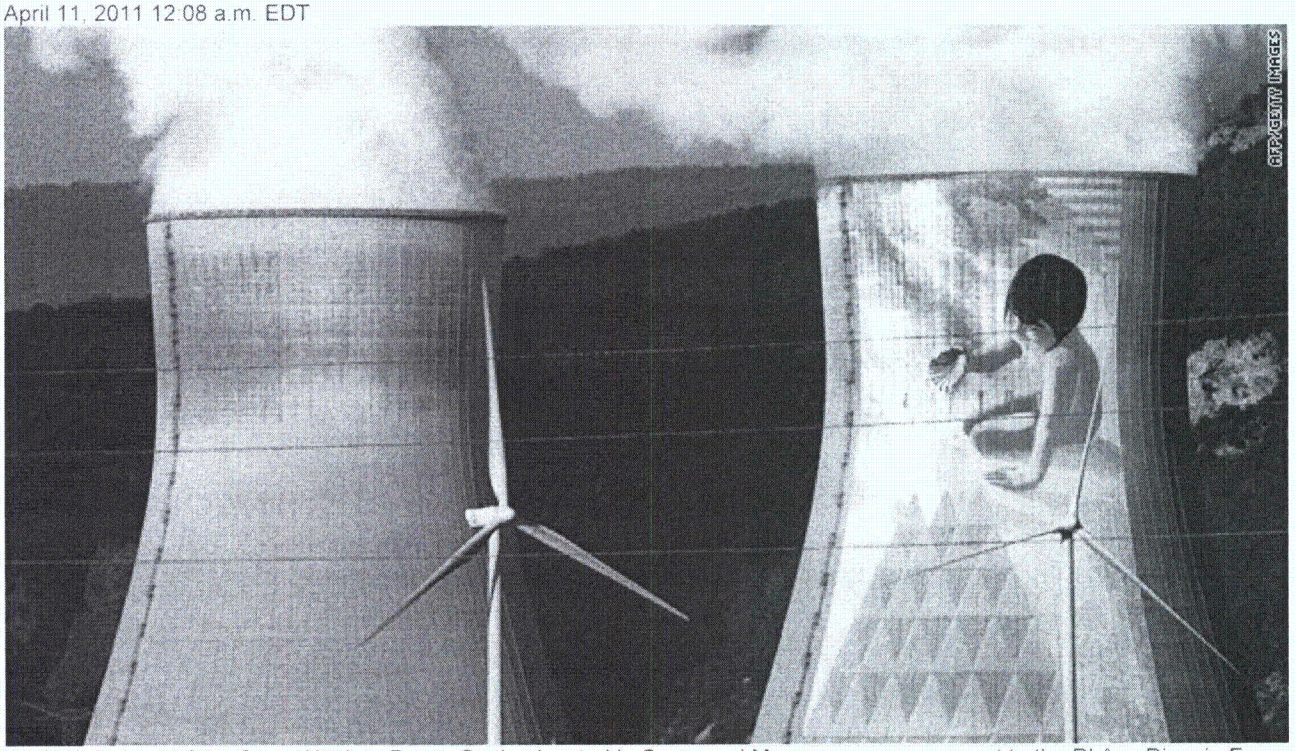
Franovich, Mike

From: Franovich, Mike
Sent: Monday, April 11, 2011 11:22 PM
To: Ostendorff, William
Cc: Nieh, Ho; Kock, Andrea; Zorn, Jason
Subject: FYI: Analysis: Fukushima and the 'nuclear renaissance' that wasn't -

CNN

Analysis: Fukushima and the 'nuclear renaissance' that wasn't

By **Kevin Voigt** and **Irene Chapple**, CNN
April 11, 2011 12:08 a.m. EDT



An April 7 photo of the Cruas Nuclear Power Station located in Cruas and Meysse communes, next to the Rhône River in France.

STORY HIGHLIGHTS

- Nuclear power dropped from 16.7% to 13.5% of global energy from 2000 to 2008
- Firms on the S&P Nuclear Index fell 8.7% after the disaster; renewables rose 17%
- EDF: 75% of French power is nuclear, keeping carbon emissions to 1990 levels
- Analysts: Public backlash against nuclear energy expected to see push for alternatives

(CNN) -- A month after a devastating earthquake sent a wall of water across the Japanese landscape, the global terrain of the atomic power industry has been forever altered.

4/5/11

The ongoing drama at the power plant in Fukushima -- a name now ranked alongside Three Mile Island and Chernobyl as history's worst nuclear accidents -- has erased the momentum the nuclear industry has seen in recent years.

The growth in the emerging world, such as China and India, fueled increased demand in planned reactors. Oil-rich regions like the United Arab Emirates and smaller nations like Vietnam announced plans to build nuclear reactors in the past year. Once the bane of environmentalists, the nuclear industry enjoyed newfound "green" credentials as a cleaner alternative to coal-fired plants that belch greenhouse gases to produce electricity.

Before Fukushima, a "nuclear renaissance" -- as it was termed in the press -- seemed well underway, except for this point: Nuclear power, as a total of world energy supply, has been in steady decline for the past decade.

From 2000 to 2008, nuclear energy dropped from 16.7% to 13.5% of global energy production, according to the World Nuclear Industry Status Report 2009. The 2010-11 preliminary report, expected to be released Wednesday, will show the downward trend has continued, according to study author Mycle Schneider. While nuclear energy production has steadily increased, its piece of the global electricity pie is shrinking compared to traditional sources such as coal and alternatives like wind and solar power.

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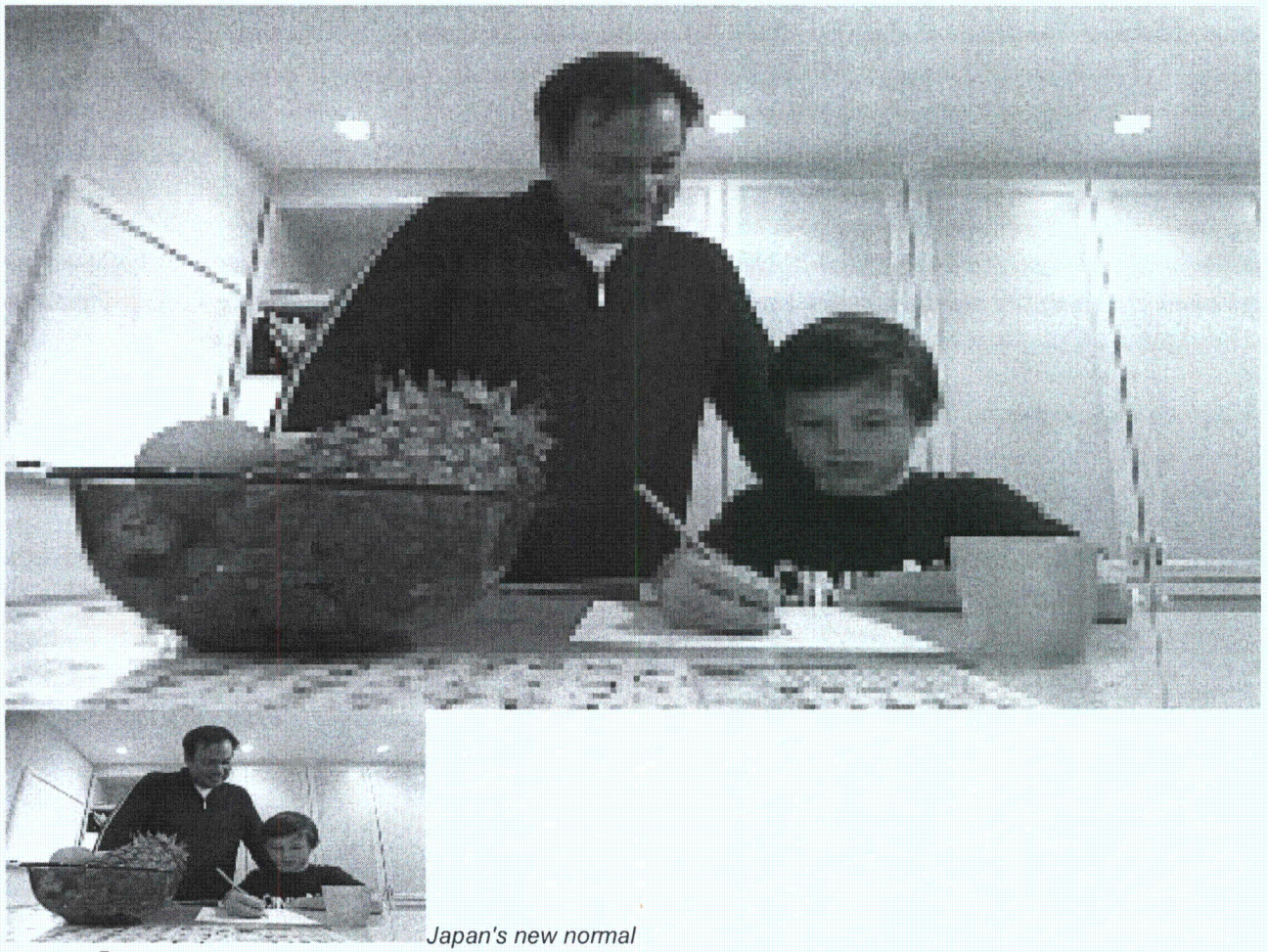

Japan's new normal

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TEPCO

48-foot wave hits nuclear plant

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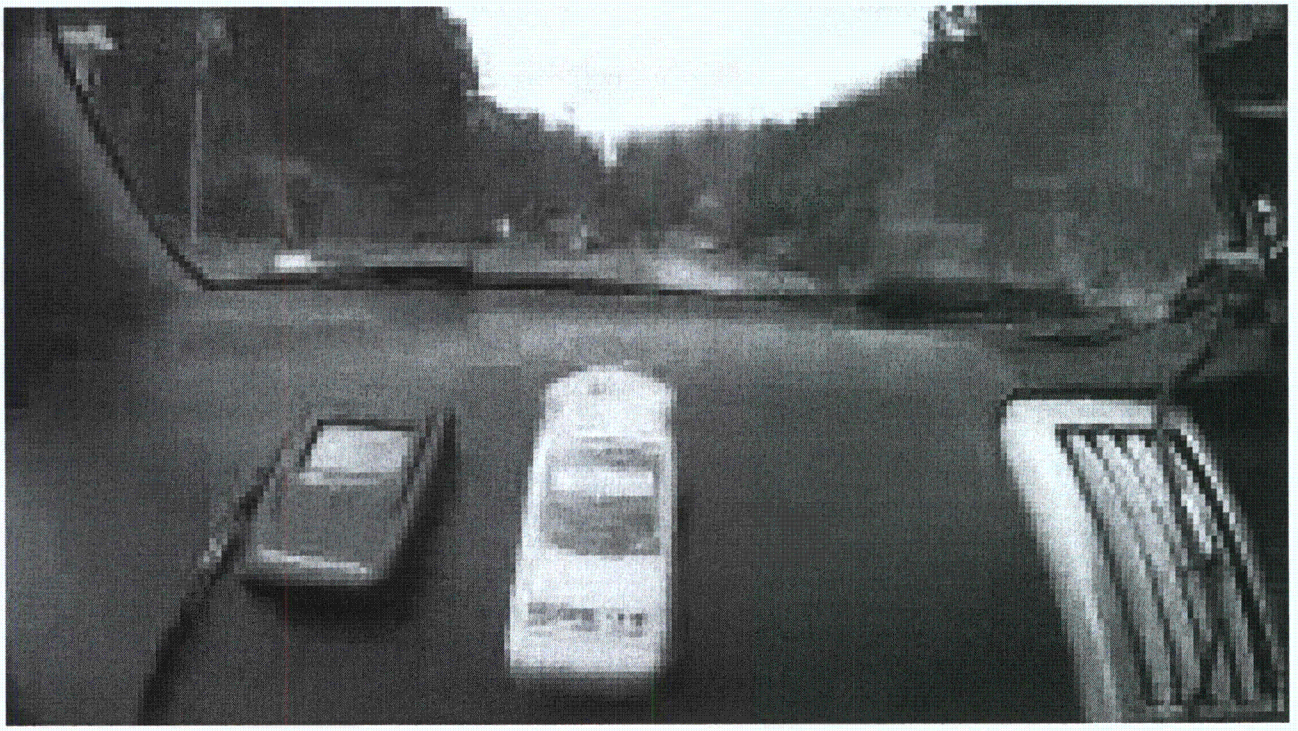
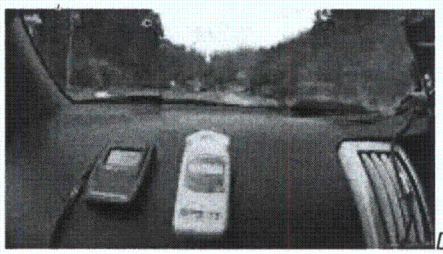



Driving into Japan's radiation zone

"This doesn't indicate there is a nuclear revival," said Brahma Chellaney, one of the architects of India's atomic strategy and a fellow at the Centre for Policy Research in New Delhi. "Had Fukushima happened two years later, the renaissance may have been underway. But if (the nuclear industry) was hoping for a real revival, you can safely say this won't happen now."

Political fallout

The shockwaves from the Fukushima plant disaster shook German politics, which could have economic implications far beyond the nuclear industry as Germany -- the largest economy in Europe -- attempts to steer the eurozone out of its debt crisis. Chancellor Angela Merkel's Christian Democrats suffered a historic loss to the Green Party during a key state election in Baden-Württemberg, a traditional stronghold for Merkel's party.

The elections came two weeks after the Japan disaster and the defeat was attributed in large part to nuclear fears in the wake of Fukushima and Merkel's pro-nuclear credentials. (Merkel temporarily shut down seven of the nation's 17 reactors and talked about an "exit strategy" from nuclear power in the week between the Japan temblor and the state elections; critics accused Merkel of flip-flopping to reflect a shift in opinion away from nuclear power.)

The political hot potato playing out in Germany can be expected elsewhere as aging reactors come up for extension of licenses or replacement in the U.S., the UK and Japan. The average age of the world's 443 nuclear reactors is 25 years, according to the World Nuclear Industry Status Report.

"In the next 10 years, nuclear power will face enormous public pressure in large democracies like the U.S. and India," said Chellaney, a nuclear energy proponent.

In the next 10 years, nuclear power will face enormous public pressure in large democracies
--Brahma Chellaney, Centre for Policy Research in New Delhi

China, by far, has the largest number of plants planned with 27 reactors currently under construction, followed by 11 in Russia, and five apiece in India and South Korea, according to the International Atomic Energy Agency (IAEA). Beijing announced that China would temporarily suspend construction of new plants pending review of the Fukushima incident, but few analysts believe China will scuttle planned reactors.

"The countries that are going to do big builds ... have said loudly and clearly, we are not backing down from nuclear energy," said Margaret Harding of the American Nuclear Society, a group for nuclear industry professionals.

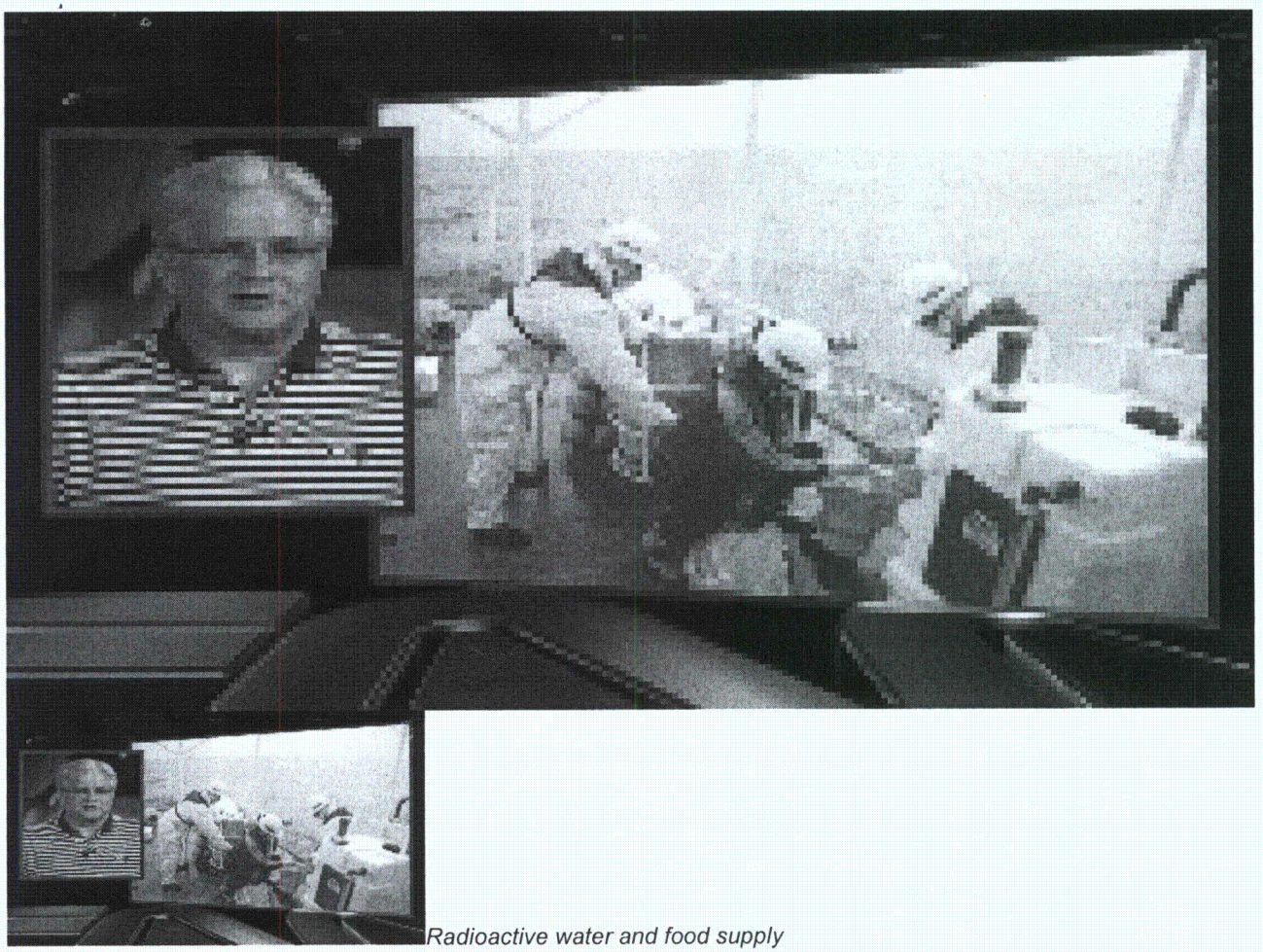
Fear factor

Nuclear power has had an uphill climb in public perception since the 1945 explosions over Hiroshima and Nagasaki at the end of World War II first put the word "atomic" onto headlines across the globe.

"Radiation in particular is a scary thing -- we can't see, we can't touch it, you can't look at the ground and know its there," said Harding, a former vice president of engineering at GE Nuclear Energy who now advises companies on nuclear industry issues.

"(Nuclear power) gets conflated in people's minds with weapons," Harding said. "The fact that the first controlled nuclear plants were to run submarines and other military secrets, there is a web of secrecy as to what you can talk about, which adds to the mystique."

While the devastation in Fukushima is "horrible," Harding and other nuclear proponents argue that nuclear crises aren't being judged by the same yardstick as other -- and statistically more deadly -- industrial disasters. "Look at Bhopal: thousands of people died there -- did people walk away from chemical engineering?" said Harding, referring to the 1984 Union Carbide chemical plant disaster in India.



Radioactive water and food supply

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Fresh Japanese quake rattles nerves

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Radiation fears slow Japan's economy

There were no deaths at the 1979 Three Mile Island crisis in the U.S. A 2005 report from the World Health Organization said as many as 4,000 people may die of radiation exposure from the 1986 Chernobyl disaster in Russia, although fewer than 50 deaths were directly attributed to the disaster.

"The numbers don't lie, coal kills millions every year" through air pollution, said Michael Shellenberger, head of the Breakthrough Institute, a think tank that aims to modernize liberal thought, at Fortune's Brainstorm Green conference last week in California.

Green nukes

When Harding moved to California in 1981, the young nuclear engineer attended a meeting of the Sierra Club, the environmental group. "When they found out what I did, they kicked me out," Harding recalled.

In the past decade, however, many environmentalists have embraced nuclear power as a better alternative than coal and gas-fired plants to reduce greenhouse gas emissions. France, for example, gets 75% of its power from nuclear plants -- the highest ratio in the world, according to the IAEA. By comparison, the U.S. gets just under 20% of its power from nuclear, although it has the most reactors in operation -- 104 reactors, nearly double the number in France.

"France's advance in terms of nuclear and hydraulic energy generation (allows) the country to maintain its emissions at the same level as they were in 1990," said Sabine Mezard, a spokesperson for French energy giant EDF.

Still, the early promise of nuclear energy as a cheap, clean form of energy has never materialized. Costs of nuclear power plants can be as high as $10 billion, according to a 2010 report by the CIGI Nuclear Energy Futures Project at Carleton University in Canada. The average construction time is seven years, but with licensing approval new builds often take a decade, Schneider said.

What's the alternative?

Alternative energy production is faster and cheaper, Schneider said. "In the U.S. in 2004, 2% of all new power produced that year came from alternative energy sources ... by 2009, 55% of all new power was from alternatives," Schneider said. "There's no way nuclear could add that much, that fast."

Nuclear power reactors are dependent on government subsidies and loan guarantees to be built, cover costs in case of accidents and assume long-term responsibility for storage of spent radioactive fuel, critics say, which artificially lowers the cost of production.

Radiation in particular is a scary thing -- we can't see, we can't touch it
--Margaret Harding, American Nuclear Society

RELATED TOPICS

- **2011 Japan Disaster**
- **Nuclear Energy**
- **Fukushima Daiichi**

"These plants are 30-year investments -- it's hard to get the market interested in more than two-year investments, and loan guarantees are not a subsidy," countered Harding of the American Nuclear Society. Government backing of insurance in case of disasters has resulted because "the nuclear industry has had so few accidents, there is no actuarial for insurance companies on which to offer an insurance policy," she added.

Market reaction has been swift against the nuclear industry after the Fukushima disaster. Companies on the Standard & Poor's Clean Energy Index rose on average 17% in the wake of the disaster, while companies on the S&P Nuclear Index fell 8.7%. "We expect a number of impacts from the public and political backlash against nuclear, which could mean the focus switches to renewables," an HSBC report said in March.

Still, no one expects the industry to fade. The U.S., Japan, South Korea, Russia and France have significant nuclear industries with important strategic as well as economic interests, analysts say.

"No one is going to walk away," Harding said. "If the U.S. wants to be a leader in this technology, they've got to be playing in this technology."

Tracking:

Franovich, Mike

From: Franovich, Mike
Sent: Monday, April 11, 2011 11:27 PM
To: Ostendorff, William
Cc: Nieh, Ho; Kock, Andrea; Zorn, Jason
Subject: AWARENESS: INES 7: Japan nuclear agency raises threat level -

CNN World

Japan nuclear agency raises threat level

By **Matt Smith**, CNN
April 11, 2011 10:59 p.m. EDT

Tokyo Electric Power Company president Masataka Shimizu (left) speaks at a news conference in Tokyo on March 13.

STORY HIGHLIGHTS

- **NEW:** The agency raises the level from 5 to 7
- 7 is the highest possible level and is on par with Chernobyl
- Japan's government has called for further evacuations
- Cities covered by Monday's orders should evacuate in about a month, Edano says

Are you there? Send your images, video via iReport.

Tokyo (CNN) -- Japanese authorities Tuesday "provisionally" declared the country's nuclear accident a level-7 event on the international scale for nuclear disasters -- the highest level -- putting it on par with the 1986 Chernobyl disaster.

4/512

Japan's Nuclear and Industrial Safety Agency announced the new level Tuesday morning. It had previously been at 5.

Regulators have determined the amount of radioactive iodine released by the damaged reactors at the Fukushima Daiichi nuclear plant was at least 15 times the volume needed to reach the top of the International Nuclear Event Scale, the agency said. That figure is still about 10 percent of the amount released at Chernobyl, they said.

The amount of radioactive Cesium-137, which has a half-life of 30 years, is about one-seventh the amount released at Chernobyl, according to the agency.

Hidehiko Nishiyama, the safety agency's chief spokesman, explained the final level won't be set until the disaster is over and a more detailed investigation has been conducted.

Tetsunari Iida, a former nuclear engineer-turned-industry critic, told CNN the declaration has no immediate practical impact on the crisis. It is a sign, however, that Japanese regulators have rethought their earlier assessments of the disaster, said Iida, who now runs an alternative energy think-tank in Tokyo.

According to the scale, a level 5 equates to the likelihood of a release of radioactive material, several deaths from radiation and severe damage to a reactor core.

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Magnitude 6.4 quake hits Japan

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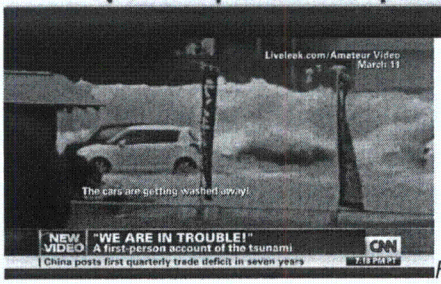

First moments of a tsunami

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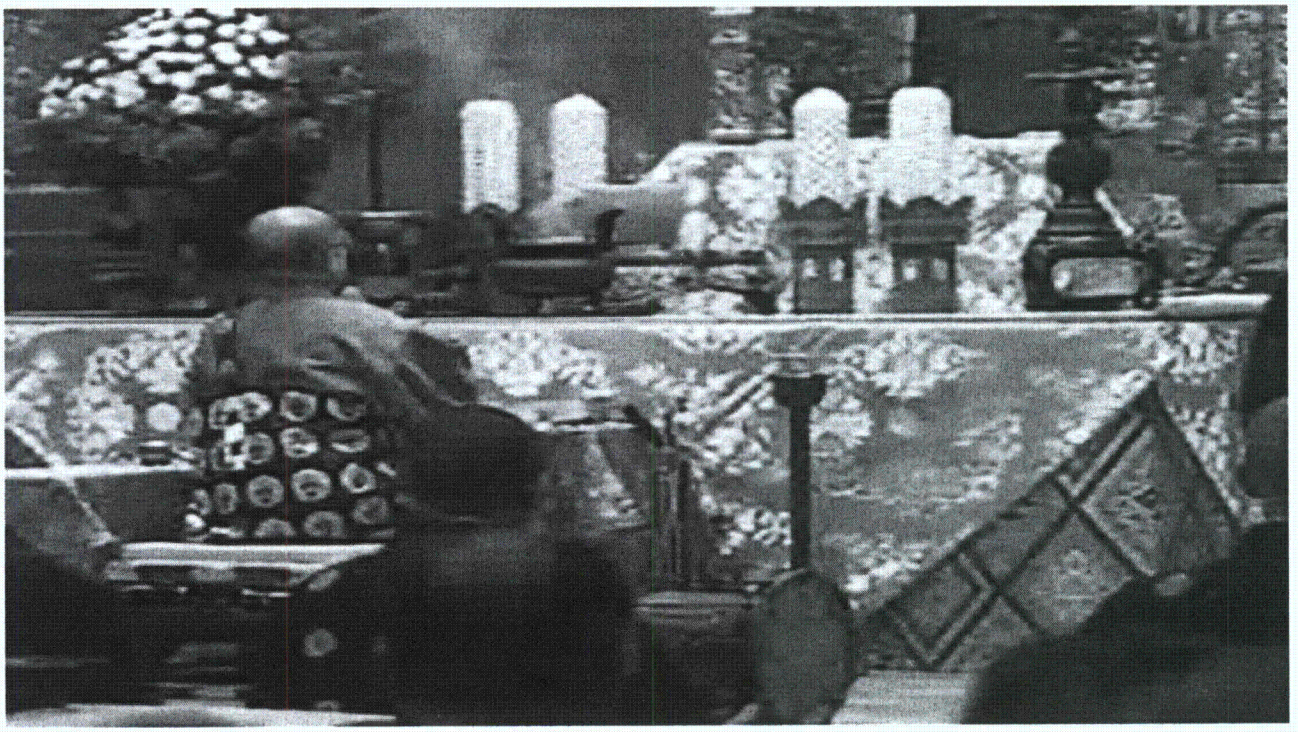

Japan: One month since quake

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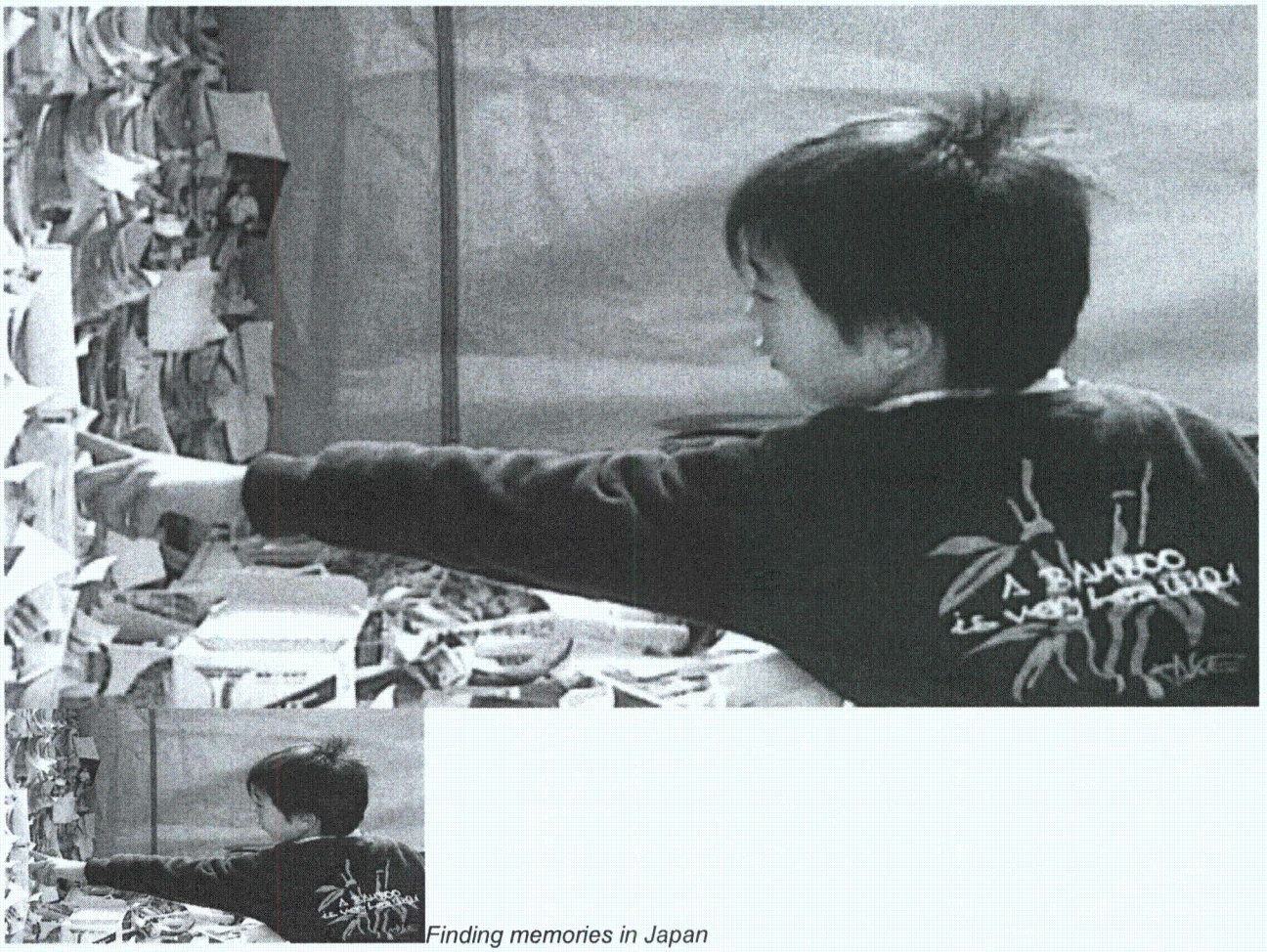

Finding memories in Japan

RELATED TOPICS

- **Fukushima Daiichi**
- **Tokyo Electric Power Co. Inc.**
- **2011 Japan Disaster**

The 1979 incident at Pennsylvania's Three Mile Island was a 5. The partial meltdown of a reactor core there was deemed the worst nuclear accident in U.S. history.

The Chernobyl accident in the former Soviet Union rated a 7 on the scale, which equates to a "major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures."

Japan's government called for evacuations Monday from several towns beyond the danger zone already declared around Fukushima Daiichi, warning that residents could receive high doses of radiation over the coming months.

Chief Cabinet Secretary Yukio Edano said the municipalities are likely to see long-term radiation levels that exceed international safety standards, and he warned that the month-old crisis at Fukushima Daiichi is not yet over.

"Things are relatively more stable, and things are stabilizing," he said. "However, we need to be ready for the possibility that things may turn for the worse."

And about an hour after he spoke, a fresh earthquake rattled the country, forcing workers to evacuate the plant and knocking out power to the three damaged reactors for about 40 minutes, the plant's owner, the Tokyo Electric Power Company, reported. The magnitude 6.6 tremor came a month to the day after the magnitude 9 quake and tsunami that knocked out the plant's cooling systems, and followed a magnitude 7.1 aftershock Thursday night. Neither the 6.6 quake nor any of the smaller ones that rippled across the region in its wake inflicted any more damage to the plant, Tokyo Electric officials told reporters.

Tuesday morning, a fire broke out in a battery storage building in a water discharge area of reactors 1-4 at Fukushima Daiichi, Tokyo Electric said. The fire was out a few hours later and the company said it caused no radiation emissions and no effect on cooling systems.

Japan's government said it did not know how many people would be displaced by the new evacuation orders. Evacuation orders have so far covered about 85,000 people inside the 20-kilometer (12.4-mile) zone, while another 62,000 within 30 kilometers have been told to stay inside, Fukushima prefecture officials told CNN.

The decision announced Monday does not create a wider radius around the plant, said Masanori Shinano, an official with Japan's Nuclear Safety Commission.

Instead, "if there are areas in the northwestern parts where there is a risk of exceeding 20 millisieverts as a cumulative dose over a one-year period, the area will be designated an evacuation area even if it is beyond the 30-kilometer area," Shinano told reporters Monday night.

That dose is a tiny fraction of what would cause immediate radiation sickness, but it's more than seven times the amount a typical resident of a western industrialized country receives from background sources in a year. Long-term exposures to those levels of radiation could increase the risk of cancer -- and the presence of cesium isotopes that have half-lives of up to 30 years means that radioactivity could linger for some time.

"This policy does not require immediate evacuation right away, but we take the long-term perspective, considering the long-term effect of radiation on your health," Edano told reporters.

Japanese authorities attributed growing concentrations of cesium-134, with a two-year half-life, and cesium-137, which loses half its radioactivity over 30 years, to the decay of larger concentrations of iodine-131, which has a half-life of eight days.

Edano said residents of five towns and cities to the north and west of the plant -- Katsurao, Kawamata, Namie, Iitate and parts of Minami Soma -- should evacuate within a month if they have not already done so. Parts of Namie and Minami Soma are already within the 20-kilometer evacuation radius drawn in the first days of the accident, while Iitate, Kawamata and Katsurao are beyond the 30-kilometer range.

Residents of five other areas -- in Hirono, Kawauchi, Naraha and parts of Tamura to the south, and the rest of Minami Soma -- were told they should be prepared to clear out soon. Hirono and Kawauchi lie in the outer belt of the current zone, while Naraha and Tamura are beyond the current 30-kilometer radius.

The anti-nuclear group Greenpeace, which had warned about higher radiation levels in towns outside the evacuation zone two weeks ago, called Edano's declaration a good step, but said evacuations should take place sooner than the one-month goal Japan has set. Jan van de Putte, a Greenpeace radiation safety expert who took readings in Iitate and Namie, said the levels of radioactivity are likely to remain dangerous "for years to come."

"The bad news is what we're seeing today is going to decay very, very gradually," van de Putte told CNN.

After a month of improvisation and frustration, Tokyo Electric says it has no idea when it will be able to restore normal cooling for the reactors and spent fuel pools at Fukushima Daiichi, about 240 kilometers (150 miles) north of Tokyo. Tokyo Electric President Masataka Shimizu visited the off-site headquarters for authorities attempting to manage the disaster Monday and met with local officials from Fukushima Prefecture, emerging to issue another apology for the situation.

"I would like to apologize from the bottom of my heart to the people of Fukushima and residents of the host towns of the Fukushima power plant for forcing them to go through enormous difficulties due to the accident that occurred in the wake of the quake and tsunami," he said in a prepared statement released through the company.

Shimizu -- who was hospitalized for "fatigue and stress" in late March -- also expressed regret that he didn't apologize to Fukushima Prefecture residents before Monday. The province's governor skipped the meeting, however.

Engineers are working to drain highly radioactive water from the basements of the turbine plants behind reactors No. 1 through 3 even as they pour hundreds of metric tons of water a day into the reactors to keep them cool. The water must be pumped out in order to get to the machinery that runs the coolant systems, and Tokyo Electric has dumped more than 10,000 tons of less-contaminated water into the Pacific Ocean in the past week to make room for the stuff -- a move that drew sharp criticism of the Japanese government, which approved the discharge as an emergency measure.

Other contamination is leaking into the Pacific behind the plant, most likely carried along by groundwater, Japanese regulators have said.

At the plant Monday, workers began installing sections of silt fence around the water intakes at the back of the plant to screen out radioactive particles. But the injection of nitrogen into the containment vessel around reactor No. 1 to counter a buildup of explosive hydrogen was stopped for the recent earthquake, said Hidehiko Nishiyama, the chief spokesman for the Nuclear and Industrial Safety Agency.

In addition, Nishiyama said engineers have found gas escaping from the reactor containment vessel. But he said the nitrogen injections will resume, and the leaks were not affecting the stability of the reactor.

Hydrogen buildup is a symptom of overheated fuel rods in the reactor core. Spectacular hydrogen explosions blew the roofs and walls off the buildings surrounding the No. 1 and No. 3 reactors in the days after the tsunami, and another suspected hydrogen blast may have caused a leak in the No. 2 reactor. Tokyo Electric has said there is little danger of another explosion, but has begun pumping nitrogen into unit No. 1 as a precaution and plans to do the same for units 2 and 3.

Ailing Chang and Susan Olson, and CNN's Whitney Hurst and Ingrid Formanek contributed to this report.

Tracking:

King, Mark

From: NEWS Administration [NEWS_Administrator@iaea.org]
Sent: Monday, April 11, 2011 10:14 PM
To: NEWS.Contact-Point@iaea.org
Subject: New Event on NEWS, Japan, Power Reactor

Dear NEWS User,

This is to notify you as a registered user of the NEWS Web site that a new Event with the title:

"Re-evaluation of INES rating; Effect to the Nuclear Facilities from the earthquake on east area of Japan"

has as of today, Tuesday, 12 April 2011, 04:00:13 UTC, been added to the NEWS Web site. Additional information regarding the new Event is as follows:

Sender Country: Japan
Date of Event: 2011-04-12
Facility/Place: Fukushima Daiichi

For more detailed information about the Event including related documents, press releases and on-site participation in forum discussions, please visit the NEWS Web site at:

http://www-news.iaea.org/news/

NEWS Administration

4513

King, Mark

From: NEWS Administration [NEWS_Administrator@iaea.org]
Sent: Monday, April 11, 2011 11:19 PM
To: NEWS.Contact-Point@iaea.org
Subject: New ERF on NEWS, INES Rating: 7, Japan, Power Reactor

Dear NEWS User,

This is to notify you as a registered user of the NEWS Web site that an Event Rating Form (ERF) for the Event titled:

"Re-evaluation of INES rating; Effect to the Nuclear Facilities from the earthquake on east area of Japan"

has as of today, Tuesday, 12 April 2011, 05:17:22 UTC, been added to the NEWS Web site. Additional information regarding the ERF is as follows:

Country: Japan
Location/Facility: FUKUSHIMA-DAIICHI-3
Event Type: Power Reactor
Event Date: 2011.03.11

Rating Date: 2011.04.12
ERF Version: Provisional
INES Rating Level: 7

For more detailed information about the ERF, including the related Event and press releases as well as on-site participation in forum discussions, please visit the NEWS Web site at:

http://www-news.iaea.org/news/

NEWS Administration

4574

King, Mark

From: NEWS Administration [NEWS_Administrator@iaea.org]
Sent: Monday, April 11, 2011 11:46 PM
To: NEWS.Contact-Point@iaea.org
Subject: New ERF on NEWS, INES Rating: 5, Japan, Power Reactor

Dear NEWS User,

This is to notify you as a registered user of the NEWS Web site that an Event Rating Form (ERF) for the Event titled:

"The core damage by loss of all cooling function due to the big tsunami."

has as of today, Tuesday, 12 April 2011, 05:32:39 UTC, been added to the NEWS Web site. Additional information regarding the ERF is as follows:

Country: Japan
Location/Facility: FUKUSHIMA-DAIICHI-3
Event Type: Power Reactor
Event Date: 2011.03.11

Rating Date: 2011.03.18
ERF Version: Provisional
INES Rating Level: 5

For more detailed information about the ERF, including the related Event and press releases as well as on-site participation in forum discussions, please visit the NEWS Web site at:

http://www-news.iaea.org/news/

NEWS Administration

4575

Nelson, Robert

From: Nelson, Robert NRC
Sent: Monday, April 11, 2011 11:12 AM
To: NRR_DORL_PMs Distribution
Cc: Giitter, Joseph; Howe, Allen; Broaddus, Doug; Campbell, Stephen; Carlson, Robert; Chernoff, Harold; Kulesa, Gloria; Markley, Michael; Pascarelli, Robert; Salgado, Nancy; Simms, Sophonia; Wall, Scott
Subject: Query: PM Needed for Japan Support Team

Importance: High

Chuck Casto, our on-site lead in Japan, has made a plea for a PM to join the 4th wave of the Japan Team. Ideally, the PM would have a BWR background and operations experience. Not sure of the dates but it's soon.

If you are interested and available, please discuss with your BC.

NELSON

4/576

Nelson, Robert

From: Nelson, Robert INRC
Sent: Monday, April 11, 2011 3:20 PM
To: NRR_DORL_PMs Distribution; Broaddus, Doug; Campbell, Stephen; Carlson, Robert; Chernoff, Harold; Kulesa, Gloria; Markley, Michael; Pascarelli, Robert; Salgado, Nancy; Simms, Sophonia; Wall, Scott
Cc: Giitter, Joseph; Howe, Allen
Subject: FYI: PM Support for Japan

Tim Lupold will provide PM support for the 4th round. Thanks to all.

NELSON

2/517

King, Mark

From: Tabatabai, Omid NRR
Sent: Monday, April 11, 2011 8:08 AM
To: Copeland, Douglas; Craffey, Ryan; Harmon, David; Issa, Alfred; Patel, Jay
Cc: Frye, Timothy; King, Mark; Thorp, John
Subject: FW: Sharepoint Database on Japan - FAQs - FYI

Fyi... I brought back some slides that the Japanese delegation presented concerning Fukushima. I will try to pdf and distribute them today and will include our NRR colleagues.

From: King, Mark NRR
Sent: Monday, April 11, 2011 7:44 AM
To: Klett, Audrey; Telson, Ross; Cauffman, Christopher; Henderson, Christopher; Telson, Ross; Fredette, Thomas; Tabatabai, Omid
Subject: FW: Sharepoint Database on Japan - FAQs - FYI

FYI

In case you are unaware, NRR and DORL have morphed the Q's and A's into a Sharepoint Database.

You can get to it from the NRR homepage... or else here is the direct link from EDO link:

http://portal.nrc.gov/edo/nrr/dorl/japan/Shared%20Documents/Questions%20and%20Answers.aspx

4578

King, Mark

From: NEWS Administration [NEWS_Administrator@iaea.org]
Sent: Monday, April 11, 2011 11:45 PM
To: NEWS.Contact-Point@iaea.org
Subject: New ERF on NEWS, INES Rating: 7, Japan, Power Reactor

Dear NEWS User,

This is to notify you as a registered user of the NEWS Web site that an Event Rating Form (ERF) for the Event titled:

"Re-evaluation of INES rating; Effect to the Nuclear Facilities from the earthquake on east area of Japan"

has as of today, Tuesday, 12 April 2011, 05:43:32 UTC, been added to the NEWS Web site. Additional information regarding the ERF is as follows:

Country: Japan
Location/Facility: Fukushima Daiichi
Event Type: Power Reactor
Event Date: 2011.04.12

Rating Date: 2011.04.12
ERF Version: Provisional
INES Rating Level: 7

For more detailed information about the ERF, including the related Event and press releases as well as on-site participation in forum discussions, please visit the NEWS Web site at:

http://www-news.iaea.org/news/

NEWS Administration

N519

King, Mark

From: King, Mark
Sent: Monday, April 11, 2011 7:30 AM
To: Thorp, John
Cc: Thomas, Eric; Thompson, John
Subject: RE: May ROP public meeting Notice concurrence request

How about a brief OpE status on Japanese events and their plants... and agency actions so far... and any known planned actions?

1) General status of the various Japanese units

2) NRC actions so far... staffing IRC/ Ops Center 24 hours... IN issued, TI issued... expectations for US plants regarding readiness reviews (b.5.b reviews / SBO / seismic and tsunami readiness of US plants ---etc.)

Numerous congressional hearings held, several commission meetings, an ACRS meeting was held, still lot of open questions.... NRC performing short term and long term reviews.... More to follow.

3) Some websites that provide useful information for the industry to follow these unfolding events and our responses to them:

The NRC public webpage - NRC Actions on Japan's Emergency

Tokyo Electric Power Company - TEPCO

Japan Atomic Industrial Forum - JAIF

Also may want to let them know the current status of any developing GC's --- is a RIS being developed? Etc. Also may want to discuss – US nuclear industry support -- INPO / NEI actions, etc.?

Just some thoughts for your consideration.
Mark

From: Thorp, John
Sent: Friday, April 08, 2011 2:42 PM
To: Thomas, Eric; Thompson, John; King, Mark
Subject: FW: May ROP public meeting Notice concurrence request

Any items you all would like to see included in the next ROP public meeting?

Let me know. Thanks,

John

From: Lian, Jocelyn
Sent: Friday, April 08, 2011 2:09 PM
To: Kobetz, Timothy; Franovich, Rani; Thorp, John
Subject: May ROP public meeting Notice concurrence request

Dear Branch Chiefs,

Enclosed is a draft copy of the May ROP Public meeting notice for your review, comment, and concurrence. Please let me know if you have any topics of interest that you want to include in the agenda. I would like to have this issued and up on the public webpage by 4/15 (in case we might be on 'vacation' the week after).

L\520

Thanks,
Jocelyn

K. Jocelyn Lian
Reactor Operations Engineer
U.S. Nuclear Regulatory Commission
NRR/DIRS/IPAB
301-415-4666

King, Mark

From: Wegner, Mary
Sent: Monday, April 11, 2011 10:07 AM
To: King, Mark
Subject: RE: News item - Onagawa, Rokkasho, Higashidori bear brunt of latest earthquake -- FYI

I have the reports from NISA and TEPCO if you are interested.

From: King, Mark
Sent: Monday, April 11, 2011 8:21 AM
To: Garmon, David
Cc: Sigmon, Rebecca; Wegner, Mary
Subject: News item - Onagawa, Rokkasho, Higashidori bear brunt of latest earthquake -- FYI

*** Onagawa, Rokkasho, Higashidori bear brunt of latest earthquake

The three-unit Onagawa plant in Japan was maintaining cooling capability using one external power line
April 8 following a magnitude 7.1 earthquake off the country's northeast coast late April 6, Japan's
NHK national broadcasting company reported.

Also, the earthquake caused a total of about 3.8 liters of water to spill from the reactors' spent
fuel storage pools, and a device to control pressure inside a turbine building was damaged, it said.
It also said blowout panels designed to control pressure were damaged at the Onagawa-3 turbine building.

NHK also reported the earthquake disabled all external power lines at Japan Nuclear Fuel Ltd.'s Rokkasho
reprocessing plant in Aomori Prefecture, with the cooling systems still running on emergency diesel power
April 8. The plant was originally to be completed in 1997, but major construction delays have pushed
the schedule out. As of late last year, JNFL was targeting commercial operation in October 2012. Spent
fuel is in interim storage at Rokkasho awaiting reprocessing.

NHK also said external power was restored to Tohoku Electric's Higashidori-1, which had used emergency
diesel generators "for some hours" after the earthquake knocked out power lines.

Meanwhile, Tokyo Electric Power Co. said April 8 the latest earthquake had not caused additional problems
at its Fukushima I nuclear power plant, which it is trying to stabilize following the March 11 earthquake
and tsunami. Tepco said it was continuing to inject nitrogen gas into the unit 1 primary containment
vessel to prevent an explosion of hydrogen gas. It also said it was providing cooling to the unit 3 spent
fuel pool by spray water by "concrete pump vehicle."

The epicenter of the April 6 earthquake was 20 km (about 12 miles) from Onagawa and about 120 km from
the Fukushima I and II nuclear power plants, the IAEA said April 8.

4521

SOURCE: http://www.internal.nrc.gov/IRM/LIBRARY/ejournal/pdf/nnf/nn110408.txt

King, Mark

From: King, Mark (NRR)
Sent: Monday, April 11, 2011 7:44 AM
To: Klett, Audrey; Telson, Ross; Cauffman, Christopher; Henderson, Christopher; Telson, Ross; Fredette, Thomas; Tabatabai, Omid
Subject: FW: Sharepoint Database on Japan - FAQs - FYI

FYI

In case you are unaware, NRR and DORL have morphed the Q's and A's into a Sharepoint Database.

You can get to it from the NRR homepage... or else here is the direct link from EDO link:

http://portal.nrc.gov/edo/nrr/dorl/japan/Shared%20Documents/Questions%20and%20Answers.aspx

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King, Mark

From: King, Mark
Sent: Monday, April 11, 2011 8:21 AM
To: Garmon, David
Cc: Sigmon, Rebecca; Wegner, Mary
Subject: News item - Onagawa, Rokkasho, Higashidori bear brunt of latest earthquake -- FYI

*** Onagawa, Rokkasho, Higashidori bear brunt of latest earthquake

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the Fukushima I and II nuclear power plants, the IAEA said April 8.

SOURCE: http://www.internal.nrc.gov/IRM/LIBRARY/ejournal/pdf/nnf/nn110408.txt

Weaver, Tonna

From: Hasselberg, Rick NSIR
Sent: Monday, April 11, 2011 12:12 PM
To: Alter, Peter; Hiland, Patrick; Brown, Frederick; Skeen, David; Dudes, Laura; Ruland, William; Case, Michael; Uhle, Jennifer; Holian, Brian; Hackett, Edwin; Howe, Allen; Richards, Stuart; Kotzalas, Margie; Rini, Brett; Bukharin, Oleg; Thomas, Eric; Berry, Rollie; Belen, Aixa; Williams, Joseph; Boyce, Tom (RES); Flanagan, Michelle; Starefos, Joelle; Kavanagh, Kerri; Orr, Mark; Collins, Frank; Schoenebeck, Greg; Morlang, Gary; Dion, Jeanne; Sloan, Scott; McGovern, Denise; Circle, Jeff; Esmaili, Hossein; Cheok, Michael; Ward, Leonard; Laur, Steven; Salay, Michael; Schaperow, Jason; Fuller, Edward; Marksberry, Don; Lane, John; Gilmer, James; Dube, Donald; Miranda, Samuel; Arndt, Steven; Helton, Donald; Dozier, Jerry; Skarda, Raymond; Howe, Andrew; Mitman, Jeffrey; Harrison, Donnie; Chung, Donald; Koshy, Thomas; Zoulis, Antonios; Gavrilas, Mirela; Wong, See-Meng; Beasley, Benjamin; Marshall, Donald; Velazquez-Lozada, Alexander; Iyengar, Raj; Criscione, Lawrence; Caruso, John; Phan, Hanh; Ghosh, Anita; Brown, Eva; Brown, Michael; Norton, Charles; Cranston, Gregory; Kolb, Timothy; Vick, Lawrence; Shea, James; Summers, Robert; Gulla, Gerald; Kauffman, John; Hart, Ken; Bloom, Steven; Padovan, Mark; Williams, Donna; Isom, James; Thorp, John; Kugler, Andrew; Roggenbrodt, William; Gardocki, Stanley; Jervey, Richard; Horn, Brian; Ramadan, Liliana; Thompson, Jon; Solorio, Dave; Reeves, Rosemary
Cc: Dozier, Jerry; Gray, Kathy
Subject: RST Watch Bill as of 1100 on Monday April 11th
Attachments: 03-13 to 04-15 Complete RST Watch Bill as of 04-11-11 at 1100.pdf

All,

Here's the updated RST watch bill through Friday the 15th. You'll notice that all but two RST positions (the BWR Systems & Operations Analyst and the Accident Analyst) have been retired as of 0700 this morning. We may have to ramp back up during certain periods, but as of now, this is the watch bill.

Notice also that we have two mid shifts open later in the week for BWR Analyst. (Thursday and Friday Mid shifts). We're soliciting volunteers for those two slots.

Peter and I want to thank all of you for your outstanding support of the Agency's response to this tragedy and for your kind indulgence with both of us and with one another as we found ourselves in uncharted international waters. Your flexibility in the face of new challenges and your ability to help proceduralize the unexpected work items are hallmarks of a professional group of responders. We don't get many opportunities to test ourselves in such an environment. I personally felt very well tested. (Beaten down on a couple of occasions). But the collective energy and innovation of our team always won the day.

There is much we will learn from our response. Your thoughts and recommendations are encouraged. Don't hold back. The squeakiest wheels will most likely get the grease.

For Rick Hasselberg & Peter Alter,

Rick Hasselberg
Sr. Emergency Response Coordinator
NRC Reactor Safety Team
Office of Nuclear Security and Incident Response
M/S T-4A43
Office - 301-415-6417

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Date	Day	Time	Shift	RST Director	RST Coordinator	Accident Analyst	BWR Expert	RST Communicator
04/06/2011	Wednesday	1500 - 2300	Swing	Ed Hackett	G Schoenebeck	Tom Koshy	Chuck Norton	Mark Padovan
04/06/2011	Wednesday	2300 - 0700	Midnight	Laura Dudes	Frank Collins	Ben Beasley	Eva Brown	Rollie Berry
04/07/2011	Thursday	0700 - 1500	Day	Stu Richards	Tom Boyce	Mirela Gavrilas	Mike Brown	Rick Jervey
04/07/2011	Thursday	1500 - 2300	Swing	B Holian	G Schoenebeck	Hossein Esmaili	Chuck Norton	John Thorp
04/07/2011	Thursday	2300 - 0700	Midnight	Fred Brown	Rick Hasselberg	Ben Beasley	Eva Brown	Rollie Berry
04/08/2011	Friday	0700 - 1500	Day	Mike Case	Mark Orr	Mirela Gavrilas	Mike Brown	Mark Padovan
04/08/2011	Friday	1500 - 2300	Swing	Pat Hiland	Joelle Starefos	Ray Skarda	Chuck Norton	Rosemary Reeves
04/08/2011	Friday	2300 - 0700	Midnight	Fred Brown	Frank Collins	Shawn Marshall	Eva Brown	Jon Thompson
04/09/2011	Saturday	0700 - 1500	Day	Mike Case	Mark Orr	Jeff Mitman	Mike Brown	Mark Padovan
04/09/2011	Saturday	1500 - 2300	Swing	Pat Hiland	Kerri Kavanagh	S M Wong	Chuck Norton	Rick Jervey
04/09/2011	Saturday	2300 - 0700	Midnight	Fred Brown	Oleg Bukharin	Velazquez-Lozada	Greg Cranston	Liliana Ramadan
04/10/2011	Sunday	0700 - 1500	Day	Ed Hackett	Rick Hasselberg	S M Wong	Larry Vick	Jim Isom
04/10/2011	Sunday	1500 - 2300	Swing	Allen Howe	Kerri Kavanagh	Raj Iyengar	Chuck Norton	Bill Roggenbrodt
04/10/2011	Sunday	2300- 0700	Midnight	Fred Brown	Joelle Starefos	Larry Criscione	Tim Kolb	Margie Kotzalas
04/11/2011	Monday	0700 - 1500	Day	Stu Richards	Michelle Falagan	Len Ward	Mike Brown	Jim Isom
04/11/2011	Monday	1500 - 2300	Swing	Allen Howe	Tom Boyce	Mark Caruso	~~Tim Kolb~~ Chuck Norton	Andy Kugler
04/11/2011	Monday	2300- 0700	Midnight	Pat Hiland	Rollie Berry	Larry Criscione	~~Eva Brown~~ Tim Kolb	Margie Kotzalas
04/12/2011	Tuesday	0700 - 1500	Day	Mike Case	Peter Alter	Ben Beasley	Mike Brown	Jim Isom
04/12/2011	Tuesday	1500 - 2300	Swing	Bill Ruland	Aixa Belen	Antonios Zoulis	~~Tim Kolb~~ Chuck Norton	Andy Kugler
04/12/2011	Tuesday	2300- 0700	Midnight	Brian Holian	Rollie Berry	Larry Criscione	~~Eva Brown~~ Tim Kolb	Margie Kotzalas
04/13/2011	Wednesday	0700 - 1500	Day	Stu Richards	Joe Williams	Mark Caruso	Mike Brown	Jim Isom
04/13/2011	Wednesday	1500 - 2300	Swing	Laura Dudes	Aixa Belen	Antonios Zoulis	~~Tim Kolb~~ Chuck Norton	Bill Roggenbrodt
04/13/2011	Wednesday	2300- 0700	Midnight	Brian Holian	Rollie Berry	Hanh Phan	~~Eva Brown~~ Tim Kolb	Joelle Starefos
04/14/2011	Thursday	0700 - 1500	Day	Stu Richards	Eric Thomas	Tina Ghosh	Mike Brown	Jim Isom
04/14/2011	Thursday	1500 - 2300	Swing	Laura Dudes	Brett Rini	Antonios Zoulis	Chuck Norton	Andy Kugler
04/14/2011	Thursday	2300- 0700	Midnight	Pat Hiland	Oleg Bukharin	Ben Beasley	~~Eva Brown~~ **TBD**	Joelle Starefos
04/15/2011	Friday	0700 - 1500	Day	Fred Brown	Peter Alter	Raj Iyengar	Greg Cranston	Jim Isom
04/15/2011	Friday	1500 - 2300	Swing	Stu Richards	Brett Rini	Antonios Zoulis	Chuck Norton	Andy Kugler
04/15/2011	Friday	2300- 0700	Midnight	Ed Hackett	Margie Kotzalas	Larry Criscione	~~Eva Brown~~ **TBD**	Joelle Starefos

as of 4/11/11 1100

Weaver, Tonna

From: EDO Update [nrc.announcement@nrc.gov]
Sent: Monday, April 11, 2011 2:27 PM
To: Taylor, Renee
Subject: EDO Update

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

EDO Update

Monday, April 11, 2011

I am sure that you are all aware that a federal government shutdown was averted on Friday when the leadership of the House and Senate and the President agreed, in principle, to a budget outline for Fiscal Year (FY) 2011 and temporary budget funding until midnight April 14th. Of course, the details have not yet been made public, so we do not know at this point what the final impact of the budget reductions—if any—will be for the NRC. The final outcome should become clearer throughout this week as the Congress develops the appropriations law for FY 2011 before the current Continuing Resolution expires. In the meantime, of course, we will carry on normal operations, including travel and training. As always, I will share any significant new information about the budget as it becomes available.

On a different topic, it has been more than a month since Northern Japan was struck by the devastating earthquake and tsunami and the resulting nuclear emergency. Although the situation at Fukushima Daiichi nuclear power station has improved, it still requires monitoring and NRC continues to provide assistance to our Japanese counterparts. We will continue to maintain a fully-engaged site team in Japan, but beginning this week we will be increasing the size and adjusting the skill set of the team to effectively support the work activities in Japan. Additional NRC employees are preparing to depart for Japan to replace current staff, allowing them to return home. The headquarters Operations Center, meanwhile, is realigning to better serve the changing needs of stakeholders in other parts of the U.S. Government and the Japanese Government.

Beginning today, the Ops Center will continue to have enhanced staffing around the clock, but will have fewer individuals per shift. Their focus will be coordination and communications, with most technical work associated with the Fukushima response shifting to the line organizations, such as NRR, RES, and NSIR. The line offices will be leveraged to perform the detailed analysis previously performed by the full Reactor

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Safety, Protective Measures, and Liaison Teams in the Operations (Ops) Center. Taskings to the line organizations will include specific expectations for internal coordination and schedules—with deadlines sometimes measured in hours—to reflect the needs and priorities of the response effort, especially the site team in Japan. I have asked that Office Directors and other supervisors recognize the importance of rapid response, when indicated, and authorize staff overtime as appropriate. This is a pilot approach to help shape our longer-term plans for staffing the Ops Center for this response, and will be re-evaluated at the end of the week.

I continue to encourage you to consult the multiple information resources available on the special section of our public website devoted to events in Japan: http://www.nrc.gov/japan/japan-info.html. Everything in this section, including testimony before Congress, is public information, so you can feel free to share the information from this website with interested friends and family.

Bill

Bill Borchardt, EDO

Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station

April 17th, 2011
Tokyo Electric Power Company

With regard to the accident at Fukushima Daiichi Nuclear Power Station due to the Tohoku-Chihou-Taiheiyo-Oki Earthquake occurred on Friday, March 11th, 2011, we are currently making our utmost effort to bring the situation under control. This announcement is to notify the roadmap that we have put together towards restoration from the accident.

1. Basic Policy

By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

2. Targets

Based on the basic policy, the following two steps are set as targets: "Radiation dose is in steady decline" as "Step 1" and "Release of radioactive materials is under control and radiation dose is being significantly held down" as "Step 2." Target achievement dates are tentatively set as follows: "Step 1" is set at around 3 months and "Step 2" is set at around 3 to 6 months after achieving Step 1.

3. Immediate Actions

Immediate actions were divided into three groups, namely, "I. Cooling", "II. Mitigation", "III. Monitoring and Decontamination." For the following five issues—"Cooling the Reactors," "Cooling the Spent Fuel Pools," "Containment, Storage, Processing, and Reuse of Water Contaminated by Radioactive Materials (Accumulated Water)," "Mitigation of Release of Radioactive Materials to Atmosphere and from Soil," and "Measurement, Reduction and Announcement of Radiation Dose in Evacuation Order/Planned Evacuation/ Emergency Evacuation Preparation Areas"—targets are set for each of the five issues and various countermeasures will be implemented simultaneously.

Please see the attachment for detailed actions.

We would like to deeply apologize again for the grave inconvenience and anxiety that the broad public has been suffering due to the accident at the Fukushima Daiichi Nuclear Power Station. We will continue to make every endeavor to bring the situation under control.

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April 17, 2011

Tokyo Electric Power Company

Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station

1. Basic Policy

By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

2. Targets

- Based on the basic policy, the following two steps are set as targets:
  - Step 1: Radiation dose is in steady decline.
  - Step 2: Release of radioactive materials is under control and radiation dose is being significantly held down.
  - (Note) Issues after Step 2 will be categorized as "Mid-term Issues"
- Target achievement dates are tentatively set as follows, although there will still be various uncertainties and risks:
  - Step 1: around 3 months
  - Step 2: around 3 to 6 months (after achieving Step 1)
  - (Note) Announcements will be made as soon as timing of step-wise target achievement or quantitative prospects are determined, as well as if revisions to the targets or achievement dates become necessary.

3. Immediate Actions

- In order to achieve the above targets, immediate actions were divided into 3 groups with targets set for each of the 5 issues. Various countermeasures will be implemented simultaneously (see the table in right.)
- In order to achieve Step 1, overcoming the following two issues that are currently being addressed will be critical:

① Prevention of hydrogen explosion inside the primary containment vessel (hereafter, PCV) (Units 1 to 3.)

- Cooling the reactor by injecting fresh water into the reactor increases the chance of steam condensation, leading to a concern of potentially triggering a hydrogen explosion.

→Nitrogen gas will be injected into the PCV of each unit to keep the concentration of hydrogen and oxygen below flammability limit.

② Prevention of release of contaminated water with high radiation level outside of the site boundary (Unit 2.)

- While cooling the reactor by injecting fresh water, accumulation of contaminated water with high radiation level in the turbine building is increasing (possible release to outside of the site boundary.)

→Actions will be taken against accumulated water to (1) secure several storage places and (2) install facilities to process the contaminated water and reduce the radiation dose, among others.

Roadmap for Immediate Actions

Areas	Issues	Targets and Countermeasures	
		Step 1	Step 2
I. Cooling	(1) Cooling the Reactors	① **Maintain stable cooling** ・Nitrogen gas injection ・Flooding up to top of active fuel ・Examination and implementation of heat exchange function ② **(Unit 2) Cool the reactor while controlling the increase of accumulated water until the PCV is sealed**	③ **Achieve cold shutdown condition (sufficient cooling is achieved depending on the status of each unit.)** ・Maintain and reinforce various countermeasures in Step 1.
	(2) Cooling the Spent Fuel Pools	④ **Maintain stable cooling** ・Enhance reliability of water injection ・Restore coolant circulation system ・(Unit 4) Install supporting structure	⑤ **Maintain more stable cooling function by keeping a certain level of water.** ・Remote control of coolant injection operation ・Examination and implementation of heat exchange function
II. Mitigation	(3) Containment, Storage, Processing, and Reuse of Water Contaminated by Radioactive Materials (Accumulated Water)	⑥ **Secure sufficient storage place to prevent water with high radiation level from being released out of the site boundary.** ・Installation of storage / processing facilities. ⑦ **Store and process water with low radiation level** ・Installation of storage facilities/decontamination processing.	⑧ **Decrease the total amount of contaminated water.** ・Expansion of storage/processing facilities. ・Decontamination/Desalt processing (reuse), etc.
	(4) Mitigation of Release of Radioactive Materials to Atmosphere and from Soil	⑨ **Prevent scattering of radioactive materials on buildings and ground** ・Dispersion of inhibitor ・Removal of debris ・Installing reactor building cover	⑩ **Cover the entire buildings (as temporary measure).**
III. Monitoring/ Decontamination	(5) Measurement, Reduction and Announcement of Radiation Dose in Evacuation Order/Planned Evacuation/ Emergency Evacuation Preparation Areas	⑪ **Expand/enhance monitoring and inform of results fast and accurately** ・Examination and implementation of monitoring methods.	⑫ **Sufficiently reduce radiation dose in evacuation order / planned evacuation / emergency evacuation preparation areas** ・Decontamination/monitoring of homecoming residences.
		(Note) With regard to radiation dose monitoring and reduction measures in evacuation order/planned evacuation/emergency evacuation preparation areas, we will take every measure through thorough coordination with the national government and by consultation with the prefectural and municipal governments.	

Attachment ①

Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station

Basic Policy: By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

Areas	Issues	Current Status (as of April 16th)	Targets, Countermeasures and Risks <Step 1 (around 3 months)> Radiation dose is in steady decline.	Targets, Countermeasures and Risks <Step 2 (around 3 to 6 months*)> Release of radioactive materials is under control and radiation dose is being significantly held down. * After achieving Step 1	Mid-term Issues
I. Cooling	(1) Cooling the Reactors	**Current Status [1] (Units 1 to 3) Cooling achieved by water injection while there is partial damage to fuel pellets.** ⇒Continued injection of fresh water and further cooling measures are required. Countermeasure [1]: Injecting fresh water into the RPV by pumps. Risk [1] Possibility of hydrogen explosion due to condensation of steam in the PCV when cooled, leading to increased hydrogen concentration. Countermeasure [2]: Injecting nitrogen gas into the PCV (start from Unit 1.) Countermeasure [3]: Consideration of flooding the PCV up to the top of active fuel. **Current Status [2] (Units 1 to 3) High likelihood of small leakage of steam containing radioactive materials through the gap of PCV caused by high temperature.** ⇒Lowering the amount of steam through cooling and implementation of leakage prevention are required. Countermeasure [4]: Lower the amount of steam generated by sufficiently cooling the reactor (to be achieved by measures in Steps 1 and 2.) Countermeasure [5]: Consideration of shielding the leakage by covering the reactor building (coordinate with issue [4].) **Current Status [3] (Unit 2) Large amount of water leakage, indicating high likelihood of PCV damage.** ⇒Repairing the damaged location is required. ⇒Need to control the amount of water injection since leakage increases as injection increases. Countermeasure [6]: Consideration of sealing the damaged location (e.g., filling with grout (glutinous cement)) Countermeasure [7]: Cooling at minimum water injection rate (control the leakage of contaminated water.) Risk[2]: Possibility of prolonged work of sealing the damaged location (→countermeasures [12] and [14]) **Current Status [4] Secured multiple off-site power (1 system each from TEPCO and Tohoku EPCO) and deployed backup power (generator cars / emergency generators)** Risk [3]: Possibility of (partial) loss of power from the grid caused by ensuring aftershocks and lightning in advance. Countermeasure [8]: Install interconnecting lines of offsite power soon.	**Target [1] (Unit 1 to 3) Maintain stable cooling.** Countermeasure [9]: Flood the PCV up to the top of active fuel. Countermeasure [10]: Reduce the amount of radioactive materials (utilization of standby gas treatment system (filter), etc.) when PCV venting (release of steam containing radioactive materials into the atmosphere). Countermeasure [11]:Continue preventing hydrogen explosion by injecting nitrogen into the PCV. Risk [4]: Increase in water leakage into the turbine building in the process of flooding the PCV. Countermeasure [12]: Consideration and implementation of measures to hold down water inflow (e.g., circulating the water back into the RPV by storing and processing the accumulated water in the turbine building.) Countermeasure [13]: Consideration of recovering heat exchange function for the reactor (installing heat exchangers). Risk [5]: Possibility of prolonged work in high dose level area (→keep countermeasures [9] and [12]) **Target [2] (Unit 2) Cool the reactor while controlling the increase of accumulated water until PCV is sealed.** Countermeasure [14]: Continue cooling by current minimum injection rate. Countermeasure [15]: Continue prevention of hydrogen explosion by nitrogen injection into the PCV. Countermeasure [16]: Continue consideration and implementation of sealing measure at damaged location. Implement cooling measures similar to those for Units 1 and 3 once the damaged location is sealed. Risk[2]: Possibility of prolonged work of sealing the damaged location (→continue countermeasures [12] and [14])	**Target [3] Achieve cold shutdown condition (sufficient cooling is achieved depending on the status of each unit.)** Countermeasure [17]: Maintain and enhance countermeasures in Step 1 if needed.	**Issue [1] Prevention of breakage, clogging and water leakage of structural materials (reactor and pipes, etc.) due to corrosion caused by salt.**

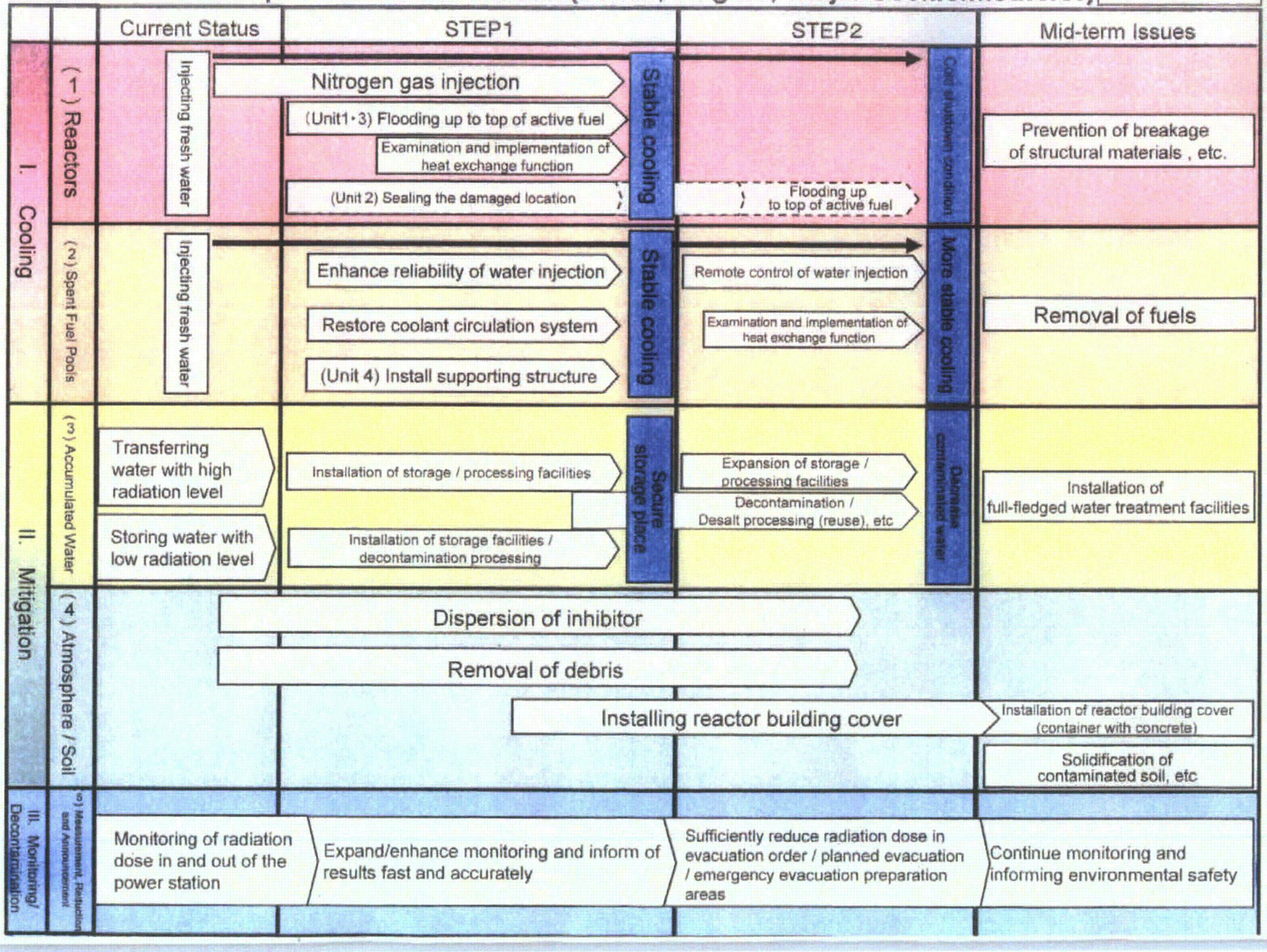
Note: Reactor pressure vessel is denoted as "RPV" and primary containment vessel is denoted as "PCV."

Areas	Issues	Current Status (as of April 16th)	Targets, Countermeasures and Risks <Step 1 (around 3 months)> Radiation dose is in steady decline.	Targets, Countermeasures and Risks <Step 2 (around 3 to 6 months*)> Release of radioactive materials is under control and radiation dose is being significantly held down. * After achieving Step 1	Mid-term Issues
I. Cooling	(2) Cooling the Spent Fuel Pools	**Current Status [5] Fresh water is injected from outside for Units 1, 3, 4 and through normal cooling line for Unit 2.** ⇒Reduction of worker exposure and countermeasures for aftershocks are required. Countermeasure [18]: Consideration/implementation of improving reliability of external water injection by concrete pumpers ("Giraffe", etc.)/switch to remote-controlled operation. **Current Status [6]: Confirmation of release of radioactive materials from the pool** Countermeasure [19]: Sampling and measurement of steam/pool water by "Giraffe", etc. ⇒Most fuels in Unit 4 have been confirmed intact according to the result of pool water analysis. **Current Status [7]: Walls of the building supporting the pool have been damaged.** ⇒Tolerance evaluation is especially needed for Unit 4. Countermeasure [20]: Seismic tolerance assessment of Unit 4. ⇒A certain level of seismic tolerance has been confirmed. Countermeasure [21]: Continue monitoring and examine necessary countermeasures (→ countermeasure [26].)	**Target [4]: Maintain stable cooling.** Countermeasure [22]: Continuation of water injection by "Giraffe", etc (reliability improvement (enhanced durability of hoses)/switch to remote-controlled operation.) Countermeasure [23]: Add cooling function to normal Fuel Pool Cooling system and continue injecting water for Unit 2. Countermeasure [24]: Examination and implementation of restoration of normal cooling system for Units 1, 3, and 4. Risk [6]: Possibility of inability to restore normal cooling line due to damages to the building Countermeasure [25]: Examination and implementation of installing heat exchangers. Countermeasure [26]: (Unit 4) Installation of supporting structure under the bottom of the pool.	**Target [5]: Maintain more stable cooling function by keeping a certain level of water.** Countermeasure [27]: Cooling by installation of heat exchangers. Countermeasure [28]: Expansion of remote-controlled operation areas of "Giraffe", etc.	**Issue [2]: Removal of fuels (including Units 5 & 6.)**
II. Mitigation	(3) Containment, Storage, Processing, and Reuse of Water Contaminated by Radioactive Materials (Accumulated Water)	**Current Status [8]: Leakage of high radiation-level contaminated water assumed to have originated from Unit 2 reactor occurred, but was subsequently stopped.** Countermeasure [29]: Identify leakage path and examine and implement preventive measures. • Placing sandbags with radioactive-material adsorption material (zeolite) in the bay. • Installing fences in the bay to prevent contamination from spreading (silt fence.) • Blockage between trenches and buildings, etc **Current Status [9]: Leakage and accumulation of high radiation level contaminated water at Unit 2's turbine building, vertical shafts and trenchs.** Countermeasure [30]: Transferring accumulated water to facilities that can store it (condenser and Centralized Waste Treatment Facility). Countermeasure [31]: Preparing decontamination and desalt of transferred accumulated water. (→Countermeasure [38]) Countermeasure [32]: Preparing to install tanks. **Current Status [10]: Increase of storage volume of water with low radiation level.** Countermeasure [33]: Preparing to store with tanks and barges. Countermeasure [34]: Preparing for decontamination and desalt of contaminated water (→Countermeasure [41]) Countermeasure [35]: Preparing to install a reservoir. **Current Status [11]: High likelihood of underground water around the building (sub-drainage water) to be contaminated.** Countermeasure [36]: Preparing to decontaminate sub-drainage water after being pumped up.	**Target [6]: Secure sufficient storage place to prevent water with high radiation level from being released out of the site boundary.** Countermeasure [37]: Utilization of "Centralized Waste Treatment Facility", etc. to store water. Countermeasure [38]: Install water processing facilities; decontaminate and desalt highly-contaminated water and store in tanks. Risk [7]: Possibility of delay in installing water processing facilities or poor operating performance of the facilities. Countermeasure [39]: Examination and implementation of backup measures (installment of additional tanks or pools or leakage prevention by coagulator, etc.) **Target [7]: Store and process water with low radiation level.** Countermeasure [40]: Increase storage capacity by adding tanks, barges, Megafloat, etc. Countermeasure [41]: Decontaminating contaminated water using decontaminants to below acceptable criteria.	**Target [8]: Decrease the total amount of contaminated water.** Countermeasure [42]: Expansion of additional tanks to store high radiation-level contaminated water. Countermeasure [43]: Continuation and reinforcement of decontamination and desalt of high radiation-level water. Countermeasure [44]: Continuation and reinforcement of decontamination and desalt of low radiation-level water. Countermeasure [45]: Reuse of processed water as reactor coolant. Countermeasure [46]: Decontamination to the level below criteria level.	**Issue [3] Installation of full-fledged water treatment facilities.**

Areas	Issues	Current Status (as of April 16th)	Targets, Countermeasures and Risks <Step 1 (around 3 months)> Radiation dose is in steady decline.	Targets, Countermeasures and Risks <Step 2 (around 3 to 6 months*)> Release of radioactive materials is under control and radiation dose is being significantly held down. * After achieving Step 1	Mid-term Issues
II. Mitigation	(4) Mitigation of Release of Radioactive Materials to Atmosphere and from Soil	**Current Status [12]: Debris are scattered outside the buildings and radioactive materials are being scattered.** Countermeasure [47]: Inhibit scattering of radioactive materials by full-scale dispersion of inhibitor after confirming its performance by test. Countermeasure [48]: Prevent rain water contamination by dispersion of inhibitor. Countermeasure [49]: Removal of debris. Countermeasure [50]: Examination and implementation of basic design for reactor building cover and full-fledged measure (container with concrete roof and wall, etc.) Countermeasure [51]: Consideration of solidification, substitution and cleansing of contaminated soil (med-term issues.)	**Target [9]: Prevent scattering of radioactive materials on buildings and ground.** Countermeasure [52]: Improvement of work condition by expanding application and dispersion of inhibitors to the ground and buildings. Countermeasure [53]: Continue removal of debris. Countermeasure [54]: Begin installing reactor building cover (with ventilator and filter.) Risk [8]: Considerable reduction of radiation dose is a prerequisite to launch construction (→continue countermeasure [52] and [53].)	**Target [10]: Cover the entire buildings (as temporary measure).** Countermeasure [55]: Complete installing reactor building covers (Units 1, 3, 4.) Risk [9]: Possibility of cover being damaged by a huge typhoon. Countermeasure [56]: Begin detailed design of full-fledged measure (container with concrete roof and wall, etc.)	**Issue [4]: Cover the entire building (as full-fledged measure)** Issue [5]: Solidification, substitution and cleansing of contaminated soil.
III. Monitoring/ Decontamination	(5) Measurement, Reduction and Announcement of Radiation Dose in Evacuation Order/Planned Evacuation/Emergency Evacuation Preparation Areas	**Current status [13]: Monitoring of radiation dose in and out of the power station is carried out.** Countermeasure [57]: Monitoring sea water, soil and atmosphere within the site boundary (25 locations.) Countermeasure [58]: Monitoring radiation dose at the site boundary (12 locations.) Countermeasure [59]: Consideration of monitoring methods in evacuation order/planned evacuation/emergency evacuation preparation areas. (→countermeasure [60] to [63])	**Target [11]: Expand/enhance monitoring and inform of results fast and accurately.** Countermeasure [60]: Consideration and implementation of monitoring methods in evacuation order / planned evacuation / emergency evacuation preparation areas (in cooperation and consultation with national/prefectural/municipal governments.) Countermeasure [61]: Announce accurately monitoring results of long half-life residue radioactive materials such as cesium 137.	**Target [12]: Sufficiently reduce radiation dose in evacuation order / planned evacuation / emergency evacuation preparation areas.** Countermeasure [62]: Monitoring of homecoming residences <in cooperation and consultation with national / prefectural / municipal governments.> Countermeasure [63]: Examination and implementation of necessary measures to reduce radiation dose (decontamination of homecoming residences and soil surface) <in cooperation and consultation with national/prefectural/municipal governments.>	Issue [6]:Continue monitoring and informing environmental safety.
		(Note) With regard to radiation dose monitoring and reduction measures in evacuation order/planned evacuation/emergency evacuation preparation areas, we will take every measure through thorough cooperation with the national government and by consultation with the prefectural and municipal governments.			

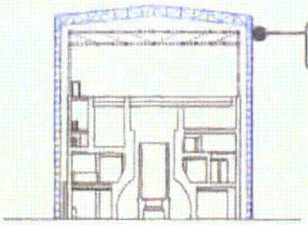
Roadmap for Immediate Actions (Issues / Targets / Major Countermeasures)

Reference 1



Overview of Major Countermeasures in the Power Station

Reference 2



Reactor building cover (countermeasures 5, 50, 54, 55)

Cooling of spent fuel pool by external water injection (countermeasures 18, 22, 28)

Sampling of steam/pool water and measurement of radioactive materials (countermeasure 19)

Storage of low radiation-level water (countermeasures 33, 35, 40)

Tanks, Megafloats, Barges, Reservoir

Nitrogen gas injection (countermeasures 2, 11, 15)

Reactor Building

Circulation cooling of spent fuel pool (countermeasures 23, 24, 25, 27)

Tank

Processing high radiation-level water (countermeasures 31, 38, 43)

Water processing facility (Decontamination and desalt processing)

PCV venting (with filtration) (countermeasure 10)

Primary Containment Vessel (PCV)

Tank Lorry

Reuse of processed water (Countermeasure 45)

Storage of high radiation-level water (countermeasures 30, 32, 37, 39, 42)

Flooding up to top of active fuel (countermeasures 3, 9)

Reactor Pressure Vessel (RPV)

Turbine Building

Steam Turbine

Heat Exchanger

Additionally-installed Tank

Centralized Waste Treatment Building

Installation of heat exchangers (countermeasure 13)

Condenser

Injection of fresh water with pumps (countermeasure 1)

Suppression Chamber

(Unit 2) Sealing the damaged location (countermeasures 6, 16)

Dispersion of inhibitor (countermeasures 47, 48, 52)
Removal of debris (countermeasures 49, 53)
Consideration of countermeasures for contaminated soil (countermeasure 51)

Preventive measures against leakage of high radiation-level water (countermeasure 29)

Treatment of sub-drainage water after being pumped up (countermeasure 36)

Seismic assessment (countermeasure 20),
Continued monitoring (countermeasure 21),
(Unit 4) Installation of supporting structure under the bottom of spent fuel pool (countermeasure 26)

piping

pumps

heat exchangers, water processing facilities

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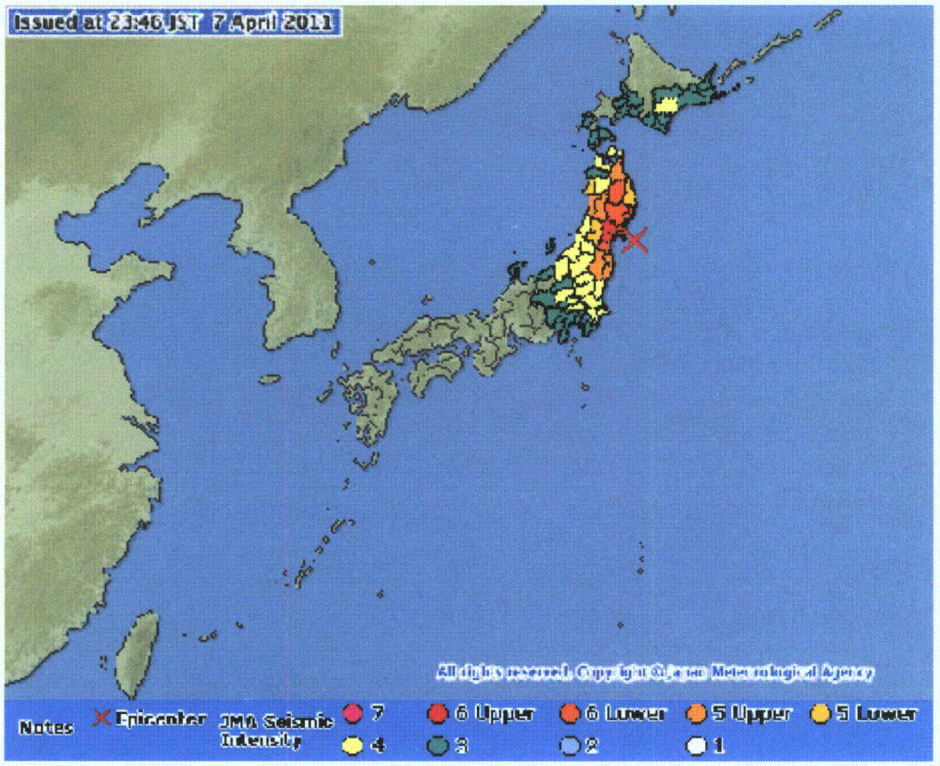
Hamilton, LaJuan

From: Jenkins, Ronaldo
Sent: Wednesday, April 13, 2011 11:39 AM
To: Chopra, Om; Fitzpatrick, Robert; Kang, Peter; Martinez-Navedo, Tania; Pal, Amar
Cc: NRO_DE_Branch_Chiefs; Shuaibi, Mohammed; Bergman, Thomas
Subject: FYI: IEEE Article/ Fukushima Catch-22

Nitrogen Injection to Continue Despite Aftershock



POSTED BY: JOHN BOYD / THU, APRIL 07, 2011

Editor's Note: John Boyd is an IEEE Spectrum contributor reporting from Kawasaki, Japan. This is part of IEEE Spectrum's ongoing coverage of Japan's earthquake and nuclear emergency. For more details on how Fukushima Dai-1's nuclear reactors work and what has gone wrong so far, see our explainer.

A 7.1 magnitude earthquake triggered a tsunami warning in the vicinity of the stricken Fukushima Dai-1 Nuclear plan, at 12:32 a.m. Friday. According press reports, Tokyo Electric Power Co. (TEPCO) says there was no additional damage, and its efforts at cleaning up and controlling the plant would continue.

One key to those efforts has been the injection of nitrogen gas into the damaged containment vessel of the No. 1 reactor. That got under way around 1:30 a.m. Thursday. In a Thursday morning press briefing, a TEPCO official said that, as expected, the pressure inside the reactor's containment vessel was "rising slightly," indicating the operation was "going smoothly."

The official said that as of 6 a.m. Thursday, the pressure in the reactor had risen 5 kilopascals from the 157 kPa the previous day. According to a paper published by the Citizens' Nuclear Information Center, an antinuclear organization which has been following the events at the plant closely, the Unit 1 containment vessel is built to withstand a maximum pressure of 429 kPa; pressure inside the vessel soared to 850 kPa after the earthquake, forcing TEPCO to vent steam into the air to relieve the pressure and prevent the vessel from rupturing.

4/526

The injection of nitrogen is needed to prevent a repeat of the 12 March hydrogen explosion that partly destroyed the No. 1 reactor building. It is currently believed that hydrogen has been building up in the containment vessel because of melted zirconium in the damaged fuel-rod cladding interacting chemically with the steam and water in the vessel. Hydrogen can also be generated when radiation breaks water molecules into hydrogen and oxygen. Injecting nitrogen will thin the hydrogen and oxygen, decreasing the likelihood of another explosion.

Hidehiko Nishiyama, deputy director-general of the Nuclear and Industrial Safety Agency (NISA), has warned that there is the possibility of gases and radioactive materials escaping while the nitrogen gas is being injected. Fear of such an escape is the reason why the procedure is being undertaken slowly, over six days, and is being carefully monitored.

Meanwhile, TEPCO reported a new development following its successful stoppering yesterday of contaminated water that had been flowing into the ocean from a cracked concrete pit near the Unit 2 seawater intake area. An inspection of the vertical shaft of the trench carrying cables and pipes for the Unit 2 turbine building showed that the highly contaminated water pooling there had risen 5 centimeters. TEPCO assumes that this is the result of its having stemmed the leak from the cracked pit. TEPCO suspects the water is flowing from the turbine building into the trench, then via a series of tunnels and pipes to the cracked pit, and until yesterday on into the ocean. A TEPCO official said they have not found any other sources of water leaking into the sea.

The water in the trench shaft remains just 1 meter from the surface, so the company is closely monitoring the situation.

In a press conference Wednesday night Nishiyama responded to a question about a *New York Times* article based on a confidential U.S. Nuclear Regulatory Committee (NRC) document that negatively assessed the problems of the Fukushima plant. Citing the document, the article suggested that among other problems the reactor containment vessels are under mounting stress as they fill up with radioactive water, making them vulnerable to aftershocks, which could cause them to rupture.
Nishiyama said that "members of the NRC are here in Japan, and we are working closely with them every day." He added that NISA was sharing with them "almost all information regarding the plant." He agreed that the containment vessels were "undergoing a rare experience .... But even if we were to have an aftershock right now, I don't believe that would lead to any emergency or dangerous situation."

His words seem prescient.

TAGS: JAPAN EARTHQUAKE // JAPAN NUCLEAR EMERGENCY // CONTAMINATION // EXPLOSION // HYDROGEN // LIQUID GLASS // NUCLEAR ENERGY // NUCLEAR POWER // NUCLEAR WASTE // OCEANS // RADIATION // RADIOACTIVE // TSUNAMI

Kock, Andrea

From: Zorn, Jason
Sent: Thursday, April 14, 2011 3:58 PM
To: Ostendorff, William; Nieh, Ho; Kock, Andrea; Franovich, Mike
Subject: FW: 04-14- Emergency Petition to Suspend all Pending Reactor Licensing Decisions and Related Rulemaking Decisions.... - Turkey Point
Attachments: 4-14-11-Petition to Suspend Proceeding (Turkey Point).pdf

FYI. The Commission just received this "adjudicatory" petition to suspend all ongoing licensing proceedings until the NRC has completed evaluation of the Fukushima event. According to the note from SECY below, it is one of 7 petitions that were filed today. The petition is assigned to OCAA for resolution, so I expect that we will see a paper with recommendations from them sometime soon.

From: Docket, Hearing
Sent: Thursday, April 14, 2011 3:53 PM
To: Adler, James; Ammon, Bernice; Bupp, Margaret; Carson, Cecilia; Clark, Lisa; Coggins, Angela; Cordes, John; Davis, Roger; Docket, Hearing; Frye, Roland; Hart, Ken; Krause, Emily; McIntyre, David; Monninger, John; Nieh, Ho; OCAAMAIL Resource; OPA Resource; Poole, Brooke; Reddick, Darani; Spicer, Susan; Temp, WCO; Temp, WDM; Vietti-Cook, Annette; Zorn, Jason
Cc: Julian, Emile; Rothschild, Trip; Hirsch, Patricia; Giitter, Rebecca
Subject: 04-14- Emergency Petition to Suspend all Pending Reactor Licensing Decisions and Related Rulemaking Decisions.... - Turkey Point

The attached is a sample of 7 petitions that arrived today on our active hearing dockets. According to the attached petition even more copies on other dockets will arrive by April 18, 2011, including copies addressing the AP1000 and ESBWR rulemakings. Additionally, page 4 of the petition notes that supporting submittals by experts will also follow at a later date.

ACTION OFFICE: OCAA **ACTION: APPROPRIATE**

Christine Pierpoint
Rulemakings and Adjudications Staff
Office of the Secretary

4/527

April 14-18, 2011

UNITED STATES OF AMERICA
U.S. NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

In the Matter of Amerenue (Callaway Plant Unit 2)	)))	Docket No. 52-037-COL
In the Matter of AP1000 Design Certification Amendment 10 CFR Part 52	)))	NRC-2010-0131 RIN 3150-A18
In the Matter of Calvert Cliffs 3 Nuclear Project, L.L.C. (Calvert Cliffs Nuclear Power Plant, Unit 3)	)))	Docket No. 52-016-COL
In the Matter of Detroit Edison Co. (Fermi Nuclear Power Plant, Unit 3)	)))	Docket No. 52-033-COL
In the Matter of Duke Energy Carolinas, L.L.C. (William States Lee III Nuclear Station, Units 1 and 2)	))))	Docket Nos. 52-018 and 52-019
In the Matter of Energy Northwest (Columbia Generating Station)	)))	Docket No. 50-397-LR
In the Matter of Entergy Nuclear Generation Co. And Entergy Nuclear Operations, Inc. (Pilgrim Nuclear Power Station)	))))	Docket No. 50-293-LR
In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Station, Units 2 and 3)	))))	Docket Nos. 50-247-LR and 50-286-LR
In the Matter of ESBWR Design Certification Amendment 10 CFR Part 52	)))	NRC-2010-0135 RIN-3150-AI85

In the Matter of FirstEnergy Nuclear Operating Co. (Davis-Besse Nuclear Power Station, Unit 1)	))))	Docket No. 50-346-LR
In the Matter of Florida Power & Light Co. (Turkey Point Units 6 and 7)	)))	Docket Nos. 52-040-COL and 52-041-COL
In the Matter of Luminant Generation, Co., L.L.C. (Comanche Peak Nuclear Power Plant, Units 3 and 4)	))))	Docket Nos. 52-034-COL and 52-035-COL
In the Matter of Nextera Energy Seabrook, L.L.C. (Seabrook Station, Unit 1)	)))	Docket No. 50-443-LR
In the Matter of Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2)	))))	Docket Nos. 50-275-LR and 50-323-LR
In the Matter of PPL Bell Bend, L.L.C. (Bell Bend Nuclear Power Plant)	)))	Docket No. 52-039-COL
In the Matter of Progress Energy Carolinas, Inc. (Shearon Harris Nuclear Power Plant, Units 2 and 3)	))))	Docket Nos. 52-022-COL and 52-023-COL
In the Matter of Progress Energy Florida, Inc. (Levy County Nuclear Power Plant, Units 1 and 2)	))))	Docket Nos. 52-029-COL and 52-030-COL
In the Matter of South Carolina Electric and Gas Co. And South Carolina Public Service Authority (Also Referred to as Santee Cooper) (Virgil C. Summer Nuclear Station, Units 1 and 2)	)))))	Docket Nos. 52-027-COL and 52-028-COL

In the Matter of Southern Nuclear Operating Co. (Vogtle Electric Generating Plant, Units 3 and 4)	))))	Docket Nos. 52-025-COL and 52-026-COL
In the Matter of South Texas Project Nuclear Operating Co. (South Texas Project, Units 3 and 4)	))))	Docket Nos. 52-012-COL and 52-013-COL
In the Matter of Tennessee Valley Authority (Bellefonte Nuclear Power Plant, Units 1 and 2)	))))	Docket Nos. 50-438-CP and 50-439-CP
In the Matter of Tennessee Valley Authority (Bellefonte Nuclear Power Plant, Units 3 and 4)	))))	Docket Nos. 52-014-COL and 52-015-COL
In the Matter of Tennessee Valley Authority (Watts Bar Unit 2)	)))	Docket No. 50-0391-OL
In the Matter of Virginia Electric and Power Co. d/b/a/ Dominion Virginia Power and Old Dominion Electric Cooperative (North Anna Unit 3)	)))))	Docket No. 52-017-COL

EMERGENCY PETITION TO SUSPEND ALL PENDING REACTOR LICENSING DECISIONS AND RELATED RULEMAKING DECISIONS PENDING INVESTIGATION OF LESSONS LEARNED FROM FUKUSHIMA DAIICHI NUCLEAR POWER STATION ACCIDENT

I. INTRODUCTION

Pursuant to the Atomic Energy Act ("AEA") and the National Environmental Policy Act ("NEPA"), Petitioners hereby request the U.S. Nuclear Regulatory Commission ("NRC" or "Commission") to exercise its supervisory jurisdiction over all pending proceedings for the consideration of applications for construction permits, new reactor licenses, combined construction permit and operating licenses ("COLs"), early site permits ("ESPs"), license renewals ("LRs"), and standardized design certification rulemakings for nuclear reactors (hereinafter collectively "licensing and related rulemaking proceedings"), to ensure the consideration in those proceedings of new and significant information regarding the safety and environmental implications of the ongoing catastrophic radiological accident at the Fukushima Daiichi Nuclear Power Station, Units 1-6 ("Fukushima"), in Okumu, Japan.

This Petition is filed by Petitioners in each of the above-captioned licensing and rulemaking proceedings now pending before the Commission. The Petition will be filed in each of the above-captioned proceedings between April 14 and April 18, 2011.[1]

Petitioners request the Commission to take the following immediate actions:

- Suspend all decisions regarding the issuance of construction permits, new reactor licenses, COLs, ESPs, license renewals, or standardized design certification pending completion by the NRC's Task Force to Conduct a Near-Term Evaluation of the Need for

[1] This Petition is complementary to the Petition to Suspend AP1000 Design Certification Rulemaking Pending Evaluation of Fukushima Accident Implications on Design and Operational Procedures and Request for Expedited Consideration that was filed by the Bellefonte Efficiency and Sustainability Team and other organizations on April 6, 2011.

Agency Actions Following the Events in Japan ("Task Force") of its investigation of the near-term and long-term lessons of the Fukushima accident and the issuance of any proposed regulatory decisions and/or environmental analyses of those issues;

- Suspend all proceedings with respect to hearings or opportunities for public comment, on any reactor-related or spent fuel pool-related issues that have been identified for investigation in the Task Force's Charter of April 1, 2011 (NRC Accession No. ML11089A045). These issues include external event issues (i.e., seismic, flooding, fires, severe weather); station blackout; severe accident measures (e.g., combustible gas control, emergency operating procedures, severe accident management guidelines); implementation of 10 C.F.R. § 50.54(hh)(2) regarding response to explosions or fire; and emergency preparedness. *Id.* The Commission should also suspend all licensing and related rulemaking proceedings with regard to any other issues that the Task Force subsequently may identify as significant in the course of its investigation. The proceedings should be suspended pending completion of the Task Force's investigation into those issues and the issuance of any proposed regulatory decisions and/or environmental analyses of those issues;
- Conduct an analysis, as required by NEPA, of whether the March 11, 2011 Tohoku-Chihou-Taiheiyo-Oki earthquake and ensuing radiological accident poses new and significant information that must be considered in environmental impact statements to support the licensing decisions for all new reactors and renewed licenses;
- Conduct a safety analysis of the regulatory implications of the March 11, 2011 Tohoku-Chihou-Taiheiyo-Oki earthquake and ensuing radiological accident and publish the results of that analysis for public comment;

- Establish procedures and a timetable for raising new issues relevant to the Fukushima accident in pending licensing proceedings. The Commission should allow all current intervenors in NRC licensing proceedings, all petitioners who seek to re-open closed licensing or re-licensing proceedings, and all parties who seek to comment on design certification proposed rules, a period of at least 60 days following the publication of proposed regulatory measures or environmental decisions, in which to raise new issues relating to the Fukushima accident.
- Suspend all decisions and proceedings regarding all licensing and related rulemaking proceedings, as discussed above, pending the outcome of any *independent* investigation of the Fukushima accident that may be ordered by Congress or the President or instigated by the Commission to complement or supersede the work of the Task Force.
- Request that the President establish an independent investigation of the Fukushima accident and its implications for the safety and environmental impacts of U.S. reactors and spent fuel pools similar to the President's Commission on the Accident at Three Mile Island, chaired by John G. Kemeny.

Petitioners respectfully submit that granting of the relief requested above is required by the AEA and NEPA, which forbid the NRC from issuing licenses for which it lacks reasonable assurance of safe operation or for which it has failed to consider all information significantly bearing on the environmental impacts of reactor operation. *See* discussion in Section V.B. below. By establishing the Task Force and ordering the investigation of the regulatory implications of the Fukushima accident for U.S. reactors, the Commission has identified the new information coming out of the Fukushima accident as new and potentially significant; and therefore it is legally obligated to consider the environmental implications of that new

information in all prospective licensing decisions. *Marsh v. Oregon Natural Resources Council,* 490 U.S. 360, 370-71 (1989). Suspension of licensing decisions pending investigations of lessons learned also would be consistent with the course followed by the Commission following the Three Mile Island accident, when the Commission delayed new licensing actions for a year and a half. *See Statement of Policy: Further Commission Guidance for Power Reactor Operating Licenses,* CLI-80-42, 12 NRC 654 (1980) ("TMI Policy Statement").[2]

Finally, emergency action by the Commission is necessary because a number of the pending licensing proceedings are approaching completion (e.g.., the Pilgrim license renewal proceeding, the AP1000 design certification proceeding, the Vogtle Units 3 and 4 COL proceeding, and the Economic Simplified Boiling Water ("ESBWR" design certification rulemaking proceeding). For these reasons, Petitioners therefore request a decision on this Petition within thirty (30) days.

II. DESCRIPTION OF PETITIONERS

Petitioners are organizations and individuals who seek, through this Petition, to ensure that they will have an opportunity to raise new safety and environmental issues emerging from

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[2] Petitioners believe that by establishing the Task Force and charging it with the task of investigating the implications of the Fukushima Daiichi accident with respect to its regulatory program, the Commission has, as a matter of law, bound itself to evaluate the significance of the information yielded by its investigation under NEPA and to analyze any information that is new and significant in supplemental environmental impact statements for all pending licensing decisions. Therefore, Petitioners do not believe it is necessary to submit an expert declaration in support of this petition.

In any event, Petitioners expect to submit additional expert support for this Petition early next week, in the form of a declaration by Dr. Arjun Makhijani, President of the Institute for Energy and Environmental Research in Takoma Park, Maryland. Because of other conflicting obligations, Dr. Makhijani was unable to complete his declaration in time to submit it by April 14, 2011. Due to the fact that some of the licensing decisions affected by this petition are imminent, however, the majority of the Petitioners are submitting their legal brief and request for relief at their earliest opportunity, starting today.

the Fukushima nuclear accident in licensing and related rulemaking proceedings. Some of the Petitioners have already intervened in pending NRC licensing proceedings and seek an opportunity to participate with respect to the application of new information regarding "lessons learned" from Fukushima to those proceedings. Other petitioners seek a renewed opportunity to participate in licensing proceedings that have been closed to public participation but that are still pending before the agency. Petitioners also seek to ensure that the NRC will not give final approval to the AP1000 and ESBWR standardized designs proposed by the NRC Staff until the agency has considered whether design modifications are necessary in light of the Fukushima accident.

Petitioners are the following individuals and organizations:

AP1000 Group[3]

Beyond Nuclear, Inc.

Blue Ridge Environmental Defense League, Inc. ("BREDL")

BREDL Chapter Bellefonte Efficiency and Sustainability Team ("BREDL")

Center for a Sustainable Coast, Inc.

Citizens Allied for Safe Energy, Inc.

Citizens Environmental Alliance of Southwestern Ontario, Inc.

Don't Waste Michigan, Inc.

Friends of the Earth, Inc.

Friends of the Coast, Inc.

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[3] The AP1000 Oversight Group consists of the Bellefonte Efficiency and Sustainability Team, BREDL, Citizens Allied for Safe Energy, Friends of the Earth, Georgia Women's Action for New Directions, Green Party of Florida, Mothers Against Tennessee River Radiation, North Carolina Waste Awareness and Reduction Network, Nuclear Information and Resource Service, Nuclear Watch South, South Carolina Chapter - Sierra Club, and SACE.

Georgia Women's Action for New Directions, Inc.

Green Party of Florida

Green Party of Ohio

Hudson River Sloop Clearwater, Inc.

Keith Gunter

Michael J. Keegan

Dan Kipnis

Leonard Mandeville

Frank Mantei

Marcee Meyers

Edward McArdle

National Parks Conservation Association, Inc.

Henry Newnan

Mark Oncavage

Missouri Coalition for the Environment, Inc.

Missourians for Safe Energy

Mothers Against Tennessee River Radiation

New England Coalition, Inc.

North Carolina Waste Reduction and Awareness Network, Inc.

Northwest Environmental Advocates, Inc. ("NWEA")

Nuclear Information and Resource Service, Inc.

Nuclear Watch South, Inc.

Public Citizen, Inc.

San Luis Obispo Mothers for Peace, Inc.

Savannah Riverkeeper, Inc.

Seacoast Anti-Pollution League, Inc.

Sierra Club, Inc. (Michigan Chapter)

Sierra Club (South Carolina Chapter)

George Steinman

Shirley Steinman

Southern Alliance for Clean Energy, Inc.

Gene Stilp

Harold L. Stokes

Southern Maryland CARES, Inc. (Citizens Alliance for Renewable Energy Solutions)

Sustainable Energy and Economic Development ("SEED") Coalition, Inc.

Marilyn R. Timmer

Village of Pinecrest, Florida

III. DESCRIPTION OF PENDING PROCEEDINGS IN WHICH PETITIONERS HAVE AN INTEREST IN APPLICATION OF LESSONS LEARNED FROM FUKUSHIMA NUCLEAR FACILITY ACCIDENT.

As discussed above in Section II, Petitioners are organizations and individuals with an interest in pending licensing decisions regarding new or existing nuclear reactors, including rulemakings for certification of standardized designs. A description of those pending proceedings and the Petitioners' interests in those proceedings follows. These descriptions of Petitioners' interests are not intended to be a complete representation of those interests nor are they intended to limit Petitioners in raising safety or environmental concerns related to the Fukushima accident in any on-going or future proceedings.

A. Construction Permit Proceedings

Bellefonte Nuclear Power Plant, Units 1 and 2. Tennessee Valley Authority's ("TVA's") Bellefonte site near Scottsboro in northeast Alabama has no operating nuclear reactors. Although TVA received construction permits for two units in 1974, it asked the NRC to revoke them in 2006. In 2008, TVA reversed course and requested the NRC to reinstate the construction permits for Bellefonte Units 1 and 2. BREDL and its chapter Bellefonte Efficiency and Sustainability Team ("BREDL") and SACE petitioned to intervene, raising concerns about the NRC's statutory authority to re-issue the construction permits and other concerns about site geology, quality assurance, safety requirement upgrades since 1974, and aging plant factors.

On April 2, 2010, the ASLB issued a Memorandum and Order recognizing standing but denying the petition to intervene. On September 29, 2010 the Commission dismissed an appeal but with a dissent in part by Chairman Jaczko. See CLI-10-26. The matter now lies before the US Court of Appeals for the District of Columbia where BREDL filed its latest brief on April 11th. *Blue Ridge Environmental Defense League v. Nuclear Regulatory Commission*, Consolidated Cases Nos. 09-1112 and 10-1058.

B. Part 50 Operating License Proceedings

Watts Bar Unit 2. TVA has attempted to resurrect the Watts Bar 2 reactor, which was all-but-abandoned in 1985. SACE was admitted as an intervenor to the operating license proceeding that commenced in 2009. While a contention regarding aquatic impacts was admitted, the ASLB rejected contentions regarding the inadequacy of TVA's SAMA analysis, including its analysis of the reliability of AC power backup for resolution of GSI-189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure From Hydrogen Combustion During a Severe Accident." SACE is very concerned about the implications of the Fukushima accident

with respect to the issues of backup power adequacy, hydrogen explosions, and the vulnerability of the proposed Watts Bar reactor's ice condenser containment.

C. Part 50 License Renewal Proceedings

Columbia Generating Station. The license renewal proceeding for the Columbia Generating Station is now pending before the NRC Staff. Under the schedule posted on the NRC's website, publication of a Draft Environmental Impact Statement ("EIS") is scheduled for June 2011. *See* http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html#schedule.

Petitioner Northwest Environmental Advocates ("NWEA") is extremely concerned about the implications of the Fukushima accident with respect to the safety of operating the Columbia Generating Station. They are particularly concerned about the implications of the Fukushima accident in light of earthquake risks to the Columbia Generating Station based on new findings of a structural zone that kinematically connects faults in central Washington with faults in the Puget Sound, the entirety of which may be seismically active. These findings are scheduled for publication later this year. The Fukushima accident also highlights the hazards associated with facility mismanagement which has been a chronic problem at the Columbia Generating Station.

Davis-Besse Nuclear Power Station, Unit 1. Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario, Don't Waste Michigan, and the Green Party of Ohio have submitted four contentions challenging the proposed extension of the Davis-Besse license, including inadequate treatment of alternative of potential for commercial-scale wind power and commercial-scale photovoltaic power generation in the ER, and inadequate Severe Accident Mitigation Alternatives ("SAMA") analysis.

Davis-Besse, a Babcock & Wilcox reactor, has a remarkable history of operational problems, the most recent being the infamous 2002 discovery of a massive corrosion hole in the

reactor head the size of a loaf of bread, where a 3/16" stainless steel liner was all that was holding back the pressurized radioactive water in the vessel. pressure.

Diablo Canyon Nuclear Power Plant, Units 1 and 2. The Diablo Canyon license renewal proceeding is now pending before the ASLB. San Luis Obispo Mothers for Peace ("SLOMFP") has intervened and gained admission of safety and environmental contentions, including contentions which challenge Pacific Gas and Electric's failure to adequately address earthquake risks to the reactor and the spent fuel pools. The ASLB has also referred to the Commission SLOMFP's petition for a waiver of NRC regulations precluding consideration of the environmental impacts of pool storage of spent fuel, based on a footnote in the 2009 Draft Revised Generic Environmental Impact Statement for Nuclear Power Plant License Renewal which excludes Diablo Canyon and other western reactors from the NRC's finding that pool storage of spent fuel does not pose significant environmental risks with respect to earthquake vulnerability.

SLOMFP is extremely concerned about the implications of the Fukushima reactor accident for the Diablo Canyon reactors and spent fuel pools, including the reactors' vulnerability to severe earthquakes and tsunamis, the lack of reliable and adequate backup power capability for the site, and the infeasibility of emergency evacuation following an earthquake.

Indian Point Nuclear Generating Station, Units 2 and 3. The Indian Point proceeding concerns the relicensing of two pressurized water reactors approximately 35 miles north of New York City. This proceeding has become the most complicated relicensing proceeding ever heard due to the large number of parties and admitted contentions. Hudson Sloop Clearwater, Riverkeeper, and New York State all have multiple contentions admitted in the proceeding. A

number of other municipal entities are participating as interested parties. Clearwater's admitted contention concerns the need to assess the environmental justice implications of severe accidents. Clearwater and Riverkeeper have recently moved to add both environmental and safety contentions regarding waste storage, based upon the recent waste confidence update. In addition, Clearwater, Riverkeeper, and New York State have moved to add environmental contentions based upon the publication of the FSEIS. Initial testimony regarding admitted contentions is now due in approximately 65 days.

Pilgrim Nuclear Power Station. The on-going Pilgrim Nuclear Power license renewal proceeding began in 2006. Two Pilgrim Watch contentions were admitted; one challenged the adequacy of the aging management program for buried pipes/tanks within scope containing radioactive liquids; the other challenged the applicant's SAMA analysis. Although the buried pipe contention was dismissed on summary disposition, the SAMA contention is still before the ASLB. In late 2010, Pilgrim Watch filed two Requests for New Hearings regarding the inadequacy of Entergy's aging management of submerged non-environmentally qualified electric cables and the lack of measures for cleanup after a severe nuclear reactor accident. The contentions are before the ASLB. Given the relevance of these issues to the Fukushima accident, and given the fact that the Pilgrim reactor shares the same boiling water reactor ("BWR") design as the Fukushima reactors, Pilgrim Watch seeks to ensure that it will have an opportunity to raise accident-related issues during the Pilgrim re-licensing proceeding.

Seabrook Station, Unit 1. In the license renewal proceeding for Seabrook Station Unit 1, the ASLB in this proceeding granted standing and admitted contentions submitted by Beyond Nuclear, Seacoast Anti-Pollution League, Sierra Club-New Hampshire Chapter, Friends of the Coast and New England Coalition. Admitted contentions that are relevant to the Fukushima

accident include Beyond Nuclear's contention challenging the licensee's apparent failure to adequately consider the availability of more environmentally benign and less risk-laden alternatives for the proposed period of extended operation. Early reports from Japan indicate that unanticipated costs to the environment and the regional economy resulting from the release of radiological fission products, activation products, and heavy radioactive elements to the environment from the Fukushima reactors and spent fuel pools will dwarf those risks considered in NRC's Generic Environmental Impact Statement , NRC site specific evaluations or in the license renewal application. Other contentions that appear relevant to the Fukushima accident relate to failure to provide for aging management of transformers, failure to provide for adequate aging management of non-qualified safety-related electrical cables susceptible to wetting or submergence, and inadequate and non-conservative Severe Accident Mitigation Alternatives ("SAMA") analysis.

The flooding phenomena at Fukushima also raise questions about the potential for tsunami impact at Seabrook, something dismissed in the LRA documents. Friends of the Coast and New England Coalition found that tsunamis have indeed occurred in adjacent waters of the North Atlantic; the most pertinent and striking example being a tsunami generated by a 7.2 earthquake epi-centered on Georges Bank at the northeast extreme of the Gulf of Maine. That tsunami, when funneled in to the bays and inlets of Newfoundland, crested at 90 feet. *See* http://www.maine.gov/doc/nrimc/mgs/explore/hazards/tsunami/jan05.htm

Clearly, the implications of such examples from recent history, coupled with the Japanese experience, should no longer be ignored when evaluating accident prospects in license renewal proceedings.

D. Part 52 Combined Licensing Proceedings

Bell Bend Nuclear Power Plant. In 2009, Gene Stilp requested a hearing on Pennsylvania Power and Light Co.'s application for a COL for the Bell Bend reactor, to be built adjacent to the two existing Susquehanna reactors. Although the ASLB found that Mr. Stilp had standing, it rejected his contentions as inadmissible. Among Mr. Stilp's rejected contentions was his concern about the safety and environmental risks of storing Bell Bend's spent fuel adjacent to the existing spent fuel storage pools at the Susquehanna site. Mr. Stilp would seek reconsideration of that issue in light of the events at the multi-unit Fukushima facility.

Bellefonte Nuclear Power Plant, Units 3 and 4. BREDL AND Southern Alliance for Clean Energy ("SACE") won the admission of four contentions in the COL proceeding regarding the Tennessee Valley Authority's ("TVA's") COL application for Bellefonte Units 3 and 4. There is considerable uncertainty regarding TVA's COL application which continues to delay the NRC's safety and environmental review schedule. In the wake of the Fukushima accident, the organizations are concerned about seismic risks to the proposed reactors: the Bellefonte site is near the Eastern Tennessee Seismic Zone, which is considered to be one of the most active seismic areas east of the Rocky Mountains. Recent studies have indicated that this seismic zone may have the potential to produce large magnitude earthquakes.

Callaway Plant Unit 2. The Missouri Coalition for the Environment and Missourians for Safe Energy intervened in the COL proceeding for Callaway Unit 2. The case was suspended after the applicant was unable to obtain construction work in progress funding from the state.

Calvert Cliffs Nuclear Power Plant, Unit 3. Calvert Cliffs Nuclear Power Plant, Unit 3. Nuclear Information and Resource Service, Public Citizen, Beyond Nuclear and Southern Maryland CARES are intervenors in this COL proceeding. Contentions on foreign ownership of

the Calvert Cliffs-3 project and on the failure of the NRC's Draft Environmental Impact Statement to adequately consider alternatives to Calvert Cliffs-3 are pending, with no hearing date yet established.

Comanche Peak Nuclear Power Plant, Units 3 and 4. Public Citizen, Inc. and the Sustainable Energy and Economic Development (SEED) Coalition, Inc. were admitted as Intervenors and raised several contentions in this COL proceeding for two new reactors on the site of the existing Comanche Peak Units 1 and 2. All of the contentions have been dismissed by the ASLB on motions for summary disposition. Intervenors have filed a petition for review of the ASLB's dismissal of contentions regarding mitigation strategies for loss of large area (LOLA) incidents caused by fires and explosions under 10 C.F.R. 50.54(hh)(2), an issue that is the subject of the Task Force's investigation.

Fermi Nuclear Power Plant, Unit 3. In July 2009, intervenors Don't Waste Michigan, Inc., Citizens for Alternatives to Chemical Contamination, Beyond Nuclear, Citizens Environmental Awareness of Southwestern Ontario, Keith Gunter, Michael J. Keegan, Edward McArdle, Leonard Mandeville, Frank Mantei, Marcee Meyers, Henry Newnan, Sierra Club (Michigan Chapter),George Steinman, Shirley Steinman, Harold L. Stokes, and Marilyn R. Timmer were granted standing and won the admission of five contentions in the COL proceeding for Fermi Unit 3. Three of those contentions are still pending.

Levy County Nuclear Power Plant, Units 1 and 2. Nuclear Information and Resource Service, The Green Party of Florida and The Ecology Party of Florida have been admitted as joint interveners in the COL proceeding for Progress Energy Florida's proposal to build two reactors on top of the recharge zone for some of the most pristine freshwater springs on the planet. The ASLB has two contentions before it and a hearing is currently set for January 2012.

North Anna Unit 3. BREDL and its chapter People's Alliance for Clean Energy have been admitted as intervenors in the COL proceeding for two proposed reactors on the site of the existing two-unit North Anna nuclear power plant. One of the original proposed plants was cancelled and the application for the other was replaced with one for a pressurized water reactor. On April 6, 2011, in LBP-11-10, the ASLB denied two additional contentions on water use and ability to withstand seismic incidents.

Shearon Harris Nuclear Power Plant, Units 2 and 3. NC WARN was admitted as an iIntervenor to this COL proceeding and submitted safety and environmental contentions on plant design, fire safety, aircraft attacks, spent fuel and emergency planning. One of the contentions on the underestimate of cost for the plants was settled when the applicant revised its cost estimates. The ASLB dismissed all of the other contentions and was affirmed by the Commission in CLI-10-05. The COL application is still pending before the NRC Staff.

South Texas Project, Units 3 and 4. Public Citizen and the SEED Coalition were admitted as intervenors and gained admission of a number of contentions, including contentions regarding mitigation strategies for loss of large area (LOLA) incidents caused by fires and explosions under 10 C.F.R. 50.54(hh)(2). Although those contentions were dismissed by the ASLB, Intervenors believe they should now be subject to reconsideration based on the Fukushima accident and the Task Force investigation.

Turkey Point Units 6 and 7. SACE, the National Parks Conservation Association, Dan Kipnis and Mark Oncavage have been admitted as joint intervenors in the COL proceeding for proposed new Units 6 and 7 at the Turkey Point Nuclear facility in Homestead, Florida. While the ASLB admitted contentions regarding groundwater impacts, it refused to admit the joint intervenors' eight other contentions, including one regarding sea level rise. That contention, which concerned

the potential environmental impact caused by construction and operation of new reactors in a region threatened by a predicted sea level rise of 1.5 to 5 feet by 2050, has particular relevance in light of the Fukushima disaster. Turkey Point is located less than 25 miles south of Miami on Biscayne Bay along Florida's southeastern coast. The lessons learned from the Task Force's investigation on external events should be applied to these coastal reactors.

V.C. Summer Units 2 and 3. Friends of the Earth and the Sierra Club were granted standing in the V.C. Summer COL case but no contentions were admitted. The COL application is still pending before the NRC Staff.

Vogtle Electric Generating Plant, Units 3 and 4. BREDL, Center for a Sustainable Coast, Georgia Women's Action for New Directions, Savannah Riverkeeper, and SACE (collectively, "Vogtle Intervenors") intervened in the COL proceeding for Plant Vogtle Units 3 and 4 and gained admission of a contention regarding the onsite storage of low level radioactive waste. In May 2010, the ASLB ruled that the issue was resolved and dismissed the case. New contentions regarding the flaws in AP1000 containment were subsequently raised, dismissed by the ASLB and are under appeal to the Commission.

In April 2011, the NRC Staff issued a Final Supplemental Environmental Impact Statement for the COL, and the Staff plans to release the Final Safety Evaluation Report in June. According to the current schedule, the Plant Vogtle COL may be issued at the end of this year, making Vogtle Units 3 and 4 the first AP1000 reactors to be licensed.

Before the license is issued, and in light of the Fukushima disaster, the following issues must be assessed at Plant Vogtle: the safety and environmental impacts of onsite spent fuel storage at multiple units; the impact of a power failure on the reactor cooling systems for the multiple units; and earthquake risks to the reactors, which lie in an area prone to seismic activity.

See NUREG-1923, Vogtle ESP Final Safety Evaluation Report, Chapter 2.5 (2009). Because Plant Vogtle will serve as the "reference" project for future AP1000 plants, the Vogtle Intervenors concern about the implications of the Fukushima disaster is heightened. If the lessons learned from Fukushima are not applied to Plant Vogtle, the repercussions will be multiplied by all plants referencing the Plant Vogtle COL in future applications.

William States Lee III Nuclear Station, Units 1 and 2. In 2008, BREDL petitioned for leave to intervene in the COL proceeding for Duke Energy Carolinas, LLC's application to construct and operate two AP1000 pressurized water reactors at the William States Lee III Nuclear Station site. On September 22, 2008, in LBP-08-17, the ASLB ruled that BREDL had standing to intervene but admitted no contentions. Among the contentions dismissed by the ASLB was a contention challenging the adequacy of the proposed reactor's seismic design, an issue now under investigation by the Task Force.

F. Standardized Design Certification Rulemakings

AP1000 Design Certification Amendment (NRC-2010-0131, RIN 3150-A18). On April 6, 2011 the AP1000 Oversight Group filed a petition to suspend the rulemaking on the certification of the AP1000 design and operational procedures which was noticed on February 24, 2011, at 76 Fed. Reg. 10,269. Currently, the comment period for the AP1000 design certification rulemaking is scheduled to close on May 10, 2011, long before the NRC concludes even its initial inquiry into the implications of the Fukushima accident.

The Petitioners requested suspension of the AP1000 design approval process while the NRC investigates the implications of the ongoing catastrophic accident in Fukushima, Japan, and decides what "lessons learned" must be incorporated into the AP1000 design and operational

procedures to ensure that they do not pose an undue risk to public health and safety or unacceptable environmental risks.

ESBWR Design Certification Amendment (NRC-2010-01325, RIN 3150-AI85). The NRC issued a proposed rule for the Economic Simplified Boiling Water Reactor ("ESBWR") standardized design certification on March 24, 2011, at 76 Fed. Reg. 16,549. The comment period closes on June 7, 2011. The ESBWR design has a particularly troublesome feature in common with the Mark I BWR design, which is the design of the Fukushima reactors: elevated spent fuel pools. Nevertheless, the Commission went ahead with the proposed rulemaking, even as the Fukushima accident unfolded.

IV. FACTUAL BACKGROUND

A. Fukushima Accident

Although many details about the Fukushima accident remain unclear, the general contours of the accident are described in NRC in Information Notice No. 2011-08 (March 31, 2011) (NRC Accession No. ML 110830824) as follows:

> On March 11, 2011, the Tohoku-Taiheiyou-Oki earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Daiichi nuclear power station as the result of a sustained loss of both the offsite and onsite power systems. Efforts to restore power to emergency equipment were hampered and impeded by damage to the surrounding areas due to the tsunami and earthquake.
>
> Units 1, 2 and 3 were operating at the time of the earthquake. Following the loss of electric power to normal and emergency core cooling systems and the subsequent failure of backup decay heat removal systems, water injection into the cores of all three reactors was compromised, and reactor decay heat removal could not be maintained. The operator of the plant, Tokyo Electric Power Company, injected sea water and boric acid into the reactor vessels of these three units, in an effort to cool the fuel and ensure that the reactors remained shut down. However, the fuel in the reactor cores became partially uncovered. Hydrogen gas built up in Units 1 and 3 as a result of exposed, overheated fuel reacting with water. Following gas venting from the primary containment to relieve pressure, hydrogen explosions occurred in both units and damaged the secondary containments. *Id.*

> Units 3 and 4 were reported to have low spent fuel pool (SFP) water levels.
>
> Fukushima Daiichi Units 4, 5 and 6 were shut down for refueling outages at the time of the earthquake. *Id.* The fuel assemblies for Unit 4 had recently been offloaded from the reactor core to the SFP. The SFPs for Units 5 and 6 appear to be intact. Emergency power is available to provide cooling water flow through the SFPs for Units 5 and 6.
>
> The damage to Fukushima Daiichi nuclear power station appears to have been caused by initiating events beyond the design basis of the facilities.

Id. at 1-2.

In a March 21, 2011, briefing, NRC Chairman also stated that the NRC believes that an accumulation of hydrogen which exploded on March 15 in Units Two and Four originated from overheated fuel in the spent fuel pool. Briefing on NRC Response to Recent Nuclear Events in Japan, Transcript at 11 (NRC ADAMS Accession No. ML110321).

According to Chairman Jaczko's March 21 statement, the NRC believes that Units One, Two, and Three have had some degree of core damage. Cooling systems for the reactors have not been restored. At the outset of the emergency, large volumes of sea water were used to cool the reactors and the spent fuel pools. The salt water injections have now been replaced by fresh water injections.

B. NRC Response to Fukushima Accident

1. Formation of Task Force

In response to the Fukushima reactor accident, the NRC announced the formation of a "senior level task force to conduct a methodical and systematic review" of NRC processes and regulations. COMGBJ-11-0002, Memorandum from Chairman Jaczko to Commissioners, re: NRC Actions Following the Events in Japan (March 21, 2011). The purpose of the task force is

to "determine whether the agency should make additional improvements to our regulatory systems and make recommendations to the Commission for its policy direction." *Id.*

The Commission instructed the task force to undertake both a near-term review and a longer-term review. For the near-term review, the Commission required the task force to evaluate issues "affecting domestic operating reactors of all designs" in areas that include "protection against earthquake tsunami, flooding, hurricanes; station blackout and a degraded ability to restore power; severe accident mitigation; emergency preparedness; and combustible gas control." *Id.* at 1. The Commission instructed the task force to complete the report in 90 days. In the meantime, the task force was instructed to provide a 30-day "quick look report" and another "status" report in 60 days. *Id.*

The Commission directed the task force to begin a "longer term" review "as soon as NRC has sufficient technical information from the events in Japan with the goal of no later than the completion of the 90 day near term report." *Id.* at 2. The longer-term study should "evaluate all technical and policy issues related to the event to identify additional research, generic issues, changes to the reactor oversight process, rulemakings, and adjustments to the regulatory framework that should be conducted by the NRC." *Id.* For the longer-term effort, the Commission instructed the task force to "receive input from and interact with all key stakeholders." *Id.* The Commission specified that within 60 days after commencing the longer-term study, the task force should "provide a report with recommendations, as appropriate, to the Commission." *Id.* The Task Force was established in early April.

2. Task Force Charter

The Task Force charter states that the group's "objective" is to:

- Evaluate currently available technical and operational information from the events that have occurred at the Fukushima Daiichi nuclear complex in Japan to identify

potential or preliminary near-term/immediate operational or regulatory actions affecting domestic reactors of all designs, including their spent fuel pools. The task force will evaluate, at a minimum, the following technical issues and determine priority for further examination and potential agency action:

- External event issues (e.g. seismic, flooding, fires, severe weather)
- Station blackout
- Severe accident measures (e.g., combustible gas control, emergency operating procedures, severe accident management guidelines)
- 10 CFR 50.54 (hh)(2) which states, "Each licensee shall develop and implement guidance and strategies intended to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire, to include strategies in the following areas: (i) Fire fighting; (ii) Operations to mitigate fuel damage; and (iii) Actions to minimize radiological release." Also known as B.5.b.
- Emergency preparedness (e.g., emergency communications, radiological protection, emergency planning zones, dose projections and modeling, protective actions)

- Develop recommendations, as appropriate, for potential changes to NRC's regulatory requirements, programs, and processes, and recommend whether generic communications, orders, or other regulatory actions are needed.
-

With respect to the longer-term review, the charter states that the Task Force will make: "[r]ecommendations for the content, structure, and estimated resource impact."

3. NRC Brief to Third Circuit U.S. Court of Appeals

By letter dated March 21, 2011, in the context of an appeal of the NRC's decision to re-license the Oyster Creek reactor, the U.S. Court of Appeals for the Third Circuit directed the NRC to "advise the Court what impact, if any, the damages from the earthquake and tsunami at the Fukushima Daiichi Nuclear Power Station have on the propriety of granting the license renewal application for the Oyster Creek Generating Station." New Jersey Environmental Federation et al. v. NRC (No. 09-2567). The NRC responded that it is:

> carefully monitoring those events, and assisting the Japanese government in

> understanding, controlling and limiting plant damage. NRC is also evaluating the information from these events for planning both short-term and longer-term responses to ensure the safety of United States reactors. In support of these tasks, NRC is gathering and absorbing data from the Fukushima Daiichi site that will enable NRC, with appropriate public participation, to put in place any new safety measures necessary to protect public health and safety in the United States.

Federal Respondents' Memorandum on the Events at the Fukushima Daiichi Nuclear Power Station, No. 09-2567 (April 4, 2011) ("NRC Memorandum").

In its Memorandum to the Third Circuit, the NRC also described its past "lessons learned" approach to significant events. *Id.* at 8. Following the 1979 accident at the Three Mile Island Unit 2 reactor, for example, the Commission established a "Lessons Learned Task Force." A Task Force "steering group" took recommendations from within *and outside* the NRC and developed a "comprehensive and integrated plan for all actions necessary to correct or improve the regulation and operation of nuclear facilities." In the course of that process, the NRC conducted a number of rulemakings "to update licensing requirements on the basis of TMI 'lessons learned.'" *Id.* at 9. In response to the attacks of September 11, 2001, the NRC also responded by ordering security improvements at all nuclear power plants, and eventually enacted many of those orders as formal regulations. *Id.* at 10.

The Commission's Memorandum to the Third Circuit does not describe one very important feature of the agency's response to the TMI accident: it suspended all licensing decisions until conclusion of the lessons learned process. TMI Policy Statement, 12 NRC 654. The Memorandum merely states that in this case the NRC has "not suspended reactor operations or licensing activity," and points out that the NRC issued a renewed license for the Vermont Yankee Nuclear Power Plant – a boiling water reactor ("BWR") of the same design as the Fukushima reactors – on March 21, 2011, during the accident. According to the NRC, "this

decision reflects NRC's confidence in the robust and redundant safety design and construction of currently operating U.S. nuclear reactors . . ." Memorandum at 13. The Memorandum also omits any discussion of NEPA or its requirement that agencies must consider new and significant information before they take actions that could significantly affect the human environment.

V. THE COMMISSION SHOULD EXERCISE ITS SUPERVISORY JURISDICTION TO STAY ALL PENDING LICENSING DECISIONS AND ALL PROCEEDINGS RELATED TO FUKUSHIMA ACCIDENT ISSUES PENDING INVESTIGATION OF REGULATORY IMPLICATIONS OF THE ACCIDENT.

A. Exercise of the Commission's Supervisory Jurisdiction is Appropriate.

This petition invokes the Commission's supervisory authority under the AEA to "oversee all aspects of the regulatory and licensing process and its overriding responsibility for assuring public health and safety in the operation of nuclear power facilities." *Consolidated Edison Co. of N.Y., Inc.* (Indian Point, Units 1, 2 and 3), CLI-75-8, 2 NRC 173 (1975). *See also* 42 U.S.C. §§ 2233(d), 2236(a), 2237. In the extraordinary circumstances of the Fukushima accident, it is appropriate for the Commission to establish clear and uniform procedures for the application of "lessons learned" to pending licensing and rulemaking decisions. Only the Commission has the authority to establish a consistent and broadly applicable set of procedures that comply with NEPA and AEA requirements for consideration of significant new information and that also provides legally required opportunities for public participation.

To leave the establishment of that process entirely to the separate ASLB panels that are now presiding over at least twenty-five separate licensing cases would invite uncertainty and chaos, especially in the administration of the general rule of thumb that significant new issues and information must be raised within thirty days of discovering them. *See, e.g., Shaw Areva MOX Services, Inc.* (Mixed Oxide Fuel Fabrication Facility), LBP-08-11, 67 NRC 460, 493 (2008) and cases cited therein. As illustrated by a recent New York Times article, the NRC's

theories about what exactly has occurred during the Fukushima accident are continuing to change. Matthew L. Wald, "Japan's Reactors Still Not Stable" (New York Times, page A6, April 13, 2011) (Attachment 1). And, there is extremely little in the way of official documentation from any source upon which Petitioners can rely in order to make a case before an individual ASLB that the unfolding events at Fukushima are relevant to individual licensing or rulemaking proceedings. Therefore it will be very difficult for intervenors or the ASLB panels that must judge motions to re-open the record and new contentions to judge the timeliness of those submissions.

The Commission should also exercise its supervisory jurisdiction to establish an ordered process for the application of "lessons learned" in licensing proceedings and related rulemaking proceedings, because it is the Commission that bears the ultimate legal responsibility for evaluating new and significant information, and it is the Commission that has the resources to carry out that responsibility. If the Commission fails to establish such a process, intervenor groups will be placed in the position of rushing to file contentions, rulemaking comments, and motions to re-open closed hearing records, based on whatever evaluations they are able to make of slowly-emerging and ever-evolving information from the accident. Such a process would not only be cumbersome, but its effectiveness would be limited by whatever limitations the intervenors or petitioners had on their resources for making a technical evaluation of the information yielded by the accident. It would place an unfair burden on intevenors and petitioners by forcing them to perform analyses that should be performed by the government in the first instance. And It would leave open the possibility of inconsistent ASLB decisions, which the Commission eventually would have to resolve.

Finally, the Commission should exercise its supervisory jurisdiction here because this petition seeks action in the non-adjudicatory context as well as the context of pending adjudications. The rulemaking proceedings for certification of the AP1000 and ESBWR designs are being conducted by the NRC Staff, over which only the Commission has authority. In addition, the Staff will be responsible for preparing the environmental and safety analyses requested by this petition.

B. The NRC Must Comply With NEPA and the AEA in Considering The Lessons Learned From the Fukushima Accident.

Both the AEA and NEPA place a burden on the NRC to address safety and environmental issues before issuing licensing decisions for nuclear reactors. These statutes preclude the NRC from issuing licenses or approving standardized reactor designs until it has completed its investigation of the Fukushima accident and considered the safety and environmental implications of the accident with respect to its regulatory program. In order to comply with those statutes, the Commission should suspend all licensing decisions, including certification of standardized design applications, pending conclusion of its investigation and issuance of proposed safety measures and environmental decision-making documents. In addition, it should suspend all pending hearings and rulemakings with respect to issues that are related to the Fukushima accident.

1. AEA

Under the AEA, the NRC may not issue a license for a reactor if it would pose an "undue risk" to public health and safety or the common security. 42 U.S.C. § 2311. "[P]ublic safety is the first, last, and a permanent consideration in any decision on the issuance of a construction permit or a license to operate a nuclear facility." *Power Reactor Development Corp. v. International Union of Electrical, Radio and Machine Workers,* 367 U.S. 396, 402 (1961). The

list of issues identified for investigation in the Task Force Charter demonstrates that the Fukushima accident raises significant questions about the adequacy of the NRC's regulatory program on a wide range of important safety issues, including the safety of spent fuel storage, seismic and flooding risks, station blackout, emergency planning, and severe accident management guidelines. In addition the Fukushima accident once more raises longstanding questions about the effectiveness of the GE Mark 1 containment. Even taking into account the degree of discretion granted by federal courts to the NRC, to proceed with reactor licensing without concluding the Task Force's investigation would constitute a abuse of the NRC's discretion in its interpretation of the "adequate assurance" standard, because in the current climate of uncertainty, it would be almost impossible for the NRC to reach the "definitive finding" on safety required by *Power Reactor Development Corp.* It is also grossly inconsistent with the Commission's previous approach to the Three Mile Island accident, where the Commission prudently suspended all licensing actions while it considered the lessons to be learned from the accident.

2. NEPA

While the NRC may have some discretion in determining whether to increase its safety regulation of reactors under the Atomic Energy Act, NEPA deprives the NRC of any discretion to consider the environmental impacts of its proposed actions. *Silva v. Romney,* 473 F.2d 287, 292 (1st Cir. 1973) (holding that an agency's NEPA duties are "not discretionary, but are specifically mandated by Congress, and are to be reflected in the procedural process by which agencies render their decisions.") *See also Public Service Co. of New Hampshire v. NRC,* 582 F.2d 77, 81 (1st Cir. 1978) ("NEPA's mandate has been given strict enforcement in the courts,

with frequent admonitions that it is insufficient to give mere lip service to the statute and then proceed in blissful disregard of its requirements.")

Even where the NRC has concluded that a proposed reactor operation meets its basic safety regulations, NEPA still requires the NRC to consider cost-effective alternatives for avoiding or mitigating environmental impacts that are reasonably foreseeable and yet not covered by safety regulations. *Limerick Ecology Action v. NRC,* 869 F.2d 730-31 (3rd Cir. 1989) (holding that the NRC could not rely on the sufficiency of a reactor license application under its safety regulations to avoid considering the cost-effectiveness of severe accident mitigation alternatives under NEPA). *See also* 40 C.F.R. § 1502.22(b)(1) (requiring consideration of "reasonably foreseeable" impacts which have "catastrophic consequences, even if their probability is low.")

NEPA's requirement to consider the environmental impacts of proposed actions continues even after a final EIS has been prepared, if new and significant information arises which could affect the outcome of the environmental analysis. 10 C.F.R. § 51.92(a). *See also Marsh,* 490 U.S. at 370-71. Here, by its own admission, the NRC has new information that concededly could have a significant effect on its regulatory program and the outcome of its licensing decisions for individual reactors. For the NRC to go ahead with licensing decisions and certification of standardized designs, ignoring the potential significance of this new information, would constitute a gross violation of NEPA. Even if the NRC ultimately concludes that the information does not have a significant effect on its licensing decisions, it must nevertheless follow NEPA's procedures for considering the information, including preparation of an environmental assessment. *Marsh,* 490 U.S. at 385 ("NEPA's mandate applies "regardless of [the agency's] eventual assessment of the significance of [the] information.")

Therefore, the position taken by the Commission in its Memorandum to the Third Circuit, that it may continue with the issuance of licenses and apply the lessons of the Fukushima accident retrospectively, is fundamentally inconsistent with both NEPA and the AEA. Instead, the Commission must take all necessary measures to protect the integrity of the NEPA decision-making process, by immediately suspending all pending licensing and related design-certification rulemaking decisions until it has addressed the significance of the new information revealed by the Fukushima accident in environmental assessments and/or EISs.[4]

C. Licensing Decisions and Hearings on Issues Related to the Fukushima Accident Must be Suspended and Should be Suspended Pending Completion of the Task Force Investigation and Publication of Proposed Decisions.

As discussed above, in order to ensure that it complies with the AEA and NEPA in responding to the regulatory implications of the Fukushima accident, the Commission must take action to delay issuance of licensing decisions while it studies and proposes to implement the lessons learned from the Fukushima accident. And even assuming for purposes of argument that such relief is not legally mandated, it is prudent and appropriate for the Commission to delay making licensing decisions until it has studied and proposed measures to implement the lessons of the Fukushima accident. The Commission should suspend its licensing actions, just as it did after the Three Mile Island accident – an event that was much less serious than the Fukushima accident.

Therefore Petitioners respectfully request the Commission to take the following actions:

- The Commission should suspend all decisions regarding the issuance of construction permits, new reactor licenses, COLs, ESPs, license renewals, or standardized design

[4] Petitioners recognize that the NRC has the discretion to choose between site-specific and generic analyses in evaluating the environmental significance of the new information. *See, e.g., Baltimore Gas and Electric Co. v. Natural Resources Defense Council,* 462 U.S. 87, 101 (1983). The Commission completely lacks discretion, however, to ignore the requirements of NEPA.

certification pending completion by the NRC's Task Force of its investigation of the near-term and long-term lessons of the Fukushima accident and the issuance of any proposed regulatory decisions and/or environmental analyses of those issues;

- The Commission should suspend all proceedings with respect to hearings or opportunities for public comment, on any reactor-related or spent fuel pool-related issues that have been identified for investigation in the Task Force's Charter of April 1, 2011 , including external event issues (i.e., seismic, flooding, fires, severe weather); station blackout; severe accident measures (e.g., combustible gas control, emergency operating procedures, severe accident management guidelines); implementation of 10 C.F.R. § 50.54(hh)(2) regarding response to explosions or fire; and emergency preparedness. The Commission should also instruct ASLB panels that are considering contentions to permit the parties an opportunity to make arguments regarding the relevance of their concerns to the Fukushima accident.
- The Commission should suspend all licensing and related rulemaking proceedings with regard to any other issues that are identified by the Task Force as the subject of its investigation. The proceedings should be suspended pending completion of the Task Force's investigation into those issues and the issuance of any proposed regulatory decisions and/or environmental analyses of those issues.
- The Commission should conduct an analysis, as required by NEPA, of whether the March 11, 2011 Tohoku-Chihou-Taiheiyo-Oki earthquake and ensuing radiological accident poses new and significant information that must be considered in environmental impact statements to support the licensing decisions for all new reactors and renewed

licenses. All environmental assessments should be published in draft form for public comment.

- The Commission should conduct a safety analysis of the regulatory implications of the March 11, 2011 Tohoku-Chihou-Taiheiyo-Oki earthquake and ensuing radiological accident. While emergency safety measures that arise from that analysis may be issued as enforcement orders, any long-term requirements should be issued as proposed rules, with appropriate opportunities for comment.
- The Commission should establish procedures and a timetable for raising new issues relevant to the Fukushima accident in pending licensing proceedings. The Commission should allow all current intervenors in NRC licensing proceedings, all petitioners who seek to re-open closed licensing proceedings, and all parties who seek to comment on design certification proposed rules, a period of 60 days following the publication of proposed regulatory measures or environmental decisions, in which to raise new issues relating to the Fukushima reactor accidents. The Commission should suspend requirements to justify the late-filing of new issues if their relevance to the Fukushima accident can be demonstrated.

D. Emergency Action is Needed in Order to Ensure Compliance with AEA and NEPA.

Petitioners request the Commission to grant the requested relief on an emergency basis, because several licensing proceedings are scheduled to conclude in the near future, including the COL proceeding for Vogtle Units 3 and 4, the license renewal proceeding for Pilgrim, and the rulemaking proceedings for the AP1000 standardized design and the ESBWR standardized design. In addition, the Commission has signaled its intent to continue with reactor licensing in spite of the emergence of new information from the Fukushima accident, by approving the

renewal of the Vermont Yankee license on March 21, 2011. Petitioners urgently request the Commission to reconsider that policy because of its fundamental inconsistency with NEPA and the AEA.

VII. CONCLUSION

For the foregoing reasons, Petitioners request the Commission to grant the above-requested relief on an emergency basis.

Respectfully submitted,

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Counsel to Dan Kipnis, Mark Oncavage, National Parks Conservation Association, and the Southern Alliance for Clean Energy in Turkey Point Units 6 and 7 COL proceeding.

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Duly authorized representative of Blue Ridge Environmental Defense League and People's Alliance for Clean Energy in North Anna COL proceeding
Duly authorized representative of Blue Ridge Environmental Defense League in W.S. Lee COL proceeding

April 14-18, 2011

April 12, 2011

Japan's Reactors Still 'Not Stable,' U.S. Regulator Says

By MATTHEW L. WALD

WASHINGTON — The condition of the damaged Fukushima Daiichi reactors in Japan is "static," but with improvised cooling efforts they are "not stable," the chairman of the Nuclear Regulatory Commission told a Senate committee on Tuesday.

"We don't see significant changes from day to day," the chairman, Gregory B. Jaczko, said, while adding that the risk of big additional releases gets smaller as each day passes.

Long-term regular cooling of the reactors has not been re-established, nor has a regular way of delivering water to the spent-fuel pools, he told the Senate Environment and Public Works Committee. And when an aftershock hit the site and cut some offshore power supplies, he said, some pumps failed and cooling stopped for 50 minutes.

The situation is "not stable" and will remain so until "that kind of situation would be handled in a predictable manner," he said.

Mr. Jaczko also offered a new theory about the cause of the explosions that destroyed the secondary containment structures of several of the reactors. The prevailing theory has been that hydrogen gas was created when the reactor cores overheated and filled with steam instead of water; the steam reacts with the metal, which turns into a powder and then gives off hydrogen.

The Tokyo Electric Power Company, which operates the nuclear plant, intended to vent the excess steam as well as the hydrogen outside of the plant, but experts have suggested that when operators tried this, the vents ruptured, allowing the hydrogen to enter the secondary containments.

But Mr. Jaczko said Tuesday that the explosions in the secondary containments might have been caused by hydrogen created in the spent-fuel pools within those containments.

If true, that would mean that the introduction of hardened vents at reactors at nuclear plants in the United States — cited as an improvement that would prevent such an explosion from happening — would not in fact make any difference.

That theory also raises the possibility that it may be safer to move some of the spent fuel out of the pools in the containment structures and into dry storage, an idea that is attracting some support in Congress. Spent nuclear fuel must remain in water for the first five years or so to cool but can then can be stored in small steel-and-concrete silos with no moving parts.

The industry uses these "dry casks" only when its pools are full. And so far the regulatory commission has said that pool and cask storage are equally safe. Still, some industry executives would like to tap the Nuclear Waste Fund, federal money set aside for a permanent waste repository, to pay for cask storage, an idea that is also favored by some environmentalists.

Mr. Jaczko's statement on the possible source of the hydrogen is the third big reversal in commission statements on the nuclear crisis at Fukushima.

Commission officials have also seemed less certain after stating that the spent-fuel pool in the No. 4 reactor was empty or close to empty, a situation that was evidently the basis for recommending a 50-mile evacuation for Americans in the plant's vicinity. Commission experts also said that radiation readings suggested that core material had slipped out of the vessel of the No. 2 reactor and entered a drywell in the primary containment, only to retreat again on whether that was in fact the case.

Mr. Jaczko also signaled that the regulatory commission itself was shifting from an extreme alert mode to a more sustainable long-term effort to monitor Japan's crisis. Staffing in the commission's round-the-clock emergency center at its headquarters in Rockville, Md., has been reduced, he said, with many staff members returning to their regular duties but available for consultation when events warrant.

He drew praise from the committee's chairwoman, Senator Barbara Boxer, a California Democrat, but criticism as well. She is seeking an especially high level of scrutiny for two twin-reactor plants in her state, the only ones that the commission says are in zones of high seismic activity. Mr. Jaczko said that all reactors were being evaluated.

She countered by saying that those two plants, Diablo Canyon and San Onofre, were at the highest risk. Mr. Jaczko said they were not, explaining that they were designed with the earthquake risk in mind and that risks to American plants generally were small.

Ms. Boxer replied that the Japanese had said the same thing, at least until the March 11 accident. "It's eerie to me," she said. "I don't sense enough humility from all of us here."

Another witness, Charles G. Pardee, the chief operating officer of Exelon Generation, the largest nuclear operator in the United States, also testified that the nation's nuclear plants were designed for the worst natural disaster observed in their areas, plus a substantial margin.

Thomas B. Cochran, a physicist at the Natural Resources Defense Council, gave some credit to American operators. Worldwide, he said, reactors are "not sufficiently safe," but "the next nuclear power plant disaster is more likely to occur abroad than in the U.S."

But the industry will have to rethink its practices nonetheless, he said. "If the nuclear power industry is to have a long-term future, attention must be paid to existing operating reactors," Mr. Cochran said. He ticked off a long list of factors, including American reactors that share Fukushima's basic design, that would be grounds for phasing them out.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

E. Roy Hawkens, Chair
Dr. Michael F. Kennedy
Dr. William C. Burnett

In the Matter of FLORIDA POWER & LIGHT COMPANY (Turkey Point Units 6 and 7)	Docket Nos. 52-040-COL and 52-041-COL ASLBP No. 10-903-02-COL-BD01

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **EMERGENCY PETITION TO SUSPEND ALL PENDING REACTOR LICENSING DECISIONS AND RELATED RULEMAKING DECISIONS PENDING INVESTIGATION OF LESSONS LEARNED FROM FUKUSHIMA DAIICHI NUCLEAR POWER STATION ACCIDENT** was served upon the following persons by Electronic Information Exchange and/or electronic mail.

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Dated: April 14, 2011

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Kock, Andrea

From: Kock, Andrea
Sent: Thursday, April 14, 2011 8:16 AM
To: Tadesse, Rebecca
Subject: Just for you

I try to be a little ray of sunshine for you on the outlook on nuclear power ☺ From today's news flashes:

US support for nuclear 'surprisingly high,' FBR says

Public support for nuclear energy in the US is "surprisingly high," although political opposition may rise after reports on the causes of the Fukushima I nuclear power plant accident are released, FBR Capital Markets said in a report April 13.

Public confidence in the safety of the existing fleet of US power reactors is holding, the Virginia-based investment bank said, citing an AP/GfK poll released last week. That poll showed 39% of US residents surveyed support building new nuclear plants, just 10 percentage points less than before the accident, FBR analyst Benjamin Salisbury wrote. By comparison, support for offshore oil and gas drilling dropped 20 percentage points following the Macondo oil spill in the Gulf of Mexico last year, FBR said.

Only 27% of respondents in the poll said they were confident the US government is prepared to handle a similar emergency, indicating policymakers may focus on emergency response instead of making changes to the existing nuclear fleet, Salisbury said.

AP-GfK polled 1,000 adults by telephone from March 24-28. The results have a margin of error of plus or minus 4 percentage points.

Political opposition might rise after the release of reports examining the cause and early responses to the crisis, Salisbury wrote. Some nuclear opponents are "dampening their objections as the crisis is ongoing," the report said.

Andrea Kock
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Technical Assistant for Materials
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301-415-2896

4/528

Kock, Andrea

From: Zorn, Jason
Sent: Thursday, April 14, 2011 2:37 PM
To: Kock, Andrea
Cc: Nieh, Ho
Subject: FW: Japan FOIA's

FYI. This is how I've been treating these anyways.

From: FOIAPASECY Resource
Sent: Thursday, April 14, 2011 2:24 PM
To: Clark, Lisa; Reddick, Darani; Davis, Roger; Bupp, Margaret; Zorn, Jason
Subject: FW: Japan FOIA's

FYI

From: Raphael, Mary Jean
Sent: Thursday, April 14, 2011 12:55 PM
To: RidsEdoMailCenter Resource; RidsNmssOd Resource; NRO_FOIA Resource; RidsNrrMailCenter Resource; FOIAPANSIR Resource; RidsOcaMailCenter Resource; FOIAPAOIP Resource; Shannon, Valerie; RidsResPmdaMail Resource; FOIAPASECY Resource; Champ, Billie; R1HELPDESK Resource; FOIAPAR2 Resource; FOIAPAR4 Resource; RIIIFOIAPA Resource
Cc: Blaney, Stephanie; Sealing, Donna
Subject: Japan FOIA's

All-

For ease in collecting and sorting records for FOIAs 118, 119, 120, 147, and 166, you may submit all records for these requests, (except for the *non-Japan* related emails and enclosures) in response to 2011-0184. The *non-Japan* FOIA's are FOIA-2011-0139, 140, 141, and 149. You need to submit the *non-Japan* related records separately. When you have provided your 'final' response to 2011-0184, please indicate the other Japan FOIA's which cover those records.

For other Japan FOIA's not listed above, please submit those responses and records separately, or identify which records are responsive from other FOIA requests.

Of any of your offices need assistance capturing and printing emails, please contact Bob Randall, OIS.

Mary Jean
Stephanie

4/529

Kock, Andrea

From:	Franovich, Mike
Sent:	Thursday, April 14, 2011 11:20 AM
To:	OST01 HOC; Zimmerman, Roy; RST01 Hoc; Hoc, PMT12; LIA08 Hoc; ET05 Hoc; ET07 Hoc
Cc:	Virgilio, Martin; Weber, Michael; Leeds, Eric; Orders, William; Hipschman, Thomas; Snodderly, Michael; Castleman, Patrick; Marshall, Michael; Muessle, Mary; Mamish, Nader; Merzke, Daniel; Bowman, Gregory; Andersen, James; Nieh, Ho
Subject:	Suggestion to Improve Fukushima Daiichi Information Flow to Commissioners' Offices

Roy, et al.,

Leveraging IT capabilities to make life a little bit easier, I have a suggestion regarding requested documents that are in the queue to be sent to the Commissioners' offices. It may be more efficient to post these documents and future requested information at a single share point site that the commissioner assistants may then access. Using share point could also help with accounting of information that has been sent previously to Commissioners' offices. If need be, you may institute limited access for control and accounting purposes.

Previously, photos from flyovers were posted at the following share point site that the CAs accessed as needed.

http://portal.nrc.gov/edo/nrr/NRR%20TA/FAQ%20Related%20to%20Events%20Occuring%20in%20Japan/Forms/AllItems.aspx?View=%7b282DC699%2dFA97%2d430B%2dA1F9%2d6008558261C5%7d&RootFolder=%2fedo%2fnrr%2fNRR%20TA%2fFAQ%20Related%20to%20Events%20Occuring%20in%20Japan%2fFukushima%20Daiichi%20Aerial%20Photos

v/r,

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N530

Franovich, Mike

From: Franovich, Mike
Sent: Thursday, April 14, 2011 9:00 PM
To: Ostendorff, William
Cc: Nieh, Ho; Zorn, Jason
Subject: T.V.A. Considers Upgrades for 6 U.S. Nuclear Power Plants - NYTimes.com

The New York Times

Environment

T.V.A. Considers Improvements for 6 U.S. Nuclear Reactors

By MATTHEW L. WALD

Published: April 14, 2011

Permalink

WASHINGTON -- The Tennessee Valley Authority said Thursday it was considering millions of dollars of improvements to protect its six nuclear reactors from earthquakes and floods.

Related

Nuclear Cleanup Plans Hinge on Unknowns (April 15, 2011)

Green

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It is the first American reactor operator to announce safety changes that it is weighing since an earthquake and tsunami set off a nuclear crisis at the Fukushima Daiichi plant in Japan last month. Other operators have said publicly that they might have to make changes, but they have avoided saying what those were.

The T.V.A. issued a fact sheet saying that it was considering reducing the amount of fuel in its spent fuel pools by transferring older fuel to passively cooled "dry casks" and adding additional backup diesel generators.

4/531

It also listed three changes that are less commonly discussed: improving electrical switchyards to make them more resistant to earthquakes, adding small generators to recharge cellphone batteries and keep the lights on, and reinforcing the pipes that provide cooling water to spent fuel pools.

Of the six reactors operated by the T.V.A., three are boiling water reactors that resemble the Fukushima reactors. The authority said that none of its reactors are in areas where an earthquake risk is high. But it said it was looking at "potential vulnerabilities from a chain of events, such as damage from a tornado or earthquake combined with flooding from a dam failure."

Nuclear critics have argued that all plants should be required to undertake such analyses of simultaneous events, although the Nuclear Regulatory Commission has generally rejected such hazards as too unlikely for such studies to be mandated. The commission's staff recently began a 90-day review of how prepared American reactors are for severe accidents, but the first progress report on that effort is not expected until early next month.

The spent fuel storage problem has been debated for years. After the attacks of Sept. 11, 2001, Congress asked the National Academy of Sciences to look into the problem, and in 2005 the academy reported that the pools might in fact be vulnerable to terrorism. It said the Nuclear Regulatory Commission should evaluate whether some of the fuel should be moved to dry casks.

Lately some members of Congress have suggested more use of dry casks.

When spent fuel is removed from a reactor, it continues to generate heat and must be kept submerged for about five years. But after that it can be sealed inside a steel can that is filled with inert gas to prevent rust; the can is then loaded into a small concrete silo with air vents. Air circulating around the can keeps the fuel well below the melting point.

American reactor operators have so far resorted to that technique only when their pools have reached capacity. The pools were designed in an era when nuclear engineers thought the fuel would be hauled away from reactors after a few years for recycling or burial and are therefore quite small; most reactors have installed new equipment in their pools to be able to squeeze in more than was originally intended. But some engineers say that this raises the risk that if the pool were emptied, the fuel could heat to the point that the metal it contains is ignited.

Thinning out the pools by removing old fuel would still leave the hottest materials in place but would reduce the chance of fire.

Robert Alvarez, a former Energy Department official, calculated recently that removing the backlog of fuel older than five years from the spent fuel pools of all 104 operating reactors would cost $3.5 billion to $7 billion and take several years to accomplish.

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Kock, Andrea

From: Franovich, Mike
Sent: Friday, April 15, 2011 12:35 PM
To: Ostendorff, William
Cc: Nieh, Ho; Kock, Andrea; Zorn, Jason
Subject: American Citizen Services Embassy of the United States Tokyo, Japan

Embassy of the United States Tokyo, Japan

AMERICAN CITIZEN SERVICES

Travel Alert - Japan (April 14, 2011)

This Travel Alert replaces the Travel Warning for Japan dated March 31, 2011. This Travel Alert expires on June 15, 2011.

The assessment of technical and subject matter experts across United States Government agencies is that while the situation at the Fukushima Daiichi plant remains serious and dynamic, the health and safety risks to areas beyond the 50 mile evacuation zone, and particularly to Tokyo, Nagoya (Aichi Prefecture), Yokohama (Kanagawa Prefecture) nearby U.S. military facilities and the prefectures of Akita, Aomori, Chiba, Gunma, Iwate, Nagano, Niigata, Saitama, Shizuoka, Tochigi, and Yamanashi, and those portions of Fukushima, Ibaraki, Miyagi and Yamagata prefectures which are outside a 50 mile radius of the Fukushima Daiichi nuclear power plant are low and do not pose significant risks to U.S. citizens.

This analysis takes into consideration both various age groups and the classification of the severity of the situation at Fukushima Daiichi as a Level 7 event by the Government of Japan, which reflects what has transpired since the initial incident and the potential long-term effects in the area surrounding the plant.

This assessment reflects inputs from our national laboratories as well as the unanimous opinion of the U.S. scientific experts on the ground in Japan. Furthermore, they are consistent with practices that would be taken in the United States in such a situation. Based on the much reduced rate of heat generation in the reactor fuel after one month of cooling and the corresponding decay of short-lived radioactive isotopes, even in the event of an unexpected disruption at the Fukushima Daiichi plant, harmful exposures to people beyond the 50 mile evacuation zone are highly unlikely, and there would be a significant amount of time to best assess any steps that might have to be taken.

The situation at the plant is dramatically different today than it was on March 16, when we saw significant ongoing releases of radioactivity, the loss of effective means to cool the reactor cores and spent fuel, the absence of outside power or fresh water supply for emergency management, and considerable uncertainty about the condition of the site. Today, while the situation remains serious, and there is still a possibility of unanticipated developments, cooling efforts are ongoing and successful, power, water supply, and back-up services have been partially or fully restored, and planning has begun to control radioactive contamination and mitigate future dangers. Our coordination with the Japanese is regular and productive, and we have a greatly increased capacity to measure and analyze risks.

The Department of State has lifted Voluntary Authorized Departure, allowing dependents of the U.S. government employees to return to Japan.

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We continue to recommend that U.S. citizens avoid travel within the 50-mile radius of the Fukushima Daiichi Nuclear Plant. U.S. citizens who are still within this radius should evacuate or shelter in place.

Japan is one of the most seismically active places in the world. Tokyo and areas to the Northeast continue to experience strong aftershocks related to the March 11 earthquake. Aftershocks following an earthquake of this magnitude can be expected to continue for more than a year. Identifying potential hazards ahead of time and advance planning can reduce the dangers of serious injury or loss of life from an earthquake. See the Embassy Website for detailed information on earthquake safety.

American Citizen Services

U.S. citizens in Japan are encouraged to enroll in the Smart Traveler Enrollment Program (STEP). U.S. citizens without internet access may enroll directly at the U.S. Embassy or U.S. Consulates. By enrolling, U.S. citizens make it easier for the Embassy/Consulates to contact them in case of emergency.

For the latest U.S. Government information on the situation in Japan, please visit the Embassy website at http://japan.usembassy.gov. Updated information on travel and security in Japan may also be obtained from the Department of State by calling **1-888-407-4747** toll-free in the United States and Canada or, for callers outside the United States and Canada, a regular toll line at **1-202-501-4444**. For further information, please consult the Country Specific Information for Japan, as well as the Worldwide Caution.

For any emergencies involving U.S. citizens, please contact the American Citizens Services (ACS) Unit of either the U.S. Embassy in Tokyo or one of the U.S. Consulates in Japan using the emergency contact information listed here.

Zorn, Jason

From: Zorn, Jason
Sent: Wednesday, April 27, 2011 7:11 AM
To: Ostendorff, William; Nieh, Ho; Franovich, Mike; Kock, Andrea
Cc: Bozin, Sunny; Herr, Linda
Subject: FW: Bloomberg news: Japan's Terrifying Day Saw Unprecedented Blown Roof Expose Tepco Fuel Rods

All

This may be old news for some of you, but I thought this was an interesting play-by-play account in Bloomberg News of the first 24 hours at Fukushima. See link below.

Jason

http://bloom.bg/h6HcfB

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Report to the Foreign Academies from Science Council of Japan on the Fukushima Daiichi Nuclear Power Plant Accident

May 2, 2011
Great East Japan Earthquake Taskforce
Science Council of Japan
http://www.scj.go.jp/en/index.html

Preamble

In the wake of the massive earthquake (magnitude 9.0) that occurred off the coast of Miyagi Prefecture on March 11, 2011 and the subsequent major tsunami and accident at the Fukushima Daiichi (No. 1) Nuclear Power Plant of Tokyo Electric Power Co., Ltd. (TEPCO) resulted in a discharge of radioactive materials and evacuation of residents living near the nuclear power plant. Science Council of Japan (SCJ) has received messages of sympathy and encouragement and offers of cooperation from academies in countries and regions around the world. We would like to express our heartfelt thanks for your warm messages of concern and comfort.

The SCJ recognizes that the leakage of radiation from the nuclear power plant may be a great concern of the people living not only in Japan but also abroad, and so we wanted to report to academies around the world on the progress of the situation at as early an opportunity as possible. We must confess honestly, however, that for some time even we did not have adequate information to enable us to do this. At present, the measurement and the influence on health evaluation about the radiation poisoning of the air, ocean and soil are done on a large scale by the government agency, and the result came regularly to be made public. The accident at the nuclear power plant itself, unfortunately, still has not been resolved. What is needed now, however, is to devise measures from a medium- and long-term perspective, based on the information that we have at present. The SCJ has prepared a provisional summary, based on what we know at this stage, of the current

situation and the issues to be resolved going forward. In presenting this report to academies in countries and areas around the world, the SCJ hopes that they will continue to provide their cooperation and support in the future.

Unless otherwise noted, the data in this report were obtained from the Nuclear and Industrial Safety Agency (NISA) of the Ministry of Economy, Trade and Industry, the Ministry of Education, Culture, Sports, Science & Technology, the Nuclear Safety Commission (NSC) of the Cabinet Office, TEPCO, and the International Atomic Energy Agency (IAEA).

I What Happened

1. Background to the accident

1) Status of Fukushima Daiichi Nuclear Power Plant immediately prior to the earthquake

Of the six reactors at the TEPCO Fukushima Daiichi Nuclear Power Plant, Units 1, 2 and 3 were in operation at the time of the earthquake. Units 4, 5 and 6 had been shut down for regular maintenance. A certain number of spent fuel rods from each of these six reactors were being stored in spent fuel pools built in the each reactor housing. In Unit 4 only, all of the fuel in the reactor core had been transferred to the spent fuel pool in order to conduct regular maintenance. As a result, there were no fuel rods in the rector core. On the other hand, the number of fuel rods from Unit 4 that were in the spent fuel pool was greater than the number at the other reactors.

2) Status of the nuclear power plant after the earthquake and legally mandated steps

At 2:46 p. m. on March 11, 2011, a massive earthquake with a magnitude of 9.0 occurred off the coast of Miyagi Prefecture. The nuclear reactors and turbines of Units 1, 2 and 3 stopped automatically. The steel towers on the plant grounds collapsed as a result of the earthquake, preventing Units 1 through 6 from receiving external power. The emergency diesel generators started up automatically. However, as a result of the major

tsunami that hit the Fukushima Daiichi Nuclear Power Plant approximately an hour later, at 3:41 p. m., all of the emergency diesel generators at Units 1 through 4 failed and stopped operating, and subsequently the diesel oil tanks were washed away. As a result of this situation, all AC power was lost, and operation continued on battery power only. As this is a situation which must be reported under Article 10 of the Nuclear Disaster Special Measures Law, TEPCO reported the situation to the national and local governments. The tsunami had flooded not only the pumps but also the turbine building, making it impossible to use the pumps, and there was no power in the central control room as well, making all operations difficult. When the batteries were exhausted and cooling became impossible, TEPCO judged that all cooling functions had been lost, and at 4:36 p. m. TEPCO reported the occurrence of a nuclear power emergency situation to the national and local governments in accordance with Article 15 of the Nuclear Disaster Special Measures Law. In response, the government announced a nuclear power emergency situation at 7:03 p. m. on March 11. From that point on, the flow of information to the media came almost exclusively from only three sources: the Prime Minister's residence, TEPCO and NISA.

With regard to cooling operations for the reactors at this point, water vapor inside the reactor at Unit 1 was cooled using the emergency condensers, and water was supplied to Unit 2 and Unit 3 using the steam-driven Reactor Core Isolation Cooling system. Meanwhile, the loss of cooling function at the spent fuel pools in Units 1 through 4 continued.

Although the site of Units 5 and 6 had also been damaged by the tsunami, one diesel generator continued to function. As a result, Units 5 and 6 achieved cold shutdown on March 20 as a result of the cooling operation.

3) Behavior of units as a result of the loss of power

As a result of the total loss of AC power, the ordinary route of released heat to the sea water was cut off. As the batteries had also been exhausted and emergency pumping of water and cooling were unstable, adequate cooling could not be conducted and the fuel rods were exposed to air. The temperature of the fuel rods rose rapidly, and the zirconium in the zirconium

alloy fuel cladding tubes reacted with the water, producing large quantities of hydrogen. As a result, early in the morning on March 12, the pressure in the containment vessel of Unit 1 began to rise due to the leakage of hydrogen, etc., and at the same time the emergency condenser stopped operating at 4:00 a. m. Accordingly, after the reactor vessel was vented at 10:17 a. m., a hydrogen explosion occurred inside the building housing the nuclear reactor at 3:36 p. m., blowing the building apart. In order to continue the cooling operation, the fire service system was used to pump in seawater at 8:20 p. m.

At Unit 2, the Reactor Core Isolation Cooling system was functioning, but it was not stable, and the reactor core was exposed. At 11:00 a. m. on March 13, the containment vessel was vented. At 11:30 a. m. on the following day, March 14, the Reactor Core Isolation Cooling system stopped functioning. Although workers began pumping in seawater at 4:34 p. m., the fuel was exposed to air for an extended period of time. Venting was initiated at 12:02 a. m. on March 15, and at 6:10 a. m. an abnormal noise was heard near the pressure suppression chamber and the pressure dropped, and it is presumed that there was a full-fledged release of the radioactive materials inside the containment vessel. This was subsequently confirmed by measurements of radiation in the atmosphere that were made public.

At Unit 3, cooling was conducted using the Reactor Core Isolation Cooling system, and at 1:00 p. m. on March 12 cooling water was pumped in using a high-pressure coolant injection system. However, at 5:10 a. m. on the following day, March 13, the high-pressure coolant injection system stopped operating, and it became impossible to start up the Reactor Core Isolation Cooling system as well. The pressure in the reactor vessel rose sharply, and at 8:41 a. m. the reactor vessel was vented, and seawater was pumped in at 1:12 p. m. At 11:01 a. m. on March 14, a hydrogen explosion occurred inside the Unit 3 reactor building as well, destroying the building. This is presumed to have been caused by the rise in the water temperature in the spent fuel pool, causing the water level to drop and exposing the fuel rods to air, producing hydrogen.

At Unit 4 as well, the loss of cooling function at the spent fuel pool caused the temperature of the water in the pool to rise, causing the water

level to drop and producing hydrogen, and as a result an explosion occurred at 6:14 a. m. on March 15, destroying that building as well.

Unit 5 and Unit 6, which had been undergoing regular inspection, had lost external power as a result of the earthquake, but a single diesel generator remained in operation and conducted emergency cooling. As a result, cold shutdown was achieved for both of these reactors on March 20. Subsequently, on March 21 and 22, external power was restored. Although cooling function at the spent fuel pools had been lost temporarily, it was subsequently restored, and at present the cooling function is operating and a sound status is being maintained.

4) Pumping of water into the spent fuel pools, restoration of external power and treatment of high-level liquid waste

In Units 1 through 4, in addition to cooling of the reactor cores, the fuel rods at the spent fuel pools which were emitting heat due to decay heat also needed to be cooled. However, as the cooling water circulating pumps were no longer functioning, the temperature of the water in the spent fuel pools in Units 3 and 4 rose and the water level dropped, giving rise to concern that the fuel rods would be exposed to air. Accordingly, on March 17, the Tokyo Fire Department, Self Defense Force etc. began spraying and discharging seawater into the spent fuel pools in Unit 3 and 4. Subsequently, the discharge of water, etc. using concrete pumping vehicles continued, and the work crews gradually shifted from the use of seawater to the use of freshwater. Beginning on March 20, external power was restored, but this was mainly for the lights only, and freshwater discharge and pumping continued.

As a result of the discharge and pumping of water into the reactor cores and spent fuel pools, water containing large quantities of radioactive materials flowed out into the ground beneath the turbine buildings and other areas. Particularly at Unit 2, the damage to the containment vessel on March 15 resulted in the release of radioactive materials, creating highly radioactive water. In order to resolve the accident, the highly radioactive water in the turbine building must be removed and the cooling system

equipment must be inspected and repaired, and continuous circulating water must be restored to the reactors and the spent fuel pools. However, it will not be possible to proceed with inspection and repairs until the highly radioactive water that has collected in the turbine building is removed. On April 2, it was discovered that highly radioactive water was flowing into the ocean from a crack in the outlet at Unit 2. In order to stop the leak of highly radioactive water and transfer it to the centralized waste treatment facility, on April 4 the low-concentration contaminated water that had been in the centralized waste treatment facility was discharged into the ocean. The transfer of the highly radioactive water will take a considerable amount of time, but the pumping of water into the reactors and spent fuel pools must be continued during this process, making this a difficult task.

Since April 6, nitrogen has been pumped into the containment vessel of Unit 1 in order to prevent a hydrogen explosion. TEPCO plans to pump nitrogen into Unit 2 and 3 as well.

2. Changes in radiation levels in areas around Fukushima Daiichi Nuclear Power Plant and current status

Due to the release of radioactive materials as a result of the accident at the Fukushima Daiichi Nuclear Power Plant, the radiation dose rate in air in various locations near the plant has increased. There was a particularly significant increase accompanying what is assumed to have been the release of radioactive materials at the time of the abnormal noise heard near the pressure suppression chamber of Unit 2 on March 15. The atmospheric concentration and soil deposition quantity of radioactive materials released into the atmosphere will differ depending on the wind direction, rainfall and other conditions at the time of the release. On March 15, there was a southeast wind, and as this was accompanied by rainfall as well, locations northwest of the plant were exposed to a high dose of radiation. After the highest values were measured from March 15 to March 17, however, the levels have decreased over time except a temporary high values measured on March 21, as shown in the attached figure 1.

The release of radioactive materials has continued, but the quantities are relatively small. Even if types of radiation that have a short half-life, such as iodine-131 (which has a half-life of approximately eight days), are deposited, they are thought to break down relatively quickly, leading to a decrease in radiation dose.

In its provisional assessment of the accident based on the International Nuclear and Radiological Event Scale (INES), made at 12:30 a. m. on March 12, NISA assessed the accident at Level 3 for Units 1 through 3 based on the standard for "Impact on radiological barriers and control". In the early evening on that same day however, as the radiation level inside the nuclear power plant had risen, it made a provisional assessment of Level 4 for Unit 1. An assessment was conducted again on March 18, and a provisional assessment of Level 5 was made for Units 1 through 3 due to the high probability of damage to the nuclear fuel rods. A provisional assessment of Level 4 was made for Unit 4. On April 12, based on a preliminary estimate of the total amount of radioactive materials released into the atmosphere from Units 1 through 3, the provisional estimate was raised to Level 7. NISA estimated that the total amount of radioactive materials released into the atmosphere was approximately 10% of the quantity released at the time of the Chernobyl accident in 1986.

3. Estimates of radioactivity

1) Amount of radioactive materials inside reactor core

NISA estimated the amount of radioactive materials in the reactor core immediately after the reactor shut down as follows. Iodine-131; approximately 1.3 million terabecquerels (1.3×10^{18} Bq) for Unit 1, 2 million terabecquerels (2.0×10^{18} Bq) for Unit 2, and 2 million terabecquerels (2.0×10^{18} Bq) for Unit 3. Cesium-137; approximately 130,000 - 370,000 terabecquerels ($1.3 - 3.7 \times 10^{17}$ Bq) for Unit 1 and 220,000 - 500,000 terabecquerels ($2.2 - 5.0 \times 10^{17}$ Bq) each for Unit 2 and 3.

Cabinet office estimated the total amount of Iodine-131and Cesium-137 in Unit 1, 2 and 3 as 6.1 million terabecquerels (6.1×10^{18} Bq) and 710,000 terabecquerels (7.1×10^{17} Bq), respectively.

2) Amount of radioactive materials in spent fuel pools

No estimates of the radioactive materials in the spent fuel pools have been released. According to Professor Shunichi Tanaka, however, as some time has passed, the quantity of iodine-131 can be disregarded in the case of Units 1 through 3, and the quantity in the spent fuel pool at Unit 4 is 11,000 terabecquerels (1.1×10^{16} Bq). The amount of cesium-137 is 350,000 terabecquerels (3.5×10^{17} Bq) at Unit 1, 470,000 terabecquerels (4.7×10^{17} Bq) each at Unit 2 and 3, and 1 million terabecquerels (1.0×10^{18} Bq) at Unit 4.

3) Amount of radioactive materials discharged into the atmosphere

According to back calculation estimates made by the Nuclear Safety Commission using the System for Prediction of Environmental Emergency Dose Information (SPEEDI) of the Nuclear Safety Commission of Japan (a cabinet office), the amount of radiation released into the atmosphere from March 11 to April 5 is 130,000 terabecquerels (1.3×10^{17} Bq) of iodine-131 and 6,100 terabecquerels (6.1×10^{16} Bq) of cesium-137.

SPEEDI was designed to quickly predict the concentration in air, dose etc. of radioactive materials in the surrounding environment when a large quantity of radioactive materials is released from a nuclear power plant or other facility, based on data on the emission source and taking into account the topography and measurements of wind and rainfall at that time. The results of SPEEDI are published in http://www.nsc.go.jp/mext_speedi /index.html

4) Amount of radioactive materials discharged into the ocean

On April 21, TEPCO measured the flow quantity and discharge water concentration near the outlet screen of Unit 2, from which water that included highly concentrated radioactive materials had been discharged into the ocean. The total amount of radioactive materials discharged into the ocean was estimated as follows: 2,800 terabecquerels (2.8×10^{15} Bq) of iodine-131, 940 terabecquerels (9.4×10^{14} Bq) of cesium-134 and 940

terabecquerels (9.4×10^{14} Bq) of cesium-137, making a total of 4,700 terabecquerels (4.7×10^{15} Bq). Assuming that there are no other major discharge routes, the amount discharged into the ocean is presumed to be close to this value.

4. Evacuation of residents

On the evening of March 11, the evacuation of residents from areas within 3 kilometers of the plant was ordered by the Prime Minister out of concern regarding the possible leakage of radiation from the Fukushima Daiichi Nuclear Power Plant. Residents living in the area of 3 to 10 kilometers around the plant were also ordered to stay indoor. On the following day, March 12, the radiation dose in the area around the plant increased, and the evacuation zone was increased to 10 kilometers around the plant, and shortly thereafter to 20 kilometers. On March 15, residents living in the area 20 to 30 kilometers around the plant were instructed to stay indoors. Approximately 140,000 people live within a 30-kilometer radius of the plant, and of these approximately 87,000 live within 20 kilometers of the plant.

On April 10, judging from changes over time in the radiation dose rate in air at various locations and calculations made using SPEEDI, the Nuclear Safety Commission indicated that there were areas northwest of the plant in which the integrated dose rate exceed 20 millisievert per year and the NSC presented measures to deal with the situation to the government. Based on the recommendations of the NSC, the government held discussions with the affected communities, and on April 22 the area 20 kilometers around the Fukushima Daiichi Nuclear Power Plant was declared a "Caution Zone" to which entry was prohibited. In addition, the instruction to remain indoors was lifted for the area 20 to 30 kilometers around the plant and the area northwest from the Caution Zone outside 20 kilometers of the plant was designated a "Planned Evacuation Zone." Also, "Emergency Evacuation Preparation Zones " are designated in the areas within the zone 20 to 30 kilometers around the plant (Figure 2).

Evacuation measures were needed to protect the health of residents, and as a result of their establishment, physical radiation damage (deterministic effect) has not been confirmed in residents, and it is expected that no such damage will be confirmed in the future as well. On the other hand, many of the residents who evacuated under emergency conditions taking nothing with them, and who moved to places that had had virtually no time to prepare to receive them, continue to live under difficult conditions.

5. Radiation contamination of food and water and damage from harmful rumors

On March 15, a temporary increase in the radiation level in the air was observed even in Tokyo, some 200 kilometers to the south-southeast from Fukushima. This led to concerns regarding increased radioactive fallout and resulting pollution of crops. Accordingly, on March 17, the Ministry of Health, Labor and Welfare established provisional standards for radiation in food in accordance with the Food Sanitation Law. For radioactive iodine (the representative nuclide is iodine-131 in the mixed isotopes), the standards were 300 Bq/kg for drinking water and milk, 2,000 Bq/kg for vegetables and so on.

Based on these standards, measurements were initiated in various prefectures. As a result, from March 19 through 21, radioactive iodine exceeding the standards was detected in vegetables, milk and water in Fukushima Prefecture, Ibaraki Prefecture and other areas. On March 21, the government instructed that the level should not exceed 100 Bq/kg for drinking water given to infants. The government also restricted shipment of certain vegetables and milk produced in Fukushima, Ibaraki, Tochigi and Gunma Prefectures.

On March 22 and 26, radioactive iodine was detected by TEPCO in seawater near the nuclear power plant, and on March 29 radioactive iodine was also detected by the Ministry of Education, Culture, Sports, Science & Technology, off the coast 16 kilometers south of the plant. In addition, on April 4, radioactive iodine was detected in small fish off the coast of Ibaraki

Prefecture. In response, the Ministry of Health, Labor and Welfare established standards for radioactive iodine in fish and shellfish (which had not been established previously), setting them to the same level as the standards that had already been established for vegetables. On April 9, radioactive cesium was detected in small fish off the coast of Fukushima Prefecture, and on April 20 restrictions were placed on the shipment and ingestion of small fish caught off the coast of Fukushima Prefecture.

With regard to the water supply, as of April 12, the level of iodine-131 in all of the water supply corporations in Fukushima, Ibaraki, Chiba, Tokyo and Tochigi Prefectures was well below the standard for infants of 100 Bq/kg. However, the village of Iitate in Fukushima Prefecture decided on its own to establish and publicize intake restrictions for infants.

With regard to contamination of vegetables and water, the situation has improved along with the decrease in radioactive fallout. In terms of seawater, contamination has been detected in some small fish, but only sporadic cases have been observed as of May 2.

In this way, the safety of the water supply and the vegetables making their way to market has been protected due to the establishment of strict regulations and the implementation of inspections. The problem that remains to be resolved is that of harmful rumors. When contamination exceeding the standards has been discovered in the crops from a certain region, the government has placed restrictions on the shipment of that crop from the entire prefecture. The government explained that the main reason for imposing shipment restrictions over such a wide area is that the labeling of the originating location of agricultural crops is done by prefecture, but another objective was to prevent the spread of harmful rumors. At present, the scope of shipment restrictions has been scaled back from the prefecture level to the regional level. Ultimately, however, sales of vegetables, fish and shellfish from Fukushima, Ibaraki, Tochigi, Chiba and other prefectures have decreased substantially. Each prefecture implemented its own measure for harmful rumor, and governors of these prefectures have made requests to the national government to take counter plans of the damages.

6. Worker exposure

The operation to remove the highly radioactive water that had collected inside the turbine buildings began on March 24. On that day, two workers were suspected of having been exposed to radiation from the contaminated water, and they were briefly hospitalized for examination. However, there was no decrease in lymphocytes and no skin burns, redness or other symptoms, and the exposure dose was estimated by National Institute of Radiological Sciences to be less than 2 to 6 sievert. Including these two workers, no radiation damage has been confirmed so far in any of the workers engaged in nuclear power plant recovery efforts, which are being managed based on the establishment of a reference exposure value of 250 millisievert per year (5 millisievert per three months for women).

7. Future predictions

At present, continuous pumping of water into the nuclear reactors and spent fuel pools at the TEPCO Fukushima Daiichi Nuclear Power Plant is being continued, and the status of reactor cooling is recognized as having been generally stabilized. If cooling is continued in an appropriate manner, it will be possible to stabilize the nuclear reactors, and the likelihood of a release of large amounts of radioactive materials is expected to gradually decrease. The highest priority is continuing the cooling operations, using multiple cooling methods and other efforts to maintain the stable status of the nuclear reactors. At the same time, however, it is also important to ensure that the water that has become contaminated by radioactive materials does not leak out into the environment. In addition, while adequately considering the risk of aftershocks and the like, a long-term stable cooling system must be built and measures must be implemented to seal in the radioactive materials.

On April 17, TEPCO released a "Roadmap toward Resolution from the Accident at the Fukushima Daiichi Nuclear Power Station." In the future objectives and prospects indicated in the Roadmap, Step 1, to be

implemented over a period of approximately three months, lists the targets of radiation dose is in steady decline — in other words, nuclear reactors and spent fuel pools are being cooled in a stable manner and contaminated water is contained and radioactive materials are being prevented from scattering into the air or soil. In Step 2, to be implemented over a period of approximately three to six months following Step 1, the targets are release of radioactive materials is controlled so radiation dose is prevented to a large degree — in other words, nuclear reactors achieve cold shutdown and spent fuel pools are cooled with greater stability, and overall quantity of contaminated water is reduced and covers are placed over reactor buildings, and decontamination and monitoring of returning resident's homes are conducted to ensure radiation dose in evacuation zone, etc. decreases sufficiently.

The targets for the medium-term issues to be resolved subsequently are corrosion fracture of nuclear reactor structural members caused by salts is prevented, fuel rods are removed from spent fuel pools, full-fledged water treatment facilities for standing water are provided, containers in the nuclear reactor buildings are provided and contaminated soil is immobilized to prevent radioactive materials from being released into the air and soil and safety of the environment in evacuation zones, etc. is confirmed on an ongoing basis.

The risks anticipated by TEPCO in implementing these measures are as follows:

(1) That cooling will cause the water vapor in the containment vessel to condense, increasing the hydrogen concentration and resulting in a hydrogen explosion.
(2) That the process of sealing damaged sections will take a long time.
(3) That further aftershocks, lightning during the summer months etc. will cause a (partial) loss of system power.
(4) That the process of filling with water will increase the amount of water flowing into the turbine buildings.
(5) That work in locations with high levels of radiation will take a long time.
(6) That it will be impossible to restore the normal cooling lines due to

damage to the buildings.

(7) That there will be a delay in providing water treatment facilities or they will not operate properly.

(8) That a large-scale reduction in radiation dose levels which is a precondition for beginning construction work will be delayed

(9) That the covers may be damaged in the event of a major typhoon

A scientific study will be needed in order to conduct a technical assessment and risk assessment of these measures and determine their validity, etc. Science Council Japan decided to tackle these matters immediately.

II What We Did

From a legal standpoint, the SCJ is the government agency consisting of Japanese scientist which is originally given the authority acting independently from government control. The SCJ charged with providing advice and recommendations relating to government and society. It should cooperate with scientists around the world to contribute to academic advancement. Although it is a government agency, however, it is not in the position to directly deal with accidents such as this one. The organization for the handling of this accident is as follows. The owner of the Fukushima Daiichi Nuclear Power Plant, Tokyo Electric Power Co., Ltd., a private sector company, deals directly with the accident; the Nuclear and Industrial Safety Agency (NISA) of the Ministry of Economy, Trade and Industry, the national government agency with jurisdictional authority, provides guidance; and the prime minister's official residence (meaning the staff under the direct control of the prime minister) give instructions to these two entities. Under this organization, almost no information regarding the accident was provided to the SCJ, and it was not possible for the SCJ to independently gather information, other than that which could be obtained through newspapers, television and other media sources. In the first few days after the earthquake, tsunami and nuclear power plant accident, we could only watch, holding our breath and with an aching heart, as the status of the accident

changed rapidly and the scale of the damage gradually became clearer.

On March 18, the SCJ issued emergency recommendations to the government agencies responsible for accident response and providing information. These recommendations included:

(1) Gather the knowledge of researchers involved in the area of nuclear power in order to resolve the accident
(2) Release information on the discharge of radiation to areas outside the plant

In addition, the SCJ established a Great East Japan Earthquake Task Force to expeditiously work to deal with the earthquake and tsunami disaster and nuclear power plant accident. The Task Force has already submitted six emergency recommendations to the government (appended as references). These emergency recommendations constitute proposals to the national and local governments regarding the response to these multiple disasters unprecedented in modern Japanese history, of an earthquake, tsunami and nuclear power plant accident. They involve rescue of disaster victims and reconstruction of affected areas, and efforts to deal with the nuclear power plant disaster and to rescue and care for evacuees. The Task Force has made the following recommendations regarding the nuclear power plant disaster.

(1) With regard to the nuclear power plant accident and the spread of radioactive materials, the government should respond to the concerns and doubts of the general public by deepening their understanding of the situation and establishing a basis for appropriate action, and should work to gain the trust and understanding of the international community.
(2) In providing information and explanations to society regarding the accident, etc., the government should create an organization in which appropriate specialists and scientists provide supplementary explanations.
(3) With regard to environmental monitoring of radioactive materials and evaluation of the data obtained through monitoring, an integrated and ongoing organization should be set up as quickly as possible, with the

participation of overseas specialists and specialized institutions in this organization, in an effort to provide reliable scientific information both at home and abroad.

(The above are from the 1st recommendation, submitted March 25)

(4) With regard to environmental monitoring, the ground surface pollution, the concentration of radiation in air, the ground level radiation dose rate and the residents' radiation exposure dose should be measured at approximately 15,000 points (each point within an area of several hundred square meters) within a 30-kilometer radius of the nuclear power plant accident site. For this purpose, a cooperative organization for universities and other institutions should be established and measurements should be initiated as soon as possible.

(The above is from the 2nd recommendation, submitted April 4)

(5) Living situations, employment and children's education should be secured for residents who have evacuated the area to avoid the danger of radioactive materials, and accurate information should be communicated to residents regarding the accident, response efforts and future prospects.

(6) It should be the government's responsibility to quickly provide compensation to victims for contamination of crops, livestock etc. from radioactive materials and related damage that may be sustained, based on the premise that claims for compensation will be made to TEPCO. In addition, adequate information should be provided regarding the contamination, and codes of practice should be presented to farmers.

(7) The safety of workers at the site who are working to deal with the accident under harsh conditions should be secured.

(8) A full inspection of currently operating nuclear power plants should be conducted to ensure their safety.

(9) A system should be established for the safe treatment of radioactive wastes.

(10) In order to resolve the nuclear power plant accident, all scientists in Japan should be mobilized and overseas cooperation and assistance should be requested as well in order to deal with the accident, and a

schedule should be presented for the process from preventing radiation leakage through cold shutdown of the reactor cores and leading up through decommissioning of the reactors. In addition, tireless efforts should be made to provide adequate information in a timely manner.

(The above are from the 3rd recommendation, submitted April 5)

(11) With regard to the specific handling of the nuclear power plant accident, a joint response team made up of the government, power companies, specialists and so on should be set up to promote efforts to utilize robotics technologies on an ongoing basis, based on cooperation with the academic community.

(The above is from the 5th recommendation, submitted April 13)

For some of these recommendations, the government has already taken comparable steps, and the objectives have been partially achieved. While pursuing these recommendation activities, the SCJ, as a group made up of scientists, has also worked to gather and analyze information. The SCJ has also requested the disclosure of data by the Nuclear Safety Commission, the government agency responsible for checking the safety of nuclear power use, but this has not been obtained. As the status of the nuclear power plant at which the accident occurred is not yet stable, it is extremely difficult to accurately determine the state of the nuclear reactors. Moreover, while it is possible to make a rough estimate of the total amount of fuel present inside the nuclear reactors and in the spent fuel pools and the degree of damage sustained by this fuel and so on, as well as the total amount of radiation in the contaminated water that has been discharged into the ocean, unfortunately we have still not been able to obtain data that would enable us to determine these values accurately. The SCJ collects the data and analyzes them continuously to investigate the whole issues of the accident from scientific point of view. We strengthen our activities and make public the accurate information to the world.

III What We Should Do

1. Steps toward resolving nuclear power plant accidents and full disclosure

The leakage of radiation from the nuclear power plant (Units 1 through 4) at which the accident occurred has not yet been terminated. At the request of the government, TEPCO, which is working at the site, has released a roadmap (April 17) toward the resolution of the accident. According to this roadmap, approximately three months will be required to complete the step at which the release of radioactive materials is decreased, and approximately three to six months will be required to complete the next step, leading to cold shutdown for the nuclear fuel rods. At present, the major problem is how to bring the nuclear power plant to the state of cold shutdown. There are concerns regarding the aftershocks occurring in the wake of, or earthquakes triggered by, the major earthquake of March 11 that may occur during these two steps, and we must also be aware of the danger of tsunamis that may occur as a result of such earthquakes.

The most imperative thing right now is to restore or rebuild a system capable of continuously and properly cooling the nuclear fuel rods in the reactor core and the spent fuel pools, and to create a situation in which these nuclear fuel rods can be brought to cold shutdown. Moreover, the power needed to operate this cooling system must be thoroughly protected against anticipated aftershocks and triggered earthquakes and the tsunamis that may occur as a result.

The workers engaged in the recovery effort must continue to conduct operations under appropriate radiation control so as to prevent radiation damage (deterministic effect) from occurring.

With regard to future efforts in accordance with the aforementioned roadmap, many factors are still present that make the effort to resolve the accident an extremely tenuous situation. The accident has had wide-ranging effects internationally, including not only the dispersal of radioactive materials in the air but also dumping of radioactive water in the ocean, and the government has an international responsibility to do everything it can to resolve the accident. The SCJ will lend its full support to the government's efforts, and furthermore will work to get a complete picture of the accident and determine its causes. Based on the recognition that it is the

international duty of the academic community in Japan to assess the impact of radioactive materials on the environment and health, the SCJ resolves to fulfill its responsibilities and, with the support and cooperation of academies in other countries, will actively work to provide information.

2. Steps toward reconstruction of evacuation zones and environs

On April 22, the government established "Caution Zones" in accordance with the Nuclear Disaster Special Measures Law for the areas within a 20-kilometer radius of the nuclear power plant at which the accident occurred. Departure of residents from Caution Zones is compulsory, and entry is restricted. Ten municipalities that are home to residents in 27,000 households have been designated Caution Zones. In the areas around these Caution Zones, Planned Evaluation Zones and Emergency Evacuation Preparation Zones have been established, and approximately 140,000 residents will need to be evacuated. Cultivation of rice in these zones in 2011 is prohibited.

The residents who are evacuated will either move as a group to another area (either within the prefecture or in another prefecture) or will relocate individually by relying on their own connections. The duration of the evacuation will depend on the progress in bringing closure to the nuclear power plant accident. The national and prefectural governments must secure places for residents to evacuate to, as well as working to secure living situations, employment and children's education in those locations. Compensation for damage sustained as a result of evacuation must be provided in a timely manner. At the government's request, TEPCO is making preparations to provide temporary lump-sum payments for this purpose.

Predicting when residents will be able to return is a precondition for the reconstruction of evacuated areas. In this regard, the government and TEPCO must take the responsibility for presenting a schedule for the resolution of the nuclear power plant disaster (from cold shutdown through decommissioning), and scientific studies of the safety of the evacuated areas

must be conducted. In such cases, the intensity distribution for radiation must be verified at various levels, including in the air, on the surface of the ground, at a shallow depth, at a rather deep depth, in groundwater, and in the ocean. This must be done in order to confirm the safety of not only the living situation of residents returning to evacuated areas but also the conditions for continuation of the agriculture and fishing industries that are major industries in the region, and the safety of crops and food from fishery resources. After safety has been confirmed in this manner, new urban planning for the time after the nuclear power plant has been decommissioned should be formulated, as a reconstruction plan that is based on the wishes and needs of the residents.

Moreover, throughout this process, steps must be taken to control the residents' exposure to radiation and ensure that no absolutely no radiation damage (deterministic effect) occurs, and to reduce the risk of developing cancer in the future to the level of "as low as reasonably achievable (ALARA)."

The Science Council of Japan positively and timely proposes our opinion to the government and to the municipality for rebuilding the life of shelter resident, and for revival of the safety of evacuation area region and the surrounding area. And we establish the system to advance continued activities until these problems are solved.

3. Recommendation actions for reconstruction in Japan

The Great East Japan Earthquake and tsunami and the accident at the Fukushima Daiichi Nuclear Power Plant constitute a major ordeal for Japan. As the Prime Minister said, in order to overcome this ordeal, we need to implement not merely "restoration" in which we return to the way things were before but "reconstruction" in which we create something better than what was there before. In this light, the SCJ has established two committees to study Japan's reconstruction (April 8). One is a committee to study the "grand design" for reconstruction of the stricken region. This committee will reassess the position of the Tohoku Region (the stricken region) in the

Japanese archipelago and pursue discussions with the goal of creating a new model for the 21st century, in terms of disaster prevention, the environment, industry, land use, urban structure and residence organization.

The other committee is one set up to study options with regard to energy policy. This committee will center on the role of nuclear power generation in order to discuss various options from a science and technology-based perspective, including further intensification and development of nuclear power generation, eliminating our dependence on nuclear power generation within a certain period of time, or immediately abandoning nuclear power generation, with the objective of contributing to the public debate regarding energy policy.

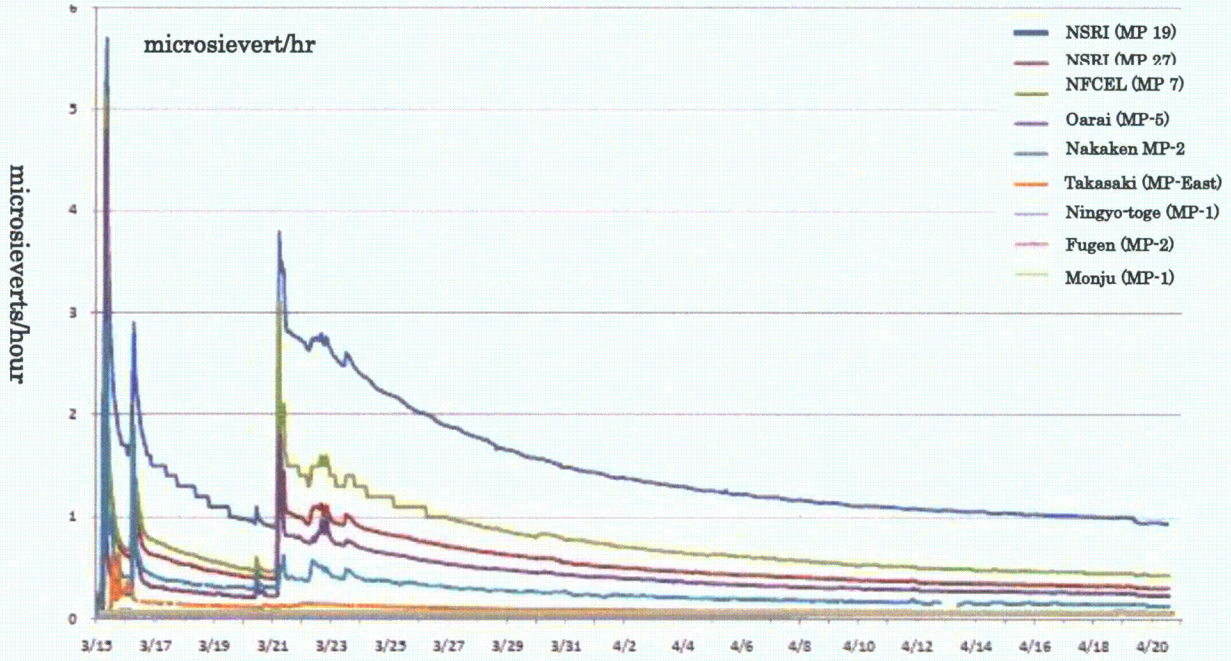
These two committees will offer important and essential points for discussion in the drafting of government policy, debate in the Diet, and public debate regarding Japan's reconstruction. This debate is urgently needed, and plans call for interim recommendations to be compiled within two months of the establishment of the committees.

Closing

The SCJ determines to advance activities with our best efforts as a representative of the scientist community in Japan for recovering Japan from the Great East Japan Earthquake. Especially, it is Japan government global responsibility to overcome the Fukushima Daiichi Nuclear Power Plant accident as soon as possible. We should do our best for the execution of these issues, and we hereafter want to ask all academies in countries and regions around the world to support and cooperate with us. In addition, this nuclear accident seriously asks us the ideal way of the science related to safety in the world. The SCJ should verify our past activities related to this matter. And we also consider that we have to wrestle with this difficult problem together with the academies in the world.

Reference data

Figure 1. The amount of radioactive materials as observed at each environment monitoring post (representative locations) of the Japan Atomic Energy Agency (March 15 to April 20)

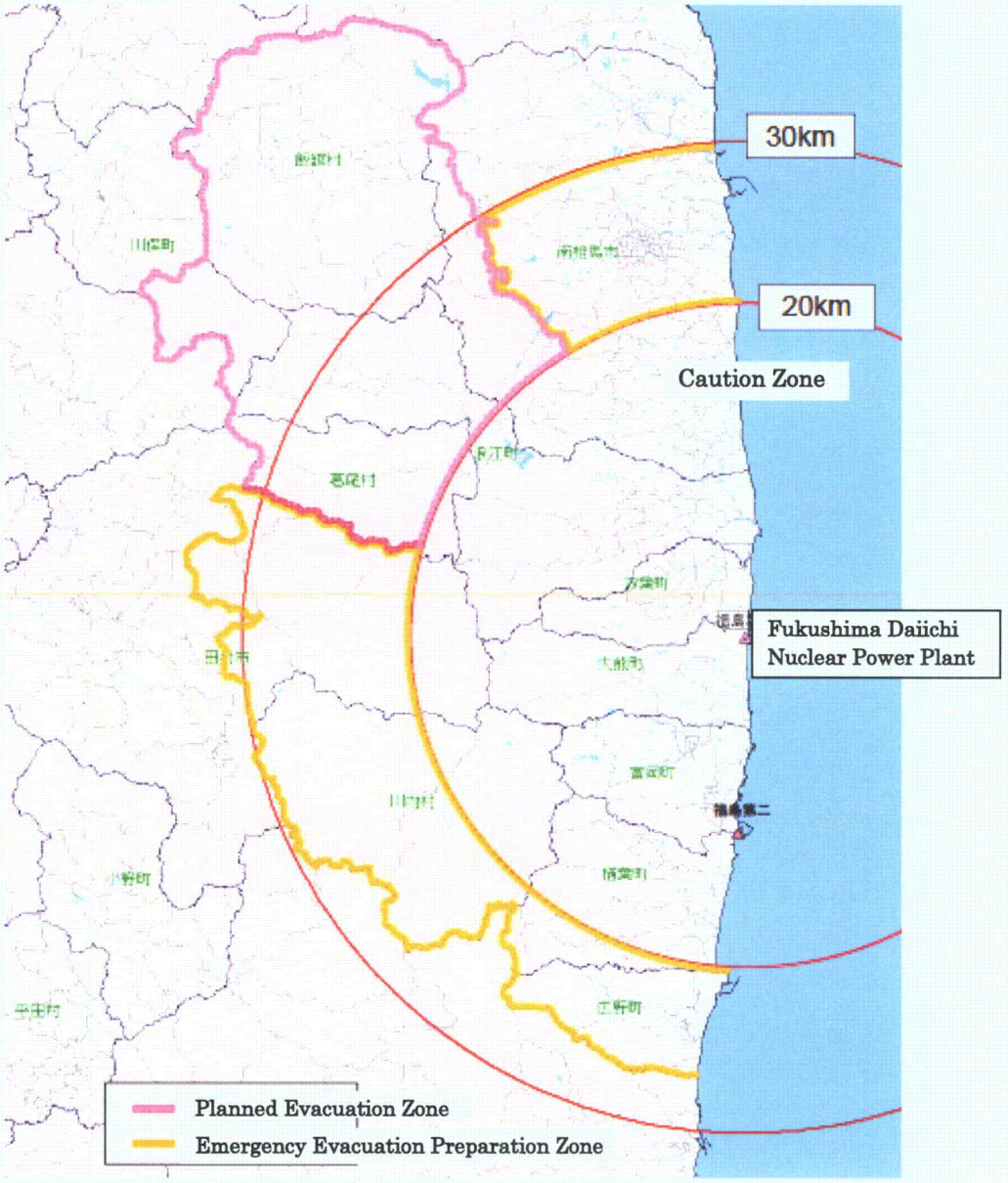


Note: 1 microgray/hr is taken as equal to 1 microsievert/hr

NSRI: Nuclear Science Research Institute

NFCEL: Nuclear Fuel Cycle Engineering Laboratories

Figure 2. Evacuation zone around Fukushima Daiichi Atomic Power Plant as of May 2, 2011



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Shoji Nagamiya	Secretary of the Section Three of the SCJ
Tateo Arimoto	Member of the SCJ

Note

Section One; Humanities and Social Sciences

Section Two; Life Sciences

Section Three; Physical Sciences and Engineering

The following committees of the SCJ also supported to make this report;

Subcommittee for investigation of Fukushima Daiichi Nuclear Plant Accidents, Committee for Comprehensive Synthetic Engineering

Sub-committee for Influence and Protection for Health against Radioactivity, Great East Japan Earthquake Taskforce

List of the Attached Documents

1. March 18, 2011: Emergency Meeting of the Science Council of Japan: Emergency report on "What can we do now?"

2. March 18, 2011: Statement of the Executive Committee of Science Council of Japan: Disaster in Northeast Japan and Nuclear Emergency

3. March 25, 2011: The first urgent proposal for the Great East Japan Earthquake

4. April 4, 2011: Regarding the necessity of the investigation of radiation levels after the accident of the Fukushima Daiichi Nuclear Power Plant

5. April 5, 2011: For the relief of victims of the Great East Japan Earthquake and the recovery of the disaster-stricken areas

6. April 5, 2011: Urgent proposal related to measures for earthquake disaster waste and prevention of environmental impact

7. April 13, 2011: Utilization of robot technology for the accident of the Fukushima Daiichi Nuclear Power Plant

8. Supplementary explanatory document for the fifth urgent proposal

9. April 15, 2011: Perspective of gender equality with regard to relief, support, and restoration

AIA Japan

A Chapter of
The American
Institute of Architects

PUBLIC SOURCE (External)

Dear AIA Colleagues:

In the wake of the series of disasters that fell on Japan two weeks ago, we have received many e-mail messages expressing concerns, sympathy, and condolences to the victims and those who were tragically affected. At the same time, everyone assured to us their support for not only us, but for the people of Japan in general, to get on with life and rebuild what has been lost.

I would like to send, on behalf of AIA Japan Chapter, our gratitude for your sincere and immediate expression of support and camaraderie. It was an eye-opening experience for me to realize that I am indeed part of a large professional community with very personal and human compassion. I would also like to give you a summary of the situation here some three weeks after it had all started, from the viewpoint of someone on the ground (though not in the area directly affected) to supplement all the reporting you must be receiving on the American media. The following is a compilation of what I saw, heard, read, and gathered through my personal experience, TV reporting, newspaper and magazine articles, and web-based media.

Hisaya Sugiyama, AIA

President AIA Japan

March 30th, 2011 in Tokyo

■ Mechanics of Earthquakes

On March 11th, at 2:46PM, three giant earthquakes occurred along the edges of the tectonic plates at the ocean bottom on the Pacific coast off the Tohoku (literally meaning "northeast") Region. Initially it was assumed that there was one big earthquake, but with the analysis of seismic movements, scientists confirmed that there were indeed three gigantic earthquakes occurring in tandem within six minutes of each other, destroying the earth crust in the length of approximately 500 km (310 miles) in length and 200 km in width, similar to the earthquakes off Sumatra in December 2004. The monstrous tremor continued for more than 5 minutes in many locations, which was unprecedented, with a combined magnitude of 9.0. It moved, for example, Oshika Peninsula to the east of Sendai by 5.3m (17'4") to east-southeast and sank it by 1.2m (47"); and the shift in the land mass increased the oscillation of the earth's rotational axis by 17cm (6.7 inches) and made the day 1.8 microseconds shorter. It was also accompanied by horizontal sheer displacement of 20m (65'7") or so, and more deadly, 3-4m (10-13') of vertical displacement of the ocean bottom, which produced tsunami waves, which reached all the pacific coasts of Japan and as far away as Hawaii and Chile, and other countries.

■ Casualty

As of today (March 30th), we have counted 11,232 people confirmed dead, of which 8,799 were identified (and 8,412 were taken back by the families), and 16,361 people reported missing. (This figure of course does not include those who are not "reported" missing; i.e., if the entire family / household is wiped out, there is nobody reporting the missing.) There are still 174,367 people living in 2,065 temporary shelters.

Japanese law requires that the dead be cremated in principal, but the gov't has declared an emergency measure allowing for regional gov'ts to have them interred if consented by

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the next of kin. The process has started in the coastal communities where the municipal cremation facilities were damaged by tsunami or are inoperable due to a lack of fuel.

As the debris are cleared away, they are sure to find many more bodies in hundreds and thousands in the tsunami hit regions. And still, there will be many whose bodies will never be found as they are carried out to sea, which will pose a significant emotional stress to the survivors

■ Tsunami

As you may know, the great majority of those who died or are missing were victims of giant tsunami waves that came about 15-30 minutes after the initial shock of earthquakes. In most locations, the government had predicted the maximum possible tsunamis to be 4-6m (13-20') tall. In reality, the waves reached and destroyed 10m tall levees and washed over the rooftops of school buildings that were 3 to 4 floors high. There are water marks at 14-20m (46' – 65'7") above ground on structures still standing. When a wall of water hit, its destructive force was enormous; all the wooden structures were washed away and only concrete structures remained standing, but their windows and doors smashed. Even parts of anti-tsunami levees were destroyed and pieces were "carried" in-land by the force of water. A tsunami wave, when rushing on shore, is not just a volume of water; it carries debris, cars, trains, fishing boats and what not, which become a massive group of projectiles that flow around destroying everything on their way, and take victims far out to sea when it recedes. The only way to survive a tsunami is to get up to a higher ground before it reaches you.

In tsunami hit communities, there are reports that many people in the coastal community did not rush to high grounds after the tremor because they had been accustomed to the "crying wolf" of tsunami alarms, and had a false sense of security with massive "state of the art" anti-tsunami levees built along the shorelines, which were in a sense proud symbols of technological progress and political maneuvering (in pork barrel project budget). On the other hand, many of the victims had put on layers of clothing, and had backpacks on full of underwear, food items, cash and bank books, and the official seal (which the Japanese use for transactions instead of signature), indicating tsunamis caught up with even those who were fully aware of the urgency of leaving the coastal areas.

Depending on how far the epicenter is, tsunamis take time to reach the shore, anywhere from 10 minutes to 2 hours to an entire day. If you have felt a strong earthquake and if you are close to the sea, you should drop everything and go for a higher ground. (The tragedy around the Indian Ocean in December 2004 was caused by the distance; no one felt the earthquake, and without a warning system along the sea side communities, people did not suspect anything unusual until tsunamis arrived the day after the earthquake that triggered the massive movement of water on the other side of the ocean. The only premonition they should have noticed was that, oftentimes before a massive tsunami reaches the shore, the water recedes first far out off the coast. Unfortunately in those resorts, people thought it was a great opportunity to go out to see fish stranded on the sea bottom.) In reality, however, there were elderly, who had mobility problems. There were people who wanted to go back home to see if their family members were alright after the big shaking. Those who were driving may have gotten stuck in traffic in narrow streets. Those people wasted the precious 15 to 30 minutes they had after the initial earthquakes.

In schools after the earthquakes, children were sometimes evacuated to a higher ground behind them; sometimes led up to the roof of their own buildings. One reported story has it that, even after having evacuated to the rooftop, a teacher was listening to the radio

report of the height of tsunamis coming to a nearby fishing village, and noticed that it was much higher than the height engineers had told the town people to be the highest possible. He then alerted the children to go further out, away and higher, which saved many lives.

In some cases, people were witnessed literally riding over the torrent on tatami mats, floating cars, or even inside their own houses. But in the end, most of them perished as they were pulled into the water, tossed upside down, or hit hard at standing structures. Survivors say the pull of the water current was so strong that they clung to whatever they could reach to literally for dear life. Some survived like a James Bond movie, but most simply drowned quickly. We still do not know how many bodies were carried out to sea that day.

We hear news of towns of population 10,000 to 15,000 people being able to account for only 5,000 or 7,000. The rest is presumed dead either buried under the debris or lost to the bottom of the sea. In fact an account of a woman rescued by a helicopter has it that she saw hundreds of bodies and fragments thereof floating around her as she was lifted up. It must have been a hellish scene. Japanese TV and magazines show only sanitized pictures; i.e., never a corpse appears in a published picture out of respect for the victims. I wonder about the traumatic effect on small children.

Japan has built so many "tsunami evacuation centers" along the coast. However, with tsunamis of this magnitude, all of these centers look too small, too short, and too weak. The ubiquitous concrete levees destroyed the beautiful seashore sceneries, cut-off the fishing community from the sea, and still did not protect the communities as planned. Many of the communities hard hit this time have a history of tsunami damages in the past so many centuries; yet the government as well as the local people believed in the power of engineering over the power of nature; causing devastation again. The only way not to repeat the mistake seems to rebuild the community on a higher ground, somewhat away from the waterfront, and have only the fishing industry related structures and park spaces (and the tsunami warning system) near the water. A 1000-year tsunami may not come again next year, but the decision they make this year could bring great sorrow to the descendants of the next generation or one after that.

■ Fukushima Daiichi Nuclear Plants – What Happened and What Is Happening

Of the six reactors at Fukushima Daiichi Nuclear Plants, approx. 230km (143 miles) north-northeast of central Tokyo, the units 4-6 were under regular maintenance, and the reactors were not running at the time of the earthquakes. The units 1-3 were running, but the automatic shut-down mechanism worked to insert the control rods into the nuclear fuel to shut off the fission reaction within the reactors. However, the temperature of the fuel rods must be under constant control by way of circulating coolant water, which rely on electric pumps. When tsunamis hit the area sometime afterwards, which were at 14m tall while the facility was designed with the maximum tsunami design height of 5.7m, the compound received physical damages as well as water damages on the electrical systems. The emergency back-up generators as well as the reactor buildings were installed with the grade level at around 10-13m above sea level.

The supposedly "fail-safe" back-up cooling systems, thus, all failed, and, while the nuclear reaction itself was somewhat controlled, the fuels kept releasing what is called decay heat. Tokyo Electric Power Company (TEPCO) immediately connected fire-fighting pumps to directly introduce sea water into the reactor vessels (the inner-most casing of the reactor fuel rods where steam is generated) to keep fuel rods from overheating. But they suspect that in some reactors, the water level within went so low that much of fuel rods were above the water level, causing overheating, damaging the fuel rod casing (zirconium

alloy tubes), and raising the radioactive water vapor pressure inside.

Another menace was the spent-fuel pools, which are built above the reactors. Spent fuel rods must be taken out of the reactor, and be submerged in water in these pools for 4-5 years to really cool them down before they can be stored in "casks" for permanent disposal. This requires again moving coolant water. These pools are less well protected than the reactors; the only shield above the pools is only one layer of the building walls. As the electrical system failed, the water circulation stopped, raising the water temperature, and eventually evaporating it to expose the, though spent still radioactive, fuel rods to air.

There were hydrogen explosions in units 1 and 3. When zirconium gets very hot, it reacts with oxygen, releasing hydrogen. As the pressure within the containment (two-meter thick concrete structure housing the reactor vessel) rose to a dangerous level, TEPCO opened valves to release some steam inside. Hydrogen was released with it to the space above the containment but inside the building envelope. At some point, the hydrogen concentration was at such point that some electrical spark or something ignited it and caused explosion.

These explosions provided sensational TV pictures of mushroom clouds raising above, which sent alarm to the entire world. Very important facts here are that the explosion was not nuclear explosions, but hydrogen explosions, and that they occurred above the concrete containment, and it is unlikely (well, at least TEPCO and some scientists say) that they damaged the containment or the reactor vessels. Though a critical state continues, these explosions themselves were not catastrophic events.

■ Fukushima Daiichi Nuclear Plants – Restoration Efforts

After the building envelope of units 1 and 3 were breached, they realized that the spent-fuel pools were problematic; white steam-like clouds hovered above these units. In order to counter the possible situation where the water may be evaporating and the fuel rods exposed to environment, they (TEPCO and government) attempted first to use helicopters to pour sea water from above. Self Defense Forces (SDF) helicopters did this job a few times, but the radiation level was so high above these units that they could not come too low and the water was dispersed in the wind. TEPCO's own fire-fighting squad tried to use their equipment to shoot water from ground with some success. Eventually the US military offered their fire engines, too. Then Tokyo Municipal Gov't's fire department with fire engines for tall buildings joined the group. They have not only the water shooting capability for tall buildings, but also some equipment to extend the hoses for 1.5 miles or so with a pump vehicle in between. This greatly extended the amount of time during which the water jets may be applied. The workers still had to count their overall cumulative exposure to radiation, and after having reached the allowed maximum, had to be replaced. Eventually the fire squads from Osaka, then Yokohama, then Kawasaki took over the positions and kept pouring water to those troubled units throughout the week. Along the way, two private companies offered German-built pressurized cement pouring equipment, which can shoot water from even a higher (52m) elevation. There are only four such equipment in Japan, and they are all there taking turns.

Because of the earlier explosion, the radioactive debris form units 1 and 3 were on the ground, which limited the activities there. SDF introduced two NBC (nuclear, biological and chemical warfare) tanks to clear the ground for easier access. These tanks are said to have thicker armor plates which reduce the radiation exposure level of those operating them inside.

In the meantime, TEPCO hurried to restore the electrical power supply. In the past few days, they were successful in installing a few miles worth of power cables from inland grid to several locations in the compound, rebuilt switchboards, and brought new power lines into the control rooms. They have also prepared replacement pumps and motors in case these mechanical elements have been damaged by tsunami. Their work has been hampered by occasional smoke coming off the reactor units and rising radiation levels, which cause them to retrench for a while. However, as of last Tuesday, the power has been restored in most of the control rooms, and they are testing the equipment and circuits to restart the cooling systems. Once the cooling systems go back up, and the measurement sensors are restored, the situation will improve dramatically. It would also provide lighting within these spaces, and HVAC would reduce radioactive particles in the indoor air, further facilitating the work of restoration. We are all hoping for success in the heroic work of the people on the ground in Fukushima Daiichi including 500 or so workers from SDF, US troops, police, fire departments of a few large cities, Hitachi and Toshiba (manufacturers of the reactors there) and their subcontractors, as well as TEPCO, many of whose locally stationed employees have lost their houses and loved ones themselves.

■ Rescue and Relief Efforts Offered by International Community

When the news of the devastation went around the globe, the international community did not wait to offer help to Japan. 133 countries and regions and 39 international organizations offered some form of assistance. Many countries sent teams of rescue experts who arrived quickly to search for the survivors of the earthquakes and tsunamis. China's humanitarian gesture surely turned around the escalation of animosity between them and Japan. So did Russian rescue team and the offer for extra LNG shipment.

The US continues to be active in providing logistical supports such as clearing of Sendai Airport, and providing fresh water to pour into the reactor cores at Fukushima Daiichi; and relief supplies to many isolated communities hard to reach on land. While many started to doubt the effectiveness of Japanese government, it was a big relief to see the image of USS Ronal Reagan off the coast of Fukushima. I hope this will also realign Japan's outlook on US presence in the Far East, which has been awkward ever since the Democrats took over the government a year and a half ago. Israel's team of doctors came in last night to care for the evacuees whose living conditions are detrimental to their health, while the local doctors are totally overworked. The US and France have sent experts on nuclear energy and radiology as well as miscellaneous equipment, protective gears, etc.

We have heard news of communities throughout the world raising money to help those affected and the rebuilding efforts to come, and are enormously moved. Some say they are returning the favor, which Japan had extended to them when they had a difficult time, such as earthquake, mudslides, and flood damages in the past. I think this will be a humbling experience to many Japanese who had thought Japan was a technologically advanced and materialistically wealthy country. The magnitude of these events was too big even for Japan to handle alone and we need these supports. At the same time, I feel happy to see that, while we all have differences, the humanity can at the very core of things still work to help one another. And I hope that because of this shock, the world will be a little more peaceful place to live in after this confusion has been sorted out in one way or another.

■ Life in Shelters and Isolated Communities

As of today, there are still 170,000 people living in shelters, and countless more in

communities that escaped the tsunamis or radiation contamination, but still in physically damaged areas within Tohoku.

Right after the earthquakes and tsunamis, people spent the night in temples, government offices, etc., but eventually they were received at designated shelters, which, in many cases were school buildings and gymnasiums, housing anywhere from 50 to 1,000 evacuees. Some simple provisions requiring only small added costs can make them more functional and comfortable for emergency uses.

1) Heat:

   Because the shelters are not built for residential use, heat source is often inadequate or non-existent. Compounded with the fuel distribution blockage, many shelters lack heat in the sub-zero weather. There was a story of a bio-fuel venture company offering a special boiler, which provides hot water that may be circulated through hoses placed around the main space. It is a quick make-shift radiant heating solution, but of course it requires a boiler, hoses, and fuel.

   For a future school gymnasium, it will make sense to incorporate such heating hoses (tubes under floor) and good insulation all around the building envelope so that it can reduce the suffering of people when and if it is used as a shelter for a minimal increase of the initial construction cost.

2) Sanitation

   The shelter is only a shelter, barely better than sleeping outdoors. The space inside tends to be cold, and becomes crowded with people whose hygiene is not necessarily at the desirable level. There is a tendency to see cases of influenza spreading fast among the evacuees. Many wear a surgical mask, but it can prevent the germs flying around only so much.

   Toilets are always a big problem. Those make-shift shelters do not usually have much sewerage capacity. Without running water supply and/or damaged sewer lines, they quickly overflow. People try digging holes in the ground outside, but of course they are not so comfortable, often soiled, smelly, and cold. As a result, people tend to take less liquid in an attempt to reduce the number of times they have to go to the bathroom, which can cause medical complications including what is so called the economy class syndrome.

   Again, future gymnasiums and school buildings and public parks should have extra toilet capacity. Systems that are slowly adopted in public facilities include one where holes in the ground, at normal times concealed with steel plates flush on the ground level, are connected directly to sewer lines. A nearby storage shack would have quick-and-easy tents to provide privacy over each of them.

   Gray water systems can provide for flushing toilets, shower/bathing possibility, and above-mentioned radiant heating systems, when the water supply lines are severed. They are a good investment in normal times, and can be precious resources in emergency, offering self-sustained water usage.

   One thing to remember is that there is always a need for handicap accessible toilets. In TV news pictures I saw many "comfort castles" or portable toilets deployed to evacuation shelters. But none were accessible. Accessible toilets were only recently incorporated in the Building Code in Japan; I suppose there are very few accessible portable toilets here.

3) Bedding

The gymnasium floor is hard and cold with little insulation. In an emergency like this time when people barely escaped the onslaught of tsunamis, they have literally have nothing with them. Minimum bedding must be provided for somehow. Even a thin sleeping mat for camping would help isolating the cold coming up from the floor. Sleeping bags can be added to the list of relief supplies to be stored by municipalities. Blankets can be of very light weight, high-tech material that we see in sporting events. Is there any way of incorporating light-weight insulating materials with the finishes of walls and/or ceilings in these public buildings so that they can be dismantled and placed on the floor?

As the magnitude of devastation goes up, the length of stay in these shelters inevitably becomes longer. The stress of spending two, or three, or four weeks in a crowded room and sleeping on hard floor can weaken the already weak. When we plan for a shelter, we tend to think about the immediate relieve of water and food; but equally important is the consideration for how to sustain the lives of those who survived for some prolonged period of time, as the temporary housing projects will take time (6-12 months) to accommodate everybody.

4) Privacy

Tens and hundreds of people cramped into a large space would inevitably suffer from a lack of privacy. This condition would exasperate the stress level of those who are already experiencing the sense of loss, displacement, and fear of uncertainties.

In some cases, elderly with mobility impairment and/or excretory difficulty would hesitate to move into a shelter lest their bodily odor might bother others or their conditions in general would make themselves "unpresentable" to strangers. So would parents of children with mental problems, who might panic in an unfamiliar environment and cry or shriek or run around, etc.

Shigeru Ban has proposed a light-weight system of paper tubes and fabric to erect temporary partitions. This system would work well under certain circumstances. Is there not something that can be incorporated into the building itself that would help? Maybe something as simple as extra rope rings along the upper portion of walls of such spaces, where ropes can be tied to hang whatever fabric or panels people can find when the time comes? Architects have to use their imagination.

5) Governance

In many shelters in Tohoku, it is reported that spontaneous, self-governing bodies have been established. This reminds me of the Chilean minors trapped underground for so many days. There would be rules all are expected to abide by, routines and responsibilities assigned to sub-groups, such as cooking, distribution of rationed supplies, overseeing small children in the designated play areas, tending whatever few kerosene heaters they have, cleaning toilets, and so on. In large shelters, you may find clinics with doctors and nurses, and mental care therapists, who themselves are evacuees. Sometimes city hall employees take up a role, but they say it is better to leave matters to the hands of residents because in any given shelter, the evacuees are likely from the same or nearby neighborhoods and know each other. There are often leadership figures and the order is rather naturally restored.

6) Information

Many evacuees are separated from their family members and still do not know if they are safe. Cell phones and land line phone system were restored only sporadically after a week or so. Those who cannot get reconnected are still searching with a hope that their loved ones are alive in a different shelter or hospitalized somewhere. At the same time, some municipalities provide daily bus rides to the morgues so one can visit the dead in order to identify them.

Many evacuees do not have access to TV or internet. So they cannot watch the non-stop coverage of TV and news media. Especially in Fukushima, the nuclear plant accident followed the earthquakes, but the evacuees are not well informed of the ever changing situation there.

Right after March 11th, with all the phone systems out, internet was the only means of communication. Twitter and Facebook are said to have been very useful to spread real-life information to cell phones. However, there are many who do not use such systems, and after the cell phone batteries die, the information stops flowing, too.

Coastal communities typically have a loud-speaker communication system installed. But it was knocked down by the earthquake or tsunami. It is therefore desirable to come up with a stable public information infrastructure taking advantage of today's technology.

7) Food Supply and Preparation

Those who escaped the tsunamis in stranded buildings and rooftops literally had to wait for rescue for a whole day, if not longer, without food or water. Even after having been admitted to the shelters, the delivery of rations was delayed so that the conditions did not improve for more than a few days. People shared what little food they had, and eventually relief supplies started to arrive.

Most shelters lack cooking facilities. Even if people had access to a kitchen, there may not be power or gas available. Therefore in early days, food items that can be served without any preparation were important.

As soon as the cooking becomes possible, Japanese shelters tend to serve rice balls and miso soup. This would help a great majority of evacuees, but there was a story of children with food allergy. Those special needs people have to be accounted for by the community and/or local government.

8) Other Supplies

After the initial rescue efforts are over, the reality of everyday life comes back. People who have food allergy or rely on daily doses of medications have lost their stock in the confusion. Local hospitals would run out of their stock very quickly without replenishment. For people with such needs, the ordeal in shelters becomes much harder than others. Those who require regular dialysis procedures had to be evacuated to hospitals in different parts of the country, which worked this time, only thanks to a network of hospitals established by a handful of private doctors who had prepared procedures for just such situations. Babies and pregnant women have their own needs, so do people with handicap in their mobility or intellectual capabilities. This reminds me of the fact that we all depend on the modern day networks of everything from food to medication to information to energy sources to banking to municipal services to everything else. Disasters hit not when everybody is able to cope with the ensuing hardships; the

preparation must be planned and designed to address needs of people with special needs while trying to help the maximum possible number of general public.

Some groups had to move several times in the past two weeks. From the administrative point of view, it makes sense to consolidate smaller shelters so that the delivery routes can be rationalized, and fewer locations would have to be taken care of. Authorities say that they learned after the Kobe Earthquake of 1995 that it would be better to relocate, if necessary, neighborhood groups together so that evacuees would maintain the community bonds, leading to a better chance of supporting each other in the hardships they are to experience.

Regional governments have started the construction of temporary housing. However, some estimate says they will need 20,000 units. So far only a few thousands have been planned or started.

Some tragic issues;

1) There are many children whose lives were saved because they were still in school, which tends to be built on a higher ground behind the coastal fishing communities. Many, however, lost their parents. Children as young as 8 years old are wondering through the destruction of the city looking for their parents and siblings. If they are taken in by their relatives, they are lucky. In many cases, the whole clan perished in the sweeping force of tsunamis. Who will care for them as time goes on? Can governments establish any effective system to support them till they grow up? It is truly heart-wrenching.

2) There have already been close to 100 deaths of elderly after they had been admitted to shelters because of the cold, lack of medicine or medical equipment, shock of changing environment, or loss of care-giver in the family, etc. In some shelters, they have seen two to three such deaths per day for the past weeks. The dead are placed in a separate room because municipal cremation facilities are either destroyed or running at full capacity, and sometimes because their families cannot be found.

Community Based Migration;

A few communities literally lost their towns, town halls, and town hall employees. Whoever is remaining decided to move together to a shelter in a distant location. For example, the residents of the town of Otsuchi have been accepted to Saitama Arena, a multipurpose sports stadium only half hour north of Tokyo with a courtesy of Prefecture of Saitama. The town hall also moved here, and opened the town councilors" meeting yesterday. It is unprecedented, but today we all have to improvise. Communities especially close to the Fukushima Daiichi Power Plants are planning for mass migration, at least for a few years, before their home towns become habitable again.

However, while the residents are in a new community, they would have to find work. Once they are successful in starting new lives, they will have less reason to go back. Either way, their lives are greatly affected.

Many prefectures and municipalities in the western Japan have offered acceptance with provisions for travelling, housing rent waiver, and even start-up money. But emotionally, those who were affected still hesitate, naturally.

■ Logistics and Impact on Economy

The initial shocks destroyed some bridges, roadways, and railways, halting the distribution network of the Tohoku Region including Sendai, a city of one million people. The coastal communities north of Sendai are separated from the population centers along the spine of flat land in the middle of Honshu Island with mountains, and, thus, were rather difficult to reach even before March 11th. Then the destruction of accesses made the logistics an acute problem in the coastal region, where relief materials were needed the most.

The quakes and tsunamis also put more than a handful of oil refineries along the Pacific coast out of business, at least initially. This threw the fuel (heating oil as well as gasoline) distribution off balance in the eastern half of Japan including the Tokyo region.

These compounded problems made the logistics of rescue and relief activities very difficult. (See more on this below.)

The Tohoku Region also has many advanced technology manufacturing plants. With the physical damage and/or the disruption of transportation, many plants were forced to close down. Since many manufacturers had adopted Toyota's just-in-time delivery tactics for parts and half-products, once a plant stops production in upstream of the supply chain, the whole line of factories, even if they were located outside the earthquake affected region, had to be shut down with very few parts in stock. There is already a report of temporary workers laid off at a factory in Shimane, at the western end of Honshu, because of the stoppage of their suppliers in Tohoku.

Many fishermen lost their boats and nets in tsunamis. The Pacific Coast of Tohoku boasted numerous large fishing bases. We will have to wait and see how much impact this will have on our dietary needs.

The nuclear scare has prompted many foreign businesses to at least temporarily flee Tokyo or the country altogether. They seem to be coming back to Tokyo as they realize that it had been an overreaction. However, as the problems at Fukushima Daiichi linger, there will be a serious economic consequence in the region. At least the communities within the 30km (19 miles) radius are vacated with no end in sight. There will be thousands of jobless people from those communities at least. As they relocate to other communities, they become competition for jobs when already the recession has squeezed the job market throughout the country.

The shortage of electric power is worrisome because it disrupts manufacturing activities in many ways. The planned blackouts are marginally necessary now, but when the summer heat arrives, the power demand will soar with air conditioning. Industries are already talking about ways to reduce the peak demand by shifting the operation to night time, assigning specific days off to individual businesses instead of everyone taking the weekend off, etc. Japan adopted the policy called "Cool Biz" a while ago to encourage business people to take the tie and jacket off during the summer months and set the air conditioning at a higher temperature. I can imagine that Japanese businesses will become even more casual this summer.

The amount of damage in both private and public sectors will be enormous. At the time of Kobe Earthquake, the damage was estimated to be approximately 2.5% of GDP. This time, it will certainly be more. So, for a year or so, the overall economic output may be down. But the rebuilding work will eventually push the economy up a little. And since this emergency will likely convince the current government to give up on some notorious campaign promises, such as child subsidy, free high-school tuition, and rice buy-up for farmers, all designed to please local constituencies in support of the Democrats, but little

economic stimulus value, the governing principal may shift to more pro-business, which we need to pay for the rebuilding as well as to compensate for the shrinking and aging demography. Some intellectuals have already started speaking up about this disaster being a wake-up call, a great opportunity to put an end to the doldrums, and push reform in our societal problems such as the pension system, healthcare, centralized control by bureaucracy, high corporate taxes, rigid employment practices, uncompetitive education, etc. (See more in "What is to Come" below.)

■ Life in Tokyo and Elsewhere

1) Dress rehearsal for the Big One for Tokyo

In a sense Tokyo is arguably better prepared for a large earthquake than any other regions in Japan for an obvious reason. It is on flat terrain; no landslide. It is somewhat protected by the closed geometry of Tokyo Bay against onslaught of tsunami; some coastal inundation may occur, but the destructive force may be reduced. Recently built large buildings follow strict seismic building code; we really, really, do not believe that they could collapse. All nuclear power plants are located far from the city. Only issues I personally worry about are the raised highways, which were built quickly for the Tokyo Olympic Games in 1964, which may collapse in sections, and envelopes of smaller buildings that might fall off due to differential movement.

Government agencies had predicted that in case of a big earthquake on a weekday, the central districts of Tokyo would be paralyzed with people hurrying home, streets filled with people as if they were in rush-hour trains, while all the public transportation network would be suspended. Agencies recommend that workers remain at work and delay their attempt to get home as much as they can. Here is a collection of anecdotes of what happened in Tokyo on March 11th.

- Most businesses closed and let workers out. Some people walked hours to get home.
- Supermarkets and convenient stores (convinis for short) quickly sold out beverages, snacks, bento boxes (take-out meals). Fast food restaurants were all crowded until dawn; some ran out of food items, but let people stay.
- Sports equipment stores had brisk sales as people bought up sneakers and bicycles.
- Japan Railway train network (JR – formerly of national train system) was down from the time of the first earthquake on till next day. The subway systems came back up towards early evening, but, in order to maintain safety of passengers within the stations, they had to limit the number of people entering stations at a time.
- Government facilities (municipal offices, auditoria, schools) were open to those who needed shelters for the evening.
- Private schools, temples and shrines also opened their buildings, and some provided free water and food.
- Private homes also helped passers-by by giving access to well water, and distributing rice balls.
- Most people wanted to go home because they could not confirm the safety of

their family members. Others were worried about old parents or young children at home.

- Mobile phone communication was restricted by providers. Land lines were difficult to get through. Twitter and SNS services through internet provided many with live information (subway line status, shelter information, etc.)

2) Mood in the Streets / Anxiety at Home

After one week or so, Tokyo was still quieter than usual; weekdays looked like weekend. As the magnitude of the casualty in Tohoku Region became clear, people were in a sober mood. Even if they did not have any family members or acquaintances directly affected by the earthquakes and tsunamis, they were and are still in a collective mourning period, it seems. My wife and I were basically glued to TV all day long, which had, for a week or so, continuous coverage of all things related to March 11th. We would be jolted by occasional emergency earthquake warnings on TV, which warn the arrival of an aftershock within 10-15 seconds. Most festivities were cancelled, including, unfortunately many commencement exercises of schools and universities. (Japanese school year is from April to March.) (In fact, the first reported death in Tokyo was at an old government-owned auditorium in downtown Tokyo where the ceiling panels fell onto a group of teachers and students attending their graduation ceremony.)

3) Foreigners and Kids Exodus – The Panic Stricken Left the Town

This is quite unfortunate, but understandable; many foreign nationals left Japan or Tokyo in panic and/or by instructions of their consulates or companies. There was a rush in the first week of foreigners getting out. Most were scared of radiation; though some had an excuse of business interruption by power blackouts, or unpredictability thereof. Some European airlines diverted Narita (Tokyo) routes to Kansai (Osaka). Most of them have come back to Narita this week, but they still stop in Seoul or Taipei or Shanghai so that their crew does not have to stay over in Tokyo, nor their planes reload drinking water at Narita. I suppose the Japanese would do and probably did the same when, for example, SARS scare kept people away from Hong Kong and some other Southeast Asian countries a few years ago. But Japanese consumers may have a little negative impression of companies like some luxury as well as fast fashion brands who closed their stores and moved the headquarters to Osaka.

Mothers of young kids were also scared of radiation – especially of radioisotope of iodine (iodine 131), which tends to accumulate in the thyroid gland causing cancer in young children under ten. So far, the amount of iodine-131 found in atmosphere, water, and some food products in Tokyo is so miniscule it cannot have any lasting effect. Its half-life of 8 days also makes it relatively safe as long as one is not exposed to it for a prolonged period of time. However, mothers who "do not want to take risk", or who do not believe in the government releases of daily iodine-131 levels took their children to western parts of the country or even farther away. Of my son's grade school class, about one third of the pupils have been missing since Monday after the earthquakes. I would question the validity of this action considering the risk of traffic accidents, stress of living out of suitcase for a prolonged period of time, and detrimental effects of being out of school and out of touch with friends from school. (The thyroid gland cancer epidemic in pre-teens around Chernobyl was due to their internal radiation exposure through prolonged intake of contaminated milk, which kept constant

replenishment of iodine 131 to unsuspecting children.)

In any case, the government is not doing enough to educate the public, nor convey accurate information daily to foreign media. The way they are handling the communication and public relations is so unprofessional that it only augments the mistrust of the authorities and suspicion that they are hiding something. In a case like this, quick, timely, and apt announcements must be released by authorities in order to avoid panic, sensationalistic public speculation, and eventually, unnecessary costs in lost businesses, in addition to preventing secondary loss of life and physical, monetary, and social damage to public and private properties.

4) Planned Power Blackouts

Because of power shortage as a result of several power plants, fuel-burning as well as nuclear, going off line, TEPCO instituted planned blackouts, which initially caused much confusion especially for train services. TEPCO did not coordinate with the train lines so train companies did not really know when to operate which lines and the "planned" part is not that well planned, making it more unpredictable. Now people are somewhat used to it, but problems do happen;

- Traffic accidents at crossing with traffic lights not working, and the victims not being able to receive necessary CT scan, for example.
- Fire and carbon monoxide death resulting from the use of barbecue grills for heating within residences.
- Blood drives not being able to accept good wills of those who want to help.
- Hospitals not being able to plan major surgeries, as small hospitals may have emergency power generators, which would last only a few hours, and now they face diesel fuel shortage, too.
- Some factories and shops require a continuous line operation. Disruption of such lines may mean a lower product quality. In many cases, a planned blackout of 3 hours does not mean 3/24 reduction in output quantity because it takes time to stop and restart the line. Some say a 3-hour blackout means 10 hours of production stoppage. Some factories are shifting to night time operation; others do not have this option if located in a residential neighborhood.

TEPCO says they are restarting old and decommissioned fuel-burning plants and installing extra gas turbines in existing plants to increase the power generation capacity; but are afraid that they may not be able to meet the peak demand during the summer months. Government is trying to figure out how to handle the peak situation.

5) Save Electric Power Campaign

Government is also asking the general public and businesses to reduce power consumption. It is in general a good thing, but the streets look darker, businesses look less active. This has a negative psychological effect. For example, in subway stations, the fluorescent lighting may be turned off about 30%; many escalators are not running; backlit advertisement panels and directionals are turned off, etc. (However, the ambient lighting is still brighter then NYC subway.) Train and subway services are now running at about

70-80% of normal in terms of frequency. Restaurants are shortening their operation hours so you have to go home at a decent hour.

There has been a big scandal with the Central League of Professional Baseball, who once decided to open the season this week and start night games in their domed fields right away. It would use so much electricity for lighting and HVAC, of course, and it brought a government intervention. Now they gave up on the initial idea and will start the season later and do more day games.

6) Disruption of Heating Oil and Gasoline Distribution

The quakes and tsunamis destroyed some oil refineries along the shore line. A shortage of heating oil as well as gasoline was a big problem for these weeks. The Tohoku Region at the end of March is still cold with the temperature dipping below freezing often.

As the distribution is disrupted because of the confusion on the network, reduced production, or even in case of Fukushima prefecture, refusal of truck drivers to drive into the area near Fukushima Daiichi Plants, heating oil is not reaching those who need it most, and most shelters lack heat. In case they want to evacuate the region to stay with their friends and relatives, they cannot pump gas to their cars. And because there is no guarantee that one can get gas for the return trip, truck drivers are even more hesitant to take aid supplies to the region. The recovery and identification of corpse is taking so long partially because they do not have enough gas to operate available equipment to remove and clear debris.

Even in Tokyo, the city bus services are still reduced. There used to be long lines at gas pumps for a while. The gas situation is much better this week, at least in Tokyo, though.

7) Disruption of General Distribution Network

Because the logistics centers were destroyed in some cases, everyday goods and food items became scarce in Tokyo supermarkets and convinis for a while. The first to go was rice, pastas, pasta sources, potato chips and chocolates (!). Milk and dairy products are also gone from the store shelves. As the facilities were repaired, there was a natural shift to rush materials to the Tohoku Region to help the evacuees. The situation is much better in Tokyo today, most restaurants are open, MacDonald's and Starbucks are business as usual; but we still see shortages of milk, for example, and bottled water.

In the Tohoku Region where they need much matériel to support the displaced people and start the temporary housing building work as well as the work of community rebuilding, the distribution network is still not back to the full capacity due to the combined effects of fuel shortage, physically severed roadways and bridges, radiation scare, destruction of distribution and manufacturing centers, etc.

8) Business as Usual

In Akihabara last weekend, girls in maid costumes distributed discount coupons for their infamous maid cafés in the street as if nothing had happened. Yodobashi Camera (one of the major electronics gadget retailers) was just as crowded as usual, and its TV section was booming with customers buying new TV sets to prepare for the upcoming switch-over from the analog to digital broadcasting systems. For a while, everybody was stunned and shocked and

stopped. But for those who were not directly affected, life must go on, and the economy has to keep moving.

Because of the power shortage and blackouts, some disruption and reduced productivity are expected; but for those who do not appear on the news are basically back to normal and back to work. We seem to be, however, in a somewhat different zeitgeist from three weeks ago.

■ Japanese Psyche

Throughout this ordeal, foreign media have pointed out how civil Japanese people are even when faced with a great difficulty. In Tokyo that evening, people, deprived of the usual commuter transportation, walked home helping each other. Stores and restaurants offered free food and beverages. In shelters, people would line up to receive food, they respect the rules established by the self-organized governing body, and share chores and duties to run the place smoothly. Stores and gas stations offer whatever they have in stock at regular prices, never attempting to take advantage of shortage. When an octogenarian was rescued with her grandson after having been trapped in the tsunami destroyed and debris covered house for 9 days, she said to the rescuer "thank you and I am sorry for taking up your time." There have been some petty thefts in stores vacated by storekeepers as reported in Sendai. But there has been no wide-spread plunder or violence in any part of the affected areas. Everybody in the entire country seems to be nice, kind, sincere, and exhibiting exemplary citizenship. I wonder if the crime rate in Japan went down in the weeks following the disaster as everybody was preoccupied with the unfolding events in Tohoku and Fukushima in particular, and if even criminals have lost the "evil" in them.

Probably people are truly in shock so much that they suppress the individual selfishness and greed; and subconsciously hoping to have a sense of belongingness to feel secure. Or, they know instinctively that they cannot have a disgraceful conduct because they would still have to live in and with the same community of people after all this has passed. Or, simply it is their nature to be kind and sympathetic to and respectful of others.

I am personally amazed to observe that the entire country seems to be aligned in the "help Tohoku" mode. The collective will power will definitely be needed to help those affected and rebuild the society and economy, while correcting the general course of this country. This emotional focusing is undoubtedly a result of the genuine love everybody feels for the suffering of the humanity. It is in fact heart-warming to see fund-raising drives everywhere inside Japan as well as in some remote countries.

But I feel a tinge of fear in the way the mass is turning in one particular direction, or feeling obliged to turn in one direction. The Japanese tend to align themselves to the perceived majority, without expressing own values. No societal issue is as simple as good or bad; but eventually, I am afraid, that the big voice will determine which way is good for the mass, and dissenting voices will never be heard in this mass hypnosis, which can be rather blind when controlled through deft maneuvering of information and public moods.

For example, there is an on-going mood that dictates that because people of Tohoku are suffering, the rest of the country should not be engaged in festivities. For a certain period of time, this may hold true, because many in other regions are indeed feeling sad, depressed, and in a sense mourning the loss of lives and all the misfortune falling on those who survived. People are in general still feeling the shock and will take some time to get back to normal. Along this logic, however, many events have been cancelled, be they sporting events, commercial events for children at shopping malls, release of popular

music titles, or even wedding banquets. People would go straight home after work, drying up the businesses of restaurants and drinking holes in town. If you insist on doing business as usual, you would be criticized as insensitive and/or disrespectful. I suspect that this must be quite similar to the mind-control (self-imposed or not) of the general public, which on surface supported the starting of war in 1920's, that it was a necessary and god-given right to invade China. A dangerous demagogue could represent the voice of the time, leading the mass to an unwanted course that nobody could reverse.

Japan will soon need constructive debates in figuring out in which way to take our country; what to do with nuclear energy, how to spend our finite resources in rebuilding economy while supporting unprecedented increase of elderly population, etc. Having a united front is not always good, and I hope the Japanese people have enough wisdom to know the difference between the feel-good patriotism under one banner and the responsibility in evaluating options and expressing opinions in a democratic way when the time comes.

In any case, we will have to resume our normal lives so that Japan becomes productive again.

■ What Is To Come

An enormous number of lives were lost. There are as many people still missing two weeks after the devastation had occurred and are presumed dead. Several coastal communities were literally wiped off the map. Hundreds of thousands of people lost their homes and some lead nomadic lives between shelters, not even knowing where they are going next. However, the people of the region and of the rest of the country have already shown the resolve to overcome all the difficulty and somehow find meanings in this tragic turn of events in the history. To pay tribute to the victims, and to find the right path for the rest of the population of Japan, we need to get to work and do many things right. No more wasteful petty skirmishes between political parties. No more indecisions about what to do to deal with the dwindling pension reserves and snowballing healthcare costs. No more turf wars between ministries sacrificing the quality of services to the populace. This series of events and the hardships Japan is experiencing in the aftermath should be a blessing in disguise, a warning against further procrastination, or the ultimatum telling us that we have no more luxury in dillydallying in addressing the problems we face.

On the ground, the recovery of corpse still continues along with the removal of debris and mechanical drainage of sea water remaining in areas that sank lower than the surrounding areas. In Miyagi Prefecture, the estimated volume of debris is said to be as much as 23 times the typical annual amount of waste disposal of the region. The cost as well as what to do with all that debris is a big issue. (They still try to separate materials manually for possible recycling, but inclusion of sea water complicates the process, and as to radiation tainted materials, there is not even a guideline for handling.)

Also hampering the process is the issue of ownership. Thousands of cars tossed around by tsunamis can be traced back to the owners at least on paper, but there are so many of them, and finding the ownership does not mean being able to contact the owners. Even house debris has shifted around; in most cases the owner of the structure and whatever found inside is different from the owner of the land on which they were found. The government finally issued a decree allowing for removal and disposal of vehicles and structures that are obviously non-functional. (Workers are still trying to safe-keep personal items, such as photo albums, in case the owners come back to retrieve them.)

Fishing boats pose an issue one notch more complicated. While the ownership can be identified sooner than cars, their bulk is much bigger. They require much bigger

equipment, and in many cases they could not be removed without damaging or taking down a building or two nearby. The national government decided to pay for removal of house and car debris, but somehow the removal of ships is said to be the responsibility of individual insurers.

In terms of architecture and urban planning, this could be a great opportunity to rebuild communities in the most desirable fashion; in a sense, a utopian opportunity. An optimum built environment suitable for new lifestyles that are ecologically sound, symbiotic with the natural forces, based on a new paradigm in economic growth represented by knowledge based industries in addition to the traditional piscatorial, agricultural, and manufacturing industries.

These will all depend on the vision of the leadership, whoever might take that role at all levels in all fields. It remains to be seen whether there will be a centrally concerted efforts to produce a grand master plan for the Tohoku Region, or each township will employ architects and planners and hurry to implement a hodgepodge of rebuilding projects.

Japan Institute of Architects, of which I am a member of the international committee without being a JIA member, has mobilized some members in the region to help municipalities in the initial assessment of building damages; i.e., safe, repair needed, unfit for occupancy, etc. While the Japan Society of Civil Engineers, The Japanese Geotechnical Society, and the City Planning Institute of Japan have issued a joint communiqué, JIA has not made any public announcement.

I have been using all my imagination to figure out what an architect can do in an emergency situation like this. For example, we see in news coverage how selflessly some people are working as rescue workers, doctors, nurses, mental health counselors, truck drivers, city hall employees, journalists, construction workers, police and military. Unfortunately, what we do as architects does not seem to be so urgently needed in the confusing reality of affected areas.

However, when the rebuilding starts in a few months time, architects should provide leadership and creativity in master planning of old and new communities; propose extra safety measures in buildings of different types, and promote economical and eco-friendly solutions. This may indeed be a good opportunity to really promote green architecture.

Even for temporary housing projects, for which the economy and speed tend to take precedence over all other issues, architects can intervene in the planning process to give something extra for the comfort of future residents, such as a plaza to foster neighborhood communication, small spaces for meetings, thoughtful site planning for maximum privacy between units and separation of pedestrian and vehicular accesses, etc.

Architects have to work with professional groups like JIA and AIA to have our presence noticed and our expertise appreciated. Our profession, at least in industrialized countries, is there to give an added value to the built environment. It is important to remain concerned and actively engaged in order to offer our expertise especially when the harsh reality of the conditions of the affected tends to highlight the bare minimum hardware, and overshadow that little extra, which would make their lives much more livable in a long run.

AIA Japan Chapter is a very small chapter with very little resources. We may not be able to do much as a group vis-à-vis the disaster. But at least we can try to identify and convey the issues we are facing, and provide opportunities for discussions for professional awareness of and possible solutions to such problems through our upcoming Northwest Pacific Region / COD conference in Japan in November.