bonaccorso, Amy
To: (b)(6)
Bcc: Deavers, Ron
Subject: REPLY: Radiation Question
Date: Thursday, March 24, 2011 11:20:00 AM

Hello Ms. Harris:

The International Atomic Energy Agency, <http://www.iaea.org/>, developed the ranking system with numbers that I believe you are referring to.

I can understand your confusion. It's unlikely that the U.S. Nuclear Regulatory Commission would rank the accident in Japan as being equivalent to Three Mile Island, but as far as I know, we have no official ranking system. A former Commissioner of the NRC, Commissioner Bradford, was reported to have agreed with your assessment - that the Japanese accident is worse than what happened at Three Mile Island, but he is not a current Commissioner - so his comments are not "official."

I am sorry that I do not have more technical information to share regarding the Japanese nuclear power plants. The U.S. Nuclear Regulatory Commission is offering to assist Japan in whatever way we can, but most of our information pertains to U.S. power plant safety and regulation.

I hope this helps.

Amy

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

From: (b)(6)
Sent: Wednesday, March 23, 2011 10:14 PM
To: OPA Resource
Subject: Radiation Question

Below is the result of your feedback form. It was submitted by

(b)(6) on Wednesday, March 23, 2011 at 22:13:44

comments: I am your (b)(6) I have lived my life in (b)(6) and remember Three Mile Island and Chernobyl accidents well. Even the red-neck stupidity with the fire at Browns Ferry Nuclear Plant.

My question is:

How is the disaster at Fukushima the equivalent of the disaster at Three Mile Island?

An explanation of the rating system might help.

With TMI, it was reported that no radioactive contamination made it into the population, yet Fukushima has radioactive contamination in vegetation, water, and animals located many miles from the plant. There were no explosions with TMI. Fukushima has had several. The core at TMI was only two and a half hours without circulating water, resulting in the meltdown. Although the reactors at Fukushima went into shutdown mode, they have gone several days without circulating water. Would they not be much hotter than the spent fuel rods? The reactors may not have blown, but common sense tells me the core melted days ago... although I am by no means an expert. Everything about Fukushima seems exponentially worse than what happened at TMI.

contactName: Karen Harris

phone: (b)(6)

AM/108

From: Bonaccorso, Amy
To: (b)(6)
Bcc: Deavers, Ron
Subject: REPLY: waste disposal
Date: Thursday, March 24, 2011 10:48:00 AM

Hello Mr. MacIntyre:

Thank you for the suggestion about nuclear waste disposal, especially in light of your experience. Unfortunately, we are not taking suggestions from the public at this time, but I will keep this on file.

Thank you,

Amy

From: Ferren MacIntyre (b)(6)
Sent: Wednesday, March 23, 2011 8:17 PM
To: OPA Resource
Subject: waste disposal

I am a (b)(6), and for about 40 years I have wondered why nuclear waste is not disposed off in what I consider the obvious manner.

It is true that material subducted into the mantle may reappear in volcanoes, but the time required is on the order of a million years, long enough to subdue most radionuclides. (If some long-lived reactor-produced isotopes *were* vented by volcanoes, would that be worse than the common practice of reactor operators today, venting their own wastes by hiding them in the raised background of a catastrophe at someone else's reactor?)

The problem then is ensuring that the waste *is* subducted, and not stuck on the nose of the continental crust, or released to seawater before being dragged down.

2 approaches:

'Needle bearings': package the waste in long, small-diameter tubes. Emplace parallel to the subduction site, so that they help roll the descending crust under the continent.

'Drill holes': Sea-floor drilling is a known art. Emplace tubes vertically in subducting crust.

Buried in anoxic mud, oxidative corrosion is minimal. One might use plain steel tubes, capping the drill holes with cement. Circulation of water through sea-floor crust is pronounced at hot ridges, but minimal at cold subduction zones.

I have never found a marine geologist who thought this a good idea; but I never got one to tell me why. Nor have I found a good research paper on the subject. It seems to me we're missing a good bet here.

Call emeritus professor Dr John Knauss at U Rhode Island Grad School of Oceanography if you want to check up on my credentials. He used to be my dean. He could probably tell you

NA/109

why the idea won't work--assuming it won't.

-- Ferren

(Dr) Ferren MacIntyre (b)(6)

(b)(6)

(b)(6)

6]

From: [Bonaccorso, Amy](#)
To: [Tobin, Jennifer](#)
Cc: [Deavers, Ron](#)
Subject: FW: REPLY: Japan meltdown
Date: Thursday, March 24, 2011 10:20:00 AM

Jenny:

I don't know if you can address him with some technical knowledge or not.

From: Mike (b)(6)
Sent: Wednesday, March 23, 2011 10:34 PM
To: Bonaccorso, Amy
Subject: Re: REPLY: Japan meltdown

Amy

Thank you for the quick reply and link to more info. In watching your chief (sorry I dont remember his name) deflect questions regarding how US reactors safety measures are in one way better than Japans I was interested in one specific statement he made regarding a fourth backup to the water cooling failures Japan experienced. Excuse me if I misunderstood but I thought he said we have some portable systems that are available to react to the loss of cooling. Can you explain what that system is? I assume a trailer with generator, pumps and heat exchangers? If we have such systems why have they not been offered to assist Japan?

Sounded like a good backup?

Best Regards

Mike

From: "Bonaccorso, Amy" <amy.Bonaccorso@nrc.gov>
To: (b)(6)
Cc: "Deavers, Ron" <Ron.Deavers@nrc.gov>
Sent: Wed, March 16, 2011 12:53:19 PM
Subject: REPLY: Japan meltdown

Dear Mr. Tracey:

At this time, the NRC does not believe protective measures are necessary in the United States. If the event circumstances change, U.S. residents should listen to the protective action decisions of their states and counties. These protective action decisions could include actions such as sheltering, evacuation, or taking potassium iodide. The NRC will provide technical assistance to the states should they request it. Unites States citizens in Japan are encouraged to follow the protective measures recommended by the Japanese government.

The NRC continues to monitor information regarding wind patterns near the Japanese nuclear power plants. Nevertheless, given the distance between the Japan and Hawaii, Alaska, the U.S. Territories and the U.S. West Coast we are not expected to experience any harmful levels of radioactivity. The EPA has publicly stated its agreement with the NRC's assessment that we do not expect to see radiation at harmful levels reaching the

NN/110

U.S. from damaged Japanese nuclear power plants.

I am sorry that we can't spend more time answering your questions about spent fuel storage and cooling systems, but information on this page (link below) may help you.

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/>

Thank you,

Amy

From: Mike (b)(6)
Sent: Tuesday, March 15, 2011 10:53 PM
To: OPA1 RESOURCE; OPA1 RESOURCE
Subject: Japan meltdown

Hi

I am hoping the NRC will take lessons learned from what is occurring in Japan. I would like to know why spent fuel is stored at the reactors? I imagine it is a cost reason and nobody else wants it. You need to get a solution that cannot be compromised as may be the case in Japan i.e. offsite storage.

I realize the odds of such a situation in Japan are slim but the severity is high. Why can't the cooling system rely on a gravity system backup? Where are they dumping that seawater?

Im sure scientists have thought of it all but it sure doesn't seem that way over the past week.

Also people are left to find their own ways to obtain potassium iodide. And guess what you can't buy it anywhere. You need to take it before exposure. By the time the meltdown release reaches the US - the levels will be safe right. Think about it - they have three to five reactors on the edge of out of control and a spent fuel pool compromised.

Is this the responsibility of the NRC or will be Obama's fault? Your expertise is key - show leadership.

Sorry but that's my perspective. I am very concerned.

Mike Tracey
(b)(6)

From: [Bonaccorso, Amy](#)
To: [Hayden, Elizabeth](#)
Cc: [Deavers, Ron](#)
Subject: FW: Shut Down Indian Point Nuclear Power Plant ASAP
Date: Thursday, March 24, 2011 11:39:00 AM

Beth:

I got an inquiry that relates to Indian Point – but don't have anything official to refer the person to. Holly asked me to pass it to you.

Thanks,

Amy

From: Harrington, Holly
Sent: Thursday, March 24, 2011 11:25 AM
To: Bonaccorso, Amy
Cc: Deavers, Ron
Subject: RE: Shut Down Indian Point Nuclear Power Plant ASAP

No press release. Please direct anything related to this meeting directly to Beth

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 10:39 AM
To: Harrington, Holly
Cc: Deavers, Ron
Subject: FW: Shut Down Indian Point Nuclear Power Plant ASAP

Are we planning a press release on the recent meeting between NRC and NY state people? I could give that to this guy. I thought I read that NRC is making Indian Point a top priority for a safety review.

From: Janbergs, Holly **On Behalf Of** OPA Resource
Sent: Thursday, March 24, 2011 7:24 AM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: Shut Down Indian Point Nuclear Power Plant ASAP

From: (b)(6)
Sent: Wednesday, March 23, 2011 5:46 PM
To: OPA Resource
Subject: Shut Down Indian Point Nuclear Power Plant ASAP

Dear Ms. Hayden,

I found it incredibly offensive to read that you found the issues at the Indian Nuclear Power Plant to be "really not a serious concern". As someone who lives in New York City I find the history at that plant a huge concern and wish my government would as well. But unfortunately, you seem more interested in working for the nuclear power industry than the citizens whose health you are supposed to protect.

AMY/11/1

I agree with Governor Cuomo, Indian Point Nuclear power plant needs to be shut down now, immediately. There should not be an old, faulty nuclear power plant within 50 miles of New York City. I ask you to reevaluate your plans for Indian Point, recognize the dangers in having such a plant in operation, and act immediately.

Sincerely,

Jennifer Savage

From: [Harrington, Holly](#)
To: [Bonaccorso, Amy](#)
Cc: [Deavers, Ron](#)
Subject: RE: REPLY: Public - Question
Date: Thursday, March 24, 2011 11:29:26 AM

This is best place to send them: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/>

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 10:19 AM
To: Harrington, Holly
Cc: Deavers, Ron
Subject: FW: REPLY: Public - Question

Hi Holly:

Do we have any public-friendly guides for non-technical folks about NRC inspections and drills in particular? I have an inquiry from a college student and want to make sure that I am not neglecting to inform him about some resource we have.

Thanks,

Amy

Here is the other issue, I am not sure what to look for in these. I have already visited and looked into recent reports from inspections and drills conducted by the NRC inspection teams at particular plants of interest, but for a novice and a student like myself this is a maze I am not sure how to wade through. Perhaps there are guides somewhere that could help me go through this valuable information, because they seem to be typically written by and for those who already understand the lingo and the topics or procedures at hand. An interested citizen such as myself couldn't possibly be expected to make any use of these things without the proper prior knowledge.

From: Luke Taylor [mailto:(b)(6)]
Sent: Wednesday, March 23, 2011 8:46 PM
To: Bonaccorso, Amy
Subject: Re: REPLY: Public - Question

Ms. Bonaccorso,

Thanks for the speedy reply. As the person who passed on this request may have told you, I am working on a report for a chemistry and society class at college that covers the most "at-risk" and irresponsible power plants in the US. Even while you cannot give me that kind of information, I appreciate the quick reply as well as the resources you have directed me to.

Here is the other issue, I am not sure what to look for in these. I have already visited and looked into recent reports from inspections and drills conducted by the NRC inspection teams at particular plants of interest, but for a novice and a student like myself this is a maze I am not sure how to wade through. Perhaps there are guides somewhere that could help me go

AW/11a

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Looking forward to hearing from you on these things,

Luke D. Taylor

Luke D. Taylor
Undergraduate Student - Political Science
Malone University
Department of History, Philosophy, and Social Sciences
440.622.5437

On Mar 23, 2011, at 10:00 AM, Bonaccorso, Amy wrote:

Hi Mr. Taylor:

I heard that you called to request a list of "at risk" plants with the most violations.

We do not have such a list - our primary focus is keeping the plants operating safely, however, you may be interested in the following resources.

This page shows all U.S. plants. If you click on a plant's name, you will find a record of enforcement actions and inspection reports. <http://www.nrc.gov/reactors/operating/list-power-reactor-units.html>

This page also gives a list of inspection reports:
http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/listofrpts_body.html#ano

Thank you,

Amy

From: [Bonaccorso, Amy](#)
To: Luke.Taylor@gmx.com
Bcc: [Deavers, Ron](#)
Subject: REPLY: Public - Question
Date: Thursday, March 24, 2011 11:41:00 AM

Hi Mr. Taylor:

I inquired about your question and Public Affairs just recommended that you look at our fact sheets:

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/>

I'm sorry if you have already looked at them – but this is what I have.

Thanks,

Amy

From: Luke Taylor [mailto:(b)(6)]
Sent: Wednesday, March 23, 2011 8:46 PM
To: Bonaccorso, Amy
Subject: Re: REPLY: Public - Question

Ms. Bonaccorso,

Thanks for the speedy reply. As the person who passed on this request may have told you, I am working on a report for a chemistry and society class at college that covers the most "at-risk" and irresponsible power plants in the US. Even while you cannot give me that kind of information, I appreciate the quick reply as well as the resources you have directed me to.

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Luke D. Taylor

Luke D. Taylor
Undergraduate Student - Political Science
Malone University
Department of History, Philosophy, and Social Sciences
440.622.5437

NW/113

On Mar 23, 2011, at 10:00 AM, Bonaccorso, Amy wrote:

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We do not have such a list - our primary focus is keeping the plants operating safely, however, you may be interested in the following resources.

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This page also gives a list of inspection reports:
http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/listofrpts_body.html#ano

Thank you,

Amy

From: Bonaccorso, Amy
To: (b)(6)
Bcc: Leavelle, KUI
Subject: Dose Calculator on NRC.GOV
Date: Thursday, March 24, 2011 12:08:00 PM

Hello:

Here is the website that I thought you might be interested in.

<http://www.nrc.gov/about-nrc/radiation/around-us/doses-daily-lives.html>

I hope it helps you.

Thank you,

Amy

NW/114

From: [Tobin, Jennifer](#)
To: [Bonaccorso, Amy](#)
Cc: [Deavers, Ron](#)
Subject: RE: Radiation Question
Date: Thursday, March 24, 2011 11:55:03 AM

Amy,
He's researching for a novel. I would steer him to the website.

Thanks!
-Jenny

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 10:51 AM
To: Tobin, Jennifer
Cc: Deavers, Ron
Subject: FW: Radiation Question

Jenny:

Should I just refer him to the NRC website or do you want to give him more info?

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

From: Janbergs, Holly On Behalf Of OPA Resource
Sent: Thursday, March 24, 2011 7:27 AM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: Radiation Question

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

From: (b)(6)
Sent: Wednesday, March 23, 2011 10:13 PM
To: OPA Resource
Subject: Radiation Question

Below is the result of your feedback form. It was submitted by

(b)(6) on Wednesday, March 23, 2011 at 22:12:33

comments: I have a few specific questions regarding radiation for a fictional story I am writing. The premise of my story takes place in a world in which the human race has been significantly reduced to about 12 million. Without the staff to run nuclear reactors, I would imagine there would be a number of consequences. How long would it take a reactor to be affected from lack of maintenance? Is it possible for the staff of a reactor to safely shut it down, or prevent any possible harm from a reactor with no staff? What exactly would happen, ie: a meltdown, explosion, both or more if a reactor is left alone? At what distances would the effected area be for its respective destruction, and what would the consequences be for exposure to such radiation? I read about genetic mishaps due to such radiation, is it plausible, for example, for physical mutations, such as an elongated body part like a leg or arm, or an overgrown eyeball, or bicep? What about the consequences for!

nature, trees/plants/animals of the surrounding areas, would they show/have physical/genetic differences? Also, how long would these effected areas be dangerous? Is it plausible to think the farther out from ground zero the quicker it will return to "normal"? What sort of materials could one use to protect one's self from such radiation? Thank you so much for your time. No rush on getting back to me as I'm in the outline stages of my story; these are questions I need answered for the most

AM/115

realistic outlook I can have regarding my characters' traveling routes, and potential obstacles, ie mutated scavenger/hunters etc. If you wish to leave your full name for credit or thanks I would be happy to include you, or at the very least the USNRC. Thanks again.

contactName: Daryl LaMontagne

phone: (b)(6) 6

From: [Bonaccorso, Amy](#)
To: [Harrington, Holly](#)
Subject: RE: Request for information
Date: Thursday, March 24, 2011 12:11:00 PM

Hi Holly:

Yes – Glenn asked for an article about the Public Inquiry Desk. I told Ron about it too...so I am going to try to get a draft ready and have him review it...as he might have something to add.

I didn't know that Ann was retiring, but Mike Weber told me at the RIC that they were considering making the Reporter more like the Researcher. He told me to inquire with Mindy. I did– she just told me they were working on it and might get back to me.

From: Harrington, Holly
Sent: Thursday, March 24, 2011 12:03 PM
To: Bonaccorso, Amy
Subject: RE: Request for information

Ok. Do what you need to do to make RES happy.

Glenn Ellmers is going to talk to you about helping him with NRC Reporter (I think this is a good move for you) as part of your duties in OPA

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 8:50 AM
To: Harrington, Holly
Subject: RE: Request for information

Well, since I could not get it to save, I don't think they can get it from anywhere. I am pretty traumatized – this was what I was thinking about as I was going to sleep last night. CSC couldn't help me – but Ron left me a note saying that my C drive is "okay now" – he tried to help me during the newsletter catastrophe too.

I have to get it done today – so I'm going to have to figure something out. I may return to Church Street when Ron gets here if I can't get it to work from here.

From: Harrington, Holly
Sent: Wednesday, March 23, 2011 4:58 PM
To: Bonaccorso, Amy
Subject: RE: Request for information

Oh no!! I had them retrieve something I accidentally deleted (a whole folder!). they couldn't pull it out of the back-up tapes for you?

From: Bonaccorso, Amy
Sent: Wednesday, March 23, 2011 4:40 PM
To: Harrington, Holly
Subject: Re: Request for information

AW/116

I think I saw some email traffic on this earlier today- will check tomorrow.

On my way back for my car. I almost finished the newsletter today, but then it would not save anywhere. CSC could not help- so I lost it. So painful!

From: Harrington, Holly
To: Bonaccorso, Amy
Sent: Wed Mar 23 16:25:04 2011
Subject: FW: Request for information

Can you get this request to the right person in Research?

From: Albert, Thomas [mailto:Thomas.Albert@dhs.gov]
Sent: Wednesday, March 23, 2011 4:00 PM
To: Harrington, Holly
Subject: RE: Request for information

The National Academies issued a report in 2005 on "Safety and Security of Commercial Spent Nuclear Fuel Storage" The report considers the risk of terrorist attacks on Spent Fuel Storage and therefore is of interest to DNDO. The public report references a classified report, so I am interested in reviewing the classified report if possible. I contacted a colleague of mine at the National Academies who informed me that the classified report was sponsored by the US NRC Office of Nuclear Regulatory Research so I would need to request the report from the sponsor. So I contacted another former colleague in the Office of Regulatory Research to inquire about the existence of the classified report and how I might request a copy. This inquiry has now apparently landed on your desk.

I'm not sure what the proper channels for requesting a NRC classified report. I'm certainly not attempting to circumvent proper channels, just trying to identify what is the proper channel.

The request is not urgent, but is relevant to current events.

Please advise how I should proceed.

Thomas E. Albert, Ph.D.
Chief Scientist
Domestic Nuclear Detection Office (DNDO)
Department of Homeland Security
Office: 202.254.7102
Fax: 202.254.7747
Mobile: (b)(6)
E-mail: Thomas.Albert@dhs.gov
Thomas.Albert@dhs.gov

From: prvs=05658b5e4=Holly.Harrington@nrc.gov [mailto:prvs=05658b5e4=Holly.Harrington@nrc.gov]

On Behalf Of Harrington, Holly
Sent: Wednesday, March 23, 2011 3:10 PM
To: Thomas.Albert@dhs.gov
Subject: Request for information

Dr. Albert – we have a long, somewhat garbled e-mail string that indicates you are seeking some information from us. It's unclear to me what you are seeking, so if you wouldn't mind providing me the specifics, as well as your timeframe, I will see what I can do to meet your needs.

If you have a regular contact person in the NRC who handles these requests from DHS, that might be a quicker route to go in light of current events the NRC is handling. If not, however, I will do my best to help you.

Holly Harrington
Office of Public Affairs
NRC

From: [Harrington, Holly](#)
To: [Bonaccorso, Amy](#)
Cc: [Deavers, Ron](#)
Subject: RE: Here is my contact info
Date: Thursday, March 24, 2011 12:00:08 PM

I do not know why this went back to Ron.

I went back to the individual with the request and asked for specifics of what he wanted.

I then sent it to you, Amy, as a person in RES, to help us get a response from RES.

Ron should be not involved.

If you have an answer from someone in research, please send it to me as a reply from the original e-mail I sent you asking for research to assess the inquiry. If research cannot help him, I need to know some specifics to provide the person.

Does that help?

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 9:16 AM
To: Harrington, Holly
Cc: Deavers, Ron
Subject: FW: Here is my contact info

Holly:

This is a follow up on that inquiry you sent me yesterday – towards the end of the day... from Thomas Albert. This email is a record of what has happened so far. The request came to RES, Nathan Siu had a look at it, and it ended up back with Ron.

I'm with Ron in that I'm not sure how this kind of thing is handled. Should I call Nathan for more details on why he could not handle it? I can do that. From Nathan's email, it sounds like someone in OPA encouraged him to send it back to us.

Thanks,

Amy

From: Deavers, Ron
Sent: Wednesday, March 23, 2011 1:32 PM
To: Harrington, Holly
Cc: Bonaccorso, Amy
Subject: FW: Here is my contact info

Holly,

This one is not public and if the study is really classified, we would not be able to find it any way.

Ron

From: Siu, Nathan

MM/1/17

Sent: Wednesday, March 23, 2011 10:29 AM
To: Deavers, Ron
Cc: Thomas.Albert@dhs.gov; Coe, Doug
Subject: FW: Here is my contact info

Ron –

I've received a telephone call from a DHS staffer – contact information below – requesting information regarding Fukushima (specifically, the existence of a PRA for the plant and the availability of an RES-sponsored classified study by the National Academy of Sciences on the safety and security of spent fuel pools). Per my management and OPA, I've been asked to forward this request to you. Please feel free to contact me if you have any questions.

Nathan Siu
U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
21 Church Street, Room 4B05
Rockville, MD 20852
301-251-7583 (phone)
301-251-7424 (fax)
Nathan.Siu@nrc.gov

From: Albert, Thomas [mailto:Thomas.Albert@dhs.gov]
Sent: Wednesday, March 23, 2011 10:12 AM
To: Siu, Nathan
Subject: Here is my contact info

Thomas E. Albert, Ph.D.
Senior Scientist
Domestic Nuclear Detection Office (DNDO)
Department of Homeland Security
Office: 202.254.7102

Fax: 202.254.7747

Mobile: (b)(6) 6

E-mail: Thomas.Albert@dhs.gov

Thomas.Albert@dhs.gov

From: Bonaccorso, Amy
To: (b)(6)
Bcc: Deavers, Ron
Subject: REPLY: Radiation Question
Date: Thursday, March 24, 2011 12:56:00 PM

Hello Mr. LaMontagne:

The NRC website, www.nrc.gov, has a lot of information on nuclear reactors and regulation. In particular, you may find the fact sheets helpful, as they are written for the general public: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/>

I am sorry I can't help you more.

Thank you,

Amy

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

From: (b)(6)
Sent: Wednesday, March 23, 2011 10:13 PM
To: OPA Resource
Subject: Radiation Question

Below is the result of your feedback form. It was submitted by

(b)(6) on Wednesday, March 23, 2011 at 22:12:33

comments: I have a few specific questions regarding radiation for a fictional story I am writing. The premise of my story takes place in a world in which the human race has been significantly reduced to about 12 million. Without the staff to run nuclear reactors, I would imagine there would be a number of consequences. How long would it take a reactor to be affected from lack of maintenance? Is it possible for the staff of a reactor to safely shut it down, or prevent any possible harm from a reactor with no staff? What exactly would happen, ie: a meltdown, explosion, both or more if a reactor is left alone? At what distances would the effected area be for its respective destruction, and what would the consequences be for exposure to such radiation? I read about genetic mishaps due to such radiation, is it plausible, for example, for physical mutations, such as an elongated body part like a leg or arm, or an overgrown eyeball, or bicep? What about the consequences for!

nature, trees/plants/animals of the surrounding areas, would they show/have physical/genetic differences? Also, how long would these effected areas be dangerous? Is it plausible to think the farther out from ground zero the quicker it will return to "normal"? What sort of materials could one use to protect one's self from such radiation? Thank you so much for your time. No rush on getting back to me as I'm in the outline stages of my story; these are questions I need answered for the most realistic outlook I can have regarding my characters' traveling routes, and potential obstacles, ie mutated scavenger/hunters etc. If you wish to leave your full name for credit or thanks I would be happy to include you, or at the very least the USNRC. Thanks again.

contactName: Daryl LaMontagne

phone: (b)(6) 6

MM/118

From: Tobin, Jennifer
To: (b)(6)
Subject: own
Date: Thursday, March 24, 2011 2:11:13 PM

Dear Mr. Tracey,

Thank you for your follow-up questions. The United States is one of a number of countries that have offered mobile generators to the Japanese government for use at the Fukushima nuclear power plant. It is up to the Japanese government to decide which nation they would like to work with to install these mobile generators on a temporary basis. I hope that addresses your concern.

Jenny (Tobin) Wollenweber
Export Licensing Officer
Office of International Programs
office: 301-415-2328

From: Mike [mailto:(b)(6)]
Sent: Wednesday, March 23, 2011 10:34 PM
To: Bonaccorso, Amy
Subject: Re: REPLY: Japan meltdown

Amy

Thank you for the quick reply and link to more info. In watching your chief (sorry I dont remember his name) deflect questions regarding how US reactors safety measures are in one way better than Japans I was interested in one specific statement he made regarding a fourth backup to the water cooling failures Japan experienced. Excuse me if I misunderstood but I thought he said we have some portable systems that are available to react to the loss of cooling. Can you explain what that system is? I assume a trailer with generator, pumps and heat exchangers? If we have such systems why have they not been offered to assist Japan?

Sounded like a good backup?

Best Regards

Mike

From: "Bonaccorso, Amy" <amy.Bonaccorso@nrc.gov>
To: (b)(6)
Cc: "Deavers, Ron" <Ron.Deavers@nrc.gov>
Sent: Wed, March 16, 2011 12:53:19 PM
Subject: REPLY: Japan meltdown

Dear Mr. Tracey:

At this time, the NRC does not believe protective measures are necessary in the United States. If the event circumstances change, U.S. residents should listen to the protective action decisions of their states and counties. These protective action decisions could include actions such as sheltering, evacuation, or taking potassium iodide. The NRC will provide technical assistance to the states should they request it. Unites States citizens in Japan are encouraged to follow the protective measures recommended by the Japanese

MM/119

government.

The NRC continues to monitor information regarding wind patterns near the Japanese nuclear power plants. Nevertheless, given the distance between the Japan and Hawaii, Alaska, the U.S. Territories and the U.S. West Coast we are not expected to experience any harmful levels of radioactivity. The EPA has publicly stated its agreement with the NRC's assessment that we do not expect to see radiation at harmful levels reaching the U.S. from damaged Japanese nuclear power plants.

I am sorry that we can't spend more time answering your questions about spent fuel storage and cooling systems, but information on this page (link below) may help you.

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/>

Thank you,

Amy

From: Mike (b)(6)
Sent: Tuesday, March 15, 2011 10:53 PM
To: OPA1 RESOURCE; OPA1 RESOURCE
Subject: Japan meltdown

Hi

I am hoping the NRC will take lessons learned from what is occurring in Japan. I would like to know why spent fuel is stored at the reactors? I imagine it is a cost reason and nobody else wants it. You need to get a solution that cannot be compromised as may be the case in Japan i.e.offsite storage.

I realize the odds of such a situation in Japan are slim but the severity is high. Why cant the cooling system rely on a gravity system backup? Where are they dumping that seawater?

Im sure scientists have thought of it all but it sure doesnt seem that way over the past week.

Also people are left to find there own ways to obtain potassium iodide. And guess what you cant buy it anywhere. You need to take it before exposure. By the time the meltdown release reaches the US - the levels will be safe right. Think about it - they have three to five reactors on the edge of out of control and a spent fuel pool compromised.

Is this the responsibilty of the NRC or will be Obamas fault? Your expertise is key - show leadership.

Sorry but thats my perspective. I am very concerned.

Mike Tracey

(b)(6)

From: Bonaccorso, Amy
To: McIntyre, David
Subject: RE: public call
Date: Thursday, March 24, 2011, 12:59:00 PM

Hi Dave:

Sure – I'll actually have Ron do it. I am behind on The Researcher and owe it to my office by the end of the day. Ron is great on the phone.

Thanks,

Amy

From: McIntyre, David
Sent: Thursday, March 24, 2011 12:27 PM
To: Bonaccorso, Amy
Subject: public call

Amy – Could you please call “Mike” at (b)(6) He left a msg on voicemail and seems to be a member of the public, not media. Said he has questions regarding the safety of “our plants”.

Thanks.

David McIntyre
Public Affairs Officer
U.S. Nuclear Regulatory Commission
(301) 415-8206 (direct)
(b)(6) mobile
Protecting People & the Environment

nm/120

From: Bonaccorso, Amy
To: Deavers, Ron
Subject: Phone Call
Date: Thursday, March 24, 2011 2:03:00 PM

Mike McDonough

(b)(6)

He has already contacted the FDA, but wants to know what specific radioactive isotopes he should test for on food products from Japan. I told him I would send him to FDA and apologized for not having further info for him. If I am able to find more – I will get back to him.

MM/121

From: Bonaccorso, Amy
To: Deavers, Ron
Subject: Public Call
Date: Thursday, March 24, 2011 2:05:00 PM

Marshall Shield

(b)(6)

Marshall is very passionate about wanting to join the NRC Task Force and lead an effort to fix the problems in Japan. I informed him that the NRC is not taking volunteers but I would record his information down here.

AM/122

Bonaccorso, Amy

From: Deavers, Ron
Sent: Thursday, March 24, 2011 2:13 PM
To: (b)(6)
Subject: REPLY RE:
Attachments: 11-055.pdf

We understand your concern. Thank you for your concise articulation of the issues at Vermont Yankee. As part of the comprehensive review of the safety of our Nuclear Power Plants that we will be undertaking in the near future, we will endeavor to address the issues you articulate in your email below and identify all other issues regarding the safety of the Vermont Yankee Nuclear Power Plant.

In addition, I have attached a new release that outline the next steps and timeline for the comprehensive review.

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

From: (b)(6)
Sent: Tuesday, March 22, 2011 10:55 PM
To: NRC Allegation
Subject:

I am very glad that you are looking into the viability of the plant right near NYC. Good idea. Please also consider that:

THE DIABLO CANYON NUCEAR POWER PLANT WAS BUILT DIRECTLY ON A MAJOR FAULT LINE.

Perhaps that is also worth looking into, from a safety standpoint.

Thank you,
Gayna Uransky

(b)(6)

NN/123



NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

Office of Public Affairs Telephone: 301/415-8200

Washington, D.C. 20555-0001

E-mail: opa.resource@nrc.gov Site: www.nrc.gov

Blog: <http://public-blog.nrc-gateway.gov>

No. 11-055

March 23, 2011

NUCLEAR REGULATORY COMMISSION DIRECTS STAFF ON CONTINUING AGENCY RESPONSE TO JAPAN EVENTS; ADJUSTS COMMISSION SCHEDULE

The Nuclear Regulatory Commission has voted to launch a two-pronged review of U.S. nuclear power plant safety in the aftermath of the March 11 earthquake and tsunami and the resulting crisis at a Japanese nuclear power plant.

The Commission supported the establishment of an agency task force, made up of current senior managers and former NRC experts with relevant experience. The task force will conduct both short- and long-term analysis of the lessons that can be learned from the situation in Japan, and the results of their work will be made public.

“Our focus is always on ensuring the health and safety of the American people through our licensing and oversight of plants and radioactive materials in this country,” Chairman Jaczko said. “Examining all the available information from Japan is essential to understanding the event’s implications for the United States. We will perform a systematic and methodical review to see if there are changes that should be made to our programs and regulations to ensure protection of public health and safety.”

The Commission set an aggressive schedule for the task force to provide formal updates on the short-term effort in 30, 60 and 90 days. NRC senior technical staff provided the Commission a 90-minute briefing on Monday, as a first step. The staff reiterated their conclusions that the United States and its territories will avoid any harmful radiation levels as a result of the ongoing events at the Fukushima Daiichi plant damaged by the quake and subsequent tsunami.

NRC inspectors who are posted at every U.S. nuclear power plant will also support the task force’s short-term effort, supplemented as necessary by experts from the agency’s regional and headquarters offices.

“This work will help determine if any additional NRC responses, such as Orders requiring immediate action by U.S. plants, are called for, prior to completing an in-depth investigation of the information from events in Japan,” said NRC Executive Director for Operations Bill Borchardt.

The longer-term review will inform any permanent NRC regulation changes determined to be necessary. The Commission said it hopes the task force can begin the long-term evaluation in no later than 90 days, and added that the task force should provide a report with recommended actions within six months of the beginning of that effort.

The Commission also decided to revise its schedule for meetings and briefings to allow ample focus on the agency's response to events in Japan. Open Commission meetings on the status of the NRC response to the Japan earthquake are scheduled for April 14 and 28, a meeting on the staff's 30-day response is planned for May 3 and a meeting on the staff's 60-day response is planned for June 16. A revised Commission meeting schedule will be posted shortly on the NRC website.

###

News releases are available through a free *listserv* subscription at the following Web address: <http://www.nrc.gov/public-involve/listserver.html>. The NRC homepage at www.nrc.gov also offers a SUBSCRIBE link. E-mail notifications are sent to subscribers when news releases are posted to NRC's website.

From: Deavers, Ron
To: (b)(6)
Subject: REPLY RE:
Date: Thursday, March 24, 2011 2:12:48 PM
Attachments: 11-055.pdf

We understand your concern. Thank you for your concise articulation of the issues at Vermont Yankee. As part of the comprehensive review of the safety of our Nuclear Power Plants that we will be undertaking in the near future, we will endeavor to address the issues you articulate in your email below and identify all other issues regarding the safety of the Vermont Yankee Nuclear Power Plant.

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

From: woodsky@humboldt.net [mailto:woodsky@humboldt.net]
Sent: Tuesday, March 22, 2011 10:55 PM
To: NRC Allegation
Subject:

I am very glad that you are looking into the viability of the plant right near NYC. Good idea.
Please also consider that:

THE DIABLO CANYON NUCEAR POWER PLANT WAS
BUILT DIRECTLY ON A MAJOR FAULT LINE.

Perhaps that is also worth looking into, from a safety standpoint.

Thank you,
Gayna Uransky

(b)(6)

NY/124

From: Deavers, Ron
To: (b)(6)
Subject: REPLY RE: possible way to get water to Jap reactor
Date: Thursday, March 24, 2011 2:19:45 PM

We appreciate the suggestions of folks with ideas to resolve the situation in Japan. Please understand that the NRC has some of the most expert people in the world available to assist the Japanese authorities in whatever way they request. We are fully staffed in all our response teams at this time and working 24-hours a day.

From: J Stuckey [mailto:Info@SouthernSportsmanOnline.com]
Sent: Thursday, March 24, 2011 9:02 AM
To: NRC Allegation
Subject: possible way to get water to Jap reactor

Use a small track bulldozer with a water cannon and hose mounted on the frame. Assemble a basic robotic remote controlled steering unit on the steering clutches and a camera. Turn on the nozzle and control the water from the source. (b)(6)

NW/125

From: Deavers, Ron
To: (b)(6)
Subject: RE: concern about nuclear safety regulatory failures
Date: Thursday, March 24, 2011 2:27:50 PM
Attachments: 11-055.pdf

We understand your concern. Thank you for your concise articulation of potential risks. As part of the comprehensive review of the safety of our Nuclear Power Plants that we will be undertaking in the near future, we will endeavor to address the issues you articulate in your email below and identify all other issues regarding the safety of the U.S. nuclear power plants.

Also attached is a press release outlining the next steps and timeline the comprehensive review.

In addition, we offer the following information:

- The US Government will be studying every aspect of the Japanese disaster and the Japanese government's response, with the goal of learning as much as possible from that review.
- If there were to be a nuclear accident here, we are prepared to respond and FEMA and the Department of Homeland Security exercise these preparedness plans with the rest of the government and state and local officials as well. Release of radioactive materials can be accidental or intentional and we have a detailed plan to respond regardless of the cause. The Nuclear/Radiological Incident Annex to the National Response Framework outlines which department or agency would have the lead for the Federal response depending on the source and type of release. For example, the Nuclear Regulatory Commission (NRC) would coordinate a response to a release at nuclear power facilities licensed by the NRC. The Department of Energy would coordinate a response to a release involving nuclear weapons in DOE custody. The Department of Homeland Security would coordinate a response to a deliberate attack using improvised nuclear devices or radiological dispersal devices.
- Given the range of potential causes, from an earthquake to a terrorist attack, the plan provides the flexibility and agility we need to respond aggressively and effectively. In addition, state and local officials and nuclear facilities have detailed emergency plans that include specific protective actions, evacuation routes, and methods to alert the public of actions to take in the event of an emergency. There is a robust and active nuclear power plant accident exercise program that includes Federal, State, and local involvement to test plans and keep them current, and just last year we conducted such an exercise. Federal protective action guides are used at all nuclear power plants and are widely accepted and used in planning and exercises, and we will continue our efforts to plan and prepare for the safety and security of the American people.

From: (b)(6)
Sent: Thursday, March 24, 2011 8:05 AM
To: OPA Resource
Subject: concern about nuclear safety regulatory failures

MW/126

Good afternoon,

Please consider the following nuclear safety concerns:

1) Japan did NOT have redundant power transmission lines to their reactors and thus lost cooling. If an event, like a plane crash, were to knock out a reactor's transmission lines AND your back-up power supply, do regulations require that there be redundant transmission lines to provide power from the grid? If not, please consider requiring such safety redundancy, for example, in underground conduits.

2) Do you require that there be security protection from a bomb inside a reactor's underwater piping that extends into a lake, river, or ocean? If not, please consider requiring such safety, for example, by a blow-out weak point in the piping, between the pipe opening and the reactor. That way, hydraulic back-pressure from an explosion at the pipe opening would not reach the reactor.

I know your PR job is to assure me that everything is fine and safe. But Tokyo Electric also had been assuring everybody that everything is fine and safe. In this instance, in addition to your assurance reply, please also pass my email up within your offices to some level where an engineer or responsible party will consider and act upon my concerns.

Sincerely,
Floyd Rudmin

Bonaccorso, Amy

From: Deavers, Ron
Sent: Thursday, March 24, 2011 2:28 PM
To: Floyd Rudmin
Subject: RE: concern about nuclear safety regulatory failures
Attachments: 11-055.pdf

We understand your concern. Thank you for your concise articulation of potential risks. As part of the comprehensive review of the safety of our Nuclear Power Plants that we will be undertaking in the near future, we will endeavor to address the issues you articulate in your email below and identify all other issues regarding the safety of the U.S. nuclear power plants.

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From: Floyd Rudmin (b)(6)
Sent: Thursday, March 24, 2011 8:05 AM
To: OPA Resource
Subject: concern about nuclear safety regulatory failures

Good afternoon,

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Sincerely,
Floyd Rudmin



NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

Office of Public Affairs Telephone: 301/415-8200
Washington, D.C. 20555-0001

E-mail: opa.resource@nrc.gov Site: www.nrc.gov
Blog: <http://public-blog.nrc-gateway.gov>

No. 11-055

March 23, 2011

NUCLEAR REGULATORY COMMISSION DIRECTS STAFF ON CONTINUING AGENCY RESPONSE TO JAPAN EVENTS; ADJUSTS COMMISSION SCHEDULE

The Nuclear Regulatory Commission has voted to launch a two-pronged review of U.S. nuclear power plant safety in the aftermath of the March 11 earthquake and tsunami and the resulting crisis at a Japanese nuclear power plant.

The Commission supported the establishment of an agency task force, made up of current senior managers and former NRC experts with relevant experience. The task force will conduct both short- and long-term analysis of the lessons that can be learned from the situation in Japan, and the results of their work will be made public.

“Our focus is always on ensuring the health and safety of the American people through our licensing and oversight of plants and radioactive materials in this country,” Chairman Jaczko said. “Examining all the available information from Japan is essential to understanding the event’s implications for the United States. We will perform a systematic and methodical review to see if there are changes that should be made to our programs and regulations to ensure protection of public health and safety.”

The Commission set an aggressive schedule for the task force to provide formal updates on the short-term effort in 30, 60 and 90 days. NRC senior technical staff provided the Commission a 90-minute briefing on Monday, as a first step. The staff reiterated their conclusions that the United States and its territories will avoid any harmful radiation levels as a result of the ongoing events at the Fukushima Daiichi plant damaged by the quake and subsequent tsunami.

NRC inspectors who are posted at every U.S. nuclear power plant will also support the task force’s short-term effort, supplemented as necessary by experts from the agency’s regional and headquarters offices.

“This work will help determine if any additional NRC responses, such as Orders requiring immediate action by U.S. plants, are called for, prior to completing an in-depth investigation of the information from events in Japan,” said NRC Executive Director for Operations Bill Borchardt.

The longer-term review will inform any permanent NRC regulation changes determined to be necessary. The Commission said it hopes the task force can begin the long-term evaluation in no later than 90 days, and added that the task force should provide a report with recommended actions within six months of the beginning of that effort.

The Commission also decided to revise its schedule for meetings and briefings to allow ample focus on the agency's response to events in Japan. Open Commission meetings on the status of the NRC response to the Japan earthquake are scheduled for April 14 and 28, a meeting on the staff's 30-day response is planned for May 3 and a meeting on the staff's 60-day response is planned for June 16. A revised Commission meeting schedule will be posted shortly on the NRC website.

###

News releases are available through a free *listserv* subscription at the following Web address: <http://www.nrc.gov/public-involve/listserv.html>. The NRC homepage at www.nrc.gov also offers a SUBSCRIBE link. E-mail notifications are sent to subscribers when news releases are posted to NRC's website.

From: Deavers, Ron
To: Bonaccorso, Amy; Deavers, Ron
Subject: RE: public call
Date: Thursday, March 24, 2011 2:35:55 PM

Discussed the comprehensive review, press release, web page

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 1:00 PM
To: Deavers, Ron
Subject: FW: public call

I told Dave that I was going to refer it to you. I need to finish the newsletter.

From: McIntyre, David
Sent: Thursday, March 24, 2011 12:27 PM
To: Bonaccorso, Amy
Subject: public call

Amy – Could you please call “Mike” at (b)(6) He left a msg on voicemail and seems to be a member of the public, not media. Said he has questions regarding the safety of “our plants”.

Thanks.

David McIntyre
Public Affairs Officer
U.S. Nuclear Regulatory Commission
(301) 415-8206 (direct)
(b)(6) (mobile) 27
Protecting People & the Environment

AM/12/8

From: [Hogan, Rosemary](#)
To: [Bonaccorso, Amy](#)
Cc: [Siu, Nathan](#)
Subject: RE: Request for information
Date: Thursday, March 24, 2011 2:52:59 PM

I am sure we have it but I don't know whether he has a need to know. Nathan?

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 1:07 PM
To: Hogan, Rosemary
Cc: Coe, Doug; Siu, Nathan
Subject: RE: Request for information

Hi Rosemary:

We have an inquiry that we need to respond to in some fashion. We may not have the exact material the gentleman is requesting, but we could still provide a polite response. Can you take a look at the email string and see if you can help us? Nathan thought you would be a good person to ask. I really appreciate your help and am sorry if this takes you away from other things!

Thanks,

Amy

From: Siu, Nathan
Sent: Thursday, March 24, 2011 1:03 PM
To: Bonaccorso, Amy
Cc: Coe, Doug
Subject: RE: Request for information

Hi Amy –

Looks like there are some kinks to be worked out still.

In general, RES/DE has been the keeper of security-related information – I think Rosemary Hogan is the right person to ask. I don't know if NSIR would need to get in the loop, but Rosemary would know.

Nathan

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 12:54 PM
To: Siu, Nathan
Subject: FW: Request for information

Hi Nathan:

I saw in my email traffic that you heard from this gentleman via the phone. OPA got this email inquiry and I was asked to see if someone in RES could handle it. If we cannot refer him to the information he is requesting, can we at least give him a polite response? It

NN/129

seems like this inquiry was mistakenly referred to the public inquiry desk in the midst of the flurry of inquiries about Japan.

Thank you,

Amy

From: Harrington, Holly
To: Bonaccorso, Amy
Sent: Wed Mar 23 16:25:04 2011
Subject: FW: Request for information

Can you get this request to the right person in Research?

From: Albert, Thomas [mailto:Thomas.Albert@dhs.gov]
Sent: Wednesday, March 23, 2011 4:00 PM
To: Harrington, Holly
Subject: RE: Request for information

The National Academies issued a report in 2005 on "Safety and Security of Commercial Spent Nuclear Fuel Storage" The report considers the risk of terrorist attacks on Spent Fuel Storage and therefore is of interest to DNDO. The public report references a classified report, so I am interested in reviewing the classified report if possible. I contacted a colleague of mine at the National Academies who informed me that the classified report was sponsored by the US NRC Office of Nuclear Regulatory Research so I would need to request the report from the sponsor. So I contacted another former colleague in the Office of Regulatory Research to inquire about the existence of the classified report and how I might request a copy. This inquiry has now apparently landed on your desk.

I'm not sure what the proper channels for requesting a NRC classified report. I'm certainly not attempting to circumvent proper channels, just trying to identify what is the proper channel.

The request is not urgent, but is relevant to current events.

Please advise how I should proceed.

Thomas E. Albert, Ph.D.
Chief Scientist
Domestic Nuclear Detection Office (DNDO)
Department of Homeland Security
Office: 202.254.7102
Fax: 202.254.7747
Mobile: (b)(6)
E-mail: Thomas.Albert@dhs.gov
Thomas.Albert@dhs.gov

From: prvs=05658b5e4=Holly.Harrington@nrc.gov [mailto:prvs=05658b5e4=Holly.Harrington@nrc.gov]

On Behalf Of Harrington, Holly
Sent: Wednesday, March 23, 2011 3:10 PM
To: Thomas.Albert@dhs.gov
Subject: Request for information

Dr. Albert – we have a long, somewhat garbled e-mail string that indicates you are seeking some information from us. It's unclear to me what you are seeking, so if you wouldn't mind providing me the specifics, as well as your timeframe, I will see what I can do to meet your needs.

If you have a regular contact person in the NRC who handles these requests from DHS, that might be a quicker route to go in light of current events the NRC is handling. If not, however, I will do my best to help you.

Holly Harrington
Office of Public Affairs
NRC

From: Deavers, Ron
To: (b)(6)
Subject: REPLY RE: Radiation Question
Date: Thursday, March 24, 2011 2:53:29 PM

The ability of "radiation" to pass through materials is specific to the nature of the radioactive particles that comprise the radiation. This is discussed on our Radiation Basics web page at:
<http://www.nrc.gov/about-nrc/radiation/health-effects/radiation-basics.html>

You may find more information by sending a message to: radiation.questions@epa.gov

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

From: (b)(6)
Sent: Thursday, March 24, 2011 2:15 PM
To: OPA Resource
Subject: Radiation Question

Below is the result of your feedback form. It was submitted by

(b)(6) on Thursday, March 24, 2011 at 14:15:12

comments: I am curious as how the hazmat suits protect people from radiation. How does wearing a mask or staying indoors help? My impression is that radiation will pass through walls let alone a hazmat suit or clothes.

contactName: Steve Downing

phone: (b)(6)

MM/130

From: Deavers, Ron
To: Michael Mulligan
Subject: RE: REPLY RE: Fukushima safety task force
Date: Thursday, March 24, 2011 3:52:41 PM

I have forwarded your email as you requested.

From: Michael Mulligan (b)(6)
Sent: Thursday, March 24, 2011 3:52:41 PM
To: Deavers, Ron
Subject: Re: REPLY RE: Fukushima safety task force

Ron,

Could I get you to show this correspondence set to your boss and give me some assurance that he seen it?

Could he send me a e-mail?

mike

From: "Deavers, Ron" <Ron.Deavers@nrc.gov>
To: (b)(6)
Sent: Thu, March 24, 2011 3:05:24 PM
Subject: REPLY RE: Fukushima safety task force

In regard to the Part 21 issues listed in the recent Inspector General Report, the NRC staff will address each recommendation in the report.

The NRC provides instructions for reporting safety or security concerns at our web page located here:

<http://www.nrc.gov/about-nrc/regulatory/allegations/safety-concern.html>

You are welcome to submit posting to our blog.

From: Michael Mulligan (b)(6)
Sent: Thursday, March 24, 2011 10:58 AM
To: NRC Allegation
Subject: Re: Fukushima safety task force

By Tennille Tracy
Of DOW JONES NEWSWIRES

WASHINGTON (Dow Jones)--Nearly 30% of U.S. nuclear power plants fail to report equipment defects that present "substantial" safety risks because of contradictions in the federal law, according to the Nuclear Regulatory Commission's inspector general.

If the issue isn't resolved, "the margin of safety for operating reactors could be reduced," the inspector general says.

ANN/131

In a new report, the Office of Inspector General says U.S. nuclear plants are confused about what they are required to report to federal regulators. That's because one section of the law, known as Part 21, requires them to report defects that can cause a loss of safety functions while another section of the law requires them to report only actual losses of safety functions.

"Licensees representing at least 28 percent of the operating reactor fleet do not, as standard practice, notify NRC of defects under Part 21 unless they are reportable under event reporting regulations," the report says.

The safety of U.S. nuclear facilities has come under question in recent days as the nuclear crisis at Japan's Fukushima plant reveals weaknesses in nuclear-plant technology. The U.S. Nuclear Regulatory Commission voted Wednesday to conduct a major safety review of the 104 nuclear reactors operating in the US.

The Nuclear Regulatory Commission has been aware of the reporting lapses since at least 2009. In that time, the commission identified 24 instances, between December 2009 and September 2010, in which nuclear plants didn't report defects under Part 21.

These instances pose "a substantial safety hazard" and prevent federal regulators from spotting manufacturer defects that could surface at other plants around the country, the inspector general said.

Because U.S. plants are failing to report defects as a result of confusion over the law, the Nuclear Regulatory Commission hasn't imposed violations or civil penalties. It has not imposed any civil penalties or significant enforcement actions for the reporting failures in at least eight years, the inspector says.

-By Tennille Tracy, Dow Jones Newswires; 202-862-6619;
tennille.tracy@dowjones.com

From: Michael Mulligan (b)(6)
To: allegation@nrc.gov
Sent: Thu, March 24, 2011 9:52:21 AM
Subject: Fukushima safety task force

Dear sir,

Based on the investigation of safety nationwide on the nuclear fleet...could I talk to somebody about LERs and part 21 reporting requirements?

The theme is LERs reporting and part 21 requirements have been eviscerated and

are generally not enforced in the last decade...

How do you report issues you wish the new safety task force would look into?

I would suggest the NRC blog...but they have lost any credibility with me in the recent past. Instead a blog for all of the people of the USA...you turned it into a extreme pro nuclear blog of exclusive people.

I would have some suggestions and criticisms concerning the task force if NRC officials would like to talk to me.

Mike

AUDIT OF NRC'S IMPLEMENTATION OF 10 CFR PART 21, REPORTING OF DEFECTS AND NONCOMPLIANCE (OIG-11-A-08)

From: Deavers, Ron
To: (b)(6)
Subject: REPLY RE: (no subject)
Date: Thursday, March 24, 2011 3:46:48 PM

We appreciate the suggestions of folks with idea to resolve the situation in Japan. Please understand that the NRC has some of the most expert people in the world available to assist the Japanese authorities in whatever way they request. We are fully staffed in all our response teams at this time and working 24-hours a day.

From: Janbergs, Holly **On Behalf Of** OPA Resource
Sent: Thursday, March 24, 2011 3:03 PM
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: (no subject)

From: (b)(6)
Sent: Thursday, March 24, 2011 2:51 PM
To: OPA Resource
Subject: (no subject)

My profile

(b)(6)

my ideas on providing a gravity water supply to all nuclear power facilities ,to be built and existing, where topography will not allow a remote storage tank system or reservoir at the necessary elevation and safe [distance] location, water towers could be used as they do in the mid west or flat topography.

a gravity fed water source would be inexpensive to construct and quick to build this water source could provide cooling water while power is restored to pumps the water source could be located a safe distance from any facility and have great capacity this type system can be built now quickly.

please deliver this to the proper people where it would be considered

THANK YOU
Robert Ferreira
(b)(6)

(b)(6)

NW/132

From: [Harrington, Holly](#)
To: [Deavers, Ron](#)
Cc: [Bonaccorso, Amy](#)
Subject: RE: REPLY RE: Fukushima safety task force
Date: Thursday, March 24, 2011 3:53:07 PM

Stop for a second and call me first

From: Deavers, Ron
Sent: Thursday, March 24, 2011 3:51 PM
To: Harrington, Holly
Cc: Bonaccorso, Amy
Subject: FW: REPLY RE: Fukushima safety task force

Holly,

I am forwarding this email at the senders request. I will inform him in a separate reply that I forwarded this email.

Thanks,

Ron

From: Michael Mulligan (b)(6)
Sent: Thursday, March 24, 2011 3:42 PM
To: Deavers, Ron
Subject: Re: REPLY RE: Fukushima safety task force

Ron,

Could I get you to show this correspondence set to your boss and give me some assurance that he seen it?

Could he send me a e-mail?

mike

From: "Deavers, Ron" <Ron.Deavers@nrc.gov>
To: (b)(6)
Sent: Thu, March 24, 2011 3:05:24 PM
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Of DOW JONES NEWSWIRES

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-By Tennille Tracy, Dow Jones Newswires; 202-862-6619;
tennille.tracy@dowjones.com

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The theme is LERs reporting and part 21 requirements have been eviscerated and are generally not enforced in the last decade...

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Mike

AUDIT OF NRC'S IMPLEMENTATION OF 10 CFR PART 21, REPORTING OF DEFECTS AND NONCOMPLIANCE (OIG-11-A-08)

From: Deavers, Ron
To: Bonaccorso, Amy; Akstulewicz, Brenda; Deavers, Ron
Subject: RE: Abusive member of the public will probably be calling back....
Date: Thursday, March 24, 2011 5:11:15 PM

Called, no answer, nor voice mail

From: Akstulewicz, Brenda
Sent: Thursday, March 24, 2011 4:24 PM
To: Deavers, Ron
Subject: FW: Abusive member of the public will probably be calling back....

Hi Ron,

Please see email below from Amy. If and only IF you are so inclined here is the caller's information.

Lisa Rains

(b)(6) :30-11pm
(b)(6) anytime
(b)(6)

She's very concerned about what exactly she needs to do if there is a nuclear meltdown. She's quite rude, insistent and scared not to mention OCD! If there's any information we can send her, she'd like that.

Brenda

From: Bonaccorso, Amy
Sent: Thursday, March 24, 2011 9:53 AM
To: Akstulewicz, Brenda
Subject: Abusive member of the public will probably be calling back....

I talked to her for 30 minutes and she was still highly upset....said she was going to keep calling back and reporting me to supervisor because I would not transfer to technical expert...aaagggghh!!!

I probably should not have allowed her to berate me for that long, but I was trying to let her get it all out.

NW/134

From: Deavers, Ron
To: Bonaccorso, Amy; Deavers, Ron
Subject: FW: REPLY RE: Citizen
Date: Thursday, March 24, 2011 5:00:42 PM

From: Deavers, Ron
Sent: Thursday, March 24, 2011 5:00 PM
To: (b)(6)
Subject: REPLY RE: Citizen

Mr. Stavros,

The government involvement in the construction financing that we discussed is in the form of loan guarantees. More information is available in this article from the Department of Energy web site:

<http://www.id.energy.gov/NEWS/PressReleases/PR100216.htm>

From: Akstulewicz, Brenda
Sent: Thursday, March 24, 2011 4:05 PM
To: Deavers, Ron
Subject: Citizen

Michael Stavros

(b)(6)

Does the US government build nuclear power plants and then turn them over to private corporations.

NW/135

From: [Rod Davis](#)
To: [Bonaccorso, Amy](#)
Subject: Re: REPLY: Response from "Contact the NRC Web Site Staff"
Date: Thursday, March 24, 2011 4:19:07 PM

Ms. Bonaccorso,

My suggestion is not for the benefit of the problem in Japan. I am attempting to introduce a method of storage of the spent fuel rods from our reactors.

As it has been in the past, my suggestion has been brushed to the side without someone even looking at it.

By way of credibility, I am a (b)(6) with more than the basic knowledge about reactors. I worked for a number of years for United Nuclear out of Norwalk, CT.

My idea is 'cheap', earthquake-safe, and guaranteed not to leak! If you are not interested... tell me who should be?

Rod Davis

(b)(6)

On Wed, Mar 23, 2011 at 7:41 AM, Bonaccorso, Amy <amy.Bonaccorso@nrc.gov> wrote:

Hello Mr. Davis:

We've received a lot of suggestions lately, especially those that work toward resolving the situation in Japan; it's reassuring to see how helpful and dedicated private citizens have been. We are fully staffed with experts to analyze the crisis overseas and also issues like nuclear waste storage though, and are not taking proposals from the public.

Thank you,

Amy

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

From: Rod Davis (b)(6)
Sent: Tuesday, March 22, 2011 8:18 PM
To: NRCWEB Resource
Subject: Response from "Contact the NRC Web Site Staff"

Handwritten notes: "NW/136" and a checkmark.

Below is the result of your feedback form. It was submitted by

Rod Davis (b)(6) on Tuesday, March 22, 2011 at 20:17:47

comments: I want to submit a method for storage of the nuclear waste from our reactor plants, i.e., spent fuel rods.

Can you provide me with a point of contact?

organization	(b)(6)
address1	(b)(6)
address2:	(b)(6)
city:	(b)(6)
state: ---	
zip:	(b)(6)
country:	(b)(6)
phone:	(b)(6) 6

--
In a democracy, silence is not golden; it is condonance in the face of injustices; it is fear, where the thought of reprisal fosters control - Rodney A. Davis

From: Mary Garland
To: Bonaccorso, Amy
Subject: Re: REPLY: Mary Garland
Date: Thursday, March 24, 2011 7:44:04 PM

Amy,

(b)(6)

(b)(6)

This is a site where the NRC did some reporting in the past. In any event, our biggest concern is liability if the containment is disturbed and subsequent contamination of water sources down gradient. The question: who is responsible in the long term regardless of land ownership?

Thanks for taking time to address this question.

Mary Garland

(b)(6)

PS I can provide more details if necessary.

--- On Thu, 3/24/11, Bonaccorso, Amy <amy.Bonaccorso@nrc.gov> wrote:

From: Bonaccorso, Amy <amy.Bonaccorso@nrc.gov>
Subject: REPLY: Mary Garland
To: (b)(6)
Date: Thursday, March 24, 2011, 9:52 AM

Hi Ms. Garland:

I just got your inquiry about radiation. What are your specific questions? Low level radiation is all around us. The U.S. Nuclear Regulatory Commission is primarily focused on regulating nuclear power plants. We have this fact sheet available that talks about the decommissioning process for nuclear power plants. Decommissioning is the safe removal of a facility from service and reduction of residual radioactivity to a level that permits termination of the NRC license. I hope this information is helpful, but please let me know if you have more specific questions.

<http://www.nrc.gov/about-nrc/regulatory/decommissioning/faq.html>

Thank you,

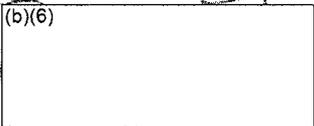
Amy

MM/137

From: Ghneim, Munira
Sent: Thursday, March 24, 2011 11:28 AM
To: Bonaccorso, Amy
Subject: Mary Garland

Hi Amy,

Mary Garland would like to know if someone could answer a few questions for her regarding continuing liability on land with radiation.

You can reach her at  by email at 

Thank You

Munira Ghneim

Contract Secretary

Office of Information Services

301-415-1170

Pannier, Stephen

From: Thomas, Eric *INRRC*
Sent: Thursday, March 24, 2011 3:43 PM
To: NRR_DIRS_IOEB Distribution
Subject: Fukushima Pix

These are from the Ops Center.

G:\ADRO\DIRS\IOEB\Subject Folders\International Activities\Japanese Earthquake\2011 Earthquake and Tsunami\Pictures

Eric Thomas

U.S. Nuclear Regulatory Commission

NRR/DIRS/IOEB

OWFN-7E24

eric.thomas@nrc.gov

301-415-6772 (office)

(b)(6)

mobile)

efp

NW/138

Nelson, Robert

From: Nelson, Robert
Sent: Thursday, March 24, 2011 1:33 PM
To: Shoop, Undine
Subject: RE: Action: REMP Reporting Levels and Fukushima
Attachments: image001.png

Thanks

NELSON

From: Shoop, Undine *mkc*
Sent: Thursday, March 24, 2011 1:31 PM
To: Nelson, Robert
Cc: Heck, Jared; Logaras, Herral; Conatser, Richard; Pederson, Cynthia; Reynolds, Steven; Barker, Allan; Westreich, Barry; Markley, Michael; Oesterle, Eric; Meighan, Sean; Nguyen, Quynh
Subject: RE: Action: REMP Reporting Levels and Fukushima

Nelson,

Based on input from OPA, we will be revising the fact sheet.

Undine

From: Nelson, Robert
Sent: Wednesday, March 23, 2011 8:11 AM
To: Shoop, Undine
Cc: Heck, Jared; Logaras, Herral; Conatser, Richard; Pederson, Cynthia; Reynolds, Steven; Barker, Allan; Westreich, Barry; Markley, Michael; Oesterle, Eric; Meighan, Sean; Nguyen, Quynh
Subject: Action: REMP Reporting Levels and Fukushima

See below. Can you take this for action? If so, please keep me advised of your plans to revise it.

R. A. Nelson

Robert A. Nelson
NRR External Communications Coordinator, Japan Events
Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation



E-mail: robert.nelson@nrc.gov | Office: (301) 415-1453 | Cell: (b)(6) *not* Fax: (301) 415-2102

From: Barker, Allan *R3*
Sent: Tuesday, March 22, 2011 4:36 PM
To: Nelson, Robert
Cc: Heck, Jared; Logaras, Herral; Conatser, Richard; Pederson, Cynthia; Reynolds, Steven
Subject: FW: REMP Reporting Levels and Fukushima

Mr. Nelson,

NN/139

My name is Allan Barker, the Region III Government Liaison Officer. I wanted to share some thoughts about the communication value that I believe exists for the agency on the regulatory environmental monitoring program that is required of licensees. The following email from Richard Conatser to regional HP branch chiefs clearly identifies a need for awareness during inspections of licensee environmental monitoring programs. In addition, I offer the following link to our public web site for the fact sheet issued in February 2002, on "Environmental Monitoring."

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/env-monitoring.html>

What's missing in content for the fact sheet is two-fold. First, a perspective on the detection capability of licensee REMP sampling stations for the Fukushima event, and second, the REMP sampling stations are another defense in depth barrier to collect data to protect the health and safety of the public and the environment.

As the Region III Government Liaison Officer, I recommend that the Environmental Monitoring fact sheet be revised so we can continue to communicate a safety message in the near-term from field data that is collected and analyzed across the nation's reactor sites.

Regards,

Allan Barker
 Government Liaison Officer
 NRC Region III
 (630) 829-9660

From: Conatser, Richard *NRX*
Sent: Monday, March 21, 2011 12:18 PM
To: Werner, Greg; Henderson, Pamela; Dickson, Billy; Bonser, Brian
Cc: Garry, Steven; Pedersen, Roger; Jimenez, Manuel; Clemons-Webb, Candace; Shoop, Undine
Subject: REMP Reporting Levels and Fukushima

All,

You may want to pass this along to your Inspectors who will be on inspections during the next couple of months.

The NRC's REMP REPORTING LEVELS may be exceeded as a result of plumes from Fukushima passing over REMP sampling stations. This email contains some unit conversions for your use. The table below shows the default NRC REPORTING LEVEL for I-131 in REMP samples listed in NUREG-1301 (PWRs) and NUREG-1302 (BWRs). It also converts the REPORTING LEVELS to those units commonly used at the plant sites.

I-131 Reporting Level in NUREG 1301 and NUREG-1302

	I-131	Units	I-131	Units
Drinking Water	2	pCi/L	2E-09	uCi/ml
Non-Drinking Water	20	pCi/L	2E-08	uCi/ml
Air	0.9	pCi/m3	9E-13	uCi/cc

These are default values, and the site-specific values will be in the licensees' ODCMs. The REMP REPORTING LEVELS may be exceeded as a result of plumes from Fukushima passing over REMP sampling stations. The REMP results may vary as various puffs/plumes traverse the US. If a nuclide concentration

exceeds the REPORTING LEVES (averaged over a calendar quarter), the licensee may be required to report the data to the NRC within 30 days. The licensee should take the actions listed in their ODCM.

Because the I-131 (and possibly other radionuclides) from Fukushima will elevate the "background," it will reduce the licensee's ability to differentiate releases from their site. Strong data evaluation and analyses are appropriate at all times, and are particularly applicable at this time. This is also a good verification of licensee's analytical detection capabilities.

Best Regards,

Richard L. Conatser

Health Physicist

Nuclear Regulatory Commission

301-415-4039

Richard.Conatser@NRC.gov

Pannier, Stephen

From: Lara, Julio *R11*
Sent: Thursday, March 24, 2011 12:01 PM
To: Shoop, Undine; Haskell, Russell; Pannier, Stephen; Bernardo, Robert; Pascarelli, Robert; DiFrancesco, Nicholas; Lindsay, Haile; Carlson, Robert; Thorp, John; Norton, Charles; Billoch, Araceli; Mahoney, Michael; NRR_DIRS_IOEB Resource; Merzke, Daniel; Brown, Eva; Norton, Charles
Subject: FW: Daily morning meeting minutes for March 24, 2011

From: Cameron, Jamnes *R11*
Sent: Thursday, March 24, 2011 11:00:49 AM
To: All R3 Users
Subject: Daily morning meeting minutes for March 24, 2011
Auto forwarded by a Rule

The Daily Morning Meeting News for March 24, 2011

Note: This newsletter may contain pre-decisional info.

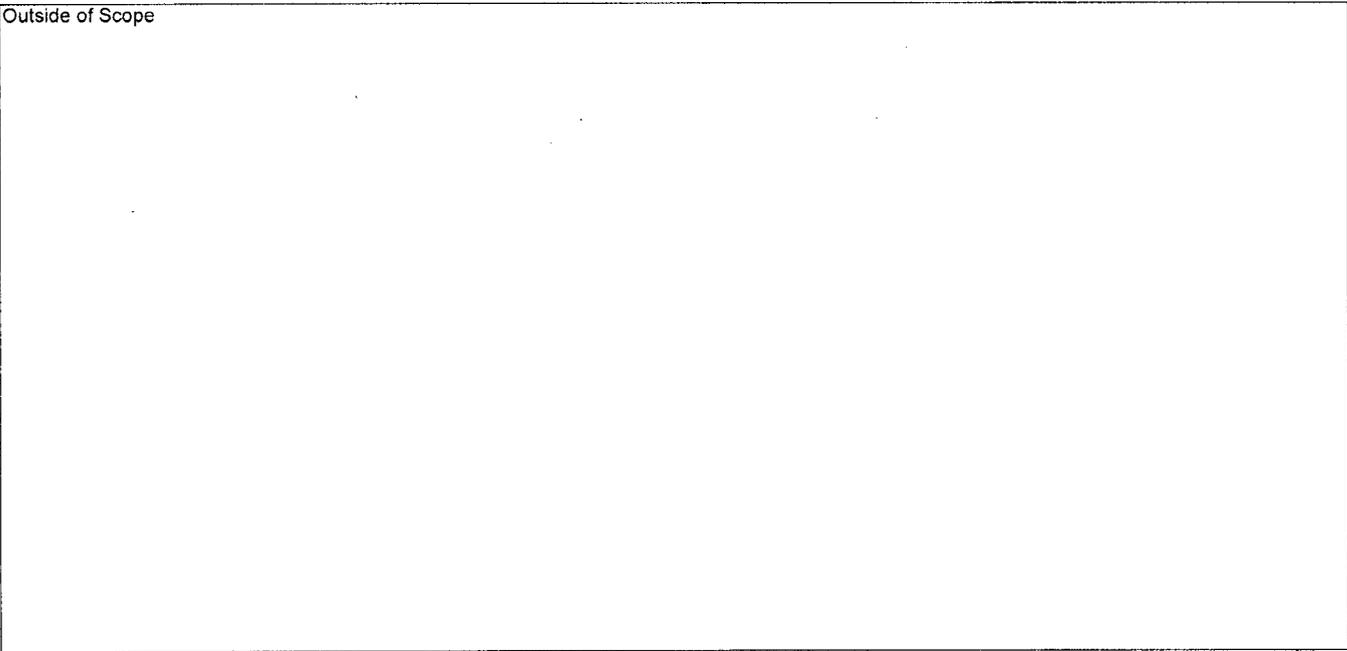
Do not distribute outside the NRC.

Support Issues:

RA Cindy provided a short update on events in Japan, with pictures of the affected Fukushima reactors.

DRP Jack Giessner is on his way to support the NRC response team in Japan. We all wish him luck and a safe return.

Outside of Scope



Outside of Scope

Outside of Scope

0/5

Outside of Scope

Nelson, Robert

From: Nelson, Robert
Sent: Thursday, March 24, 2011 9:38 AM
To: Shoop, Undine
Subject: RE: Action: REMP Reporting Levels and Fukushima
Attachments: image001.png

Thanks!

NELSON

From: Shoop, Undine *MSK*
Sent: Thursday, March 24, 2011 9:36 AM
To: Nelson, Robert
Cc: Heck, Jared; Logaras, Harral; Conatser, Richard; Pederson, Cynthia; Reynolds, Steven; Barker, Allan; Westreich, Barry; Markley, Michael; Oesterle, Eric; Meighan, Sean; Nguyen, Quynh
Subject: RE: Action: REMP Reporting Levels and Fukushima

Nelson,

I have contacted OPA and asked them for guidance since they are our communication experts. As soon as I hear from them I will let you know if we will be revising it or not.

Undine

From: Nelson, Robert *MSK*
Sent: Wednesday, March 23, 2011 8:11 AM
To: Shoop, Undine
Cc: Heck, Jared; Logaras, Harral; Conatser, Richard; Pederson, Cynthia; Reynolds, Steven; Barker, Allan; Westreich, Barry; Markley, Michael; Oesterle, Eric; Meighan, Sean; Nguyen, Quynh
Subject: Action: REMP Reporting Levels and Fukushima

See below. Can you take this for action? If so, please keep me advised of your plans to revise it.

Robert A. Nelson

Robert A. Nelson
NRR External Communications Coordinator, Japan Events
Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation



E-mail: robert.nelson@nrc.gov | Office: (301) 415-1453 | Cell: (b)(6) *et 6* Fax: (301) 415-21021

From: Barker, Allan *11/3*
Sent: Tuesday, March 22, 2011 4:36 PM
To: Nelson, Robert
Cc: Heck, Jared; Logaras, Harral; Conatser, Richard; Pederson, Cynthia; Reynolds, Steven
Subject: FW: REMP Reporting Levels and Fukushima

MSK/141

Mr. Nelson,

My name is Allan Barker, the Region III Government Liaison Officer. I wanted to share some thoughts about the communication value that I believe exists for the agency on the regulatory environmental monitoring program that is required of licensees. The following email from Richard Conatser to regional HP branch chiefs clearly identifies a need for awareness during inspections of licensee environmental monitoring programs. In addition, I offer the following link to our public web site for the fact sheet issued in February 2002, on "Environmental Monitoring."

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Regards,

Allan Barker
Government Liaison Officer
NRC Region III
(630) 829-9660

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Cc: Garry, Steven; Pedersen, Roger; Jimenez, Manuel; Clemons-Webb, Candace; Shoop, Undine
Subject: REMP Reporting Levels and Fukushima

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Air	0.9	pCi/m3	9E-13	uCi/cc

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Best Regards,

Richard L. Conatser

Health Physicist

Nuclear Regulatory Commission

301-415-4039

Richard.Conatser@NRC.gov

Weaver, Tonna

From: Thomas, Brian *MYK*
Sent: Thursday, March 24, 2011 8:07 AM
To: Ruland, William; Meighan, Sean
Cc: Lubinski, John; Mitchell, Matthew; Hardies, Robert; Wolfgang, Robert; Karwoski, Kenneth; Cusumano, Victor; McMurtray, Anthony
Subject: Candidates for 3rd team to Japan

Bill, Sean,

Below are two individuals from DCI for the third team to Japan:

Tim Lupold: has a (b)(6)

Matt Mitchell: has a

..brian



Brian E. Thomas, Acting Deputy Director
Division of Component Integrity (DCI)
Office of Nuclear Reactor Regulations (NRR)
U. S. Nuclear Regulatory Commission
(301) 415-2803

NW/142

Khanna, Meena

From: Burnell, Scott
Sent: Friday, March 25, 2011 1:18 PM
To: Khanna, Meena
Subject: FW: AP reporter: Questions/Diablo Canyon

Hi Meena;

Thanks for your quick work on the GL question and I'm sorry to be a pest -- could you send along that language on these questions? Thanks again.

Scott

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

From: Blood, Michael [<mailto:mblood@ap.org>]
Sent: Friday, March 25, 2011 12:51 PM
To: Burnell, Scott
Subject: RE: AP reporter: Questions/Diablo Canyon

Thanks, Scott.

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

From: Burnell, Scott [<mailto:Scott.Burnell@nrc.gov>]
Sent: Friday, March 25, 2011 9:46 AM
To: Blood, Michael
Subject: RE: AP reporter: Questions/Diablo Canyon

Understood, thanks.

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

From: Blood, Michael [<mailto:mblood@ap.org>]
Sent: Friday, March 25, 2011 12:44 PM
To: Burnell, Scott
Subject: RE: AP reporter: Questions/Diablo Canyon

Again, forget the numbers for now. I'll double check them and get back to you.

Just answer this, please:

Was the Tau Effect used in the design of any other U.S. nuclear plant and, if so, where?

Thanks.

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

From: Burnell, Scott [<mailto:Scott.Burnell@nrc.gov>]
Sent: Friday, March 25, 2011 9:42 AM
To: Blood, Michael
Cc: Dricks, Victor
Subject: RE: AP reporter: Questions/Diablo Canyon

Hi Michael;

NW/143

We'll keep working on 2 and 3. I'm puzzled after a re-read of #2 -- you're aware that Diablo Canyon's safe shutdown earthquake uses the 0.75g number, correct? Thanks.

Scott

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

✓ From: Blood, Michael [mailto:mblood@ap.org]
Sent: Friday, March 25, 2011 12:35 PM
To: Burnell, Scott
Cc: Dricks, Victor
Subject: RE: AP reporter: Questions/Diablo Canyon

Scott,

In the interest of time, please put aside question No. 1 for now. I will send you a revised question later, but don't hold up the other two.

Can you please get me, ASAP, a response to the Tau Effect, in particular, was Diablo the only U.S. nuclear plant where this calculation was used? If there are others, please tell me where.

There is also a question on concrete. Context is below.

Thanks, and please call with any questions.

MB.

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

From: Burnell, Scott [mailto:Scott.Burnell@nrc.gov]
Sent: Friday, March 25, 2011 7:53 AM
To: Blood, Michael
Cc: Dricks, Victor
Subject: RE: AP reporter: Questions/Diablo Canyon

Hello Michael;

Lara's out today so I'm trying to follow up on your questions -- what specific deadline are you working under? My apologies if any of this duplicates e-mails you've already gotten.

Our seismic staff is puzzled by the 1.25g reference, could you be more specific on your source for that? The normal analysis they're familiar with requires no changes whatsoever to arrive at the .75g number.
Thanks.

Scott Burnell
Public Affairs Officer
Nuclear Regulatory Commission

✗ From: Blood, Michael [mailto:mblood@ap.org]
Sent: Tuesday, March 22, 2011 4:51 PM
To: Uselding, Lara
Subject: Questions/Diablo Canyon

Lara,

I understand several changes were made during seismology hearings at Diablo Canyon during its NRC licensing.

Can you relay these questions to one of your NRC experts: I would like to know if these calculations have been used at any other U.S. nuclear plants and, if so, where.

1. At the urging of PG&E, effective acceleration was calculated at an average value, rather than peak. For a magnitude 7.5 quake, peak ground acceleration would be 1.25 times gravity at the plant. The change reduced that to .75g, with the adjustment from peak ground acceleration to effective ground acceleration.
2. A so-called "tau factor" was used, which reduced it again to .67g.
3. To assess the strength of concrete, actual values were used, rather than code allowable minimums.

Thanks.

[cid:image002.jpg@01CBE8A0.908640C0]

Michael R. Blood
Political Writer, Los Angeles

(213) 346-3116, office

(b)(6) cell

<http://twitter/michaelrbloodap>

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[IP_US_DISC]

msk dccc60c6d2c3a6438f0cf467d9a4938

Khanna, Meena

From: Burnell, Scott *10/11/11*
Sent: Friday, March 25, 2011 5:02 PM
To: 'Blood, Michael'
Cc: Uselding, Lara; Dricks, Victor
Subject: RE: AP reporter: Questions/Diablo Canyon

Michael;

The staff is only aware of Diablo Canyon having used the Tau Effect. Please keep in mind that any more definitive statement would involve the staff undertaking that time-consuming search itself. Thanks.

Scott

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

X **From:** Blood, Michael [mailto:mblood@ap.org]
Sent: Friday, March 25, 2011 4:22 PM
To: Burnell, Scott
Cc: Uselding, Lara; Dricks, Victor
Subject: RE: AP reporter: Questions/Diablo Canyon

Scott,

On the Tau Effect question, can your experts put any parameters on the response, at all?

To state the obvious, it will be very time-consuming to undertake a review of 104 FSARs, and many of those reports might not be easily available on Adams.

Can staff say if the use of the Tau Effect in nuclear plant seismic design is commonplace, occasional, rare, mostly unheard of, etc.? Any guidance at all?

Thanks.

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

From: Burnell, Scott [mailto:Scott.Burnell@nrc.gov]
Sent: Friday, March 25, 2011 12:57 PM
To: Blood, Michael
Cc: Uselding, Lara; Dricks, Victor
Subject: RE: AP reporter: Questions/Diablo Canyon

Michael;

Here are the staff responses:

2) The NRC does not readily have a count of nuclear plants that have used the Tau factor approach for evaluation of seismic response of plant structures. Such information may be typically found in the updated Final Safety Analysis Report (FSAR) of the plant, which is a public document. Detailed state-of-the-art soil-structure interaction analyses including the effects of incoherence and embedment are being used by applicants for new reactors.

NN/144

3) Diablo Canyon used an increased concrete compressive strength only for design evaluation of its containment structures for accident load combination that includes the HE seismic design spectrum based on a postulated magnitude 7.5 earthquake on the Hosgri Fault 3 miles from the Diablo Canyon site with a peak ground acceleration of 0.75g. The specified minimum compressive strength of concrete was used for all other load combinations including those with the original operating-basis design earthquake and the original safe shutdown earthquake.

Scott

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

✘ From: Blood, Michael [mailto:mblood@ap.org]
✘ Sent: Friday, March 25, 2011 12:51 PM
To: Burnell, Scott
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Scott Burnell
Public Affairs Officer
Nuclear Regulatory Commission

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[cid:image002.jpg@01CBE8A0.9C9C1100]

Michael R. Blood

Political Writer, Los Angeles

(213) 346-3116, office

(b)(6) ell

<http://twitter/michaelrbloodap>

EXG

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[IP_US_DISC]

msk dccc60c6d2c3a6438f0cf467d9a4938

Bano, Mahmooda

From: Scott, Michael
Sent: Saturday, March 26, 2011 8:03 AM
To: Casto, Chuck; Monninger, John; Dorman, Dan
Subject: Fw: NEW INFO REQUEST FROM JAPAN

Fyi

Sent from my NRC blackberry

Michael Scott
(b)(6)

From: Scott, Michael
To: RST01 Hoc
Cc: 'hochevarar@inpo.org' <hochevarar@inpo.org>; Blamey, Alan
Sent: Sat Mar 26 06:09:18 2011
Subject: NEW INFO REQUEST FROM JAPAN

Dear RST comrades:

The Japanese government requests that we provide available documents that describe how the TMI-2 core was successfully removed from the vessel and prepared for shipping offsite, hopefully including lessons learned. The request included any research documents applicable to the subject.

Please assign this as appropriate. While no specific due date was provided, they regard the effort to figure out what to do with the damaged fuel as a high priority.

For awareness, INPO was requested to provide similar information industry/licensee may have.

Alan, please add this item to your tracker.

NW/145

From: Taylor, Robert *MARK*
To: Scott, Michael
Subject: Re: Status & Recommendations 3-26-11 21 hrs.docx
Date: Sunday, March 27, 2011 7:02:51 AM

RST confirms it is. Presuming no feedback from the industry bosses. Can I send it to the President's science advisor.

Sent from an NRC BlackBerry
Robert Taylor

(b)(6)

From: Scott, Michael *MS*
To: Taylor, Robert
Sent: Sun Mar 27 06:57:55 2011
Subject: Re: Status & Recommendations 3-26-11 21 hrs.docx

Maybe you should verify it's the latest and greatest.

Sent from my NRC blackberry
Michael Scott

(b)(6)

From: Taylor, Robert *MARK*
To: Scott, Michael
Sent: Sun Mar 27 06:52:23 2011
Subject: Re: Status & Recommendations 3-26-11 21 hrs.docx

I did not realize this was the blessed version. The RST continues to pursue "briefings" of industry management. Does Chuck want to wait for that before distributing?

Sent from an NRC BlackBerry
Robert Taylor

(b)(6)

From: Scott, Michael *MS*
To: Taylor, Robert
Sent: Sun Mar 27 06:45:00 2011
Subject: Fw: Status & Recommendations 3-26-11 21 hrs.docx

You already had it.

Sent from my NRC blackberry
Michael Scott

(b)(6)

From: Scott, Michael *MS*
To: Giessner, John; Taylor, Robert; Blamey, Alan; Ali, Syed; Sheikh, Abdul
Cc: Dorman, Dan; Casto, Chuck; Monninger, John
Sent: Sun Mar 27 02:32:54 2011

MM/146

Subject: Fw: Status & Recommendations 3-26-11 21 hrs.docx

Reactor/sfp team: pls review this carefully and be prepared to discuss tonight after the 5:30 meeting.
Thanks

Sent from my NRC blackberry

Michael Scott

(b)(6)

From: RST01 Hoc

To: Blamey, Alan; Casto, Chuck; Dorman, Dan; GE Hitachi
<GE.HitachiNuclearResponseTeam@ge.com>; Giessner, John; INPO ERC Main <inpoerc@inpo.org>;
INPO ERC Tech <inpoerctech@inpo.org>; John Kelly - DOE <johne.kelly@nuclear.energy.gov>;
Monninger, John; Richard Stark - DOE <Richard.Stark@nuclear.energy.gov>; Rob Versluis - DOE
<ROB.VERSLUIS@nuclear.energy.gov>; RST01B Hoc; RST03 Hoc; Sal Golub - DOE
<sal.golub@nuclear.energy.gov>; Scott, Michael; Taylor, Robert

Cc: Ruland, William; RST07 Hoc; RST08 Hoc; RST09 Hoc; RST03 Hoc; LIA07 Hoc; Orr, Mark

Sent: Sat Mar 26 22:55:51 2011

Subject: Status & Recommendations 3-26-11 21 hrs.docx

Team:

Attached is the RST's Consensus Assessment of Fukushima Daiichi Units
with input from the team.

Mark Orr

RST Coordinator

From: Taylor, Robert
To: Ali, Syed
Subject: Re: Followup on SNL paper
Date: Sunday, March 27, 2011 2:49:02 AM

HQ believes that the paper is a good summary and very useful for analyzing hydrogen conditions. In short, it is a relevant document that they can use.

Sent from an NRC BlackBerry
Robert Taylor

(b)(6)

----- Original Message -----
From: Ali, Syed *RES*
To: Taylor, Robert
Sent: Sun Mar 27 02:46:58 2011
Subject: Followup on SNL paper

Mr Omoto at the meeting here is asking if we have followed up on the SNL paper that he gave to Tony Nakanishi yesterday. MScott is asking if you could please find out about that.
Thanks,
Syed

NR/147

17K12
From: Taylor, Robert
To: Moninger, John
Subject: SFP calculations
Date: Monday, March 28, 2011 6:07:24 PM

John,

Please send me the SFP calcs we talked about yesterday before you depart us.

Rob

Sent from an NRC BlackBerry

Robert Taylor

(b)(6)

NW/148

1285

From: Scott, Michael
To: Sheikh, Abdul; Ali, Syed; "john.geissner@nrc.gov"; Taylor, Robert
Subject: Re: Spent Fuel Cooling
Date: Monday, March 28, 2011 4:00:40 AM

Good stuff - thanks. Will discuss tomorrow at 11 am meeting.

Sent from my NRC blackberry
Michael Scott

(b)(6)

From: Sheikh, Abdul
To: Ali, Syed; Scott, Michael; john.geissner@nrc.gov <john.geissner@nrc.gov>; Taylor, Robert
Sent: Mon Mar 28 01:32:10 2011
Subject: Spent Fuel Cooling

This morning TEPCO informed us of the following:

Volume of water to fill the pool: 1400 metric tons
Volume of water pumped yesterday in SFP for Unit 4: (b)(6)
Increase in water level: 50 mm (2 inch)

I made calculations and found the following:

Volume of water in the pool: 1385 metric tons
Increase in water level due to 125 Tons of water: 44.60 inch

Of course some water will be lost in the spray to the other areas of reactor building. But not in a ratio of 1 to 22. We should ask clarification from TEPCO about this issue.

Abdul

NW/149

Nelson, Robert

From: Nelson, Robert
Sent: Monday, March 28, 2011 12:34 PM
To: PMT07 Hoc
Subject: RE: NEI website for monitoring data from US Plant
Attachments: image001.png

Will do!

Robert A. Nelson

Robert A. Nelson
NRR External Communications Coordinator, Japan Event
Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation



E-mail: robert.nelson@nrc.gov | Office: (301) 415-1453 | Cell: (b)(6) *cab* | Fax: (301) 415-2102

From: PMT07 Hoc
Sent: Monday, March 28, 2011 12:04 PM
To: Nelson, Robert
Cc: Hoc, PMT12
Subject: NEI website for monitoring data from US Plant

Robert:

On a telecom today with industry and government response centers Ellen Anderson of NEI identified you as the POC to receive the username and password to access the NEI website where they will be tabularizing the collected data from US plants related to the Japan Fukushima Daiichi Accident.

Ellen indicated that there would be only one sign in per organization and we request that you forward the sign in information to PMT12.hoc@nrc.gov when you receive it.

Thanks!

NW/150

Weaver, Tonna

From: Smith, Brooke *DIP*
Sent: Monday, March 28, 2011 7:41 PM
To: Nakanishi, Tony
Subject: Fw: NRC Meetings for March 29, 2011
Attachments: NRC meetings 03-29-11.docx

Sent from an NRC Blackberry.
Brooke G. Smith

(b)(6) *tb*

From: Brooke Smith <(b)(6)> *~ W/H*
To: Smith, Brooke
Sent: Mon Mar 28 19:39:45 2011
Subject: NRC Meetings for March 29, 2011

NW/151

NRC meetings scheduled for March 29, 2011

	<u>Location</u>
1100 NISA/TEPCO daily status	TEPCO
1100 Health Effects Meeting	Cabinet
1400 NISA – Shielding / Confinement Taskforce	NISA
1400 MOD – Crisis Management	MOD
1430 NISA – Health Effects Taskforce	NISA
1600 NISA – Spent Fuel Removal Taskforce	NISA
2000 Cabinet meeting	Kantei

Note:

1. An additional meeting with TEPCO may be scheduled today to discuss radiation protection.

Wilson, George

From: Wilson, George *ARK*
Sent: Tuesday, March 29, 2011 3:18 PM
To: Armstrong, Kenneth; Wertz, Trent; Nguyen, Quynh; Nelson, Robert; Milligan, Patricia
Cc: Mathew, Roy; Matharu, Gurcharan; Hiland, Patrick; Skeen, David; Leeds, Eric; Virgilio, Martin; Uhle, Jennifer; Sheron, Brian; Weber, Michael
Subject: RE: ACTION: RESPONSE - News Article on SOARCA

Question 1. 93 of the U.S. plants only had a 4-hour coping capacity for SBO. The rest could cope for 8 hours. Is this valid? (NRR)

No that is not correct, the NRC only allows up to a 4 hour coping analysis with batteries, anything longer requires an alternate AC source, the coping time for an alternate AC source ranges from 2 to a maximum of 16 hours. 44 plants are battery coping plants, 60 plants are alternate AC source plants. The definition of coping is the time until off site power is restored or an emergency diesel generator is restored (.i.e. on site or off site power is restored)

Two methods of coping with a SBO event:

- I. AC independent (relying on Battery power only)
 - II. Alternate AC
1. AC independent (Battery coping) plants have to satisfy all the requirements for maintaining a plant in a safe condition for a maximum duration of 4 hours. Hence plants relying on battery power alone have adequate battery capacity for only FOUR HOURS based on the SBO loads and using the existing safety related batteries. 44 plants fall in this category.
 2. If the configuration of offsite power (the grid system), onsite power (emergency diesel generators) and reliability of these sources could be affected by weather related events, and IF restoration of these sources was not possible within 4 hours, then the plants had to use an alternate AC (AAC) source. Therefore, these plants decided to comply with SBO rule by using the AAC source. Plants using AAC source had a variable coping duration between 2 hours and 16 hours. 60 plants fall in this category (4-16 hours).

In summary,

44 plants adopted AC independent method and have battery power for 4 hours.

43 plants use AAC methodology and can restore AC (EDG or Offsite) power within 4 hours. Hence have a coping duration of 4 hours.

14 plants use AAC methodology and can restore AC (EDG or Offsite) power within 8 hours

3 plants uses AAC and have a 16 hour duration for restoration of AC power. This site (3 units) had originally assumed a 4 hour duration but EDG reliability and LOOP events affected the calculated duration that this plant had to consider.

Question 2. Does this take into consideration the B5b mitigating measures? (NRR, NSIR)

No the SBO rule was made before B5b, the following was used to analyze the coping time. The specified SBO duration is based on the following factors:

- The redundancy of the onsite emergency ac power sources

NW/152

- The reliability of the onsite emergency ac power sources
- The expected frequency of loss of offsite power
- The probable time needed to restore offsite power

Question 3. What power is available for SFP cooling in US plants? (Diesels, batteries, etc?) (NRR)

SBO rule does not address this. But the power supply bus that provides power to the SFP pumps is normally powered from off- site power and can be backed up or powered by the EDG's.

From: Armstrong, Kenneth
Sent: Tuesday, March 29, 2011 2:39 PM
To: Wilson, George
Subject: RE: ACTION: RESPONSE - News Article on SOARCA

George,

Thanks for your help, I am pooling information together for a consolidated response back to Mike, please let me know if you are able to address the questions below or if you are developing your own Q&As.

Thanks!
Kenneth

From: Wilson, George *NR*
Sent: Tuesday, March 29, 2011 2:19 PM
To: Armstrong, Kenneth; Milligan, Patricia
Subject: Re: ACTION: RESPONSE - News Article on SOARCA

We are working on this

Sent from nrc blackberry

George Wilson

(b)(6)

ELB

From: Armstrong, Kenneth
To: Milligan, Patricia; Wilson, George
Sent: Tue Mar 29 13:49:29 2011
Subject: FW: ACTION: RESPONSE - News Article on SOARCA

Patricia and George,

Kathy drafted the 5 questions below in response to Mike Weber's info request pertaining to the recent AP article on SOARCA (link below). Would you please provide a response where appropriate before 3:00PM today if possible?

http://news.yahoo.com/s/ap/20110329/ap_on_re_us/us_us_japan_nuclear_blackouts_2

Thanks for your time,
Kenneth

From: Gibson, Kathy
Sent: Tuesday, March 29, 2011 1:44 PM
To: Sheron, Brian
Cc: Armstrong, Kenneth; Tinkler, Charles
Subject: RE: ACTION: RESPONSE - News Article on SOARCA

These are the questions we are working on. Ken Armstrong will reach out to NRR (Wilson), NSIR (Milligan), and Charlie is working on SOARCA insights. Ideally we will try to get NRR and NSIR to provide their answers to us so we can provide one package to EDO. This is the plan I agreed to with Roger Rihm.

1. 93 of the U.S. plants only had a 4-hour coping capacity for SBO. The rest could cope for 8 hours. Is this valid? (NRR)
2. Does this taken into consideration the B5b mitigating measures? (NRR, NSIR)
3. What power is available for SFP cooling in US plants? (Diesels, batteries, etc?) (NRR)
4. SOARCA insights relevant to AP article. (RES, Charlie)
5. Was SBO considered among the scenarios that resulted in the U.S. decision to establish the nominal exposure pathway EPZ at 10 miles?) (NSIR, Trish)
6. Do we need a bigger EPZ? (NSIR, Trish)

I'm also trying to contact Scott Burnell to see if we already have Q's and A's on these topics to draw from and not duplicate. Also OCA.



Kathy Halvey Gibson
Director
Division of Systems Analysis

Kathy.Gibson@nrc.gov
(301) 251-7499 Work
(b)(6) Cell

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulation, Research
Protecting People and the Environment

From: Sheron, Brian
Sent: Tuesday, March 29, 2011 1:37 PM
To: Gibson, Kathy
Subject: FW: ACTION: RESPONSE - News Article on SOARCA

From: Wilson, George
Sent: Tuesday, March 29, 2011 1:21 PM
To: Leeds, Eric; Hiland, Patrick
Cc: Weber, Michael; Skeen, David; Sheron, Brian; Uhle, Jennifer; Virgilio, Martin
Subject: RE: ACTION: RESPONSE - News Article on SOARCA

I am already working on this

From: Leeds, Eric
Sent: Tuesday, March 29, 2011 12:48 PM
To: Wilson, George; Hiland, Patrick

Cc: Weber, Michael; Skeen, David; Sheron, Brian; Uhle, Jennifer; Virgilio, Martin
Subject: ACTION: RESPONSE - News Article on SOARCA

George –

Please see Mike's comments and questions below. Could you please comment on the SBO coping times that UCS has provided and clarify as appropriate for me and Mike. I'll be giving a presentation at the National Governors Association meeting next Monday and the info will be helpful.

Thanks!

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

From: Weber, Michael
Sent: Tuesday, March 29, 2011 12:14 PM
To: Sheron, Brian

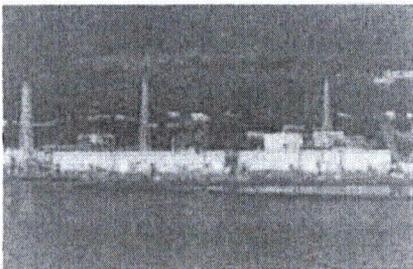
Cc: Virgilio, Martin; Leeds, Eric; Johnson, Michael; Wiggins, Jim; Rihm, Roger; Milligan, Patricia; Wittick, Brian; Brenner, Eliot; Hayden, Elizabeth; Schmidt, Rebecca; Powell, Amy; Muesle, Mary; Andersen, James; Bowman, Gregory
Subject: RESPONSE - News Article on SOARCA

Thanks, Brian. I'll need to be prepared to respond to this concern in tomorrow morning's hearing and the Chairman will need to be prepared to respond at his hearings tomorrow. Please work with OEDO staff (Roger Rihm/Brian Wittick) to ensure that we develop a short-response by COB today that we can use tomorrow in case this comes up.

David Lochbaum reported at this morning's hearing that 93 of the U.S. plants only had a 4-hour coping capacity for SBO. The rest could cope for 8 hours. Is this valid? Does this taken into consideration the B5b mitigating measures? Was SBO considered among the scenarios that resulted in the U.S. decision to establish the nominal exposure pathway EPZ at 10 miles?

AP IMPACT: Long blackouts pose risk to US reactors

AP Associated Press



AP – Only Unit 2 is covered with white concrete housing, seen on left of an iron tower on right, at the stricken ...

By DINA CAPPIELLO, Associated Press Dina Cappiello, Associated Press – Tue Mar 29, 3:13 am ET

WASHINGTON – Long before the nuclear emergency in Japan, U.S. regulators knew that a power failure lasting for days at an American nuclear plant, whatever the cause, could lead to a radioactive leak. Even so, they have only required the nation's 104 nuclear reactors to develop plans for dealing with much shorter blackouts on the assumption that power would be restored quickly.

In one nightmare simulation presented by the Nuclear Regulatory Commission in 2009, it would take less than a day for radiation to escape from a reactor at a Pennsylvania nuclear power plant after an earthquake, flood or fire knocked out all electrical power and there was no way to keep the reactors cool after backup battery power ran out. That plant, the Peach Bottom Atomic Power Station outside Lancaster, has reactors of the same older make and model as those releasing radiation at Japan's Fukushima Dai-ichi plant, which is using other means to try to cool the reactors.

And like Fukushima Dai-ichi, the Peach Bottom plant has enough battery power on site to power emergency cooling systems for eight hours. In Japan, that wasn't enough time for power to be restored. According to the International Atomic Energy Agency and the Nuclear Energy Institute trade association, three of the six reactors at the plant still can't get power to operate the emergency cooling systems. Two were shut down at the time. In the sixth, the fuel was removed completely and put in the spent fuel pool when it was shut down for maintenance at the time of the disaster. A week after the March 11 earthquake, diesel generators started supplying power to two other two reactors, Units 5 and 6, the groups said.

The risk of a blackout leading to core damage, while extremely remote, exists at all U.S. nuclear power plants, and some are more susceptible than others, according to an Associated Press investigation. While regulators say they have confidence that measures adopted in the U.S. will prevent or significantly delay a core from melting and threatening a radioactive release, the events in Japan raise questions about whether U.S. power plants are as prepared as they could and should be.

"We didn't address a tsunami and an earthquake, but clearly we have known for some time that one of the weak links that makes accidents a little more likely is losing power," said Alan Kolaczowski, a retired nuclear engineer who worked on a federal risk analysis of Peach Bottom released in 1990 and is familiar with the updated risk analysis.

Risk analyses conducted by the plants in 1991-94 and published by the commission in 2003 show that the chances of such an event striking a U.S. power plant are remote, even at the plant where the risk is the highest, the Beaver Valley Power Station in Pennsylvania.

These long odds are among the reasons why the United States since the late 1980s has only required nuclear power plants to cope with blackouts for four or eight hours, depending on the risk. That's about how much time batteries would last. After that, it is assumed that power would be restored. And so far, that's been the case.

Equipment put in place after the Sept. 11, 2001, terrorist attacks could buy more time. Otherwise, the reactor's radioactive core could begin to melt unless alternative cooling methods were employed. In Japan, the utility has tried using portable generators and dumped tons of seawater, among other things, on the reactors in an attempt to keep them cool.

A 2003 federal analysis looking at how to estimate the risk of containment failure said that should power be knocked out by an earthquake or tornado it "would be unlikely that power will be recovered in the time frame to prevent core meltdown."

In Japan, it was a one-two punch: first the earthquake, then the tsunami.

Tokyo Electric Power Co., the operator of the crippled plant, found other ways to cool the reactor core and so far avert a full-scale meltdown without electricity.

"Clearly the coping duration is an issue on the table now," said Biff Bradley, director of risk assessment for the Nuclear Energy Institute. "The industry and the Nuclear Regulatory Commission will have to go back in light of what we just observed and rethink station blackout duration."

David Lochbaum, a former plant engineer and nuclear safety director at the advocacy group Union of Concerned Scientists, put it another way: "Japan shows what happens when you play beat-the-clock and lose."

Lochbaum plans to use the Japan disaster to press lawmakers and the nuclear power industry to do more when it comes to coping with prolonged blackouts, such as having temporary generators on site that can recharge batteries.

A complete loss of electrical power, generally speaking, poses a major problem for a nuclear power plant because the reactor core must be kept cool, and back-up cooling systems — mostly pumps that replenish the core with water — require massive amounts of power to work.

Without the electrical grid, or diesel generators, batteries can be used for a time, but they will not last long with the power demands. And when the batteries die, the systems that control and monitor the plant can also go dark, making it difficult to ascertain water levels and the condition of the core.

One variable not considered in the NRC risk assessments of severe blackouts was cooling water in spent fuel pools, where rods once used in the reactor are placed. With limited resources, the commission decided to focus its analysis on the reactor fuel, which has the potential to release more radiation.

An analysis of individual plant risks released in 2003 by the NRC shows that for 39 of the 104 nuclear reactors, the risk of core damage from a blackout was greater than 1 in 100,000. At 45 other plants the risk is greater than 1 in 1 million, the threshold NRC is using to determine which severe accidents should be evaluated in its latest analysis.

The Beaver Valley Power Station, Unit 1, in Pennsylvania had the greatest risk of core melt — 6.5 in 100,000, according to the analysis. But that risk may have been reduced in subsequent years as NRC regulations required plants to do more to cope with blackouts. Todd Schneider, a spokesman for FirstEnergy Nuclear Operating Co., which runs Beaver Creek, told the AP that batteries on site would last less than a week.

In 1988, eight years after labeling blackouts "an unresolved safety issue," the NRC required nuclear power plants to improve the reliability of their diesel generators, have more backup generators on site, and better train personnel to restore power. These steps would allow them to keep the core cool for four to eight hours if they lost all electrical power. By contrast, the newest generation of nuclear power plant, which is still awaiting approval, can last 72 hours without taking any action, and a minimum of seven days if water is supplied by other means to cooling pools.

Despite the added safety measures, a 1997 report found that blackouts — the loss of on-site and off-site electrical power — remained "a dominant contributor to the risk of core melt at some plants." The events of Sept. 11, 2001, further solidified that nuclear reactors might have to keep the core cool for a longer period without power. After 9/11, the commission issued regulations requiring that plants have portable power supplies for relief valves and be able to manually operate an emergency reactor cooling system when batteries go out.

The NRC says these steps, and others, have reduced the risk of core melt from station blackouts from the current fleet of nuclear plants.

For instance, preliminary results of the latest analysis of the risks to the Peach Bottom plant show that any release caused by a blackout there would be far less rapid and would release less radiation than previously thought, even without any actions being taken. With more time, people can be evacuated. The NRC says improved computer models, coupled with up-to-date information about the plant, resulted in the rosier outlook.

"When you simplify, you always err towards the worst possible circumstance," Scott Burnell, a spokesman for the Nuclear Regulatory Commission, said of the earlier studies. The latest work shows that "even in situations where everything is broken and you can't do anything else, these events take a long time to play out," he said. "Even when you get to releasing into environment, much less of it is released than actually thought."

Exelon Corp., the operator of the Peach Bottom plant, referred all detailed questions about its preparedness and the risk analysis back to the NRC. In a news release issued earlier this month, the company, which operates 10 nuclear power plants, said "all Exelon nuclear plants are able to safely shut down and keep the fuel cooled even without electricity from the grid."

Other people, looking at the crisis unfolding in Japan, aren't so sure.

In the worst-case scenario, the NRC's 1990 risk assessment predicted that a core melt at Peach Bottom could begin in one hour if electrical power on- and off-site were lost, the diesel generators — the main back-up source of power for the pumps that keep the core cool with water — failed to work and other mitigating steps weren't taken.

"It is not a question that those things are definitely effective in this kind of scenario," said Richard Denning, a professor of nuclear engineering at Ohio State University, referring to the steps NRC has taken to prevent incidents. Denning had done work as a contractor on severe accident analyses for the NRC since 1975. He retired from Battelle Memorial Institute in 1995.

"They certainly could have made all the difference in this particular case," he said, referring to Japan. "That's assuming you have stored these things in a place that would not have been swept away by tsunami."

From: Chang, Richard

Sent: Tuesday, March 29, 2011 7:35 AM

To: Schaperow, Jason; Tinkler, Charles; Santiago, Patricia; Ghosh, Tina; Armstrong, Kenneth

Subject: FYI- News Article on SOARCA

http://news.yahoo.com/s/ap/20110329/ap_on_re_us/us_us_japan_nuclear_blackouts_2

Richard Chang
Program Manager
RES/DSA/SPB
301-251-7980

Tracking:

Recipient	Read
Armstrong, Kenneth	Read: 3/29/2011 3:27 PM
Wertz, Trent	
Nguyen, Quynh	Read: 3/31/2011 2:23 PM
Nelson, Robert	
Milligan, Patricia	Read: 3/29/2011 7:15 PM
Mathew, Roy	Read: 3/29/2011 3:21 PM
Matharu, Gurcharan	Read: 3/29/2011 3:29 PM
Hiland, Patrick	Read: 3/29/2011 4:51 PM
Skeen, David	
Leeds, Eric	
Virgilio, Martin	Read: 3/29/2011 4:09 PM
Uhle, Jennifer	Read: 3/29/2011 3:41 PM
Sheron, Brian	Read: 3/29/2011 3:20 PM
Weber, Michael	Read: 3/29/2011 5:25 PM

From: Taylor, Robert *NRK*
To: Cook, William
Subject: Re: Info
Date: Tuesday, March 29, 2011 4:23:05 AM

Units 1,2 - Intermittent (not daily) additions. No set pattern
Units 3,4 - Normally daily 3-hour additions, approx 18 tons/hr

Sent from an NRC BlackBerry
Robert Taylor

(b)(6)

----- Original Message -----
From: Cook, William *NRK*
To: Taylor, Robert
Sent: Tue Mar 29 04:02:54 2011
Subject: Re: Info

Do you guys know how much water is being pumped into the leaking SFPs? (Per day). Question pertains to the amount of effluent tepco is trying to contain. Goes in vs go out. Bill
Sent via NRC BlackBerry

----- Original Message -----
From: Taylor, Robert *NRK*
To: Cook, William
Sent: Tue Mar 29 03:43:39 2011
Subject: Info

I think Monninger indicated you need some info. How do you want to close the loop?

Sent from an NRC BlackBerry
Robert Taylor

(b)(6)

NRK/153

From: Klein, Paul *NR*
To: Taylor, Robert
Subject: RE: TASKING: NRR-DCI Salt Water Effects and Drywell Pressure
Date: Tuesday, March 29, 2011 8:51:24 AM
Attachments: 3-28-2011-2100_email_from_Berkeley_professor.docx

Rob,

It was an email from a UC Berkeley professor (attached) stating that SCC rates could be up to 0.3 inches per day. We provided a best estimate range of 0.02 to 0.1 inches per day. Based on data in 22% sodium chloride solution at 105C, we chose 0.03 inches per day for our calculations, an order of magnitude lower than the professor's upper bound limit.

Lacking information about the time-temperature history experienced by the reactor vessel and piping materials, our relative ranking of susceptibility is clearly a best guess.

Paul

From: Taylor, Robert *NR*
Sent: Tuesday, March 29, 2011 8:29 AM
To: Klein, Paul
Subject: Re: TASKING: NRR-DCI Salt Water Effects and Drywell Pressure

What was the source of this request? I heard it was in response to something sent in from a member of the public.

Sent from an NRC BlackBerry
Robert Taylor

(b)(6) *EL*

From: Klein, Paul *NR*
To: RST01 Hoc
Cc: Lubinski, John; Hardies, Robert; Tregoning, Robert; Csontos, Aladar; Mitchell, Matthew; Taylor, Robert
Sent: Mon Mar 28 15:07:31 2011
Subject: RE: TASKING: NRR-DCI Salt Water Effects and Drywell Pressure

NRC staff response follows:

Question #1: Provide an assessment of the timeframe (i.e. days, weeks, months) for which structural failures of RPV and torus components due to stress corrosion cracking should be a focus. The more specificity that can be provided the better.

Response:

General Comments:

1. NRC staff concurs that seawater injection will cause corrosion degradation of stainless steel components, most likely at welds.
2. Stress corrosion cracking of austenitic stainless steels in concentrated chloride-containing solutions such as concentrated seawater can progress

NN/154

rapidly 0.02-0.1 in/day (email attachment provides stress corrosion cracking data with references).

3. **Best estimates for cracking are provided. Recognize that actual crack rates are highly dependent on the local environment and the staff has limited information.**
4. Prioritization of concerns (timeliness of concern with respect to leakage from initiation of seawater injection):
 1. Stainless Steel Recirculation Piping (couple of weeks)
 2. Stainless Steel Reactor Pressure Vessel CRD Housing (couple of weeks)
 3. Stainless Steel External Core Spray Line (couple of weeks)
 4. Stainless Steel Internals/Spargers (days to couple of weeks)
 5. Torus & RPV not significant concerns in the short term (several weeks to months)

- Absent significant pressure or seismic loadings, leakage from cracks, pits, etc is more likely than a pipe rupture.
- Staff agrees that fresh water injection is beneficial, however, chloride SCC will not be immediately mitigated by injection of fresh water since crevices and cracks will retain chlorides.
- SCC cracking of austenitic stainless steel vessel internals will occur over time so that potential changes to core geometry from progressing SCC should be anticipated.

Component Specific Concerns

1. Stainless steel piping systems: (Recirculation & Core Spray)
 - Assumptions:
 - Stress corrosion cracking rate of 0.03 in/day
 - Typical and bounding weld residual stress profiles
 - Temperature/Pressure profiles from available information
 - Preliminary Component Integrity Calculations:
 - Through-wall circumferential cracking:
 - ~2 weeks for a 0.5" thick pipe
 - ~4 weeks for 1" thick pipe
 - Note: many calculated circumferential cracks arrested prior to growing through-wall, but, may grow through-wall during a transient, e.g. additional seismic loading.
 - Low probability of occurrence for pipe rupture scenario
 - Leakage from these cracks more likely than rupture
 - Through-wall axial cracking:
 - Similar timeframe for leakage as circumferential cracking
 - Axial cracking more likely and widespread than circumferential cracking
1. Stainless Steel Reactor Pressure Vessel CRD Housing:
 - Assumptions:
 - Same as stainless steel piping
 - Tensile yield stress through-wall
 - Preliminary Component Integrity Calculations:
 - ~2-3 weeks for a 0.565" (14mm) thick CRD housing
 - Higher likelihood of leakage than piping:
 - Higher concentration of salt

- Location at the bottom of the vessel
 - Large of number of housings
 - High weld residual stresses
2. Stainless Steel Internals/Spargers (days to couple of weeks)
 - Assumptions:
 - Same as stainless steel piping
 - Preliminary Component Integrity Assessment:
 - More likely than piping systems to be damaged by corrosion and thermo-mechanical loading from heating and environmental effects.
 - Concern is rated #3 because internals are not a barrier to fission product release, however, internals/spargers failures could increase core damage.
 3. Torus & RPV:
 - Less susceptible to stress corrosion cracking in salt water:
 - Carbon and Low Alloy Steels not stainless steel
 - RPV stainless steel cladding (0.1875in (5mm) thick) is susceptible to stress corrosion cracking, however, RPV (~5in (~125mm) thick) is a low alloy steel and is less susceptible to stress corrosion cracking

Corrosion of the RPV could occur over longer time frames than stress corrosion cracking in stainless steel piping systems, e.g. months

Points of Contact: NRR/DCI – Robert Hardies, Matthew Mitchell; RES/DE – Al Csontos, Robert Tregoning, Darrell Dunn

Question #2: What is the maximum design pressure, per ASME Code requirements, the containment should be able to withstand (i.e. x% design bases pressure).

Response

1. ASME B&PV Code, Section III, Division 1, Subsection NE, sets the rules for class MC components which include metal containments.
2. Per 2010 Edition of ASME B&PV Code NE-3112.1, Design Pressure, "The design internal pressure shall not be less than 100% of the maximum containment internal pressure under conditions for which the containment function is required."
3. Per 2010 Edition of ASME B&PV Code NE-6000, Testing, all pressure retaining vessels and appurtenances shall be pressure tested.
 - a. If a hydrostatic test pressure is conducted, the minimum pressure is 1.2 times the design pressure.
 - b. If a pneumatic pressure test is conducted, the minimum test pressure is 1.1 times the design pressure.
4. The load conditions that the containment is designed include:
 - a. Test condition
 - b. Design condition
 - c. Service conditions (Level-A, B, C and D service limits)

The corresponding stress limits for each load condition are specified in ASME B&PV Code, Section III, Division 1, Subsection NE.

5. Design guidance for steel containment vessel loading is provided in RG 1.57 and SRP 3.8.2. Each load condition (test, design or service) consists of specific load combinations.

As an example, design condition includes design pressure and temperature whereas Level C service condition includes design pressure and temperature in combination with safe shutdown earthquake. ASME B&PV Code, Section III, Division 1, Subsection NE allows a higher stress limit for Level C than for the design condition. Therefore, depending on the magnitude of the SSE, Level C loading condition may or may not govern the design of the vessel.

6. Per Quad Cities FSAR: This provides a perspective for Mark I.

"The drywell design pressure for Quad Cities is 56 psig whereas the design pressure for the Dresden Units is 62 psig."

".... The containment vessels were pneumatically over-pressure tested at 115% of the design pressure ($1.15 \times 62 = 71.3$ psig in the case of Dresden)"

Definitions:

- a. Test condition - This is to verify the leak-tight integrity and structural integrity of the containment.
- b. Design condition - This includes all design loadings that the containment vessel is subjected. Such loads include design pressure, design temperature, and the design mechanical loads generated by the design-basis accident.
- c. Level A service limits - These service limits are applicable to the service loadings to which the containment is subjected, including the design-basis accident conditions for which the containment function is required.
- d. Level B service limits - These service limits include the loads subject to Level A service limits, plus the additional loads resulting from natural phenomena (e.g., OBE) during which the plant must remain operational.
- e. Level C service limits - These service limits include the loads subject to Level A service limits, plus the additional loads resulting from natural phenomena (e.g., SSE) for which safe shutdown of the plant is required.
- f. Level D service limits - These service limits include other applicable service limits and loadings of a local dynamic nature (e.g., design basis accident and SSE in combination with missile impact or jet impingement loads) for which the containment function is required.

Point of Contacts: NRR/DE – George Wilson, Farhad Farzam

From: RST01 Hoc

Sent: Monday, March 28, 2011 4:39 AM

To: Lubinski, John; Hardies, Robert; Klein, Paul; Tregoning, Robert; Csontos, Aladar

Cc: Sheron, Brian; Weber, Michael; Virgilio, Martin

Subject: FW: TASKING: NRR-DCI Salt Water Effects and Drywell Pressure

From: RST07 Hoc
Sent: Monday, March 28, 2011 4:25 AM
To: RST01 Hoc
Subject: TASKING: NRR-DCI Salt Water Effects and Drywell Pressure

Please pass on to John Lubinski, Paul Klein, Bob Hardies, Al Santos, and Rob Tregonig with a :CC to Brian Sheron, Mike Weber, and Marty Virgilio.

~~~~~

As a result of the need to inject saltwater into the Fukushima Daiichi Units 1-3 reactor pressure vessels, there are growing concerns regarding the effect of the salt in the seawater on the vessel internals. The three units are BWR-with Mark I containments (similar to Dresden –Unit 1 and Quad Cities - Units 2 and 3). The licensee (Tokyo Electric Power Company, TEPCO) ceased injection of seawater on March 25<sup>th</sup> for Units 1 and 3 and on March 26<sup>th</sup> on Unit 2 and are now using fresh water. For some time they were injecting borated seawater on Units 1 and 3. Boric acid injection began on Unit 2 with the freshwater injection.

The industry, the Department of Energy (DOE) and the Office of Naval Reactors has provided input (see attached) regarding the effects. For the most parts these assessments indicate no concern, in the short term (i.e. days), regarding any reactor pressure vessel (RPV) structural failures (i.e. welds, etc...) as a result of a corrosion mechanism. However, last night RES received the attached e-mail from a Berkley professor concerned that the chloride concentration could result in a high corrosion rate (0.8 cm/day in stainless).

It is our understanding that RES and DCI have already started looking at concerns related to salt accumulation and corrosion and we are looking for a response. The response should be sure to address the following questions:

Question #1: Provide an assessment of the timeframe (i.e. days, weeks, months) for which structural failures of RPV and torus components due to stress corrosion cracking should be a focus. The more specificity that can be provided the better.

Also, there is a concern regarding when to vent containment. There is core damage on the three units (Units 1-3). Pressure has been increasing .

Question #2: What is the maximum design pressure, per ASME Code requirements, the containment should be able to withstand (i.e. x% design bases pressure).

The RST is looking for a response by COB March 28, 2011.

Eva Brown, RST BWR Systems and Ops Analyst

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

From: Per F. Peterson [mailto:[peterson@nuc.berkeley.edu](mailto:peterson@nuc.berkeley.edu)]

Sent: Sunday, March 27, 2011 5:25 PM

To: DL-NITsolutions

Subject: Fwd: reactor#3 and others

I am forwarding this email from Professor Tom Devine, a colleague in Materials Science and Engineering at UC Berkeley who has extensive experience in corrosion processes in light water reactor systems. He expresses strong concern about the likelihood of very rapid stress corrosion cracking in the reactor primary system (0.8 cm/day), given the high concentration of chloride in the reactor coolant. He believes that it is urgent to begin flushing salt water out of these systems. I think that it is worthwhile to take this concern seriously.

-Per

>Date: Fri, 25 Mar 2011 09:57:48 -0700

>Subject: reactor#3 and others

>From: [devine@berkeley.edu](mailto:devine@berkeley.edu)

>To: [Peterson@nuc.Berkeley.edu](mailto:Peterson@nuc.Berkeley.edu)

>

>-----

>Per,

>

>I'm troubled by the report I just heard on CNN, which indicated that Co  
>was in the

>ocean adjacent to the plant and in the water that burned the three

>workers. Apparently the workers were exposed to Co-containing water while

>in the turbine room. The presence of Co at these two locations suggests

>that water from the core is releasing into the ocean and into the turbine

>room.

>

>The cause of the leak(s) might be pipes that were cracked during the

>hydrogen explosions. Alternatively, the leak(s) might be due to corrosion

>and/or stress corrosion cracking. The possibility of corrosion and scc

>must be urgently addressed.

>

>The email that I sent to you one week

>ago was prompted by our parking-lot discussion in which you mentioned the  
>amount of salt water that was being used to cool the reactors. My concern  
>then was that the chloride would cause stress corrosion cracking of the  
>stainless steel cladding that coats the inside of the RPV and of stainless  
>steel piping that is part of the cooling system. I indicated that an upper  
>limit SCC velocity of about 0.8 cm/day in stainless steel exposed to hot  
>aqueous chloride. Hot aqueous chloride would severely corrode, and  
>possibly crack, low alloy steel and carbon steel, especially if oxygen  
>(from air) is also present.

>

>The only sure way of stopping SCC is to remove the stress. In this case  
>removing the stress might not be possible because the highest stresses are  
>most likely residual. Furthermore, the carbon steel and low alloy steel  
>are susceptible to very high corrosion rates in high temperature aqueous  
>chloride, so if cracks have penetrated the RPV cladding then corrosion of  
>the low alloy steel is as much of a potential problem as is SCC.

>

>The steam lines going from the RPV to the turbine are carbon steel, so hot  
>aqueous chloride can be expected to severely corrode and possibly crack  
>the steam lines.

>

>At this point the best remedial action to take is to get rid of the salt.  
>Probably the only way to do it is by dilution: flooding the reactor with  
>salt-free water. In my view it is extremely urgent that the chloride be  
>removed asap. Can you communicate this message to someone in authority?

>

>Tom

---

Per F. Peterson  
Professor and Chair  
Department of Nuclear Engineering  
University of California  
4153 Etcheverry Hall  
Berkeley, California 94720-1730  
[peterson@nuc.berkeley.edu](mailto:peterson@nuc.berkeley.edu)  
Office: (510) 643-7749 Fax: (510) 643-9685  
[http://www.nuc.berkeley.edu/People/Per\\_Peterson](http://www.nuc.berkeley.edu/People/Per_Peterson)

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*NR*  
**From:** Thomas, Eric  
**To:** Ross-Lee, MaryJane; Taylor, Robert; Rini, Brett; Thorp, John  
**Cc:** Scott, Michael  
**Subject:** RE: Spent Fuel Pool Sloshing  
**Date:** Tuesday, March 29, 2011 8:00:51 AM  
**Attachments:** KK U6 Spent Fuel Pool Sloshing.jpg

---

Here's another still shot.

*Eric Thomas*

U.S. Nuclear Regulatory Commission  
NRR/DIRS/IOEB  
OWFN-7E24  
eric.thomas@nrc.gov  
301-415-6772 (office)

(b)(6) (mobile) *EL*

**From:** Ross-Lee, MaryJane  
**Sent:** Tuesday, March 29, 2011 7:33 AM  
**To:** Taylor, Robert; Rini, Brett; Thorp, John; Thomas, Eric  
**Cc:** Scott, Michael  
**Subject:** Re: Spent Fuel Pool Sloshing  
**Importance:** High

I'll check with Op E group. There is one, I was thinking 2 ft. But let me get the facts.  
Sent from my blackberry

[M.J. (b)(6) *EL*

*NR*  
**From:** Taylor, Robert  
**To:** Ross-Lee, MaryJane; Rini, Brett  
**Cc:** Scott, Michael  
**Sent:** Tue Mar 29 05:23:28 2011  
**Subject:** Spent Fuel Pool Sloshing

Mary-Jane and Brett,

I recall a video of the KK spent fuel pool during the 2007 earthquake. Is my recollection correct that one exists? Do you have a copy of it? What height of sloshing (best guess) occurred?

As you can guess, this relates to Daiichi.

Best regards,

Rob Taylor  
NRC Japan Team

*NR/155*



2007-07-18

90:11:17 9F720

*MR*  
**From:** Thomas, Eric  
**To:** Ross-Lee, MaryJane; Taylor, Robert; Rini, Brett; Thorp, John  
**Cc:** Scott, Michael  
**Subject:** RE: Spent Fuel Pool Sloshing  
**Date:** Tuesday, March 29, 2011 7:58:59 AM

---

MJ,

I found this in a followup presentation from the Japanese. It's not the .mpg version so just a still shot.

I'll keep looking for the video and send to Rob if I find it.



*Eric Thomas*

U.S. Nuclear Regulatory Commission

NRR/DIRS/IOEB

OWFN-7E24

eric.thomas@nrc.gov

301-415-6772 (office)

(b)(6) (mobile) *EL*

**From:** Ross-Lee, MaryJane *JADM*  
**Sent:** Tuesday, March 29, 2011 7:33 AM  
**To:** Taylor, Robert; Rini, Brett; Thorp, John; Thomas, Eric  
**Cc:** Scott, Michael  
**Subject:** Re: Spent Fuel Pool Sloshing  
**Importance:** High

I'll check with Op E group. There is one, I was thinking 2 ft. But let me get the facts.

Sent from my blackberry

MJ (b)(6) *EL*

---

**From:** Taylor, Robert *MR*  
**To:** Ross-Lee, MaryJane; Rini, Brett  
**Cc:** Scott, Michael  
**Sent:** Tue Mar 29 05:23:28 2011  
**Subject:** Spent Fuel Pool Sloshing

*MM/156*

Mary-Jane and Brett,

I recall a video of the KK spent fuel pool during the 2007 earthquake. Is my recollection correct that one exists? Do you have a copy of it? What height of sloshing (best guess) occurred?

As you can guess, this relates to Daiichi.

Best regards,

Rob Taylor  
NRC Japan Team

**Weaver, Tonna**

---

**From:** Smith, Brooke *101P*  
**Sent:** Tuesday, March 29, 2011 8:21 PM  
**To:** 'bannai-toshihiro@meti.go.jp'; 'sato.h.takashi@tepco.co.jp'; 'nei-hisanori@meti.go.jp'  
**Cc:** Casto, Chuck; Stahl, Eric; Emche, Danielle; Nakanishi, Tony  
**Subject:** Fw: NRC Meetings for March 30, 2011  
**Attachments:** NRC meetings 03-30-11.docx

Dear Bannai-san and Satoh-san,

Please find attached the document with the schedule for NRC meetings today.

I have copied Ms. Danielle Emche and Mr. Eric Stahl on this email. Going forward you will be receiving NRC's schedule from one of them.

Best regards,  
Brooke

Sent from an NRC Blackberry.

Brooke G. Smith

(b)(6) *efb*

**From:** Brooke Smith (b)(6)  
**To:** Smith, Brooke  
**Sent:** Tue Mar 29 20:09:48 2011  
**Subject:** NRC Meetings for March 30, 2011

*NW/157*

NRC meetings scheduled for March 30, 2011

|                                               | <u>Location</u> |
|-----------------------------------------------|-----------------|
| 1100 NISA/TEPCO daily status                  | TEPCO           |
| 1100 Radiation Monitoring                     | MEXT            |
| 1400 NISA – Shielding / Confinement Taskforce | NISA            |
| 1600 Health Effects Working Group on KI       | Kantei          |
| 2000 Cabinet meeting                          | Kantei          |

Note:

1. An additional meeting with NISA/TEPCO may be scheduled today to discuss radiation protection.

**Weaver, Tonna**

---

**From:** Alan Blamey (b)(6)  
**Sent:** Tuesday, March 29, 2011 8:37 PM  
**To:** Nakanishi, Tony

During the meeting yesterday you had questioned the use of containment spray before flooding. We noted that this "Additional Consideration" will most likely be removed because it is undesirable to utilize containment spray prior to inerting the environment. Specifically, spraying containment with a steam environment may result in increasing the hydrogen concentration as the steam is condensed.

NW/158

**Arndt, Steven**

---

**From:** Arndt, Steven *MMK*  
**Sent:** Wednesday, March 30, 2011 10:37 AM  
**To:** Ruland, William  
**Subject:** RE: Request for Ops Center RTS support

Bill,

Do you know if RES has been formally tasked with this work, by the RST or someone else?

Steven

**From:** Ruland, William  
**Sent:** Wednesday, March 30, 2011 10:36 AM  
**To:** Arndt, Steven; Skeen, David; RST06 Hoc; Cheok, Michael; Gibson, Kathy  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael  
**Subject:** RE: Request for Ops Center RTS support

Great thinking! I've always been a Fred Brown fan! For my benefit, what is the objectives for this task and by when do we need to get the answers?

Regarding the core damage percentages, I understand that they were early numbers. Are we yet in a position to revise them?

Bill

**From:** Arndt, Steven  
**Sent:** Wednesday, March 30, 2011 7:33 AM  
**To:** Skeen, David; RST06 Hoc; Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael  
**Subject:** Re: Request for Ops Center RTS support

I agree with Dave, this should be done out side of the Op Center. A group of RES folks are already doing some analysis in this area (DRA and DSA) to support the PMT. We should task them to do this and provide them with additional resources if needed.

Sent from a NRC blackberry  
Steven Arndt

(b)(6)

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**From:** Skeen, David  
**To:** RST06 Hoc; Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; Arndt, Steven  
**Sent:** Tue Mar 29 23:43:46 2011  
**Subject:** Re: Request for Ops Center RTS support

Good thought, Fred.

I think this would be a worthwhile task, and I think we need a small group of severe accident experts to discuss the

*NN/159*

potential worst case outcomes for each scenario.

I believe this effort should be conducted outside of the RST, on the normal day shift, with either NRR or RES taking the lead to put a team together to develop the potential outcomes.

Please let me know if you need any support from NRR/DE. We could potentially offer Steve Arndt to support.

---

**From:** RST06 Hoc

**To:** Check, Michael; Gibson, Kathy

**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; Skeen, David; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; RST01 Hoc

**Sent:** Tue Mar 29 23:01:43 2011

**Subject:** RE: Request for Ops Center RTS support

Please see below.

---

**From:** Brown, Frederick

**Sent:** Tuesday, March 29, 2011 10:56 PM

**To:** Check, Michael; Gibson, Kathy

**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; Skeen, David; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; Brown, Frederick; RST01 Hoc

**Subject:** Request for Ops Center RTS support

**Importance:** High

Mike, Kathy

First, I'm not sure that you two are the right folks to ask, but I know that you'll know where this should go.

I'd like to have folks with the right skill set look at two issues (the two are inter-related, but the first may be easier to give a quick answer to without the work that the second will take):

- 1) Given the known, or assumed, status of the three units and four pools, what realistic scenarios exist for energetic dispersion of high quantities of radioactive material that would result in mobile plumes? The point of this question is that there are many clear scenarios that present significant near-area radiological challenges, but given the time since shutdown (for the operating units) and age of much of the fuel (in the SFPs) what are the remaining scenarios of concern with respect to more distant locations (Tokyo with a large concentration of US citizens, Alaska, Hawaii, etc).
- 2) Given the assumed condition of the three units and four pools, can we generate basic event trees for the coming weeks/months? The point would be to identify key success criteria and to help identify key decision points/risk factors to be balanced (qualitative not quantitative analysis). For instance, take two units, each with significant core damage and prior release of volatile fission products, each with primary and secondary containment failure, but one with an intact RPV and the other with a breach of RPV - would there be a difference in potential releases that would lead to different strategies for flooding the primary containment of these two units? This question will make more sense if you look at the assumed conditions below and the attached assessment document where we recommend that TEPCO utilize the SAMG recommendation to flood all 3 units' containments.

Note that the intent is to limit this activity to hours and days, not weeks or years. Once we validate the concept of this evaluation, we can turn it over to US industry for further action/development.

Assumed status (slightly different than the status in the attached assessment):

Unit 1 Rx: Shutdown 3/11. 70% core damage. Cooling with 30 gpm. Significant salt deposits in vessel, core spray plugged. Primary pressure 65 psig. Drywell pressure 25 psig. Secondary containment destroyed. Containment has been vented at least once since fuel damage occurred. Attempting to establish Nitrogen purge prior to resuming venting.

Unit 2 Rx: Shutdown 3/11. 30% core damage. Significant salt deposits in vessel/drywell. Assumed RPV breach, with at least some core ex-vessel that occurred approximately 3/15. Primary containment breached in the torus. Secondary containment breached. Significant release of volatile fission products has occurred through both airborne release and also via water drainage out of the Rx building.

Unit 3 Rx: same assumptions as Unit 2, but do not assume RPV failure and location of primary containment breach may be the drywell.

SFP 1: 292 bundles. Pool intact. All fuel at least 12 years old. No secondary containment. Rubble on top of pool. Water can be added through external spray. Now at saturation temperature.

SFP 2: 587 bundles. Pool intact. Water added to the point of pool over-flow. Pool had reached saturation temperature at one time.

SFP 3: 548 bundles.  $\frac{1}{4}$  core offload previous refueling. No checker boarding of hotter fuel. Structural damage to pool area suspected. Pool leakage possible. External addition of water has been made repeatedly, but flooding of pool may not be possible due to damage.

SFP 4: 1331 bundles. Full core offload about 120 days ago. No checker boarding of hotter fuel. Structural damage to pool area is known to exist, and structure may not support a full pool weight load. Pool leakage likely, requiring addition of water periodically. Pool was likely dry enough to have cladding/water reaction which produced enough hydrogen to lead to catastrophic explosion that destroyed secondary containment.

**Arndt, Steven**

---

**From:** Arndt, Steven *MLK*  
**Sent:** Wednesday, March 30, 2011 8:13 AM  
**To:** Skeen, David  
**Subject:** Re: Request for Ops Center RTS support

Dave,

Please call me I am not sure what my action is.

Sent from a NRC blackberry  
Steven Arndt

(b)(6) *MLK*

---

**From:** Skeen, David *MLK*  
**To:** Arndt, Steven  
**Cc:** Hiland, Patrick  
**Sent:** Wed Mar 30 08:05:29 2011  
**Subject:** Re: Request for Ops Center RTS support

Steve,

Please contact Richard Lee.

Kathy Gibson says he is the RES poc.

---

**From:** Arndt, Steven *MLK*  
**To:** Skeen, David; RST06 Hoc; Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael  
**Sent:** Wed Mar 30 07:33:07 2011  
**Subject:** Re: Request for Ops Center RTS support

I agree with Dave, this should be done out side of the Op Center. A group of RES folks are already doing some analysis in this area (DRA and DSA) to support the PMT. We should task them to do this and provide them with additional resources if needed.

Sent from a NRC blackberry  
Steven Arndt

(b)(6) *MLK*

---

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**To:** RST06 Hoc; Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; Arndt, Steven  
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Good thought, Fred.

*MM/160*

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Please let me know if you need any support from NRR/DE. We could potentially offer Steve Arndt to support.

---

**From:** RST06 Hoc  
**To:** Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; Skeen, David; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; RST01 Hoc  
**Sent:** Tue Mar 29 23:01:43 2011  
**Subject:** RE: Request for Ops Center RTS support

Please see below.

**From:** Brown, Frederick  
**Sent:** Tuesday, March 29, 2011 10:56 PM  
**To:** Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; Skeen, David; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; Brown, Frederick; RST01 Hoc  
**Subject:** Request for Ops Center RTS support  
**Importance:** High

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First, I'm not sure that you two are the right folks to ask, but I know that you'll know where this should go.

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## Arndt, Steven

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**From:** Gibson, Kathy *AK*  
**Sent:** Wednesday, March 30, 2011 6:05 PM  
**To:** RST06 Hoc; Ruland, William; Arndt, Steven; Skeen, David; Cheok, Michael; Coe, Doug  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Scott, Michael; Tinkler, Charles; Cool, Donald; Correia, Richard  
**Subject:** Re: Request for Ops Center RTS support

First, I can't tell who "me" is. Suggest if you are using an HOC email address you first say who you are.

Second, RES has the lead for both items, DSA (me) for the first one and DRA (Doug Coe) for the second one. I added Rich Correia to the distribution as he is our new DRA division director and Doug Coe's father passed away so he is gone.

Richard Lee is our POC with the Ops Center. Charlie Tinkler is the staff person working the first item and Mary Druin is working the second item.

Let us know (preferably via Richard) if you need anything else.

---

**From:** RST06 Hoc  
**To:** Ruland, William; Arndt, Steven; Skeen, David; Cheok, Michael; Gibson, Kathy; Coe, Doug  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Scott, Michael; Tinkler, Charles; Cool, Donald  
**Sent:** Wed Mar 30 17:35:33 2011  
**Subject:** RE: Request for Ops Center RTS support

Just noticed that I'm not even on the distribution. Please add me. Thanks.

**From:** RST06 Hoc  
**Sent:** Wednesday, March 30, 2011 5:34 PM  
**To:** Ruland, William; Arndt, Steven; Skeen, David; Cheok, Michael; Gibson, Kathy; Coe, Doug  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Scott, Michael; Tinkler, Charles; Cool, Donald  
**Subject:** RE: Request for Ops Center RTS support

Thanks Bill. You must be a fan of other tired, old, acts too – Cher maybe?

Before responding, can I ask that whomever has stepped-up to take the lead for this do a respond-all to let us know?

Objective for first question (energetic release potential): this information is important to the Ambassador in Japan and the US military command that would be responsible for movement of US citizens who were ordered to be evacuated from any locations in the Pacific. In fact, the Pacific Command asked the same question of the NRC at today's Deputies Meeting that is attended by the Chairman. The answer to this question may also impact when we as the NRC ramp down our activities? **We should attempt to address this by Friday (4/1).**

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Of course, my request should be seen as the start of a process, and that others should add to it in order to shape into an end product that goes beyond, or corrects, the vision that I started with.

Fred

**From:** Ruland, William  
**Sent:** Wednesday, March 30, 2011 10:36 AM  
**To:** Arndt, Steven; Skeen, David; RST06 Hoc; Cheok, Michael; Gibson, Kathy  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael  
**Subject:** RE: Request for Ops Center RTS support

Great thinking! I've always been a Fred Brown fan! For my benefit, what is the objectives for this task and by when do we need to get the answers?

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Bill

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**To:** Skeen, David; RST06 Hoc; Cheok, Michael; Gibson, Kathy  
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**Subject:** Re: Request for Ops Center RTS support

I agree with Dave, this should be done out side of the Op Center. A group of RES folks are already doing some analysis in this area (DRA and DSA) to support the PMT. We should task them to do this and provide them with additional resources if needed.

Sent from a NRC blackberry  
Steven Arndt

(b)(6)

---

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**Sent:** Tue Mar 29 23:43:46 2011  
**Subject:** Re: Request for Ops Center RTS support

Good thought, Fred.

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Please let me know if you need any support from NRR/DE. We could potentially offer Steve Arndt to support.

---

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**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; Skeen, David; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; RST01 Hoc  
**Sent:** Tue Mar 29 23:01:43 2011  
**Subject:** RE: Request for Ops Center RTS support

Please see below.

**From:** Brown, Frederick  
**Sent:** Tuesday, March 29, 2011 10:56 PM  
**To:** Cheok, Michael; Gibson, Kathy  
**Cc:** Ruland, William; Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; Skeen, David; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Coe, Doug; Scott, Michael; Brown, Frederick; RST01 Hoc  
**Subject:** Request for Ops Center RTS support  
**Importance:** High

Mike, Kathy

First, I'm not sure that you two are the right folks to ask, but I know that you'll know where this should go.

I'd like to have folks with the right skill set look at two issues (the two are inter-related, but the first may be easier to give a quick answer to without the work that the second will take):

- 1) Given the known, or assumed, status of the three units and four pools, what realistic scenarios exist for energetic dispersion of high quantities of radioactive material that would result in mobile plumes? The point of this question is that there are many clear scenarios that present significant near-area radiological challenges, but given the time since shutdown (for the operating units) and age of much of the fuel (in the SFPs) what are the remaining scenarios of concern with respect to more distant locations (Tokyo with a large concentration of US citizens, Alaska, Hawaii, etc).
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## Arndt, Steven

---

**From:** Cheok, Michael *MM*  
**Sent:** Wednesday, March 30, 2011 6:09 PM  
**To:** RST06 Hoc; Ruland, William; Arndt, Steven; Skeen, David; Gibson, Kathy; Coe, Doug  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Scott, Michael; Tinkler, Charles; Cool, Donald; Harrison, Donnie; Lee, Samson; Tate, Travis; Parillo, John; Brown, Frederick  
**Subject:** RE: Request for Ops Center RTS support

My e-mail crossed paths with Kathy's. (Timing is everything). I defer to her proposals.

**From:** RST06 Hoc  
**Sent:** Wednesday, March 30, 2011 6:07 PM  
**To:** Cheok, Michael; Ruland, William; Arndt, Steven; Skeen, David; Gibson, Kathy; Coe, Doug  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Scott, Michael; Tinkler, Charles; Cool, Donald; Harrison, Donnie; Lee, Samson; Tate, Travis; Parillo, John; Brown, Frederick  
**Subject:** RE: Request for Ops Center RTS support

Thanks Mike.

Mike Scott is in Japan.

Fred Brown  
RST on-shift Director

**From:** Cheok, Michael  
**Sent:** Wednesday, March 30, 2011 6:05 PM  
**To:** RST06 Hoc; Ruland, William; Arndt, Steven; Skeen, David; Gibson, Kathy; Coe, Doug  
**Cc:** Dudes, Laura; Uhle, Jennifer; Hiland, Patrick; Hackett, Edwin; RST01 Hoc; Hoc, PMT12; McDermott, Brian; Scott, Michael; Tinkler, Charles; Cool, Donald; Harrison, Donnie; Lee, Samson; Tate, Travis; Parillo, John  
**Subject:** RE: Request for Ops Center RTS support

The first question will need SOARCA/PRA Level II expertise – so RES/DSA (Kathy's staff) would be optimal (Kathy was not in the office today, and I will discuss this with her and/or Mike Scott tomorrow). NRR/DRA can support with John Parillo or someone else in our accident dose branch.

NRR/DRA (Donnie Harrison will be POC) can take the lead on Question 2 and will work with RES/DRA and RES/DSA on a response.

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Steven Arndt

(b)(6)

*per b*

---

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iver, Tonna

---

Stahl, Eric *OLP*  
Wednesday, March 30, 2011 7:55 PM  
'bannai-toshihiro@meti.go.jp'; 'sato.h.takashi@tepco.co.jp'; 'nei-hisanori@meti.go.jp'; oshima.toshiyuki@meti.go.jp; koyama-masaomi@meti.go.jp  
Casto, Chuck; Emche, Danielle; Nakanishi, Tony  
Subject: NRC Meetings for 31 March 2011  
Attachments: NRC meetings 03-31-11.docx

Bannai-san and Sato-san,

I find attached the document with the schedule for NRC meetings today. If you have any questions or concerns, please let me know.

Regards,

Stahl  
Nuclear Regulatory Commission  
Office of International Programs

(b)(6)

*ab*

*NN/163*

**U.S. Nuclear Regulatory Commission Meetings**  
**Thursday, 31 March 2011**

| <b>Time</b>          | <b>Organization</b> | <b>Topic</b>                     | <b>Location</b> |
|----------------------|---------------------|----------------------------------|-----------------|
| 0900                 | METI                | Coordination on Robotics         | METI            |
| 1100                 | NISA & TEPCO        | Daily Status                     | TEPCO           |
| Follows 1100 meeting | NISA & TEPCO        | Radiation Protection             | TEPCO           |
| 1400                 | NISA                | Shielding/Confinement Task Force | NISA            |
| 1600                 | NISA                | Fuel Removal Working Group       | NISA            |
| 1900                 | Cabinet             | General Topics                   | Kantei          |

Weaver, Tonna

From: 大島 俊之 [Toshima-toshiyuki@meti.go.jp](mailto:Toshima-toshiyuki@meti.go.jp)  
Sent: Wednesday, March 30, 2011 8:45 PM  
To: Stahl, Eric; [bannai-toshihiro@meti.go.jp](mailto:bannai-toshihiro@meti.go.jp); [satoh.takashi@tepcoco.jp](mailto:satoh.takashi@tepcoco.jp); [nei-hisanori@meti.go.jp](mailto:nei-hisanori@meti.go.jp); [koyama-masaomi@meti.go.jp](mailto:koyama-masaomi@meti.go.jp)  
Cc: Casto, Chuck; Emche, Danielle; Nakanishi, Tony  
Subject: RE: NRC Meetings for 31 March 2011

Dear Eric

Good morning!  
Thank you for your e-mail about the NRC schedule today.  
The fuel project meeting of 16:00 is canceled today. Please let you inform participants of the fuel meeting about the cancellation.  
I will say this information at the morning meeting, too.

Best regards,

Hi

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

From: Stahl, Eric [<mailto:Eric.Stahl@nrc.gov>]  
Sent: Thursday, March 31, 2011 8:55 AM  
To: [bannai-toshihiro@meti.go.jp](mailto:bannai-toshihiro@meti.go.jp); [satoh.takashi@tepcoco.jp](mailto:satoh.takashi@tepcoco.jp); [nei-hisanori@meti.go.jp](mailto:nei-hisanori@meti.go.jp); [oshima-toshiyuki@meti.go.jp](mailto:oshima-toshiyuki@meti.go.jp); [koyama-masaomi@meti.go.jp](mailto:koyama-masaomi@meti.go.jp)  
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Dear Bannai-san and Satoh-san,

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If you have any questions or concerns, please let me know.

Best regards,  
Eric

Eric Stahl

U.S. Nuclear Regulatory Commission

Office of International Programs

(b)(6)  


*Handwritten signature*

*Handwritten: NRP/1104*

**From:** Taylor, Robert  
**To:** Bower, Fred  
**Subject:** Re: Peach Bottom TIA Status: Conference Bridge: Dial in 888-566-5902, Passcode 42099  
**Date:** Thursday, March 31, 2011 8:16:38 AM

---

Units 1-3 have a mix of racks. Some are AI and Some are AI with Boron. The Region 4 racks are SS without Boron. They are very similar to what we would call high density racks. I sent the specs on the racks to RST01 earlier.

Sent from an NRC BlackBerry  
Robert Taylor

(b)(6) E 6

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**From:** Bower, Fred  
**To:** Miller, Barry; Ulses, Anthony; Wood, Kent; Taylor, Robert; Wong, Emma; Yoder, Matthew; Krohn, Paul; Torres, Edgardo; Hughey, John; Rosebrook, Andrew; Ziedonis, Adam; R1DRPPBCAL RESOURCE; R1DRPBR4CAL RESOURCE  
**Sent:** Thu Mar 31 08:12:54 2011  
**Subject:** RE: Peach Bottom TIA Status: Conference Bridge: Dial in 888-566-5902, Passcode 42099

Does anyone know if the Fukushima plants have high density racks? Do their racks use Boraflex absorber panels?

*Fred Bower*

Senior Resident Inspector

Peach Bottom Atomic Power Station

Outside of Scope

p/s

NP/165

Outside of Scope

o/s

*1 NRC*  
**From:** Scott, Michael  
**To:** Taylor, Robert; Blamey, Alan; Giessner, John; Nakanishi, Tony  
**Subject:** Fw: Bisconti TDY-Tokyo  
**Date:** Thursday, March 31, 2011 6:17:13 AM

---

Fyi

Sent from my NRC blackberry

Michael Scott

(b)(6)

---

**From:** Bisconti, Giulia <Giulia.Bisconti@nuclear.energy.gov>  
**To:** Scott, Michael  
**Sent:** Thu Mar 31 05:07:56 2011  
**Subject:** FW: Bisconti TDY-Tokyo

Here's a response on your question.

Giulia

**From:** Kelly, John E (NE)  
**Sent:** Wednesday, March 30, 2011 1:16 PM  
**To:** Bisconti, Giulia  
**Subject:** RE: Bisconti TDY-Tokyo

Origin of 5 sq in hole is from discussions with GE-H and, while I'm not certain, may have been inferred from pressure measurements. Milestone people speculated that the shock wave from an explosion in the vent traveled back down the pipe causing a rupture at the connection with the wetwell.

*NW/1106*

**Nelson, Robert**

---

**From:** Nelson, Robert *NRK*  
**Sent:** Thursday, March 31, 2011 3:34 PM  
**To:** Chernoff, Harold  
**Subject:** RE: Question from Congressional staffer

Thanks!

NELSON

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

**From:** Chernoff, Harold  
**Sent:** Thursday, March 31, 2011 2:35 PM  
**To:** Nelson, Robert; Markley, Michael; Oesterle, Eric  
**Cc:** Ennis, Rick  
**Subject:** FW: Question from Congressional staffer

I gave Sean the information Rick generated yesterday for the NY Times reporter's question.

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

**From:** Meighan, Sean *NRK*  
**Sent:** Thursday, March 31, 2011 1:59 PM  
**To:** Chernoff, Harold  
**Subject:** FW: Question from Congressional staffer

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

**From:** Wittick, Brian *EDD*  
**Sent:** Thursday, March 31, 2011 1:52 PM  
**To:** Meighan, Sean; Nguyen, Quynh  
**Cc:** Trapp, James  
**Subject:** CONGRESSIONAL QUERY: Question from Congressional staffer

Request answer to the below query from Markey's

Thanks

Sent from NRC BlackBerry  
Brian Wittick

(b)(6) *all*

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

**From:** Riley (OCA), Timothy  
**To:** Wittick, Brian  
**Sent:** Thu Mar 31 13:24:35 2011  
**Subject:** Question from Congressional staffer

Brian,

*NR/167*

I've been routing questions to the RST or PMT, but this one may need a bit of attention. Can you have OEDO/NRR look at this issue:

-----  
So both the Chairman (today) and Borchardt yesterday claimed that US facilities are equipped w hydrogen recombiners to prevent explosions. We are hearing that these used to be required but no longer are - they may be still installed, but are not required to be maintained and may not be hooked up to power supply. Can you please clarify?

Sent from an NRC Blackberry.

Tim Riley

(b)(6)

efb

**- Sigmon, Rebecca**

---

**From:** Sigmon, Rebecca *NRR*  
**Sent:** Monday, April 04, 2011 9:32 AM  
**To:** Garmon, David; Thorp, John; Thomas, Eric  
**Subject:** RE: ACRS Brief

Slide 6 – I'll go back through the early press releases and see if I can get a clearer idea of when they had EDG capability for units 5 & 6. This may be as accurate a statement as you can make right now though.

Slide 7 – There was talk about recharging the batteries or swapping out the used batteries for new ones. I'm not sure exactly what they did, but there were press releases that reported RCIC injection after the 6-8 hour mark (though I think the RST had questions about whether it was actually injecting any water to one of the units at one point). Maybe qualify the speaker notes to say – "HPCI and RCIC would have been rendered inoperable by either high containment pressure preventing further steam exhaust from the turbine or by a loss of battery power. The plants had 6-8 hours of battery power available initially, though reports of intermittent RCIC operability over the course of the first few days of the accident indicate that they may have been able to extend the life of batteries. It is not readily apparent even if RCIC was operating though, that there was successful injection of water to the cores after the first several hours."

Slide 15 – The Japanese are forbidden by their constitution from having a military, so it's actually called the Self Defense Force. Though the effect is the same, it's a point of some sensitivity.

Rebecca Sigmon  
Reactor Systems Engineer  
NRR/DIRS/IOEB  
Operating Experience Branch  
(301) 415-4018  
[Rebecca.Sigmon@nrc.gov](mailto:Rebecca.Sigmon@nrc.gov)

**From:** Garmon, David *NRR*  
**Sent:** Monday, April 04, 2011 7:19 AM  
**To:** Thorp, John; Thomas, Eric; Sigmon, Rebecca  
**Subject:** ACRS Brief

John,

(b)(6)

I was working on the presentation this morning but had CITRIX problems again so I wasn't able to send it out for comments. I still have work to do on it but it is much closer than yesterday (at least I hope you will agree). You can look at it in my personal folder on the G drive under Japan/ACRS brief.

I understand you want this to be ready for review by COB today, is that correct?

Rebecca and Eric, please review the presentation and provide comments as you see fit. I will shoot out an email when I am available to discuss if you prefer to not type up an email.

Dave

*NRR/168*

**Sigmon, Rebecca**

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**From:** Sigmon, Rebecca  
**Sent:** Monday, April 04, 2011 1:08 PM  
**To:** Garmon, David  
**Subject:** Slide 7  
**Attachments:** Slide 7.pptx

That would be slide 7 from the revision I was working on. Looking at what you've got going, this looks like it's mostly redundant as you've done an even better job of getting it all compressed down.

# Accident Milestones

- Intermittent venting of containments and seawater injection for Units 1, 2 and 3
- Increase in hydrogen concentration due to reaction of zircaloy cladding and water/steam at high temperatures
- Hydrogen explosions at Units 1 (3/12) and 3 (3/14) destroyed the reactor buildings
- Hydrogen explosion at Unit 2 (3/15) damaged primary containment
- Zirc-water reaction in Unit 4 spent fuel pool resulted in damage to Unit 4 reactor building

**Pannier, Stephen**

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**From:** Pannier, Stephen *NRR*  
**Sent:** Monday, April 04, 2011 11:22 AM  
**To:** Gray, Kathy; Thomas, Eric  
**Subject:** FW: ROP Call for 4/7/11 Including TI 2515-183

Thanks Eric.

SP

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**From:** Thomas, Eric *NRR*  
**Sent:** Monday, April 04, 2011 11:20 AM  
**To:** Pannier, Stephen  
**Subject:** RE: ROP Call for 4/7/11 Including TI 2515-183

Steve,

INPO issued IER 1-11 related to the Japanese Earthquake and Tsunami. In addition, IOEB has 2 OpE COMMs posted: 1 for the Fukushima Daiichi Event, and another for the Fukushima Daini Event which came out as an INES Level 3. IOEB is scheduled to brief the ACRS later this week on these events.

Eric

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**From:** Pannier, Stephen *NRR*  
**Sent:** Monday, April 04, 2011 10:35 AM  
**To:** NRR\_DIRS\_IOEB Distribution  
**Subject:** FW: ROP Call for 4/7/11 Including TI 2515-183

Hi Folks,

The bi-weekly ROP call is this Thursday, and our input to the call is due Thursday morning.

Question: Are there any OpE Highlights related to our (IOEB) response to the Japan earthquake and tsunami that are instructive in nature and something that we want to share with the Regions??

Thanks,

Steve

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**From:** Cauffman, Christopher *NRR*  
**Sent:** Monday, April 04, 2011 10:26 AM  
**Subject:** ROP Call for 4/7/11 Including TI 2515-183

To All,

The ROP Branch Chief Counterpart Call is currently scheduled on Thursday 4/7/11, at 2 P.M. EDT. Please submit agenda items to me by 10 A.M. Thursday 4/7/11. The Agenda will be updated and made available on the ROP Branch Chief Counterpart Call SharePoint Site.

We are also planning on using this meeting to discuss any significant inspector observations related to TI 2515-183, "Followup to Fukushima Daiichi Nuclear Station Fuel Damage Event"

Location: OWFN-07-B06

*NM/1169*

Call In: 800-857-6094 | Passcode: (b)(6)

Respectfully,

*Chris C. Cauffman*

U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Division of Inspection & Regional Support  
NRR/ADRO/DIRS/IRIB  
Office: O-07E09  
Mail Stop: O-07C2A  
301-415-8416 (Voice)  
301-415-3313 (Fax)  
[christopher.cauffman@nrc.gov](mailto:christopher.cauffman@nrc.gov)

## Weaver, Tonna

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**From:** Neil Passman, [neilp@standtech.com](mailto:neilp@standtech.com)  
**Sent:** Monday, April 04, 2011 1:04 PM  
**To:** Miranda, Samuel  
**Subject:** RE: Fukushima Daiichi chain of events

Hi Sam,

Even though it's almost two weeks old, it does provide a good high level picture of what went on. Being an old PWR guy, I probably don't understand all the ramifications. I assume that since you sent this to me, it contains no safeguards information and I can pass it along. Please confirm.

Neil

**From:** Miranda, Samuel [<mailto:Samuel.Miranda@nrc.gov>]  
**Sent:** Monday, April 04, 2011 8:06 AM  
**To:** (b)(6) Caddick, (b)(6) Haley, Betty; [neilp@standtech.com](mailto:neilp@standtech.com)  
**Subject:** Fukushima Daiichi chain of events

[http://iis-db.stanford.edu/evnts/6615/March21\\_JapanSeminar.pdf](http://iis-db.stanford.edu/evnts/6615/March21_JapanSeminar.pdf)

**Samuel Miranda, Sr Reactor Sys Engr**  
U.S. Nuclear Regulatory Commission  
NRR/DSS/SRXB - (301) 415-2303

NN/170

**Fields, Leslie**

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**From:** Pasquale, Daniel  
**Sent:** Tuesday, April 05, 2011 10:52 AM  
**To:** Marc Tannenbaum (mtannenbaum@epri.com); Biggins, James; Campbell, Andy; Erlanger, Craig; Langan, Scott; Rasmussen, Richard; Shuaibi, Mohammed; Skeen, David; Tappert, John; Tschiltz, Michael; Arndt, Steven; Jackson, Terry; Jung, Ian; Santos, Daniel; Sydnor, Russell; Wilson, George; Atack, Sabrina; Beardsley, James; Benner, Eric; Brown, Michael; Campbell, Larry; Caverly, Jill; Coco, Paul; Costello, Ralph; Edmonds, Shavon; Fields, Leslie; Frye, Timothy; Hogan, Alfred; Huang, Eugene; Jacobson, Jeffrey; James, Lois; Keim, Andrea; Morell, Clyde; Murphy, Martin; Newman, Garrett; O'Donnell, John; Owens, Janice; Pannier, Stephen; Pasquale, Daniel; Peralta, Juan; Prescott, Paul; Ramsey, Jack; Rivers, Joseph; Ryder, Christopher; Scales, Kerby; Smith, Stacy; Thomas, Eric; Thorp, John; Wittick, Brian  
**Subject:** FW: D.C. Counterfeit Microelectronics Working Group - More on Japan  
**Attachments:** SiliconExpert - Japan Earthquake - Impacts on the Electronics Industry.pdf

Followup report

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**From:** Schornstein, Sherri (USADC) [<mailto:Sherri.Schornstein@usdoj.gov>]  
**Sent:** Tuesday, April 05, 2011 10:47 AM  
**Subject:** D.C. Counterfeit Microelectronics Working Group - More on Japan

Dear Members:

Attached is a report prepared by SiliconExpert Technologies, which details the impact of the recent earthquake in Japan on the electronics industry. As you are probably well aware, the earthquake and tsunami resulted in a large number of human casualties and caused extensive damage to buildings and factories along Japan's eastern coast. The report provides an overview and listing of electronic component manufacturers affected and lists the impact on global electronic part supplies from leading component manufacturers and the respective product lines that have been affected.

Special thanks to Donald "Myri" Leach, NAWCAD, for forwarding me this report.

Sherri

***Sherri L. Schornstein***

Assistant U.S. Attorney

Fraud & Public Corruption Section

U.S. Attorney's Office

for the District of Columbia

555 4th Street, NW, Washington, D.C. 20001

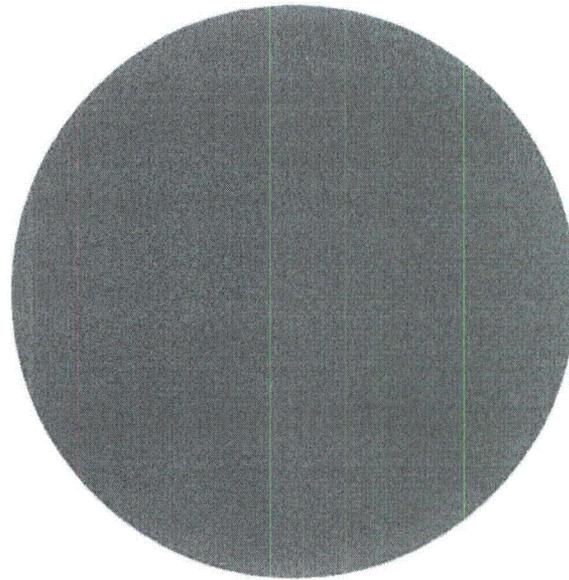
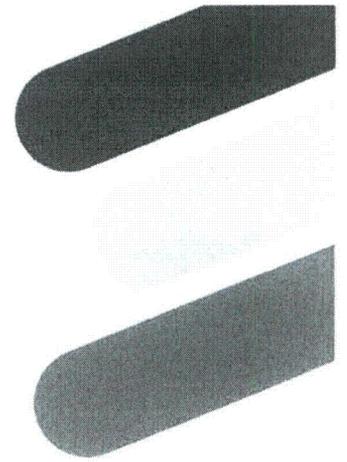
T: 202.252.7883 F: 202.252.7864 C: (b)(6) *296*

[sherri.schornstein@usdoj.gov](mailto:sherri.schornstein@usdoj.gov)

*NN/171*

<<SiliconExpert - Japan Earthquake - Impacts on the Electronics Industry.pdf>>

# Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry



An overview and listing of electronic component manufacturers affected by the 2011 Tōhoku Japanese Earthquake that occurred on March 11th, 2011. The magnitude 9.0 earthquake and resulting tsunami resulted in large amounts of human casualties and caused extensive damage to buildings and factories along Japan's eastern coast.

This report lists the impact of the 2011 Tōhoku earthquake on global electronic part supplies from leading component manufacturers and the respective product lines that have been affected.

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier                  | Location                                                                                        | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Down Status | Facility Type      | Damage  | Affected Products                | News Date |
|---------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|----------------------------------|-----------|
| ALPS Electric             | Fukushima Pref                                                                                  | Operation of the plants in the region is stopped, and we make the best effort for its restoration. There is no collapse of buildings, no fire, and no damage of the Tsunami. We are now investigating the details of the struck situation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | None    | Not Reported                     | 15-Mar-11 |
| AVX                       | Yamagata                                                                                        | AVX sells and services, outside of Japan, certain products produced by Kyocera Corporation and in general those products have not been significantly impacted. Most of Kyocera's factories are located in the Southern Island which was farthest away from the natural disaster. A facility located in Northern Japan that produces crystals for oscillator products is the only one to sustain any damage. This factory (Yamagata), has limited power at this time and Kyocera is assessing the options to restart operations as soon as possible. Current supply of materials from Japan at this time appears not to be an immediate issue to AVX.                                                                                                                                                                       | Unknown     | Manufacturing Site | Low     | Crystals for oscillator products | 15-Mar-11 |
| Citizen Electronics       | Yamanashi > Head office                                                                         | Account for about 70% of domestic production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Restarted   | Manufacturing Site | Partial | Not Reported                     | 17-Mar-11 |
| Citizen Electronics       | Yamanashi > Citizen Electronics Timel Co., Ltd.                                                 | Account for about 70% of domestic production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Restarted   | Manufacturing Site | Partial | Not Reported                     | 17-Mar-11 |
| Citizen Electronics       | Citizen Electronics Funehiki Co., Ltd. > Funehiki-cho                                           | The Government has issued instructions that residents staying in the area 20 km to 30 km radius from the station shall stay indoors. Citizen Electronics Funehiki is located outside the area, but its employees have been staying home according to our own judgment and the operation of Citizen Electronics Funehiki has been suspended since 10 am on March 15 restarted transportation by road from Yamanashi to the Funehiki factory on March 14. It took two times as long as usual but the system is slowly returning to normal. In addition, functions of Narita Airport such as customs clearance have been restored. However, shipping of some parts and materials, especially from suppliers in eastern Japan, has been interrupted. We are striving to obtain these parts and materials through other routes. | Restarted   | Manufacturing Site | Partial | Not Reported                     | 17-Mar-11 |
| Citizen Electronics       | Citizen Electronics Funehiki Co., Ltd. > Tamura-shi                                             | Partly damaged                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Restarted   | Manufacturing Site | Partial | Not Reported                     | 17-Mar-11 |
| Citizen Electronics       | Citizen Electronics Funehiki Co., Ltd. > Fukushima-ken                                          | Partly damaged                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Restarted   | Manufacturing Site | Partial | Not Reported                     | 17-Mar-11 |
| COSEL                     | Cosel Company > Toyama                                                                          | Assessing any potential delay in supply as well and transportation delay which may be slight                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Unknown     | Manufacturing Site | Unknown | Not Reported                     | 20-Mar-11 |
| Epson Electronics America | Epson Toyocom Corporation Fukushima Plant (Minami-Ōsoma, Fukushima Prefecture)                  | Epson suffered damage at Epson Toyocom Corporation's Fukushima Plant and also to Group companies in the Tohoku areas, Epson is also checking the extent of damages to our subcontractors and materials factories in the areas that are affected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | Unknown | Not Reported                     | 14-Mar-11 |
| Epson Electronics America | Epson Atmix Corporation (Hachinohe, Aomori Prefecture)                                          | Epson suffered damage at Epson Toyocom Corporation's Fukushima Plant and also to Group companies in the Tohoku areas, Epson is also checking the extent of damages to our subcontractors and materials factories in the areas that are affected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | Unknown | Not Reported                     | 14-Mar-11 |
| Epson Electronics America | Akita Epson Corporation (Yuzawa, Akita Prefecture)                                              | Epson suffered damage at Epson Toyocom Corporation's Fukushima Plant and also to Group companies in the Tohoku areas, Epson is also checking the extent of damages to our subcontractors and materials factories in the areas that are affected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | Unknown | Not Reported                     | 14-Mar-11 |
| Epson Electronics America | Seiko Epson Corporation Sakata Plant and Tohoku Epson Corporation (Sakata, Yamagata Prefecture) | Epson suffered damage at Epson Toyocom Corporation's Fukushima Plant and also to Group companies in the Tohoku areas, Epson is also checking the extent of damages to our subcontractors and materials factories in the areas that are affected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | Unknown | Not Reported                     | 14-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier               | Location                                                                                             | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Down Status        | Facility Type                                | Damage  | Affected Products                                                                                                            | News Date |
|------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------|-----------|
| FCI                    | FCI Japan KK Headquarters - Tokyo, Japan                                                             | These force majeure circumstances are having a dramatic impact on life and business in this region which could prevent us from manufacturing/shipping products from Japan.<br>FCI is currently assessing the impact on the supply chain and will be contacting our customers and distribution partners as soon as additional information on any specific supply interruptions is available.                                                                                                                                                                                                                                                                                                                                                                                                                                                     | None               | Sales,<br>Engineering and<br>Business Office | None    | Not Reported                                                                                                                 | 15-Mar-11 |
| FCI                    | FCI Japan KK Ishioka Site - Ishioka, Japan (100 km northeast of Tokyo)                               | These force majeure circumstances are having a dramatic impact on life and business in this region which could prevent us from manufacturing/shipping products from Japan.<br>FCI is currently assessing the impact on the supply chain and will be contacting our customers and distribution partners as soon as additional information on any specific supply interruptions is available.                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Few days           | Manufacturing Site                           | Partial | FFC/FPC, Mobile Phone connectors, BTFM/BTFW/BTEM and PHEC/PHEN                                                               | 15-Mar-11 |
| Freescal Semiconductor | Sendai wafer fabrication facility                                                                    | Within the next week, we hope to be able to provide more clarity regarding factory damage. In the meantime, we are aggressively working to minimize the effect on our customers' operations and executing on a number of contingency options to address supply gaps. These measures include:<br>a) Use of substantial inventories already built in anticipation of the previously announced Sendai factory closure;<br>b) Partnering with customers to substitute compatible, alternate devices where viable, and;<br>c) Production ramp of products already qualified, as well as the acceleration of ongoing qualification and transition efforts with customers for products not yet qualified, in alternate fabrication facilities in Oak Hill, Texas (USA); Chandler, Arizona (USA); or foundry partners where capacity exists and allows. | Alternatives found | Wafer fab                                    | Unknown | Flash memory embedded microcontrollers, analog/digital embedded microcontrollers, pressure sensors and acceleration sensors. | 17-Mar-11 |
| Fujitsu                | Iwate Prefecture > Fujitsu Semiconductor Limited - Iwate plant (Kanegasaki-cho, Isawa-gun)           | Damages to buildings and production equipment including the ceilings, walls, and drain pipes of the Fujitsu Group's plants and offices have affected business operations. Furthermore, planned rotational electricity blackouts have affected operations of Fujitsu Group companies based in the Kanto region of Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Unknown            | Manufacturing Site                           | Unknown | Not Reported                                                                                                                 | 14-Mar-11 |
| Fujitsu                | Miyagi Prefecture > Fujitsu Integrated Microtechnology Ltd. - Miyagi plant (Murata-cho, Shibata-gun) | Damages to buildings and production equipment including the ceilings, walls, and drain pipes of the Fujitsu Group's plants and offices have affected business operations. Furthermore, planned rotational electricity blackouts have affected operations of Fujitsu Group companies based in the Kanto region of Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Unknown            | Manufacturing Site                           | Unknown | Not Reported                                                                                                                 | 14-Mar-11 |
| Fujitsu                | Fukushima Prefecture > Fujitsu Semiconductor Limited - Aizu-Wakamatsu plant (Aizu-Wakamatsu-shi)     | Damages to buildings and production equipment including the ceilings, walls, and drain pipes of the Fujitsu Group's plants and offices have affected business operations. Furthermore, planned rotational electricity blackouts have affected operations of Fujitsu Group companies based in the Kanto region of Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Unknown            | Manufacturing Site                           | Unknown | Not Reported                                                                                                                 | 14-Mar-11 |
| Fujitsu                | Fukushima Prefecture > Fujitsu Semiconductor Technology, Inc. - Main plant (Aizu-Wakamatsu-shi)      | Damages to buildings and production equipment including the ceilings, walls, and drain pipes of the Fujitsu Group's plants and offices have affected business operations. Furthermore, planned rotational electricity blackouts have affected operations of Fujitsu Group companies based in the Kanto region of Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Unknown            | Manufacturing Site                           | Unknown | Not Reported                                                                                                                 | 14-Mar-11 |
| Fujitsu                | Fukushima Prefecture > Fujitsu Integrated Microtechnology Ltd. - Main plant (Aizu-Wakamatsu-shi)     | Damages to buildings and production equipment including the ceilings, walls, and drain pipes of the Fujitsu Group's plants and offices have affected business operations. Furthermore, planned rotational electricity blackouts have affected operations of Fujitsu Group companies based in the Kanto region of Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Unknown            | Manufacturing Site                           | Unknown | Not Reported                                                                                                                 | 14-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier                            | Locations                                                                          | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Down Status | Facility Type      | Damage  | Affected Products              | News Date |
|-------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|--------------------------------|-----------|
| Fujitsu                             | Fukushima Prefecture > Fujitsu Isotec Limited - Main plant (Date-shi)              | Damages to buildings and production equipment including the ceilings, walls, and drain pipes of the Fujitsu Group's plants and offices have affected business operations. Furthermore, planned rotational electricity blackouts have affected operations of Fujitsu Group companies based in the Kanto region of Japan                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Unknown | Not Reported                   | 14-Mar-11 |
| Hirose Electric                     | Tohoku Disaster                                                                    | At 3 Hirose factories located in Tohoku area, damage to buildings or production equipment, by the earthquake or tsunami is small and all factories are still in operation since Mar 14th. As soon as electric power, telecommunication and distribution are rechecked, production will be fully restarted                                                                                                                                                                                                                                                                                                                                                | None        | Manufacturing Site | Partial | Not Reported                   | 14-Mar-11 |
| Hitachi                             | Tokyo                                                                              | Toshiba Corporation today announced that it will cooperate with Tokyo Electric Power Company's (TEPCO) request to cut electricity consumption by operating only those of its businesses related to provision of essential services required for social and economic activities. This decision extends to Toshiba Group companies and covers production facilities and business premises in areas where TEPCO plans controlled power outages.<br>In line with this decision, Toshiba has closed for today all of its premises in those areas with power outages, other than its headquarters and those business operations related to essential services. | Unknown     | Manufacturing Site | None    | Not Reported                   | 14-Mar-11 |
| Japan Aviation Electronics Industry | Hirosaki Aviation Electronics (HAE) in Hirosaki City, Aomori Prefecture            | We had been preparing for production by inspecting production equipment. Although the power supply currently provided by Tohoku Electric Power is not sufficient for normal production level                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Restarted   | Manufacturing Site | None    | Not Reported                   | 16-Mar-11 |
| Kyocera                             | KYOCERA Corporation, Fukushima Tanagura Plant (Higashi-shirakawa, Fukushima Pref.) | The impact of the earthquake and subsequent planned rolling power outages on business performance is currently being investigated along with other factors including the status of business partners and the effects on production depending on the implementation of planned rolling power outages.                                                                                                                                                                                                                                                                                                                                                     | Restarted   | Manufacturing Site | Partial | PHS handsets and base stations | 17-Mar-11 |
| Kyocera                             | KYOCERA Chemical Corporation, Koriyama Plant (Koriyama City, Fukushima Pref.)      | The impact of the earthquake and subsequent planned rolling power outages on business performance is currently being investigated along with other factors including the status of business partners and the effects on production depending on the implementation of planned rolling power outages.                                                                                                                                                                                                                                                                                                                                                     | Unknown     | Manufacturing Site | Partial | Organic materials              | 17-Mar-11 |
| Kyocera                             | KYOCERA KINSEKI Yamagata Corporation (Higashine City, Yamagata Pref.)              | The impact of the earthquake and subsequent planned rolling power outages on business performance is currently being investigated along with other factors including the status of business partners and the effects on production depending on the implementation of planned rolling power outages.                                                                                                                                                                                                                                                                                                                                                     | Unknown     | Manufacturing Site | Partial | Quartz crystal components      | 17-Mar-11 |
| Kyocera                             | KYOCERA Chemical Corporation, Kawaguchi Plant (Kawaguchi City, Saitama Pref.)      | The impact of the earthquake and subsequent planned rolling power outages on business performance is currently being investigated along with other factors including the status of business partners and the effects on production depending on the implementation of planned rolling power outages.                                                                                                                                                                                                                                                                                                                                                     | Restarted   | Manufacturing Site | Partial | Organic materials              | 17-Mar-11 |
| Kyocera                             | KYOCERA Chemical Corporation, Kawasaki Plant (Kawasaki City, Kanagawa Pref.)       | The impact of the earthquake and subsequent planned rolling power outages on business performance is currently being investigated along with other factors including the status of business partners and the effects on production depending on the implementation of planned rolling power outages.                                                                                                                                                                                                                                                                                                                                                     | Restarted   | Manufacturing Site | Partial | Organic materials              | 17-Mar-11 |
| Kyocera                             | KYOCERA Chemical Corporation, Moka Plant (Moka City, Tochigi Pref.)                | The impact of the earthquake and subsequent planned rolling power outages on business performance is currently being investigated along with other factors including the status of business partners and the effects on production depending on the implementation of planned rolling power outages.                                                                                                                                                                                                                                                                                                                                                     | Restarted   | Manufacturing Site | Partial | Organic materials              | 17-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier                  | Location                                                                                                                 | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Down Status | Facility Type      | Damage  | Affected Products                                                                                                                                                     | News Date |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Lineage Power             |                                                                                                                          | Early feedback from products come from Japanese suppliers indicates that electricity disruptions and shift staffing shortages have reduced normal output capacity, and a few primary manufacturing facilities were damaged. While shipments of these electronics components to Lineage Power may slow down during the next 90 days, we are taking aggressive steps to procure as many of these electronics components as possible from global distribution sources while prioritizing existing orders with our Japanese suppliers                                                                                     | None        | Manufacturing Site | Low     | Capacitor, diode, relay, resistor and transistor components used in Lineage Power telecom energy systems, AC-DC power supplies and DC-DC board mounted power products | 18-Mar-11 |
| Maxim Integrated Products | Seiko Epson > Sakata                                                                                                     | Maxim Integrated Products, Inc. reported no structural damage to its partner facility, Seiko Epson, as a result of the catastrophic earthquake in Japan. However, a regional power outage has affected production at the facility located in Sakata, Japan., The Seiko Epson facility provided approximately 15 percent of Maxim's wafer starts last quarter. All products manufactured at Seiko Epson can be manufactured at other facilities, which have sufficient excess capacity. Therefore, Maxim has already begun shifting production from the Japan facility to its internal fabs and other foundry partners | None        | Wafer fab          | None    | Not Reported                                                                                                                                                          | 17-Mar-11 |
| Mitsubishi Electric       | Sendai, Miyagi Prefecture                                                                                                | Mitsubishi Electric Corporation announced today that its two major business operations in the Tohoku region have sustained damage as a result of the Tohoku Pacific Earthquake. The impact of the earthquake on the Mitsubishi Electric Group and its financial performance is currently being evaluated and remains to be determined. The company intends to make an announcement promptly should it foresee significant impact to its business                                                                                                                                                                      | Unknown     | Sales Offices      | Partial | Not Reported                                                                                                                                                          | 15-Mar-11 |
| Mitsubishi Electric       | Koriyama Factory, located in Koriyama, Fukushima Prefecture                                                              | Mitsubishi Electric Corporation announced today that its two major business operations in the Tohoku region have sustained damage as a result of the Tohoku Pacific Earthquake. The impact of the earthquake on the Mitsubishi Electric Group and its financial performance is currently being evaluated and remains to be determined. The company intends to make an announcement promptly should it foresee significant impact to its business                                                                                                                                                                      | Few days    | Manufacturing Site | Partial | CCTVs and communications equipment                                                                                                                                    | 15-Mar-11 |
| Murata Manufacturing      | Tome Murata Manufacturing Co., Ltd (11-1, Nakae 4-chome, Sanuma, Hasama-cho, Tome-shi, Miyagi 987-0511 Japan)            | At present, we are confirming the details of the disaster, but we have noticed damage to some of our buildings and equipment. As of the afternoon, 17th March, electricity has been restored, and we are making progress on preparations for restoring the buildings and equipment. We will inform you of the restoration status of other lifelines as well as the resumption of production schedule once it is confirmed                                                                                                                                                                                             | Unknown     | Manufacturing Site | Partial | Wire Wound Type EMI Suppression Filters, Coils                                                                                                                        | 18-Mar-11 |
| Murata Manufacturing      | Kanazawa Murata Manufacturing Co., Ltd. Sendai Plant (2-6, Akedori 3-chome, Izumi-ku, Sendai-shi, Miyagi 981-3206 Japan) | There was no significant damage to our buildings or equipment, but the lifelines of electricity (production use), water and gas are still unavailable. We will inform you of the restoration schedule once it is confirmed. If the restoration takes longer than expected, the plan is for products to be sent from the Kanazawa Murata Plant instead                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Low     | Piezoelectric Products and SAW filters                                                                                                                                | 18-Mar-11 |
| Murata Manufacturing      | Murata Manufacturing Co., Ltd. Oyama Plant (1-480, Inuzuka, Oyama-shi, Tochigi 323-8678 Japan)                           | We are making preparations to restart operations now, but if power cannot be obtained due to planned blackouts or other reasons, it will be some time before the restoration can be completed. We will inform you of the projected restoration schedule once it is confirmed.                                                                                                                                                                                                                                                                                                                                         | Few days    | Manufacturing Site | Low     | Polymer Capacitors                                                                                                                                                    | 18-Mar-11 |
| NEC TOKIN America         | NEC TOKIN America > Toyama                                                                                               | Production: Under standard Operation<br>Shipment: Keeping standard shipment, can not chip only to northern part of Japan due to traffic conditions.<br>Materials: They have keeping all materials for march and April production , also they are communicating for material supply after may production                                                                                                                                                                                                                                                                                                               | None        | Manufacturing Site | None    | Not Reported                                                                                                                                                          | 17-Mar-11 |
| NEC TOKIN America         | NEC TOKIN America > Thailand                                                                                             | Production: Under standard Operation<br>Shipment: Keeping standard shipment, can not chip only to northern part of Japan due to traffic conditions.<br>Materials: They have keeping all materials for march and April production , also they are communicating for material supply after may production                                                                                                                                                                                                                                                                                                               | None        | Manufacturing Site | None    | Not Reported                                                                                                                                                          | 17-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier                | Location                                                                                  | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Down Status | Facility Type      | Damage  | Affected Products    | News Date |
|-------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|----------------------|-----------|
| New Japan Radio         |                                                                                           | There appears to be little damage to the factories of New Japan Radio Co., Ltd. and our group companies, but the effects of this earthquake on the factories are currently under investigations                                                                                                                                                                                                                                                                                                                                                               | Unknown     | Manufacturing Site | Partial | Not Reported         | 14-Mar-11 |
| NIC Components          | NIC Components Corp                                                                       | Any impact on component production due to power blackouts has yet to be determined                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | Unknown | Component production | 18-Mar-11 |
| Nichicon                | NICHICON (IWATE) CORPORATION > Iwate prefecture                                           | All the production equipment have been completely inspected and will resume operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Restarted   | Manufacturing Site | Unknown | Not Reported         | 14-Mar-11 |
| NIDEC Copal Electronics | Tohoku Region Pacific Ocean Coast > Tajiri Plant Located in Osaki City, Miyagi Prefecture | At this point, no structural damage has been found. However, some of the equipments were damaged. Vital infrastructure have not been restored which has forced us to temporarily shut down the facility. We will continue to assess the damages to the building and to the equipments. As soon as the infrastructure are restored, we will work toward resuming operation as quickly as possible.                                                                                                                                                             | Unknown     | Manufacturing Site | Partial | Not Reported         | 20-Mar-11 |
| NIDEC Copal Electronics | Tohoku Region Pacific Ocean Coast > Sano Plant Located in Sano City, Tochigi Prefecture   | We resumed operation as no major damage was found to the building and damages to the manufacturing equipments were minimal. However, due to the sever power shortage, electric company is planning rolling blackouts. Operation may stop from time to time, which will affect our production.                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Low     | Not Reported         | 20-Mar-11 |
| Oki Semiconductor       | Oki Semiconductor Miyagi Co., Ltd.                                                        | Water and electric power have yet to be fully restored at this time and preparations are underway to restart operations as soon as the infrastructure is repaired. In addition, a substitute production system is being formulated at the ROHM Kyoto main factory and ROHM Hamamatsu Co., Ltd. Efforts are being made to maintain a supply system that will fill customer orders.                                                                                                                                                                             | Unknown     | Manufacturing Site | Low     | LSI                  | 20-Mar-11 |
| Oki Semiconductor       | ROHM Tsukuba Co., Ltd.                                                                    | Although the water for factory operations has yet to be restored, a partial operations has started at March 19. In addition, thanks to the formulation of a substitute production system at ROHM Wako Devices Co., Ltd. and ROHM Apollo Devices Co., Ltd., a supply system is maintained to fulfill customer orders.                                                                                                                                                                                                                                          | Restarted   | Manufacturing Site | Low     | Transistors, diodes  | 20-Mar-11 |
| ON Semiconductor        | Aizu                                                                                      | ON Semiconductor Corporation today announced the impact to operations in Japan from last Friday's 9.0 magnitude earthquake. The company has confirmed that there have been no on-site injuries to the SANYO Semiconductor division or other ON Semiconductor employees in Japan as a result of the earthquake and tsunami. The company currently anticipates infrastructure services will improve towards the end of the first quarter. The company is identifying options to shift production to other facilities to support supply continuity for customers | Unknown     | Wafer fab          | Low     | Not Reported         | 20-Mar-11 |
| ON Semiconductor        | Niigata                                                                                   | ON Semiconductor Corporation today announced the impact to operations in Japan from last Friday's 9.0 magnitude earthquake. The company has confirmed that there have been no on-site injuries to the SANYO Semiconductor division or other ON Semiconductor employees in Japan as a result of the earthquake and tsunami. The company currently anticipates infrastructure services will improve towards the end of the first quarter. The company is identifying options to shift production to other facilities to support supply continuity for customers | None        | Wafer fab          | Low     | Not Reported         | 20-Mar-11 |
| ON Semiconductor        | Gifu, leased from SANYO Electric Co. Ltd                                                  | ON Semiconductor Corporation today announced the impact to operations in Japan from last Friday's 9.0 magnitude earthquake. The company has confirmed that there have been no on-site injuries to the SANYO Semiconductor division or other ON Semiconductor employees in Japan as a result of the earthquake and tsunami. The company currently anticipates infrastructure services will improve towards the end of the first quarter. The company is identifying options to shift production to other facilities to support supply continuity for customers | None        | Wafer fab          | Low     | Not Reported         | 20-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier         | Location                                     | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Down Status | Facility Type      | Damage  | Affected Products | News Date |
|------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|-------------------|-----------|
| ON Semiconductor | Gunma, leased from SANYO Electric Co. Ltd    | ON Semiconductor Corporation today announced the impact to operations in Japan from last Friday's 9.0 magnitude earthquake. The company has confirmed that there have been no on-site injuries to the SANYO Semiconductor division or other ON Semiconductor employees in Japan as a result of the earthquake and tsunami. The company currently anticipates infrastructure services will improve towards the end of the first quarter. The company is identifying options to shift production to other facilities to support supply continuity for customers | Unknown     | Wafer fab          | Low     | Not Reported      | 20-Mar-11 |
| ON Semiconductor | Kasukawa, leased from SANYO Electric Co. Ltd | ON Semiconductor Corporation today announced the impact to operations in Japan from last Friday's 9.0 magnitude earthquake. The company has confirmed that there have been no on-site injuries to the SANYO Semiconductor division or other ON Semiconductor employees in Japan as a result of the earthquake and tsunami. The company currently anticipates infrastructure services will improve towards the end of the first quarter. The company is identifying options to shift production to other facilities to support supply continuity for customers | None        | Wafer fab          | Low     | Not Reported      | 20-Mar-11 |
| ON Semiconductor | Hanyu                                        | ON Semiconductor Corporation today announced the impact to operations in Japan from last Friday's 9.0 magnitude earthquake. The company has confirmed that there have been no on-site injuries to the SANYO Semiconductor division or other ON Semiconductor employees in Japan as a result of the earthquake and tsunami. The company currently anticipates infrastructure services will improve towards the end of the first quarter. The company is identifying options to shift production to other facilities to support supply continuity for customers | None        | Wafer fab          | Low     | Not Reported      | 20-Mar-11 |
| Optrex           | Hiroshima                                    | Optrex was formed in 1976 by Asahi Glass and Mitsubishi Electric. Headquartered in Tokyo, Japan, Optrex has followed an aggressive policy of growth and expansion and now serves customers through an extensive in-field network of applications engineers and more than 100 sales and distribution offices throughout the world, including Optrex America Inc. in Plymouth, MI, USA.                                                                                                                                                                         | Unknown     | Manufacturing Site | None    | Not Reported      | 14-Mar-11 |
| Optrex           | Kumamoto                                     | Optrex was formed in 1976 by Asahi Glass and Mitsubishi Electric. Headquartered in Tokyo, Japan, Optrex has followed an aggressive policy of growth and expansion and now serves customers through an extensive in-field network of applications engineers and more than 100 sales and distribution offices throughout the world, including Optrex America Inc. in Plymouth, MI, USA.                                                                                                                                                                         | Unknown     | Manufacturing Site | None    | Not Reported      | 14-Mar-11 |
| Optrex           | Tokyo                                        | Optrex was formed in 1976 by Asahi Glass and Mitsubishi Electric. Headquartered in Tokyo, Japan, Optrex has followed an aggressive policy of growth and expansion and now serves customers through an extensive in-field network of applications engineers and more than 100 sales and distribution offices throughout the world, including Optrex America Inc. in Plymouth, MI, USA.                                                                                                                                                                         | Unknown     | Sales Offices      | None    | Not Reported      | 14-Mar-11 |
| Panasonic        | AVC Networks Company Fukushima Factory       | While placing priority on the safety of Panasonic's employees and in cooperation with the planned power outages scheduled by Tokyo Electric Power Co. (TEPCO) and Tohoku Electric Power Co., Panasonic is preparing to resume production at factories in the affected region while confirming the supply of electricity, gas and water, as well as the situation of logistics and supplies                                                                                                                                                                    | Unknown     | Manufacturing Site | Unknown | Digital cameras   | 17-Mar-11 |
| Panasonic        | AVC Networks Company Sendai Factory          | While placing priority on the safety of Panasonic's employees and in cooperation with the planned power outages scheduled by Tokyo Electric Power Co. (TEPCO) and Tohoku Electric Power Co., Panasonic is preparing to resume production at factories in the affected region while confirming the supply of electricity, gas and water, as well as the situation of logistics and supplies                                                                                                                                                                    | Unknown     | Manufacturing Site | Unknown | Optical pickups   | 17-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier            | Location                                                                                                   | Description of Statement                                                                                                                                                                                                                                                                                                                                                                   | Down Status | Facility Type      | Damage  | Affected Products                            | News Date |
|---------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|----------------------------------------------|-----------|
| Panasonic           | Panasonic Electric Works Koriyama Co., Ltd.                                                                | While placing priority on the safety of Panasonic's employees and in cooperation with the planned power outages scheduled by Tokyo Electric Power Co. (TEPCO) and Tohoku Electric Power Co., Panasonic is preparing to resume production at factories in the affected region while confirming the supply of electricity, gas and water, as well as the situation of logistics and supplies | Unknown     | Manufacturing Site | Unknown | Electronic materials                         | 17-Mar-11 |
| Panasonic           | SANYO Electric Co., Ltd. Tokyo Plant located in Gunma                                                      | While placing priority on the safety of Panasonic's employees and in cooperation with the planned power outages scheduled by Tokyo Electric Power Co. (TEPCO) and Tohoku Electric Power Co., Panasonic is preparing to resume production at factories in the affected region while confirming the supply of electricity, gas and water, as well as the situation of logistics and supplies | Unknown     | Manufacturing Site | Unknown | Commercial air conditioners, showcases etc.. | 17-Mar-11 |
| Renesas Electronics | Renesas Northern Japan Semiconductor, Inc., Tsugaru Factory (Front-end line), Goshogawara-shi, Aomori City | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | Partial | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas Yamagata Semiconductor Co., Ltd., Tsuruoka Factory (Front-end line), Tsuruoka-shi, Yamagata City   | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | None    | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas Electronics Corporation, Naka Factory (Front-end line), Hitachinaka-shi, Ibaraki City              | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Unknown     | Manufacturing Site | High    | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas Electronics Corporation, Takasaki Factory (Front-end line), Takasaki-shi, Gunma City               | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | Partial | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas Electronics Corporation, Kofu Factory (Front-end line), Kai-shi, Yamanashi City                    | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | Partial | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas High Components, Inc. (Back-end line) Tsuruta-cho, Aomori City                                     | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | None    | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas Northern Japan Semiconductor, Inc., Yonezawa Factory (Back-end line), Yonezawa-shi, Yamagata City  | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | Partial | Not Reported                                 | 15-Mar-11 |
| Renesas Electronics | Renesas Eastern Japan Semiconductor, Tokyo Device Division (Back-end line), Oume-shi, Tokyo City           | Renesas Electronics Group's factories that are currently shutting production due to the earthquake (as of March 15, 2011, 12:00 p.m)                                                                                                                                                                                                                                                       | Restarted   | Manufacturing Site | Partial | Not Reported                                 | 18-Mar-11 |
| RICOH Semiconductor | Ricoh Optical Industries Co., Ltd.>> Hanamaki, Iwate                                                       | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Unknown | Optical products, projectors, etc            | 18-Mar-11 |
| RICOH Semiconductor | Hazama Ricoh, Inc. >>Tome, Miyagi                                                                          | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Unknown | Product parts                                | 18-Mar-11 |
| RICOH Semiconductor | Tohoku Ricoh Co., Ltd. >>Shibata-gun,Miyagi                                                                | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Unknown | MFPs, printers, toner                        | 18-Mar-11 |
| RICOH Semiconductor | Ricoh Printing Systems, Ltd. >>Hitachinaka, Ibarak                                                         | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Partial | Production printing products                 | 18-Mar-11 |
| RICOH Semiconductor | Ricoh Unitechno Co., Ltd. > Yashio, Saitama                                                                | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Partial | High capacity MFPs, refurbishing, recycling  | 18-Mar-11 |
| RICOH Semiconductor | Atsugi Plant > Atsugi,Kanagawa                                                                             | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Unknown | MFP and printer parts                        | 18-Mar-11 |
| RICOH Semiconductor | Gotemba Plant > Gotemba,Shizuoka                                                                           | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Unknown | MFPs and printers                            | 18-Mar-11 |
| RICOH Semiconductor | Numazu Plant > Numazu,Shizuoka                                                                             | Ricoh Manufacturing Sites in Japan Affected by the Great East Japan Earthquake and Tsunami                                                                                                                                                                                                                                                                                                 | Unknown     | Manufacturing Site | Partial | Supplies, toner, etc.                        | 18-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier        | Location                                                                        | Description of Statement                                                                                                                                                                                                                                                                                                                                                                      | Down Status | Facility Type      | Damage | Affected Products   | News Date |
|-----------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|--------|---------------------|-----------|
| ROHM            | OKI Semiconductor Miyagi Co., Ltd.                                              | Water and electric power have yet to be fully restored at this time and preparations are underway to restart operations as soon as the infrastructure is repaired. In addition, a substitute production system is being formulated at the ROHM Kyoto main factory and ROHM Hamamatsu Co., Ltd. Efforts are being made to maintain a supply system that will fill customer orders.             | Unknown     | Manufacturing Site | Low    | LSI                 | 20-Mar-11 |
| ROHM            | ROHM Tsukuba Co., Ltd.                                                          | Although the water for factory operations has yet to be restored, a partial operations has started at March 19. In addition, thanks to the formulation of a substitute production system at ROHM Wako Devices Co., Ltd. and ROHM Apollo Devices Co., Ltd., a supply system is maintained to fulfill customer orders.                                                                          | Restarted   | Manufacturing Site | Low    | Transistors, diodes | 20-Mar-11 |
| Rubycon         | North-east Japan > Akita Rubycon                                                | The factory is in normal operation.                                                                                                                                                                                                                                                                                                                                                           | None        | Manufacturing Site | None   | Not Reported        | 14-Mar-11 |
| Rubycon         | North-east Japan > Fukushima Rubycon                                            | The examination of the machines and facilities has been completed and the factory is about to resume normal operation.                                                                                                                                                                                                                                                                        | Unknown     | Manufacturing Site | Low    | Not Reported        | 14-Mar-11 |
| Rubycon         | North-east Japan > Niigata Rubycon                                              | The factory is in normal operation.                                                                                                                                                                                                                                                                                                                                                           | None        | Manufacturing Site | None   | Not Reported        | 14-Mar-11 |
| Rubycon         | North-east Japan > Tohoku sales office and Mito sales office                    | Sales headquarter(Ina) has been supporting their operation and should you have any difficulty to contact to these offices, please contact to Sales headquarter. (Tel:+81 (0) 265 72 7114)                                                                                                                                                                                                     | None        | Sales Offices      | None   | Not Reported        | 14-Mar-11 |
| Sanken Electric | Yamagata Sanken Co., Ltd. (Higashine, Yamagata Prefecture)                      | The production at Yamagata Sanken Co., Ltd. (Higashine, Yamagata Prefecture), Fukushima Sanken Co., Ltd. (Nihonmatsu, Fukushima Prefecture) and Kashima Sanken Co., Ltd. (Kamisu, Ibaragi Prefecture) is currently placed on halt. The supply of electric power was resumed, and the review of the earthquake impact on production equipments and analysis of recovery measures are underway. | Unknown     | Manufacturing Site | None   | Not Reported        | 13-Mar-11 |
| Sanken Electric | Fukushima Sanken Co., Ltd. (Nihonmatsu, Fukushima Prefecture)                   | The production at Yamagata Sanken Co., Ltd. (Higashine, Yamagata Prefecture), Fukushima Sanken Co., Ltd. (Nihonmatsu, Fukushima Prefecture) and Kashima Sanken Co., Ltd. (Kamisu, Ibaragi Prefecture) is currently placed on halt. The supply of electric power was resumed, and the review of the earthquake impact on production equipments and analysis of recovery measures are underway. | Unknown     | Manufacturing Site | None   | Not Reported        | 13-Mar-11 |
| Sanken Electric | Kashima Sanken Co., Ltd. (Kamisu, Ibaragi Prefecture)                           | The production at Yamagata Sanken Co., Ltd. (Higashine, Yamagata Prefecture), Fukushima Sanken Co., Ltd. (Nihonmatsu, Fukushima Prefecture) and Kashima Sanken Co., Ltd. (Kamisu, Ibaragi Prefecture) is currently placed on halt. The supply of electric power was resumed, and the review of the earthquake impact on production equipments and analysis of recovery measures are underway. | Unknown     | Manufacturing Site | None   | Not Reported        | 13-Mar-11 |
| SANYO DENKI     | Ueda                                                                            | The Announcement due to the influence of Tohoku District /Pacific Coast Earthquake                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | None   | Not Reported        | 14-Mar-11 |
| SANYO DENKI     | Nagano                                                                          | The Announcement due to the influence of Tohoku District /Pacific Coast Earthquake                                                                                                                                                                                                                                                                                                            | Unknown     | Manufacturing Site | None   | Not Reported        | 14-Mar-11 |
| SANYO DENKI     | Sendai                                                                          | The Announcement due to the influence of Tohoku District /Pacific Coast Earthquake                                                                                                                                                                                                                                                                                                            | Unknown     | Sales Offices      | None   | Not Reported        | 14-Mar-11 |
| SANYO DENKI     | Utsunomiya                                                                      | The Announcement due to the influence of Tohoku District /Pacific Coast Earthquake                                                                                                                                                                                                                                                                                                            | Unknown     | Sales Offices      | None   | Not Reported        | 14-Mar-11 |
| Shindengen      | Akita Shindengen Co., Ltd. (114-2, Aza Kamiyachi, Ooura, Yurihonjo City, Akita) | We have currently halted operation at the main production facilities below located in the affected areas. The power outage is currently being restored, and we are confirming the production facility damage and working towards resuming operation. We shall issue another report as soon as we can confirm when to expect operation to begin.                                               | Unknown     | Manufacturing Site | None   | Not Reported        | 15-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier         | Location                                                                                | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Down Status | Facility Type      | Damage  | Affected Products                  | News Date |
|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|------------------------------------|-----------|
| Shindengen       | Higashine Shindengen Co., Ltd. (5600-1, Kou, Ooaza Higashine, Higashine City, Yamagata) | We have currently halted operation at the main production facilities below located in the affected areas. The power outage is currently being restored, and we are confirming the production facility damage and working towards resuming operation. We shall issue another report as soon as we can confirm when to expect operation to begin.                                                                                                                                                                                                                                                                                                                                                                           | Unknown     | Manufacturing Site | None    | Not Reported                       | 15-Mar-11 |
| SMC Corporation  | Soka (in Saitama Prefecture)                                                            | Our factories in Soka (in Saitama Prefecture) and Tsukuba (in Ibaraki Prefecture) and Yamatsuri (in Fukushima Prefecture) are now in operation, but rolling electricity outage is affecting the production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Unknown     | Manufacturing Site | None    | Not Reported                       | 14-Mar-11 |
| SMC Corporation  | Tsukuba (in Ibaraki Prefecture)                                                         | Our factories in Soka (in Saitama Prefecture) and Tsukuba (in Ibaraki Prefecture) and Yamatsuri (in Fukushima Prefecture) are now in operation, but rolling electricity outage is affecting the production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Unknown     | Manufacturing Site | None    | Not Reported                       | 14-Mar-11 |
| SMC Corporation  | Yamatsuri (in Fukushima Prefecture)                                                     | Our factories in Soka (in Saitama Prefecture) and Tsukuba (in Ibaraki Prefecture) and Yamatsuri (in Fukushima Prefecture) are now in operation, but rolling electricity outage is affecting the production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Unknown     | Manufacturing Site | None    | Not Reported                       | 14-Mar-11 |
| SMC Corporation  | Tono (in Iwate Prefecture)                                                              | In the factory in Tono (in Iwate Prefecture), we are getting power supply effective today. We are now checking and adjusting machineries, and we expect to resume operation sometime within the week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Unknown     | Manufacturing Site | None    | Not Reported                       | 14-Mar-11 |
| SMC Corporation  | Kamaishi (in Iwate Prefecture)                                                          | The building of the factory in Kamaishi (in Iwate Prefecture) has not been damaged and machineries' damage was minimal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | None    | Not Reported                       | 14-Mar-11 |
| Sony Electronics | Sony Chemical & Information Device Corporation                                          | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Not Reported                       | 14-Mar-11 |
| Sony Electronics | Tagajyo Plant (Miyagi Prefecture)                                                       | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Magnetic Tapes, Blu-ray Discs etc. | 14-Mar-11 |
| Sony Electronics | Tome Plant, Nakada/Toyosato Sites (Miyagi Prefecture)                                   | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Optical devices, IC cards etc.     | 14-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier         | Location                                                                | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Down Status | Facility Type      | Damage  | Affected Products                    | News Date |
|------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|--------------------------------------|-----------|
| Sony Electronics | Miyagi Prefecture > Sony Shiroishi Semiconductor Inc.                   | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Semiconductor Lasers etc.            | 14-Mar-11 |
| Sony Electronics | Fukushima Prefecture > Sony Energy Devices Corporation, Koriyama Plant  | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Lithium Ion Secondary Batteries etc. | 14-Mar-11 |
| Sony Electronics | Fukushima Prefecture > Sony Energy Devices Corporation, Motomiya Plant  | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Lithium Ion Secondary Batteries etc. | 14-Mar-11 |
| Sony Electronics | Saitama Prefecture > Sony Manufacturing Systems Corporation, Kuki Plant | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | Surface mounting equipment etc.      | 14-Mar-11 |
| Sony Electronics | Ibaraki Prefecture > Sony DADC Japan Inc., Ibaraki Facility             | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Manufacturing Site | Unknown | CDs, DVDs etc.                       | 14-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier         | Location                                                    | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Down Status | Facility Type      | Damage  | Affected Products                                                                                                                                                        | News Date |
|------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Sony Electronics | Tagaiyo, Miyagi > Sony Corporation Sendai Technology Center | Operations at several Sony Corporation and Sony Group sites and facilities have been affected by the Pacific Coast of Tohoku Earthquake and tsunami, and Sony is monitoring the status of each of these sites on an on-going basis, while also considering the most effective recovery measures. Sony also has responded to reports of widespread power outages by voluntarily suspending operations at several sites. No significant injuries have been reported to employees working at any of these sites when the earthquake or tsunami occurred.<br>The company is currently evaluating the full impact of the earthquake, tsunami and related power outages on Sony's businesses and consolidated financial results | Unknown     | Technology Center  | Unknown | Not Reported                                                                                                                                                             | 14-Mar-11 |
| Spansion         |                                                             | Spansion's final manufacturing sites are outside Japan and the impact to near term product supply is expected to be minimal. Spansion is actively engaged in working with its manufacturing partners in Japan to provide assistance and understand any future changes to production as they deal with the tragedy daily. In order to ensure stability of supply to customers, Spansion has the flexibility to move manufacturing of certain products to its Austin facility or other partners as the situation evolves.                                                                                                                                                                                                   | None        | Manufacturing Site | Low     | Not Reported                                                                                                                                                             | 15-Mar-11 |
| Taiyo Yuden      | Fukushima Co., Ltd                                          | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Optical recording media (CD-R, DVD-R, BD-R)                                                                                                                              | 18-Mar-11 |
| Taiyo Yuden      | Egi Plant, Takasaki Global Center > Takasaki, Gunma         | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Main business activities: Personnel, General Affairs and Administration departments                                                                                      | 18-Mar-11 |
| Taiyo Yuden      | Haruna Plant>>Takasaki, Gunma                               | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Multilayer Ceramic Capacitors                                                                                                                                            | 18-Mar-11 |
| Taiyo Yuden      | Tamamura Plant > Tamamura-machi, Sawa-gun, Gunma            | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Multilayer Ceramic Capacitors, Multilayer Chip Inductors for High Frequency, Multilayer Chip Inductors, Multilayer Chip Varistors and Multilayer Chip Antennas / Filters | 18-Mar-11 |
| Taiyo Yuden      | Yawatabara Plant > Takasaki, Gunma                          | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Circuit Modules                                                                                                                                                          | 18-Mar-11 |
| Taiyo Yuden      | R&D Center > Takasaki, Gunma                                | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Not Reported                                                                                                                                                             | 18-Mar-11 |
| Taiyo Yuden      | Taiyo Chemical Industry Co., LTD. >>Takasaki, Gunma         | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Surface processing of electronic components and Production and sales of mounting tools                                                                                   | 18-Mar-11 |
| Taiyo Yuden      | Akagi Electronics Co., Ltd. >>Maebashi, Gunma               | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown     | Manufacturing Site | Partial | Main business activities: Design and mounting of printed boards                                                                                                          | 18-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier            | Location                                                 | Description of Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Down Status  | Facility Type      | Damage  | Affected Products                                                                                                                                                                                                                                                                             | News Date |
|---------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Taiyo Yuden         | That's Fukushima Co., Ltd. > Date-shi, Fukushima         | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Unknown      | Manufacturing Site | Partial | Optical recording media<br>Current situation: Some facilities and buildings have been damaged. At present, the site has been under investigation and operations are suspended. The site is not in the area of the planned outages, however electric transmission has not been fully restored. | 18-Mar-11 |
| Taiyo Yuden         | Niigata Taiyo Yuden Co., Ltd > Joetsu-shi, Niigata       | The planned electricity power outages that were recently started by Tokyo Electric Power Company will have an influence on the restoration and the ongoing efficiency of our production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Unknown      | Manufacturing Site | Partial | Multilayer Ceramic Capacitors<br>Current situation: This site has a possibility to be affected by the planned outages at a later date.                                                                                                                                                        | 18-Mar-11 |
| TDK                 | TDK Micro Device Corporation, Kitaibaraki-city, Ibaraki  | The 2011 off the Pacific coast of Tohoku Earthquake and the impact of the planned rolling blackout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown      | Manufacturing Site | Partial | Organic EL displays                                                                                                                                                                                                                                                                           | 14-Mar-11 |
| TDK                 | TDK-MCC Corporation Kitakami Plant, Kitakami-city, Iwate | The 2011 off the Pacific coast of Tohoku Earthquake and the impact of the planned rolling blackout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unknown      | Manufacturing Site | Partial | Capacitors                                                                                                                                                                                                                                                                                    | 14-Mar-11 |
| Texas Instruments   | Miho                                                     | TI is moving quickly to shift production to other fabs and so far has identified alternate manufacturing sites for about 60 percent of Miho's wafer production. Work is underway to increase this percentage by moving the production of additional products.<br>Specific damage at Miho includes the following:<br>The infrastructure systems that deliver chemicals, gases, water and air were damaged, and repairs should be complete in about three weeks.<br>Impact to the manufacturing equipment is unclear until continuous power is available from the electric utility.<br>Work-in-process was damaged, and the current assumption is that about 40 percent of it can be recovered to support customers.<br>The Miho building itself suffered little damage and remains structurally sound | Until May 1  | Manufacturing Site | High    | Not Reported                                                                                                                                                                                                                                                                                  | 14-Mar-11 |
| Texas Instruments   | Aizu-wakamatsu                                           | TI's fab in Aizu-wakamatsu, about 150 miles north of Tokyo, also was damaged in the earthquake, though equipment there already is being re-started and full production is estimated by mid-April, assuming a stable power supply. The company's third fab in Hiji, about 500 miles south of Tokyo, was undamaged and is currently running at normal capacity                                                                                                                                                                                                                                                                                                                                                                                                                                         | Until May 1  | Manufacturing Site | High    | Not Reported                                                                                                                                                                                                                                                                                  | 14-Mar-11 |
| Toko                | TOKO Coltec Co., Ltd.(Ninohe-shi, Iwate-ken)             | Personnel and building unaffected. The normal operation has been started.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | None         | Manufacturing Site | None    | Not Reported                                                                                                                                                                                                                                                                                  | 18-Mar-11 |
| Toko                | Hikari Electronics Co., Ltd.(Osaki-shi, Miyagi-ken)      | No personnel injury, a portion of the factory and equipment was damaged                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Until Mar 22 | Manufacturing Site | Partial | Not Reported                                                                                                                                                                                                                                                                                  | 18-Mar-11 |
| Toko                | Elec-kitakami Co., Ltd.(Kitakami-shi, Iwate-ken)         | No personnel injury, a portion of the factory and equipment was damaged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Restarted    | Manufacturing Site | Partial | Not Reported                                                                                                                                                                                                                                                                                  | 18-Mar-11 |
| Torex Semiconductor | South of Japan                                           | Two of production partners do have factories closer to the earthquake zone and both have reported some damage as a result of the quake.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Unknown      | Manufacturing Site | None    | Not Reported                                                                                                                                                                                                                                                                                  | 14-Mar-11 |
| Toshiba             | Tokyo                                                    | Toshiba Corporation today announced that it will cooperate with Tokyo Electric Power Company's (TEPCO) request to cut electricity consumption by operating only those of its businesses related to provision of essential services required for social and economic activities. This decision extends to Toshiba Group companies and covers production facilities and business premises in areas where TEPCO plans controlled power outages.<br>In line with this decision, Toshiba has closed for today all of its premises in those areas with power outages, other than its headquarters and those business operations related to essential services.                                                                                                                                             | Unknown      | Manufacturing Site | None    | Not Reported                                                                                                                                                                                                                                                                                  | 14-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier         | Location                                                     | Description of Statement                                                                                                                                                                                                                                                                                                                                                             | Down Status | Facility Type      | Damage  | Affected Products | News Date |
|------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|---------|-------------------|-----------|
| Tyco Electronics |                                                              | Our facilities in Japan had only minor damage that caused little or no delay in production                                                                                                                                                                                                                                                                                           | Unknown     | Unknown            | Partial | Not Reported      | 21-Mar-11 |
| United Chemi Con | Nippon Chemi-Con Corp. Niigata Plant (Kita-Kanbara, Niigata) | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Hidaka Electron Co., Ltd. (Samani, Hokkaido)                 | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Iwate Corp. (Kitakami, Iwate)                      | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Iwate Electrolytic Industry Corp. (Kitakami, Iwate)          | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Sealing Rubber Corp. (Kitakami, Iwate)             | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Nichiei Electronics Corp. (Kitakami, Iwate)                  | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Iwate Electronics Corp. (Kitakami, Iwate)                    | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Yamagata Corp. (Nagai, Yamagata)                   | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Yonezawa Corp. (Higashi-Okitama, Yamagata)         | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None    | Not Reported      | 17-Mar-11 |

## Impacts of the 2011 Tōhoku Japanese Earthquake on the Electronics Industry

| Supplier         | Location                                                  | Description of Statement                                                                                                                                                                                                                                                                                                                                                             | Down Status | Facility Type      | Damage | Affected Products | News Date |
|------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|--------|-------------------|-----------|
| United Chemi Con | Fukushima Electrolytic Industry Corp. (Kitakami, Iwate)   | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None   | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Nagaoka Corp. (Nagaoka, Niigata)                | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None   | Not Reported      | 17-Mar-11 |
| United Chemi Con | Nippon Chemi-Con Corp. Takahagi Plant (Takahagi, Ibaraki) | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None   | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Machinery Corp. Sendai Plant (Iwanuma, Miyagi)  | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None   | Not Reported      | 17-Mar-11 |
| United Chemi Con | Chemi-Con Fukushima Corp. (Nishi-Shirakawa, Fukushima)    | Production status at the major plants can be divided into two categories; production bases with facilities which are able to operate as usual and production bases under recovery works. Production bases with facilities which are able to operate as usual however remains under reduced operation with the effect of rolling blackouts and lack of gasoline and heavy oil supply. | Unknown     | Manufacturing Site | None   | Not Reported      | 17-Mar-11 |
| Venkel           |                                                           | At this time Venkel is not experiencing any raw material shortages. Issues related to manufacturing or delivery constraints as a result of the Japan earthquake and tsunami                                                                                                                                                                                                          | None        | Manufacturing Site | None   | Not Reported      | 15-Mar-11 |

## Unaffected Electronic Component Manufacturers - 2011 Tōhoku Japanese Earthquake

| Manufacturer               | Status       | Source Link                 |
|----------------------------|--------------|-----------------------------|
| Atmel                      | Not Affected | <a href="#">Source Link</a> |
| Chilisin Electronics       | Not Affected | <a href="#">Source Link</a> |
| Coilcraft                  | Not Affected | <a href="#">Source Link</a> |
| e2v                        | Not Affected | <a href="#">Source Link</a> |
| Emerson                    | Not Affected | <a href="#">Source Link</a> |
| Everlight Electronics      | Not Affected | <a href="#">Source Link</a> |
| Fuji Electric              | Not Affected | <a href="#">Source Link</a> |
| Hokuriku Electric Industry | Not Affected | <a href="#">Source Link</a> |
| KEMET Electronics          | Not Affected | <a href="#">Source Link</a> |
| Laird Technologies         | Not Affected | <a href="#">Source Link</a> |
| Macronix International     | Not Affected | <a href="#">Source Link</a> |
| NXP Semiconductors         | Not Affected | <a href="#">Source Link</a> |
| Omron                      | Not Affected | <a href="#">Source Link</a> |
| ProTek Devices             | Not Affected | <a href="#">Source Link</a> |
| Samtec                     | Not Affected | <a href="#">Source Link</a> |
| Semtech                    | Not Affected | <a href="#">Source Link</a> |
| Sensata Technologies       | Not Affected | <a href="#">Source Link</a> |
| TriQuint Semiconductor     | Not Affected | <a href="#">Source Link</a> |
| Yageo                      | Not Affected | <a href="#">Source Link</a> |

**From:** Taylor, Robert *INXER*  
**To:** Blamey, Alan  
**Cc:** Holahan, Vincent  
**Bcc:** Taylor, Robert  
**Subject:** PACOM embedded contact  
**Date:** Tuesday, April 05, 2011 12:59:00 AM

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Alan,

Going forward, Chuck wants us to keep Vince as reasonably well informed as possible so he can keep the military informed and minimize the number of questions they have for us. I have been sending him the Daily Assessment tool and we should consider what other things he might need to be cc'd on.

His contact info is as follows:

(b)(6) *EKG*

Regards,  
Rob

*NN/172*

**Sigmon, Rebecca**

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**From:** Sigmon, Rebecca *NR*  
**Sent:** Tuesday, April 05, 2011 3:53 PM  
**To:** Garmon, David  
**Subject:** RE: Need anything?

I don't know that I've seen anything. All I saw mentioned about the iso condenser was a press release (tepco I think) that said it had been operating and then stopped. I imagine that immediately after the earthquake and scram they weren't worried about the iso condenser as a first priority, and when the tsunami struck before they would have needed to refill it, they lost their normal and backup refill methods. By the time they were working with fire trucks and sea water injection Unit 1 had already experienced the hydrogen explosion, which probably complicated any iso condenser operation irrevocably. But that is purely speculation on my part, there hasn't been anything I've seen that goes into that at all.

Rebecca

**From:** Garmon, David *NR*  
**Sent:** Tuesday, April 05, 2011 3:41 PM  
**To:** Sigmon, Rebecca  
**Subject:** RE: Need anything?

(b)(6)

See the attached for the final product. John and I spent some time settling this over the phone. I couldn't find anything with specifics so do you recall what prevented them from refilling the iso condenser?

**From:** Sigmon, Rebecca *NR*  
**Sent:** Tuesday, April 05, 2011 3:18 PM  
**To:** Garmon, David  
**Subject:** Need anything?

(b)(6)

Rebecca

*NR/173*

**Weaver, Tonna**

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**From:** Bailey, Stewart *NY/12*  
**Sent:** Tuesday, April 05, 2011 10:14 AM  
**To:** Golla, Joe  
**Cc:** Nelson, Robert; Burnell, Scott; Dennig, Robert  
**Subject:** FW: questions from the WSJ

I'm forwarding this to Joe Golla, BWROG lead PM, hoping he can help with the historic information on the generic operating procedures.

My branch doesn't really have information on these issues.

**From:** Burnell, Scott *10/17/11*  
**Sent:** Tuesday, April 05, 2011 10:10 AM  
**To:** Dennig, Robert; Bailey, Stewart  
**Cc:** Nelson, Robert  
**Subject:** FW: questions from the WSJ  
**Importance:** High

Gentlemen;

Are we in a position to provide substantive answers (or the requested excerpts) on these questions? The letter in question is ML003678152. The reporter's in Tokyo, so I'm hoping we can reply one way or another by COB so that the reporter will have it first thing tomorrow. Thanks.

Scott

**From:** Dvorak, Phred *Phred* [mailto:Phred.Dvorak@wsj.com]  
**Sent:** Tuesday, April 05, 2011 9:51 AM  
**To:** Burnell, Scott  
**Subject:** questions from the WSJ

Scott, hi --

It's Phred Dvorak at the Wall Street Journal in Tokyo, with those questions about BWR accident guidelines.

As I mentioned, I'm looking into the idea that some actions that are required by the "generic" BWR severe accident guidelines in the U.S. don't seem to have been performed by the Fukushima Daiichi operators in Japan. So to follow up, I'm trying to first pin down what those standard protocols are in the U.S. -- specifically with regard to venting the primary containment vessel and injecting water.

- I'm told that the latest version of those protocols is this: "BWR Owners' Group Emergency Procedure and Severe Accident Guidelines - Rev 2, 2001 - 03". Can you confirm that's true? And are they publically available?

- If they're not, could I obtain excerpts from the parts concerning venting the primary containment vessel (when, how and how long to vent, venting philosophy -- how to factor in risk of radiation release etc, who's responsible for the decision) and injecting water (similarly: when it's absolutely necessary to inject, who's responsible for the decision).

- Further to the "venting philosophy" question, I found in your public documents database a Jan. 28, 2000 letter from the BWR Operators' Group to the NRC expressing some concerns about wording in the (then) proposed Revision 2. The wording in question was that vents should be opened "irrespective of the offsite radioactivity release rate." The BWROG asked the wording be softened. Can you tell me how this issue was resolved? (What was the final wording?)

*NY/174*

- The same letter also noted the need for guidance that "clearly established responsibilities within the licensee's management organization for authorizing containment venting under accident conditions." Could you please tell me whether that happened, and what the resulting guidance was?

- In the venting and water injection instructions, are there parts of the generic SAG (the BWROG Severe Accident Guidelines referred to above) that are modifiable by the operators and parts that are not? What are the NRC rules concerning how such SAGs can or should be modified with plant-specific information?

Many thanks in advance for your help!  
Phred

-----  
Phred Dvorak  
Wall Street Journal

(b)(6) cellphone)

✉ [phred.dvorak@wsj.com](mailto:phred.dvorak@wsj.com)

**From:** Taylor, Robert *MARK*  
**To:** Scott, Michael  
**Subject:** Re: NYT story on NRC "confidential assessment" of Fukushima  
**Date:** Wednesday, April 06, 2011 12:33:15 AM

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Don't think so. Story broke after the meeting.

Sent from an NRC BlackBerry  
Robert Taylor

(b)(6)

**From:** Scott, Michael *MS*  
**To:** Taylor, Robert  
**Sent:** Wed Apr 06 00:31:28 2011  
**Subject:** Re: NYT story on NRC "confidential assessment" of Fukushima

Had Nei heard about this at the 11?

Sent from my NRC blackberry  
Michael Scott

(b)(6)

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**From:** Taylor, Robert *MARK*  
**To:** Scott, Michael  
**Sent:** Wed Apr 06 00:23:42 2011  
**Subject:** FW: NYT story on NRC "confidential assessment" of Fukushima

Looks like communications are about to go in the toilet anyway.

**From:** Stahl, Eric *DIP*  
**Sent:** Wednesday, April 06, 2011 12:08 AM  
**To:** Casto, Chuck; Collins, Elmo  
**Cc:** Harrington, Holly; Emche, Danielle; Doane, Margaret  
**Subject:** FW: NYT story on NRC "confidential assessment" of Fukushima  
**Importance:** High

FYI, in case you haven't already seen this...

**From:** Morimura, Stephanie (TDY/PAS) [mailto:TDYMorimuraS@state.gov]  
**Sent:** Tuesday, April 05, 2011 11:58 PM  
**To:** Stahl, Eric; giulia.bisconti@hq.doe.gov  
**Cc:** Quade, Christopher P; Largent, Dale A; Hoffmann, Phillip P  
**Subject:** FW: NYT story on NRC "confidential assessment" of Fukushima  
**Importance:** High

What's your take?

This email is UNCLASSIFIED.

*NN/175*

**From:** Quade, Christopher P  
**Sent:** Wednesday, April 06, 2011 11:48 AM  
**To:** Zumwalt, James P; Hoffmann, Phillip P; Largent, Dale A; Phillips, Leslie M; Morimura, Stephanie (TDY/PAS); Basalla, Suzanne I; Fuller, Matthew G  
**Subject:** NYT story on NRC "confidential assessment" of Fukushima  
**Importance:** High

Not necessarily what we needed at this point...

April 5, 2011

## U.S. Sees Array of New Threats at Japan's Nuclear Plant

By JAMES GLANZ and WILLIAM J. BROAD

United States government engineers sent to help with the crisis in Japan are warning that the troubled nuclear plant there is facing a wide array of fresh threats that could persist indefinitely, and that in some cases are expected to increase as a result of the very measures being taken to keep the plant stable, according to a confidential assessment prepared by the Nuclear Regulatory Commission.

Among the new threats that were cited in the assessment, dated March 26, are the mounting stresses placed on the containment structures as they fill with radioactive cooling water, making them more vulnerable to rupture in one of the aftershocks rattling the site after the earthquake and tsunami of March 11. The document also cites the possibility of explosions inside the containment structures due to the release of hydrogen and oxygen from seawater pumped into the reactors, and offers new details on how semimolten fuel rods and salt buildup are impeding the flow of fresh water meant to cool the nuclear cores.

In recent days, workers have grappled with several side effects of the emergency measures taken to keep nuclear fuel at the plant from overheating, including leaks of radioactive water at the site and radiation burns to workers who step into the water. The assessment, as well as interviews with officials familiar with it, points to a new panoply of complex challenges that water creates for the safety of workers and the recovery and long-term stability of the reactors.

While the assessment does not speculate on the likelihood of new explosions or damage from an aftershock, either could lead to a breach of the containment structures in one or more of the crippled reactors, the last barriers that prevent a much more serious release of radiation from the nuclear core. If the fuel continues to heat and melt because of ineffective cooling, some nuclear experts say, that could also leave a radioactive mass that could stay molten for an extended period.

The document, which was obtained by The New York Times, provides a more detailed technical assessment than Japanese officials have provided of the conundrum facing the Japanese as they struggle to prevent more fuel melting at the Fukushima Daiichi plant. But it appears to rely largely on data shared with American experts by the Japanese.

Among other problems, the document raises new questions about whether pouring water on nuclear fuel in the absence of functioning cooling systems can be sustained indefinitely. Experts have said the Japanese need to continue to keep the fuel cool for many months until the plant can be stabilized, but there is growing awareness that the risks of pumping water on the fuel present a whole new category of challenges that the nuclear industry is only beginning to comprehend.

The document also suggests that fragments or particles of nuclear fuel from spent fuel pools above the reactors were blown "up to one mile from the units," and that pieces of highly radioactive material fell between two units and had to be "bulldozed over," presumably to protect workers at the site. The ejection of nuclear material, which may have occurred during one of the earlier hydrogen explosions, may indicate more extensive damage to the extremely radioactive pools than previously disclosed.

David A. Lochbaum, a nuclear engineer who worked on the kinds of General Electric reactors used in Japan and now directs the nuclear safety project at the Union of Concerned Scientists, said that the welter of problems revealed in the document at three separate reactors made a successful outcome even more uncertain.

"I thought they were, not out of the woods, but at least at the edge of the woods," said Mr. Lochbaum, who was not involved in preparing the document. "This paints a very different picture, and suggests that things are a lot worse. They could still have more damage in a big way if some of these things don't work out for them."

The steps recommended by the nuclear commission include injecting nitrogen, an inert gas, into the containment structures in an attempt to purge them of hydrogen and oxygen, which could combine to produce explosions. The document also recommends that engineers continue adding boron to cooling water to help prevent the cores from restarting the nuclear reaction, a process known as criticality.

Even so, the engineers who prepared the document do not believe that a resumption of criticality is an immediate likelihood, Neil Wilmshurst, vice president of the nuclear sector at the Electric Power Research Institute, said when contacted about the document. "I have seen no data to suggest that there is criticality ongoing," said Mr. Wilmshurst, who was involved in the assessment.

The document was prepared for the commission's Reactor Safety Team, which is assisting the Japanese government and the Tokyo Electric Power Company, which owns the plant. It says it is based on the "most recent available data" from numerous Japanese and American organizations, including the electric power company, the Japan Atomic Industrial Forum, the United States Department of Energy, General Electric and the Electric Power Research Institute, an industry group.

The document contains detailed assessments of each of the plant's six reactors along with recommendations for action. Nuclear experts familiar with the assessment said that it was regularly updated but that over all, the March 26 version closely reflected current thinking.

The assessment provides graphic new detail on the conditions of the damaged cores in reactors 1, 2 and 3. Because slumping fuel and salt from seawater that had been used as a coolant is probably blocking circulation pathways, the water flow in No. 1 "is severely restricted and likely blocked." Inside the core itself, "there is likely no water level," the assessment says, adding that as a result, "it is difficult to determine how much cooling is getting to the fuel." Similar problems exist in No. 2 and No. 3, although the blockage is probably less severe, the assessment says.

Some of the salt may have been washed away in the past week with the switch from seawater to fresh water cooling, nuclear experts said.

A rise in the water level of the containment structures has often been depicted as a possible way to immerse and cool the fuel. The assessment, however, warns that "when flooding containment, consider the implications of water weight on seismic capability of containment."

Experts in nuclear plant design say that this warning refers to the enormous stress put on the containment structures by the rising water. The more water in the structures, the more easily a large aftershock could rupture one of them.

Margaret Harding, a former reactor designer for General Electric, warned of aftershocks and said, "If I were in the Japanese's shoes, I'd be very reluctant to have tons and tons of water sitting in a

containment whose structural integrity hasn't been checked since the earthquake."

The N.R.C. document also expressed concern about the potential for a "hazardous atmosphere" in the concrete-and-steel containment structures because of the release of hydrogen and oxygen from the seawater in a highly radioactive environment.

Hydrogen explosions in the first few days of the disaster heavily damaged several reactor buildings and in one case may have damaged a containment structure. That hydrogen was produced by a mechanism involving the metal cladding of the nuclear fuel. The document urged that Japanese operators restore the ability to purge the structures of these gases and fill them with stable nitrogen gas, a capability lost after the quake and tsunami.

Nuclear experts say that radiation from the core of a reactor can split water molecules in two, releasing hydrogen. Mr. Wilmshurst said that since the March 26 document, engineers had calculated that the amount of hydrogen produced would be small. But Jay A. LaVerne, a physicist at Notre Dame, said that at least near the fuel rods, some hydrogen would in fact be produced, and could react with oxygen. "If so," Mr. LaVerne said in an interview, "you have an explosive mixture being formed near the fuel rods."

Nuclear engineers have warned in recent days that the pools outside the containment buildings that hold spent fuel rods could pose an even greater danger than the melted reactor cores. The pools, which sit atop the reactor buildings and are meant to keep spent fuel submerged in water, have lost their cooling systems.

The N.R.C. report suggests that the fuel pool of the No. 4 reactor suffered a hydrogen explosion early in the Japanese crisis and could have shed much radioactive material into the environment, what it calls "a major source term release."

Experts worry about the fuel pools because explosions have torn away their roofs and exposed their radioactive contents. By contrast, reactors have strong containment vessels that stand a better chance of bottling up radiation from a meltdown of the fuel in the reactor core.

"Even the best juggler in the world can get too many balls up in the air," Mr. Lochbaum said of the multiplicity of problems at the plant. "They've got a lot of nasty things to negotiate in the future, and one missed step could make the situation much, much worse."

Henry Fountain contributed reporting from New York, and Matthew L. Wald from Washington.

This email is UNCLASSIFIED.

**From:** Salay, Michael *MS*  
**To:** Taylor, Robert  
**Subject:** RE: neutron absorbers in SFP  
**Date:** Saturday, April 09, 2011 7:11:48 PM

---

Thanks,  
-Mike

---

**From:** Taylor, Robert  
**Sent:** Saturday, April 09, 2011 6:53 AM  
**To:** Salay, Michael  
**Subject:** Re: neutron absorbers in SFP

Units 1-3 have 2 types of racks. Some have borated Al racks while others don't. Unit 4 has SS racks with no boron panels. TEPCO provided the info. We we're so surprised that we reconfirmed it with them in a subsequent meeting.

Sent from an NRC BlackBerry  
Robert Taylor

(b)(6)

---

**From:** Salay, Michael *MS*  
**To:** Taylor, Robert  
**Cc:** Blamey, Alan  
**Sent:** Sat Apr 09 04:33:26 2011  
**Subject:** neutron absorbers in SFP

Rob,

Glad you got back OK. How was business class?

Alan mentioned that you spent some time on this:

Can you confirm that there are no neutron absorbers in the SFPs at Fukushima? If so, do you have a source for that info?

Thanks,  
-Mike

*NN/176*

**Weaver, Tonna**

---

**From:** Klein, Paul *MPK*  
**Sent:** Thursday, April 14, 2011 2:27 PM  
**To:** Lehning, John  
**Subject:** FW: Webcam picture of tsunami striking the plant

Do you think this is an actual photo?

**From:** Taylor, Robert *MPK*  
**Sent:** Tuesday, April 12, 2011 7:03 AM  
**To:** Hunt, Christopher; Johnson, Andrew; Klein, Paul; Morgan, Thomas; Murphy, Emmett; Obodoako, Aloysius; Wong, Emma; Yoder, Matthew  
**Cc:** Lubinski, John; Mitchell, Matthew; Lupold, Timothy; McMurtray, Anthony; Hardies, Robert; Karwoski, Kenneth; Thomas, Brian; Evans, Michele  
**Subject:** FW: Webcam picture of tsunami striking the plant

I had heard this existed. Rumor is that a video exists as well.

---

**From:** Blamey, Alan *AB*  
**To:** Taylor, Robert  
**Sent:** Sat Apr 09 05:00:03 2011  
**Subject:** FW: Webcam picture of tsunami striking the plant

FYI...

**From:** Emche, Danielle *DE*  
**Sent:** Friday, April 08, 2011 7:03 PM  
**To:** Giessner, John; Blamey, Alan  
**Subject:** Re: Webcam picture of tsunami striking the plant

Wow, unbelievable.

Hope to work with you again Jack, enjoy your weekend.  
Danielle  
Sent from an NRC BlackBerry.

---

**From:** Giessner, John *RG*  
**To:** Blamey, Alan; Emche, Danielle  
**Sent:** Fri Apr 08 15:31:58 2011  
**Subject:** Fw: Webcam picture of tsunami striking the plant

For team  
(Sent from Blackberry)

---

**From:** Ring, Mark *MR*  
**To:** Shear, Gary; West, Steven; Cameron, Jamnes; Duncan, Eric; Giessner, John; Lara, Julio; Kunowski, Michael; Riemer, Kenneth  
**Sent:** Fri Apr 08 14:36:41 2011  
**Subject:** FW: Webcam picture of tsunami striking the plant

*MM/177*

**From:** Orlikowski, Robert

12111

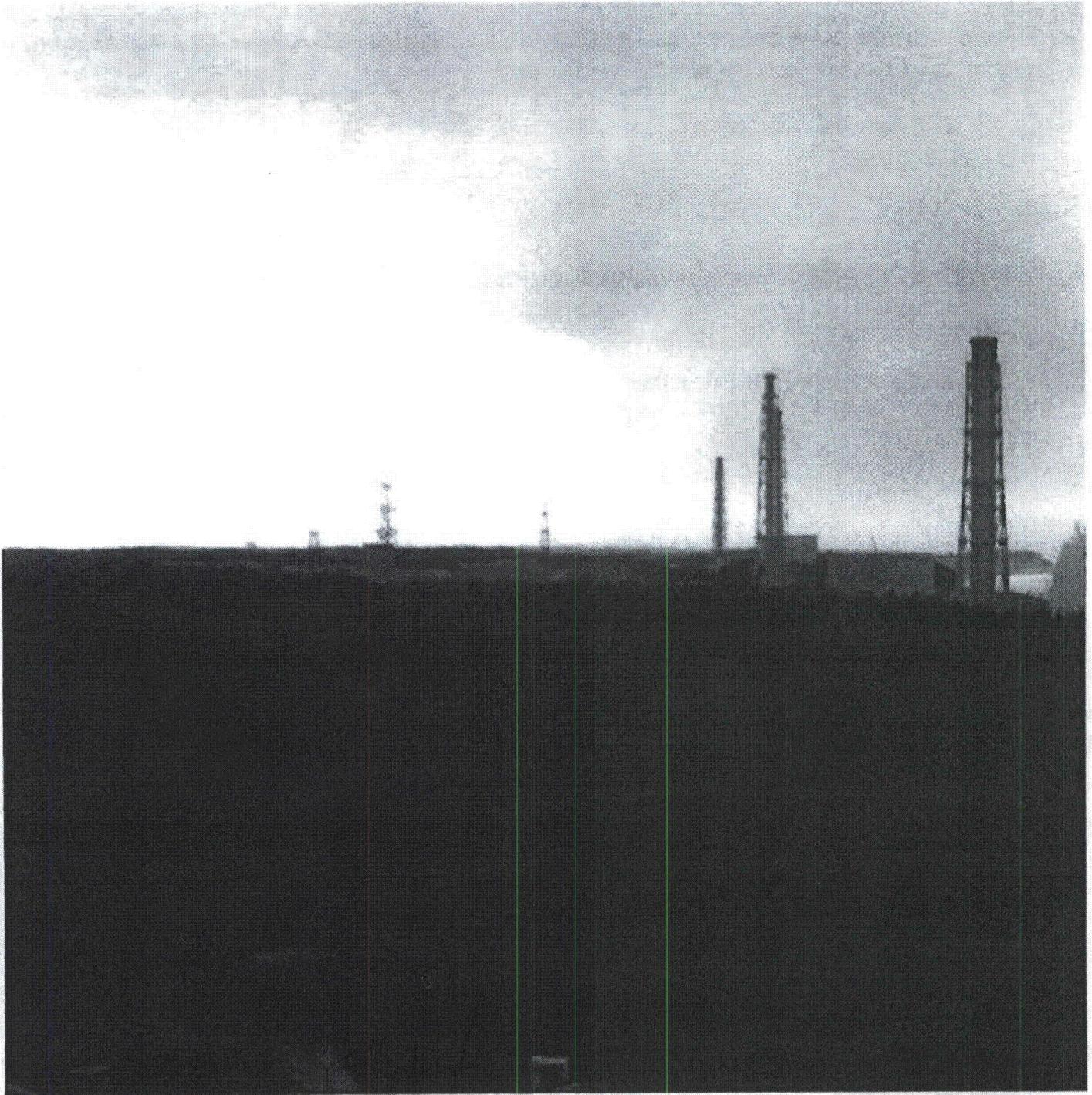
**Sent:** Thursday, April 07, 2011 8:35 AM

**To:** Ring, Mark; Draper, Jason; Kemker, Brian; Cushman, Brian; Lords, David; Melendez-Colon, Daneira; Phillips, Charles; McGhee, James

**Subject:** FW: Webcam picture of tsunami striking the plant

Thought you might like this. (and no, I didn't get this directly from Jeff Merrifield)

**Subject:** FW: Webcam picture of tsunami striking the plant



FYI.

**Jeffrey S. Merrifield**  
Senior Vice President - Shaw Power Group.

1701 378 5227 direct  
(b)(6) cell

**Pelton, David**

---

**From:** Holian, Brian *NRR*  
**Sent:** Thursday, April 14, 2011 7:22 AM  
**To:** Green, Kimberly  
**Cc:** Pelton, David  
**Subject:** FW: Request for interview about license extensions

Can you support ...with me...  
Let me know

**From:** Burnell, Scott *OPA*  
**Sent:** Thursday, April 14, 2011 6:42 AM  
**To:** Holian, Brian  
**Cc:** Brenner, Eliot  
**Subject:** Re: Request for interview about license extensions

OK, I'll let the reporter know and I'll be in your office at 1015. Thanks.

Sent from an NRC Blackberry  
Scott Burnell

(b)(6) *EX 6*

---

**From:** Holian, Brian *NRR*  
**To:** Burnell, Scott  
**Cc:** Brenner, Eliot  
**Sent:** Thu Apr 14 06:39:23 2011  
**Subject:** RE: Request for interview about license extensions

1015 my office...unless you want some other place. I'll have one of my staff with me...since I'm off to the Grand Canyon tomorrow...and they can follow up as necessary

- Brian

**From:** Burnell, Scott *OPA*  
**Sent:** Thursday, April 14, 2011 5:55 AM  
**To:** Holian, Brian  
**Cc:** Brenner, Eliot  
**Subject:** Fw: Request for interview about license extensions

Brian;

Do you have time today? If not, who do you suggest? Thanks.

Scott

Sent from an NRC Blackberry  
Scott Burnell

(b)(6)

---

**From:** Smith, Rebecca <Rebecca.Smith@wsj.com>  
**To:** Burnell, Scott

*NN/178*

**Sent:** Wed Apr 13 19:15:49 2011

**Subject:** RE: Request for interview about license extensions

Thanks, Scott. I'm up early so anything after 10 a.m. EDT is fine.

Regards,  
Rebecca

---

**From:** Burnell, Scott [mailto:Scott.Burnell@nrc.gov] *OPA*

**Sent:** Wednesday, April 13, 2011 3:20 PM

**To:** Smith, Rebecca

**Cc:** Brenner, Eliot

**Subject:** Re: Request for interview about license extensions

Rebecca,

Keeping in mind the 3-hour time difference, I'll see what we can arrange. Thanks.

Scott

Sent from an NRC Blackberry

Scott Burnell

(b)(6)

*ex 6*

---

**From:** Smith, Rebecca <Rebecca.Smith@wsj.com>

**To:** Burnell, Scott

**Sent:** Wed Apr 13 18:16:33 2011

**Subject:** RE: Request for interview about license extensions

Anytime tomorrow would be great.

Thanks, Scott.

Regards,  
Rebecca

---

**From:** Burnell, Scott [mailto:Scott.Burnell@nrc.gov] *OPA*

**Sent:** Wednesday, April 13, 2011 2:40 PM

**To:** Smith, Rebecca

**Cc:** Brenner, Eliot; Hayden, Elizabeth

**Subject:** RE: Request for interview about license extensions

OK, let me check on availability tomorrow – times that work for you?

**From:** Smith, Rebecca [mailto:Rebecca.Smith@wsj.com]

**Sent:** Wednesday, April 13, 2011 5:37 PM

**To:** Burnell, Scott

**Cc:** Brenner, Eliot; Hayden, Elizabeth

**Subject:** RE: Request for interview about license extensions

Hi, Scott,

I have some questions that are about procedural matters and some that are more technical on aging management issues.

Regards,  
Rebecca

---

**From:** Burnell, Scott [mailto:Scott.Burnell@nrc.gov]  
**Sent:** Wednesday, April 13, 2011 2:26 PM  
**To:** Smith, Rebecca  
**Cc:** Brenner, Eliot; Hayden, Elizabeth  
**Subject:** RE: Request for interview about license extensions

Hi Rebecca;

I can certainly go over that with you, but I get the impression you'd want to speak to a technical staffer?

Scott

**From:** Smith, Rebecca [mailto:Rebecca.Smith@wsj.com]  
**Sent:** Wednesday, April 13, 2011 5:24 PM  
**To:** Burnell, Scott  
**Cc:** Brenner, Eliot; Hayden, Elizabeth  
**Subject:** WSJ: Request for interview about license extensions

Hi, Scott, Eliot and Elizabeth,  
I'm writing a story about relicensing of nuclear plants and need to get a better understanding of what's fair game and what's off limits in terms of issues that can be raised. Would it be possible to get an interview with someone there on Thursday or Friday?

I am reading what's on the web site but still would appreciate an interview. Thanks.

Regards,  
Rebecca

Rebecca Smith  
Staff Reporter  
The Wall Street Journal  
415-765-8212

---

**From:** Burnell, Scott [mailto:Scott.Burnell@nrc.gov] OPA  
**Sent:** Wednesday, April 06, 2011 1:24 PM  
**To:** Smith, Rebecca  
**Cc:** Brenner, Eliot; Hayden, Elizabeth  
**Subject:** RE: Today's house oversight and investigations report on peach bottom

Hi Rebecca;

We've discussed the preliminary SOARCA results at our annual conferences, including this year:

[https://ric.nrc-gateway.gov/docs/abstracts/SessionAbstract\\_58.htm](https://ric.nrc-gateway.gov/docs/abstracts/SessionAbstract_58.htm)

and in 2009:

<http://www.nrc.gov/public-involve/conference-symposia/ric/past/2009/slides/presentations/wed-400-530-state-of-art-reactor/presentation-format/tinkler-joint-slides.ppt>  
<http://www.nrc.gov/public-involve/conference-symposia/ric/past/2009/slides/presentations/wed-400-530-state-of-art-reactor/presentation-format/gaunt-slides.pdf>

The "full" SOARCA report is still being finalized.

Let me check on the 3/26. Thanks.

Scott

---

**From:** Smith, Rebecca [mailto:Rebecca.Smith@wsj.com]  
**Sent:** Wednesday, April 06, 2011 4:19 PM  
**To:** Burnell, Scott  
**Subject:** Re: Today's house oversight and investigations report on peach bottom

I don't think so. It is in draft form, right? Is there a copy of soarca draft report available?

Also, we finally got 3/26 NRC status update for Daiichi. Can we get these as produced? Not marked confidential and would help a lot.

Regards,  
Rebecca

-----  
Sent from my BlackBerry Wireless Device

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**From:** Burnell, Scott OPA  
**To:** Smith, Rebecca  
**Cc:** Brenner, Eliot ; Hayden, Elizabeth  
**Sent:** Wed Apr 06 13:08:35 2011  
**Subject:** RE: Today's house oversight and investigations report on peach bottom  
Hi Rebecca;

I understand you've spoken to other folks about SOARCA, do you still need to talk to us?

Scott

**From:** Smith, Rebecca [mailto:Rebecca.Smith@wsj.com]  
**Sent:** Wednesday, April 06, 2011 11:18 AM  
**To:** Burnell, Scott  
**Cc:** Brenner, Eliot; Hayden, Elizabeth  
**Subject:** Today's house oversight and investigations report on peach bottom

Hi, Scott, Eliot and Elizabeth,

We are doing a story about station blackout situations, based on the House subcommittee testimony today.

They presented information on an NRC analysis concerning the vulnerability of Peach Bottom, in a station blackout situation.

Could I get additional comment?

Regards,  
Rebecca

Rebecca Smith  
Staff Reporter  
The Wall Street Journal  
415-385-7224

---

**From:** Burnell, Scott [mailto:Scott.Burnell@nrc.gov] OPA  
**Sent:** Wednesday, April 06, 2011 8:10 AM  
**To:** Burnell, Scott  
**Cc:** Brenner, Eliot; Hayden, Elizabeth  
**Subject:**

Good Morning;

Here is the NRC response to the NY Times article:

The March 26 document represented an interim snapshot of what NRC staff and other experts considered as possible conditions inside the damaged units at Fukushima-Daiichi; the document does not reflect our understanding of the current situation. Based on those possible conditions, the NRC staff's recommendations should be considered prudent measures; they are not offered as the only possible solutions. We shared those recommendations with the Japanese operator and regulator of the plants. We understand they are pursuing an alternative set of strategies to control the plants and ensure the safety of the people working at the plants and living nearby. We are working with our counterparts to consider these strategies and explore additional steps that could enhance safety.

If the NRC has any further comment, you'll be informed via e-mail. Thank you.

Scott Burnell



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April 14, 2011

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### Information Security Reminder

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They are not intended for distribution outside the agency.

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**Rebecca Sigmon** (3/29/2011 8:51:23 am)

Revised on 4/1/2011 10:44:07 am

### International - Tsunami Causes Complete Loss of Ultimate Heat Sink and Near Miss Incidents at Three Units at Fukushima DAINI Site

#### Summary

Following the magnitude 9.0 Tohoku-Taiheiyou-Oki Earthquake and ensuing tsunami on March 11, 2011 off the eastern coast of Japan, three of four units at the Fukushima Daini (or Fukushima II) reactor site experienced a complete loss of ultimate heat sink due to a loss of all seawater pumps. After suppression pool temperatures reached the saturation point at each of the three units, containment pressure started to increase. Unlike at the Fukushima Dai'ichi site though, offsite power was never lost. Operators were able to restore sufficient seawater cooling to RHR heat exchangers before core damage occurred. The Japanese regulator (NISA) assigned an International Nuclear and Radiological Event Scale (INES) rating of level 3 to the events at each of these three plants.

#### \*\*\*Note\*\*\*

**This post comprises an interpretation of the best information available at this time, but is subject to change. This COMM will be updated as more information becomes available.**

#### Discussion

The magnitude 9.0 Tohoku-Taiheiyou-Oki Earthquake that struck 150 miles off the eastern coast of Japan on March 11, 2011 and the ensuing tsunami had a direct impact on 11 operating reactors in Japan. While most of the world's attention has been focused on the sequence of events that resulted in an extended station blackout (SBO) and core damage at multiple units at the Fukushima Dai'ichi site ([see related COMM here](#)), events at the nearby Fukushima Daini reactor site are notable both for their level of severity, and for the important differences that allowed these plants to be recovered before core damage resulted.

Review of reports released by the utility (TEPCO), the regulator (NISA), and the [INES event review form](#) submitted to the IAEA by the regulator indicates the following likely sequence of events.

Fukushima Daini is a 4 Unit site run by the Tokyo Electric Power Company (TEPCO). Unit 1 came online in 1982 and most recently Unit 4 came online in 1987. All of the plants at the Fukushima Daini site are BWR-5 designs with a Mark II containment.

MM/179

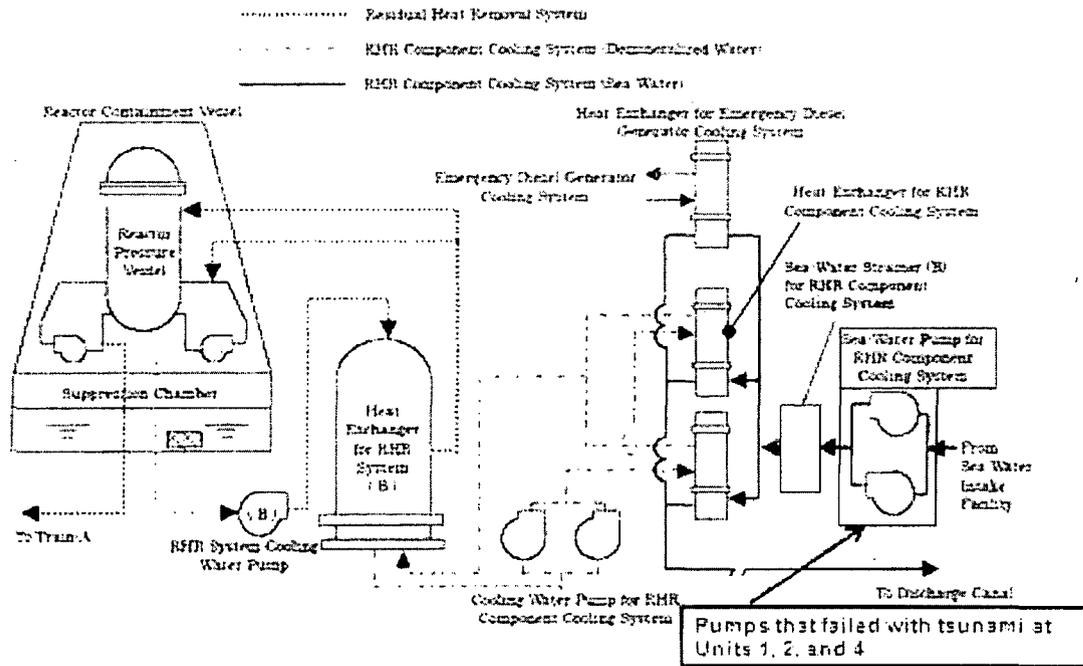
At 1448 JST (Japan Standard Time), a magnitude 9.0 earthquake struck approximately 150 miles northeast of the Fukushima Daini site. Ground motions felt at the site triggered an automatic turbine trip and reactor scram. The reactor shutdown was uncomplicated. Unlike at the Fukushima Dai'ichi site, which lost offsite power when the earthquake struck, offsite power was never lost at the Fukushima Daini site. When the tsunami struck the site, it impacted the seawater pumps at Units 1, 2, and 4. It is unclear at this time why pumps at Unit 3 were not affected. The tsunami strike at Fukushima Dai'ichi resulted in the loss of emergency AC power. It is not clear to what extent the tsunami impacted the emergency AC power availability at the Fukushima Daini site.

Following the reactor shutdown, normal shutdown systems responded as expected, including normal injection to the reactor from the turbine driven reactor core isolation cooling (RCIC) system. Immediately following the tsunami, about 50 minutes after the earthquake, an automatic emergency core cooling system (ECCS) injection signal was received on high containment pressure. The licensee issued an Article 10 declaration as required by regulation (analogous to an emergency action level declaration, [see Japanese "Act on Special Measures"](#)) upon receipt of an ECCS injection signal for units 1, 2, and 4. Though it was initially thought that the high containment pressure was the result of reactor coolant system (RCS) leakage, it was later determined that the RCS was most likely intact. It is thought that the high containment pressure signal coincided with the loss of cooling to the containment when sea water cooling of the residual heat removal (RHR) system cooling system was lost when the sea water pumps were flooded by the tsunami.

The RCIC system at the Fukushima Daini plants operates in the same manner as at most U.S. BWR plants that have the system. Steam from the reactor drives a turbine driven pump which takes suction from either the condensate storage tank or the suppression pool and injects it to the reactor. Typically RCIC provides sufficient injection capacity to maintain the fuel covered from about 15 minutes after shutdown following design operation (see course manual description of RCIC from the PDC's GE BWR technology overview class, R-104B, [here](#)). As such, RCIC flow would have been sufficient to maintain the core covered by the time the tsunami engulfed the site.

RCIC exhaust though, is directed to the suppression pool. If there is no cooling provided to the suppression pool, the exhaust will eventually heat the suppression pool to the point where the system is saturated, and the pump will trip off. The decay heat from the fuel continues to heat the coolant currently in the reactor vessel, raising reactor pressure to the point where relief valves are lifted. The relief valves also discharge to the suppression pool though, compounding the problem.

Suppression pool cooling is one of the functions of the RHR system. (The R-104B course manual description of RHR can be seen [here](#)). Unlike at the Fukushima Dai'ichi site, electrical power was still available to the RHR pumps, to the pumps for the RHR system cooling system, and to the seawater pumps that allow the transfer of heat to the ultimate heat sink (in this case, the ocean). The effect of the tsunami had been to flood and disable the seawater pumps.



Over the course of the next 48 hours, site personnel worked to re-establish the function of the sea water cooling pumps. Preparations were made to vent the containment if necessary in order to prevent a catastrophic failure, but the procedure was never actually performed. Sea water cooling was established at the 3 affected plants between 36 and 48 hours after the earthquake, and the final plant (Unit 4) was brought to cold shutdown at 0714 on March 15, 2011, about 88 hours after the earthquake.

As mentioned above, it is not clear at this time what impact the earthquake and tsunami had on emergency AC power. The seawater pumps that were made inoperable by the tsunami do also provide seawater cooling for the emergency diesel generators (EDGs). It is possible that if offsite power had been lost, the EDGs would not have been available following the tsunami until the repair of the seawater cooling pumps, which would have placed the Fukushima Daiichi site in the same extended station blackout situation that the Fukushima Daiichi site faced.

Reports at this point indicate that there was no damage to the fuel in any of the Fukushima Daiichi units. The Japanese regulatory authority assigned an INES rating of level 3 to each of the 3 affected plants based on defense-in-depth criteria. This rating assumes that the last level of defense-in-depth remained intact, and that fuel damage was prevented. The INES Event Rating Forms can be found [here](#). The basis for the rating using defense-in-depth for a reactor operating at power (Chapter 5 of the INES User's Manual, 2008 Edition) was an event with a real initiator (Section 5.1.3, table 9), expected initiator (reactor trip), inadequate safety system response (loss of RHR cooling), which was nonetheless recovered by operator actions in time to prevent fuel damage.

### Operating Experience

The evidence to date is that the seismic damage incurred at Fukushima Daiichi due to the magnitude 9.0 earthquake was minimal. Analysis since the quake by Japanese seismologists and the regulator shows that the ground motion felt at the site was within or just outside the design basis earthquake for which the plant had been analyzed. The increased risk to the plants occurred as a result of the tsunami, so the operating experience

Outside of Scope

O/S

**Ross, Robin**

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**From:** Wertz, Trent on behalf of Leeds, Eric  
**Sent:** Thursday, April 14, 2011 11:20 AM  
**To:** Wertz, Trent  
**Subject:** FW: Feedback - Meeting with Japan Nuclear Technology Institute

---

**From:** McCree, Victor *12/1*  
**Sent:** Monday, March 28, 2011 5:16 PM  
**To:** Miller, Charles  
**Cc:** Leeds, Eric  
**Subject:** FW: Feedback - Meeting with Japan Nuclear Technology Institute

Charlie – I'm about to leave for the day; however, if you'd like to chat more about Walt Rogers before tomorrow morning, please feel free to call me on my cell (b)(6) *eyb*

Also, Eric asked me to forward you the email below. I think "NEFDE" sounds good, but the **Charlie Miller Pre-Retirement (CMPR)** Task Force has a nice ring to it too!!

Vic

---

**From:** Leeds, Eric *12/1*  
**Sent:** Monday, March 28, 2011 5:10 PM  
**To:** McCree, Victor  
**Subject:** RE: Feedback - Meeting with Japan Nuclear Technology Institute

I like it. Please feed it to Charlie – I'm ready for a new acronym!

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

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**From:** McCree, Victor  
**Sent:** Monday, March 28, 2011 1:50 PM  
**To:** Leeds, Eric; Collins, Elmo; Satorius, Mark; Dean, Bill  
**Subject:** RE: Feedback - Meeting with Japan Nuclear Technology Institute

How about... **Near-term Evaluation of Fukushima Daiichi Event (NEFDE)** Task Force?

---

**From:** Leeds, Eric  
**Sent:** Monday, March 28, 2011 12:37 PM  
**To:** Collins, Elmo; Howell, Art; Satorius, Mark; Westreich, Barry; Reynolds, Steven; McCree, Victor; Wert, Leonard; Dean, Bill; Lew, David  
**Subject:** FYI: Feedback - Meeting with Japan Nuclear Technology Institute

Please see below. FYI.

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

*12/1/11*

---

**From:** Leeds, Eric

**Sent:** Friday, March 25, 2011 4:58 PM

**To:** Borchardt, Bill; Virgilio, Martin; Weber, Michael

**Cc:** Grobe, Jack; Holahan, Gary; Miller, Charles; Wiggins, Jim; Skeen, David; Brown, Frederick; Boger, Bruce; Evans, Michele; Johnson, Michael

**Subject:** Feedback - Meeting with Japan Nuclear Technology Institute

The purpose of this email is to provide a very high level overview of a significant meeting NRR just had with members of the JNTI. With me at the meeting was Fred Brown, Dave Skeen and several other NRR managers. The Chairman came to the beginning of the meeting and greeted the JNTI but then had to leave before the presentation started.

The JNTI is roughly equivalent to INPO. Yesterday they briefed NEI for 3 hours. They began the meeting explaining their purpose was to share information concerning the Fukushima event because the Japanese had received criticism for not having provided meaningful information about the event to other countries. They plan to visit, ASN, NEA, and others next week. The meeting had been set up late yesterday and we did not understand the purpose or their intentions until hours before today's meeting.

Both Skeen and Brown have spent a significant amount of time on shift and there were a number of items that the JNTI covered that were new or different from what we thought. Fred will provide the RST with slides that show information different than what we had: e.g., that the Unit 4 spent fuel pool temperatures spiked high much earlier than we thought (day 2). We also learned that the Japanese do not checkerboard, or otherwise manage the heat load in their spent fuel pools. There are a number of these examples that I've asked Fred and Dave to capture in their notes and to be prepared to provide insights to the near term task force (Charlie – get an acronym so I don't have to type that out anymore!).

To cover the highpoints with regard to beyond design basis accident preparations: The Japanese do have SAMGs, but we couldn't get into any significant detail. It seemed that they use a similar strategy for SBO coping and after the Tsunami took out all ac, they were fine for 8 to 10 hours until the batteries ran out. They also believe that the plants rode out the earthquake without any significant damage, it was really the tsunami that caused the problems. As for the Mark I containment, we think that they do inert with nitrogen and they did take some actions with regard to hardening the vents (they definitely hedged as to hardening the vents), but it was difficult with the short time and translation impediments to get much detail. They were not at all positive about their nuclear emergency preparedness program – in fact they sounded quite negative.

I acknowledged that there would be more lessons learned over time and that it was still very early in the event, but I asked the team leader, Dr. Ishikawa, if he could share any initial learnings from Fukushima. He provided three major lessons learned (obviously a man of superior intellect!):

1. Need to learn more about external hazards (mother earth)
2. Backup power is crucial. Not just diesels, but other, diverse sources of power that can be protected, put on higher ground, brought in and hooked up when all else fails.
3. Hydrogen control. The nuclear industry is so focused on containing radionuclides that we may have hurt ourselves. Perhaps the Japanese more so than the US. We need to re-think our strategy so we can vent areas and bring fresh air in to prevent the buildup of hydrogen.

They left us with a couple of videos and a detailed presentation. We will screen and if valuable, we'll share as appropriate.

Eric J. Leeds, Director

Office of Nuclear Reactor Regulation

U.S. Nuclear Regulatory Commission

301-415-1270