

Barto, Andrew

From: Rahimi, Meraj
Sent: Tuesday, March 22, 2011 4:13 PM
To: Barto, Andrew
Subject: FW: Fukushima accident progression presentation
Attachments: Fukuchima_eng_20110320.pps

Please forward the attached presentation to the TAG members.

Thanks,

Meraj Rahimi
Chief of Criticality, Shielding, and Dose Assessment Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Materials Safety and Safeguard
U.S. Nuclear Regulatory Commission
6003 Executive Blvd., Suite 301
Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

From: Saverot, Pierre
Sent: Monday, March 21, 2011 7:43 AM
To: Rahimi, Meraj; Call, Michel; Hrabal, Craig; Smith, Jeremy; Jordan, Natreon
Cc: Li, Zhian
Subject: Fukushima accident progression presentation

From my AREVA- Germany friends...
It's good stuff, clear and concise.
Pierre





The Fukushima Daiichi Incident

1. Plant Design
2. Accident Progression
3. Radiological releases
4. Spent fuel pools
5. Sources of Information

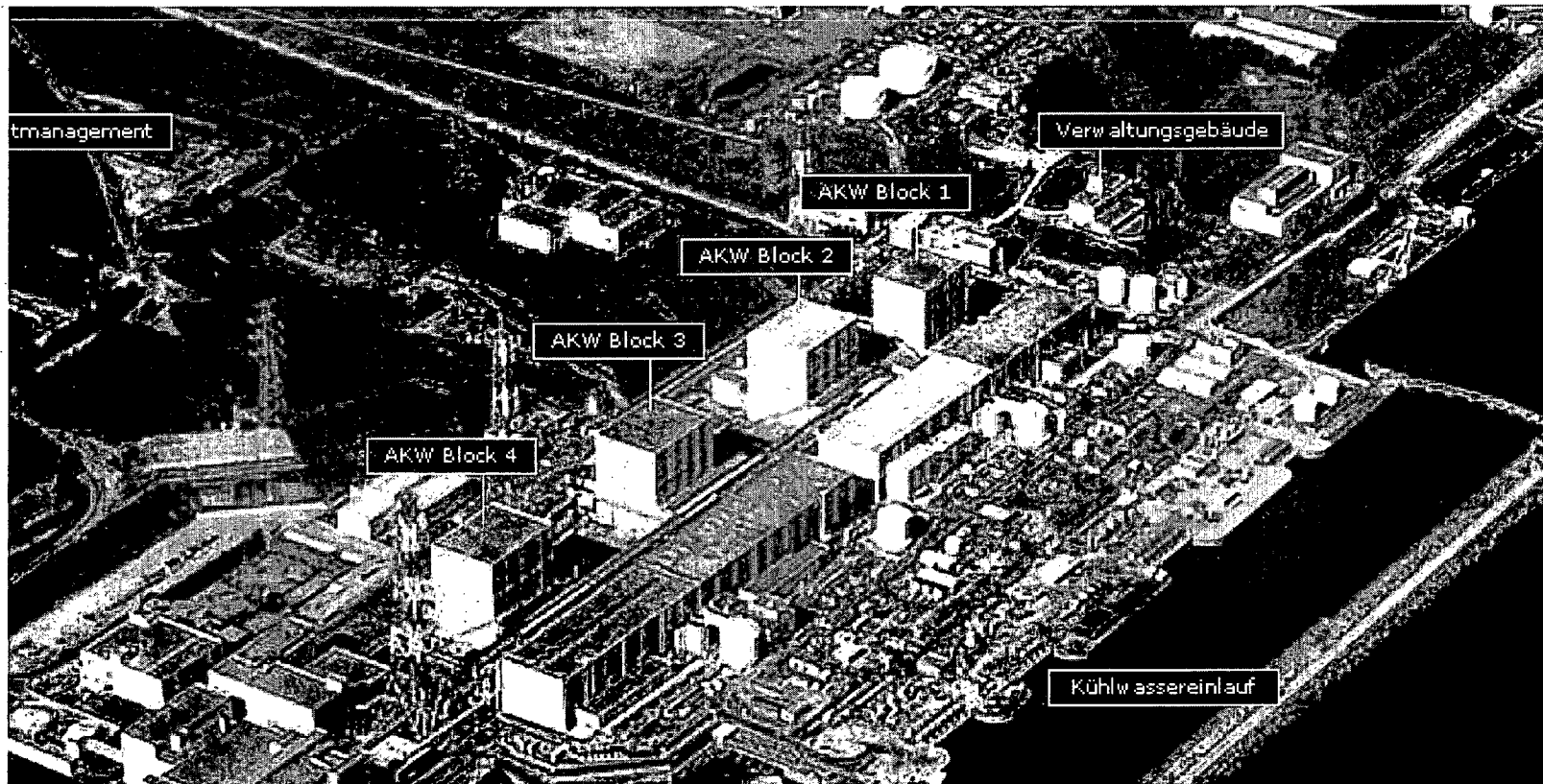
Matthias Braun
PEPA4-G, AREVA-NP GmbH
Matthias.Braun@AREVA.com

The Fukushima Daiichi Incident

1. Plant Design

► Fukushima Daiichi (Plant I)

- ◆ Unit I - GE Mark I BWR (439 MW), Operating since 1971
- ◆ Unit II-IV - GE Mark I BWR (760 MW), Operating since 1974

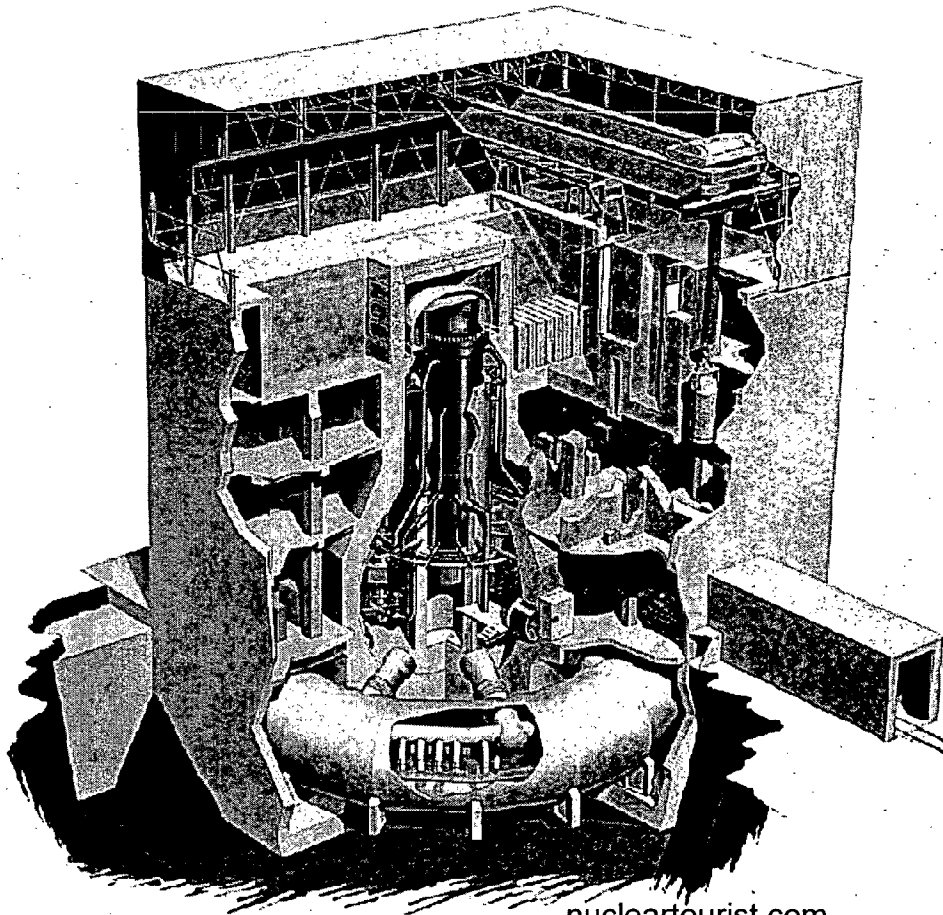


The Fukushima Daiichi Incident

1. Plant Design

► Building structure

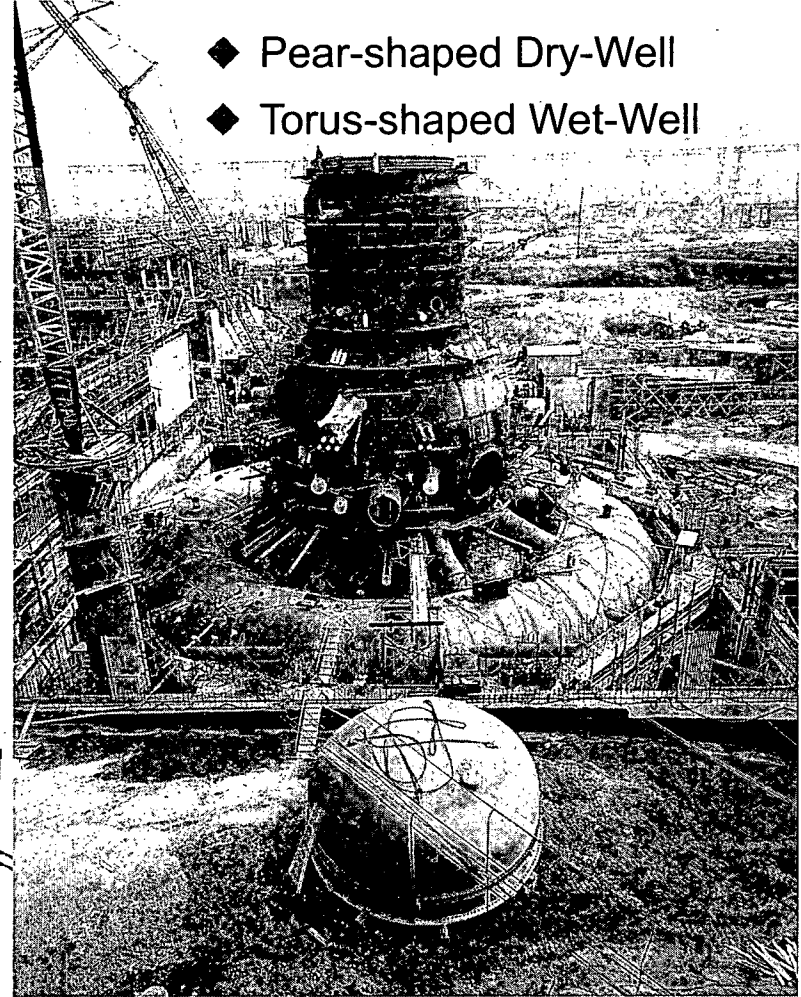
- ◆ Concrete Building
- ◆ Steel-framed Service Floor



nucleartourist.com

► Containment

- ◆ Pear-shaped Dry-Well
- ◆ Torus-shaped Wet-Well

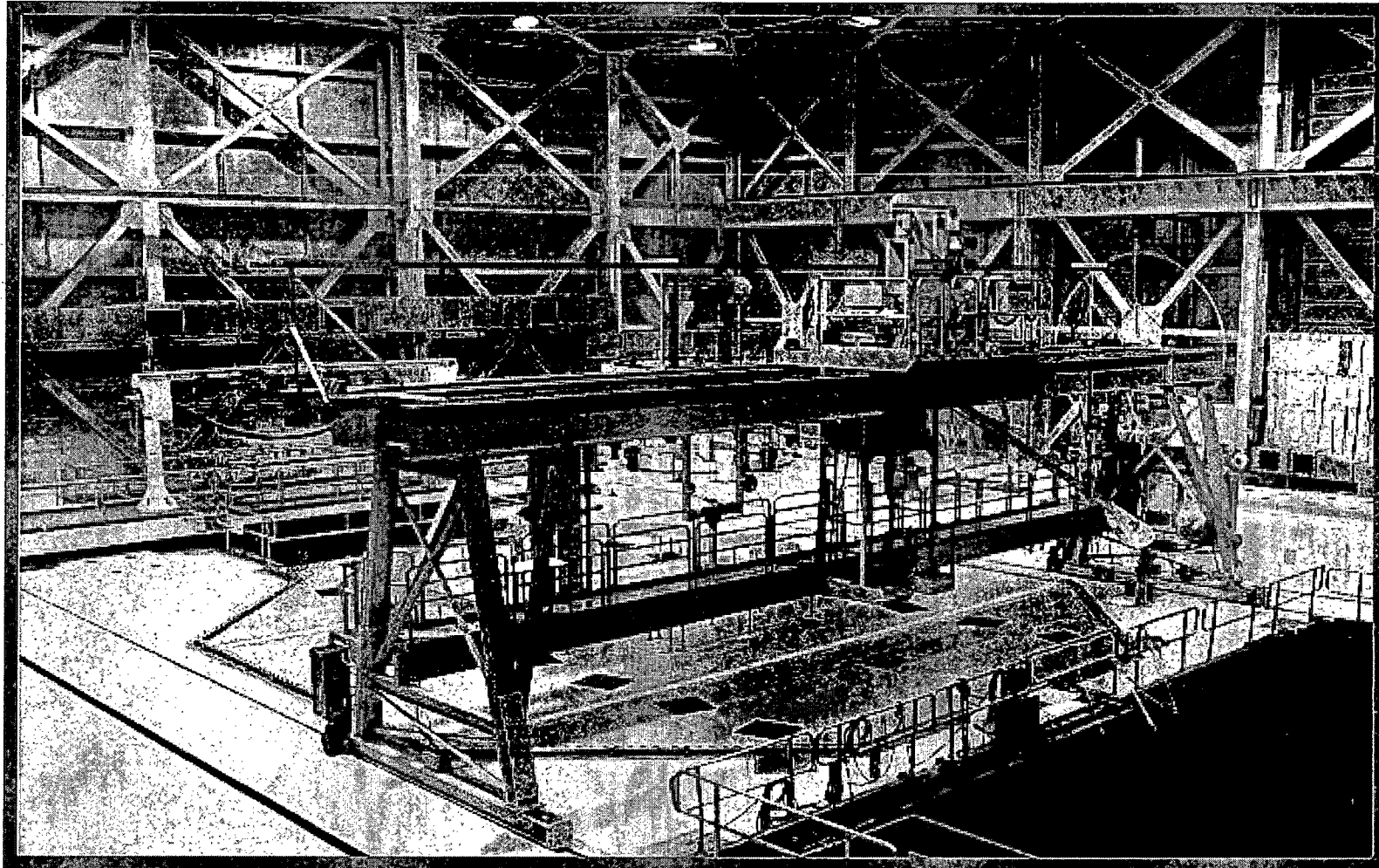


en.wikipedia.org/wiki/Browns_Ferry_Nuclear_Power_Plant

The Fukushima Daiichi Incident

1. Plant Design

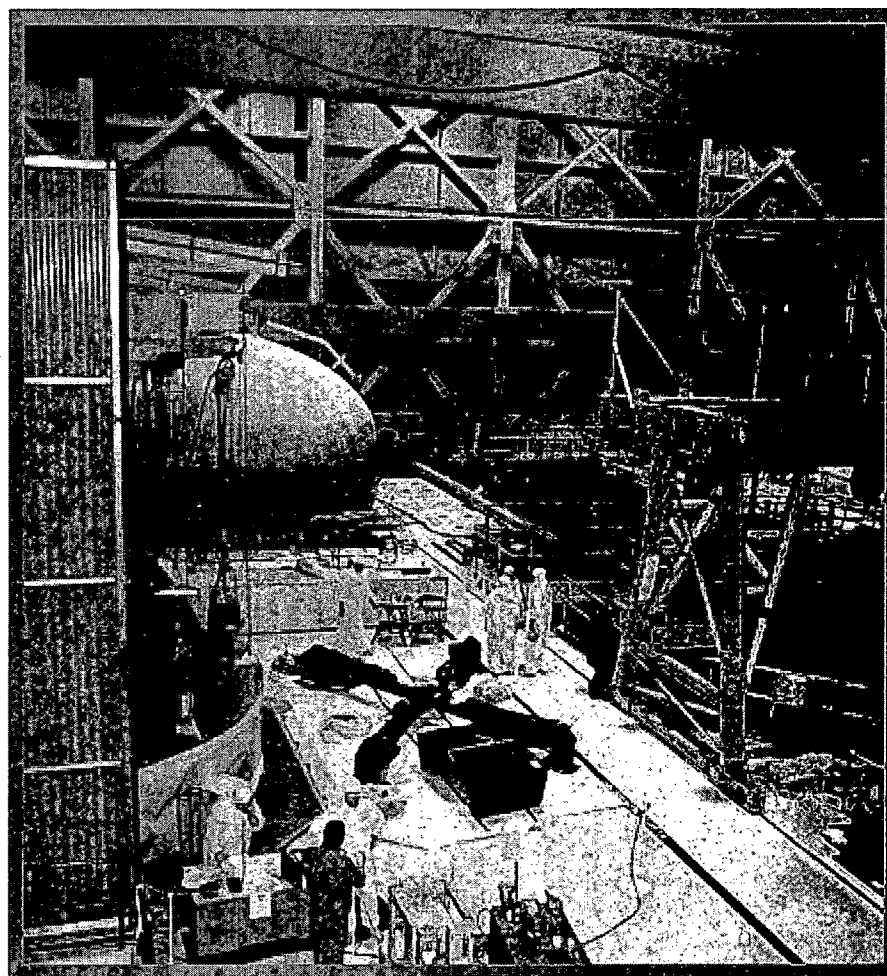
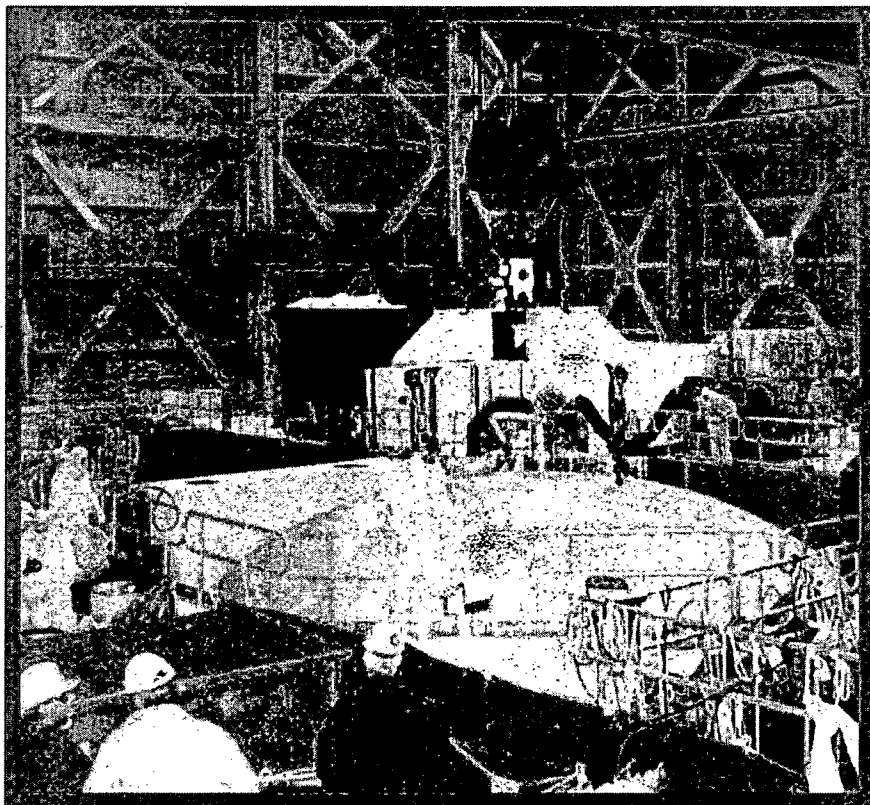
► Service Floor



The Fukushima Daiichi Incident

1. Plant Design

- ▶ Lifting the Containment closure head



The Fukushima Daiichi Incident

1. Plant Design

► Reactor Service Floor
(Steel Construction)

► Concrete Reactor Building
(secondary Containment)

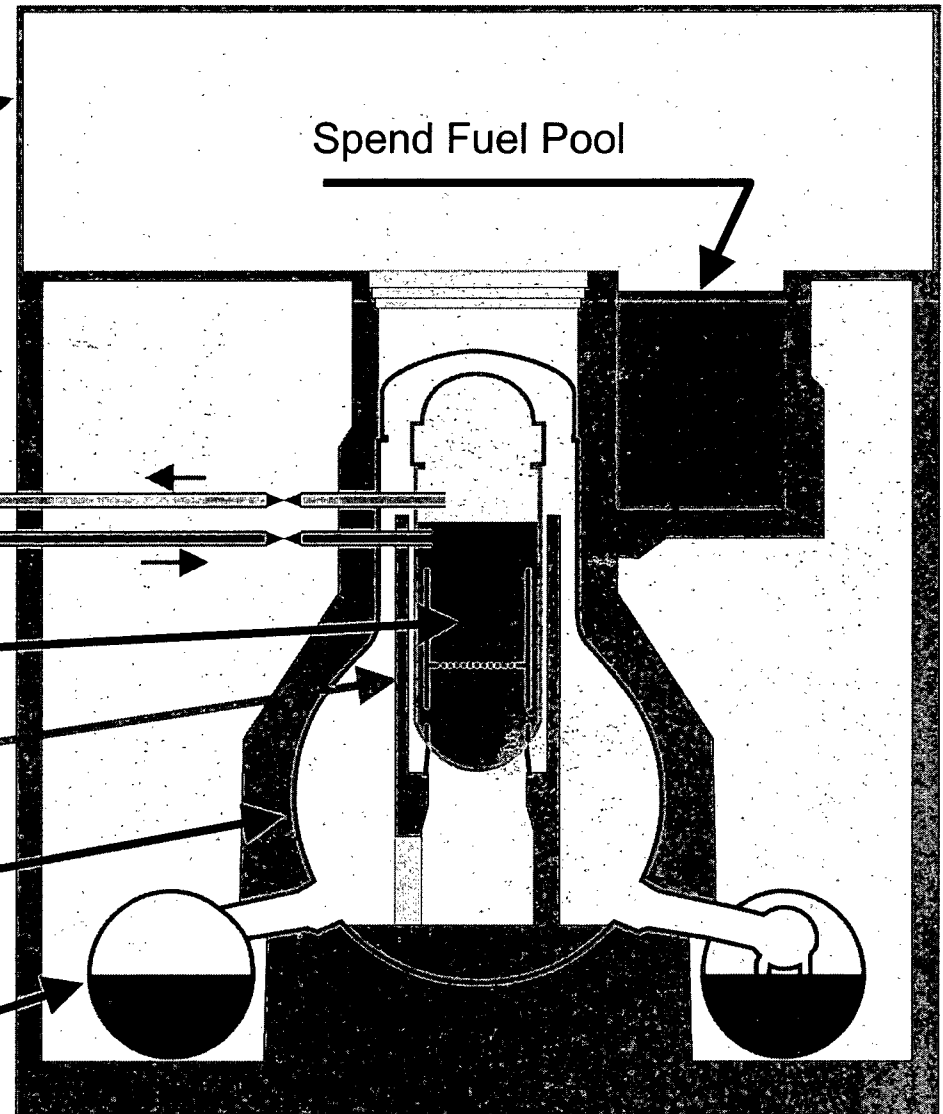
Fresh Steam line
Main Feedwater

► Reactor Core

► Reactor Pressure Vessel

► Containment (Dry well)

► Containment (Wet Well) /
Condensation Chamber



The Fukushima Daiichi Incident

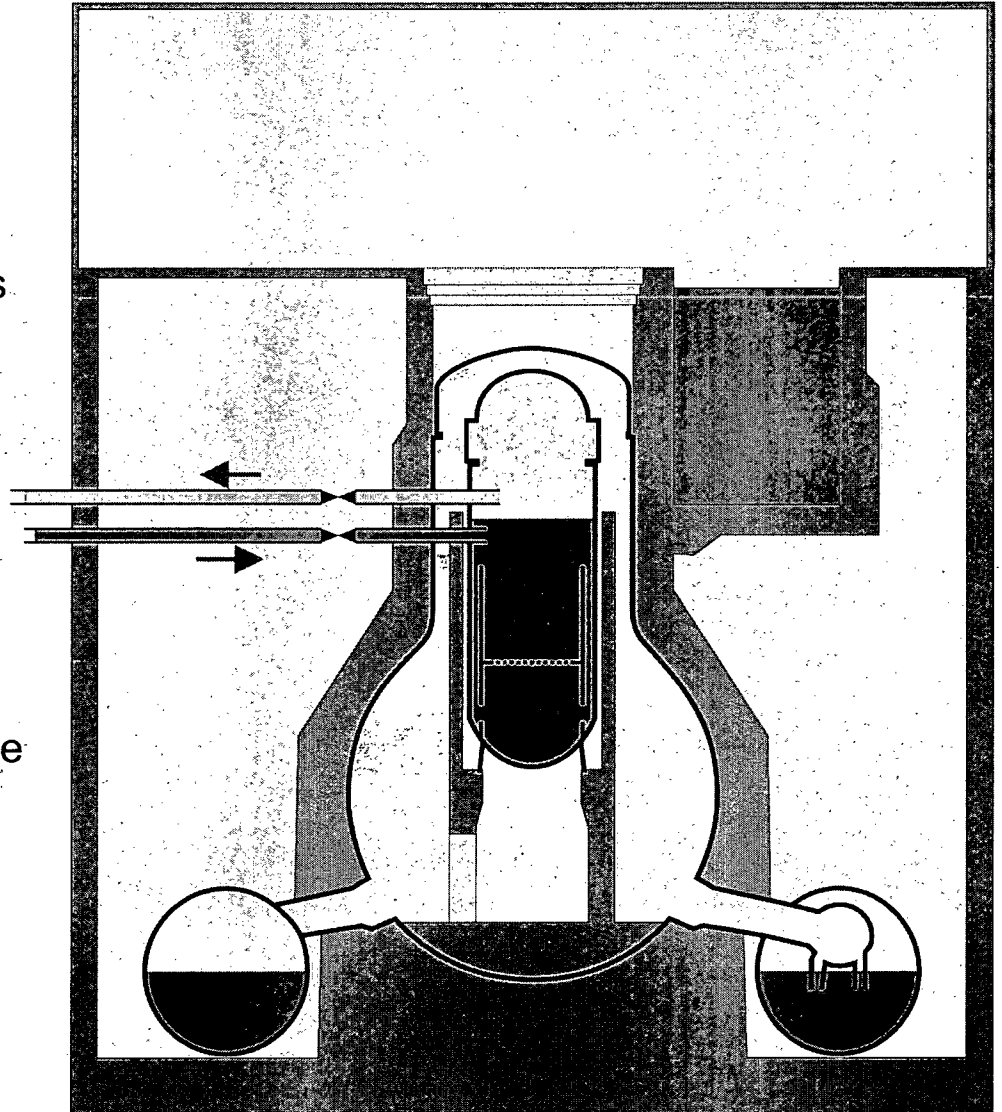
2. Accident progression

► 11.3.2011 14:46 - Earthquake

- ◆ Magnitude 9
- ◆ Power grid in northern Japan fails
- ◆ Reactors itself are mainly undamaged

► SCRAM

- ◆ Power generation due to Fission of Uranium stops
- ◆ Heat generation due to radioactive Decay of Fission Products
 - After Scram ~6%
 - After 1 Day ~1%
 - After 5 Days ~0.5%



The Fukushima Daiichi Incident

2. Accident progression

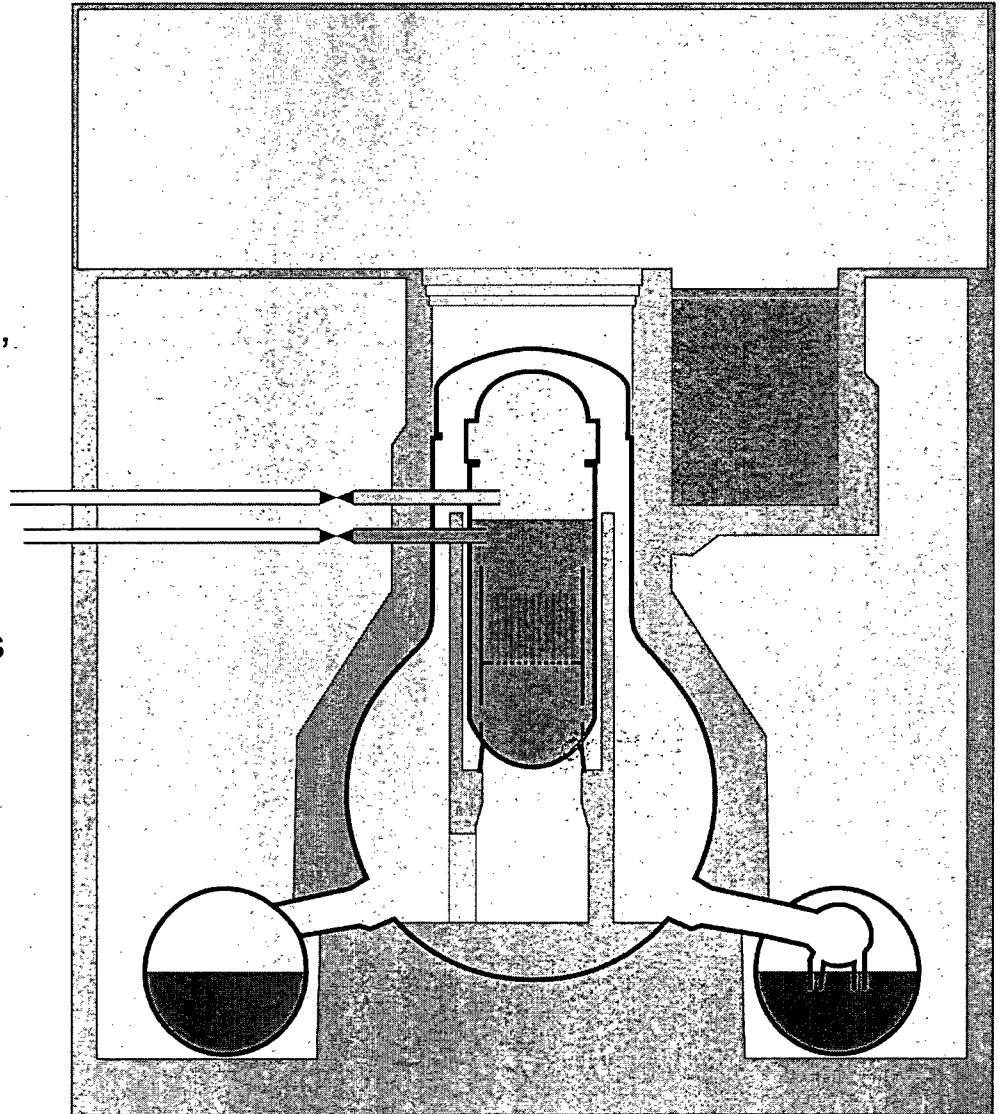
► Containment Isolation

- ◆ Closing of all non-safety related Penetrations of the containment
- ◆ Cuts off Machine hall
- ◆ If containment isolation succeeds, a large early release of fission products is highly unlikely

► Diesel generators start

- ◆ Emergency Core cooling systems are supplied

► Plant is in a stable state



The Fukushima Daiichi Incident

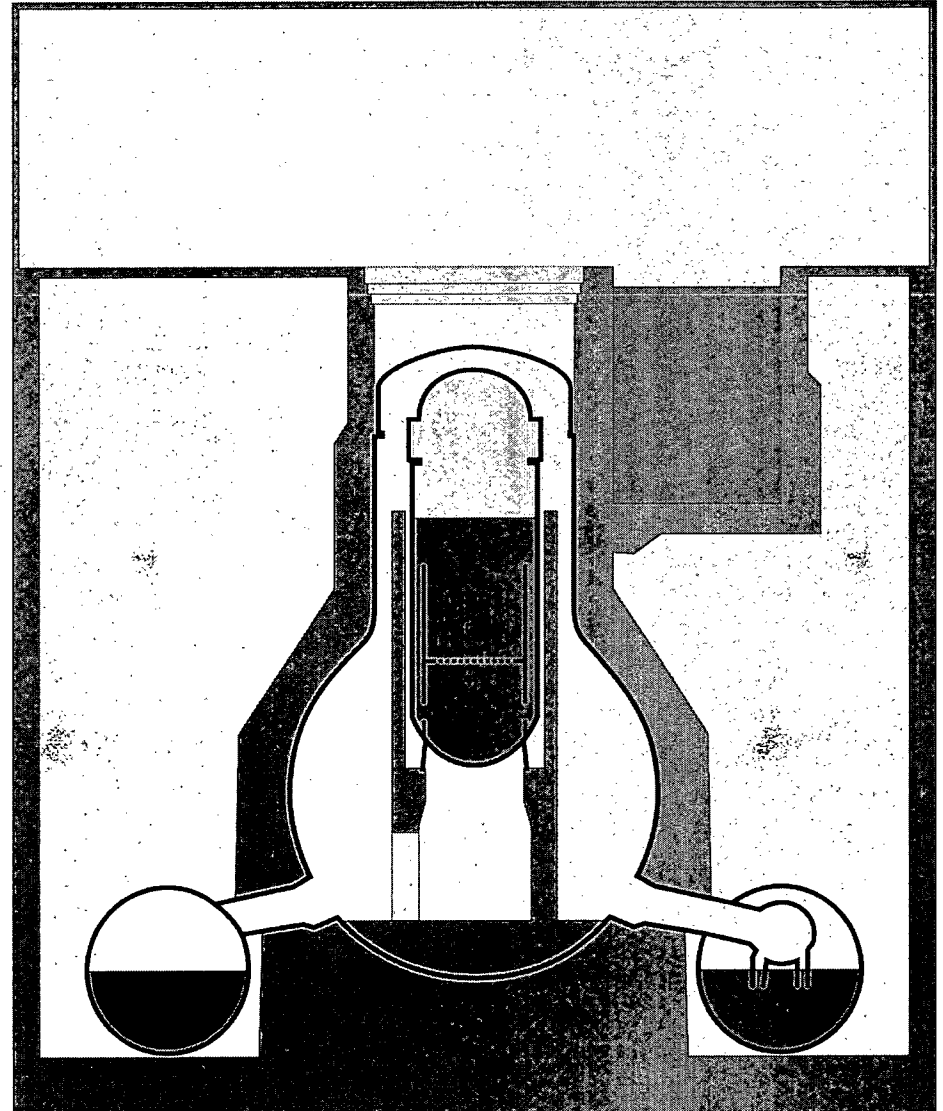
2. Accident progression

► 11.3. 15:41 Tsunami hits the plant

- ◆ Plant Design for Tsunami height of up to 6.5m
- ◆ Actual Tsunami height >7m
- ◆ Flooding of
 - Diesel Generators and/or
 - Essential service water building cooling the generators

► Station Blackout

- ◆ Common cause failure of the power supply
- ◆ Only Batteries are still available
- ◆ Failure of all but one Emergency core cooling systems



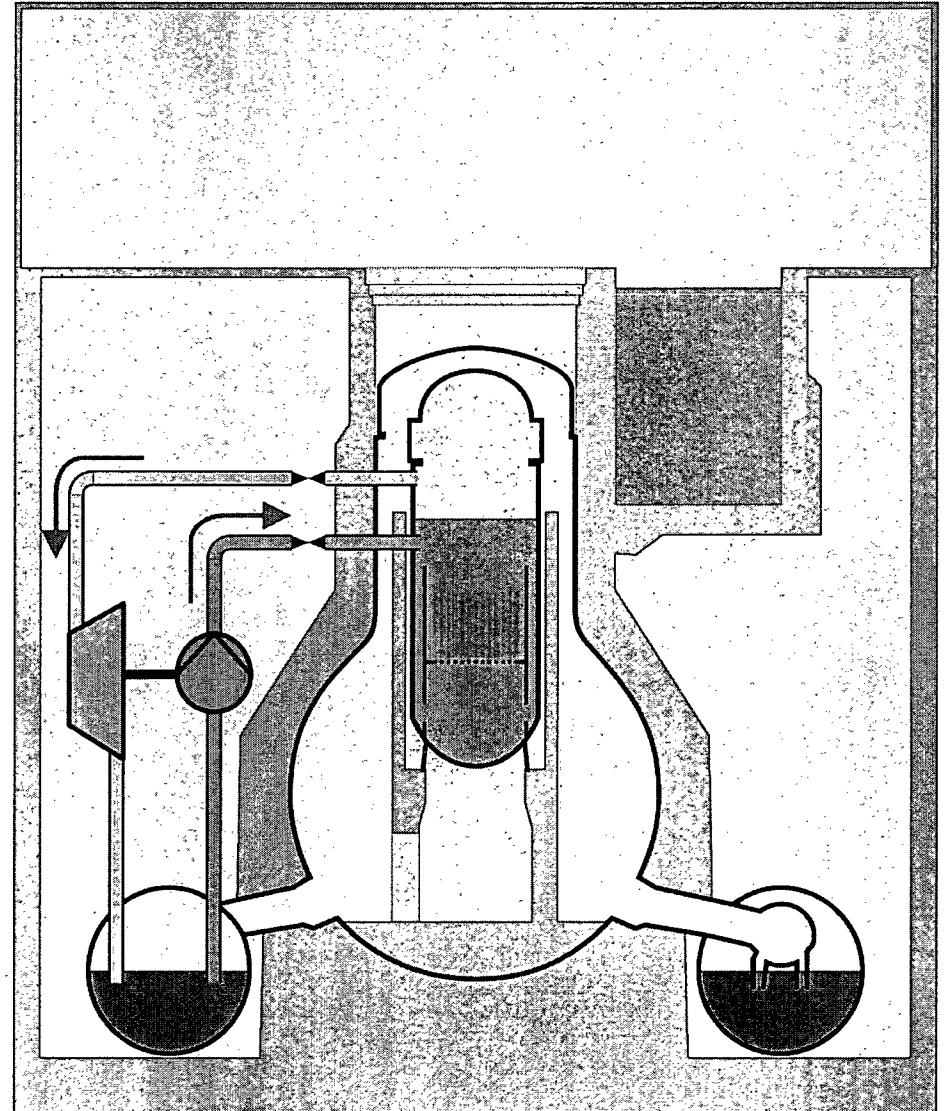
The Fukushima Daiichi Incident

2. Accident progression

► Reactor Core Isolation Pump still available

- ◆ Steam from the Reactor drives a Turbine
- ◆ Steam gets condensed in the Wet-Well
- ◆ Turbine drives a Pump
- ◆ Water from the Wet-Well gets pumped in Reactor
- ◆ Necessary:
 - Battery power
 - Temperature in the wet-well must be below 100°C

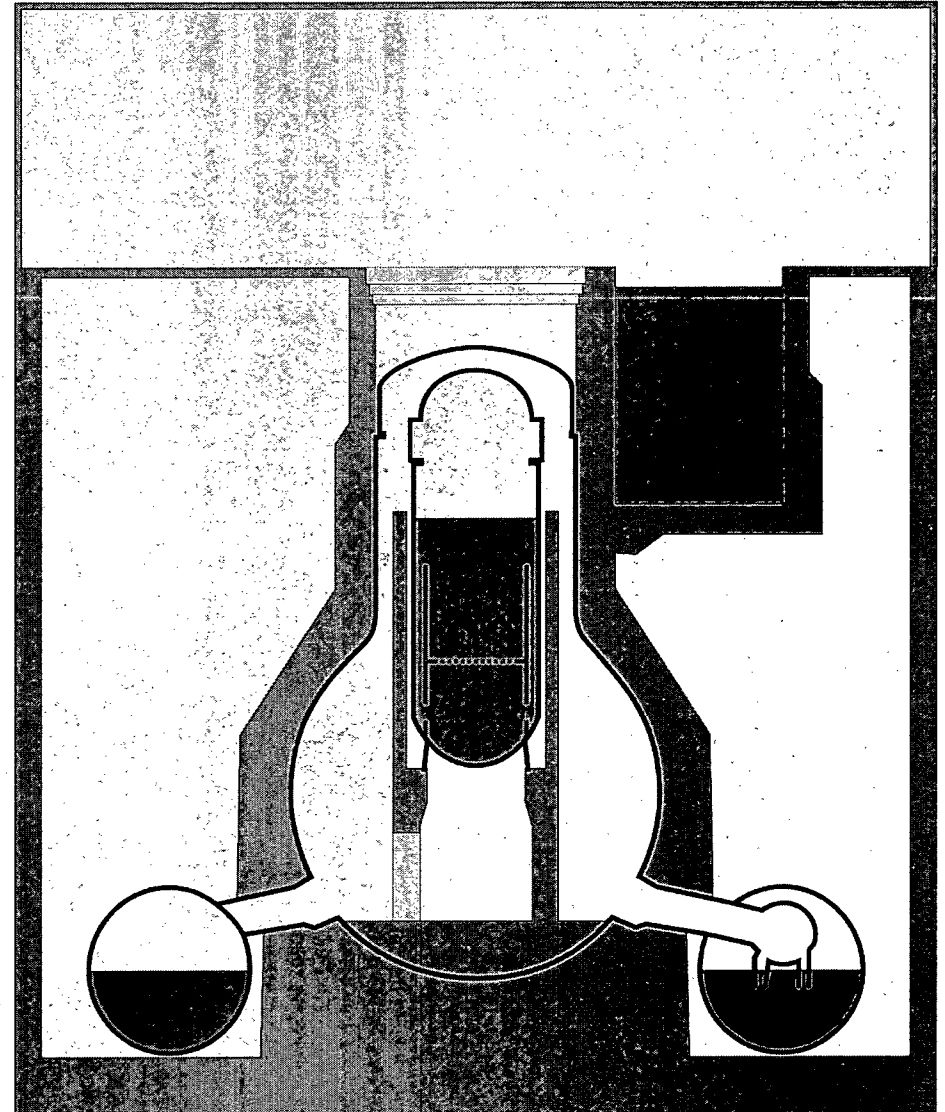
► As there is no heat removal from the building, the Core isolation pump cant work infinitely



The Fukushima Daiichi Incident

2. Accident progression

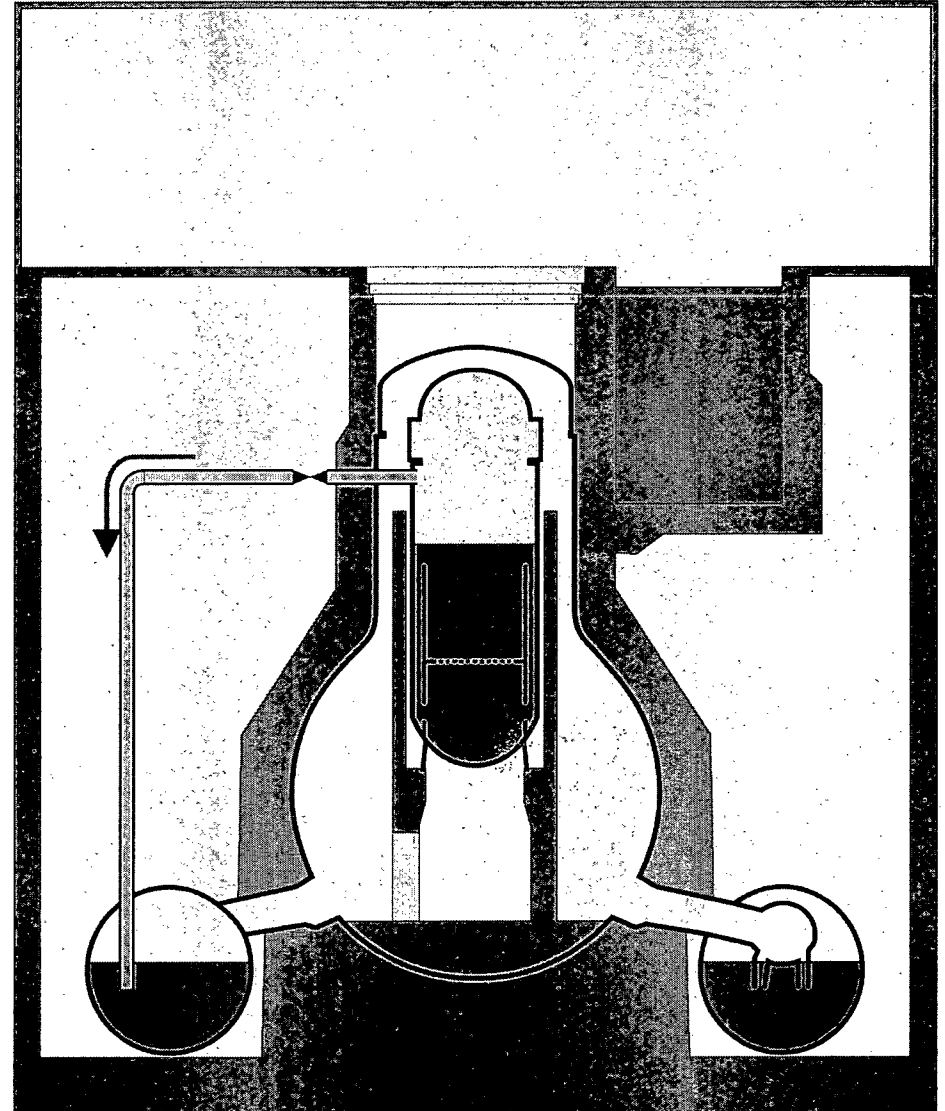
- ▶ Reactor Isolation pump stops
 - ◆ 11.3. 16:36 in Unit 1
(Batteries empty)
 - ◆ 14.3. 13:25 in Unit 2
(Pump failure)
 - ◆ 13.3. 2:44 in Unit 3
(Batteries empty)
- ▶ Decay Heat produces still steam in Reactor pressure Vessel
 - ◆ Pressure rising
- ▶ Opening the steam relieve valves
 - ◆ Discharge Steam into the Wet-Well
- ▶ Descending of the Liquid Level in the Reactor pressure vessel



The Fukushima Daiichi Incident

2. Accident progression

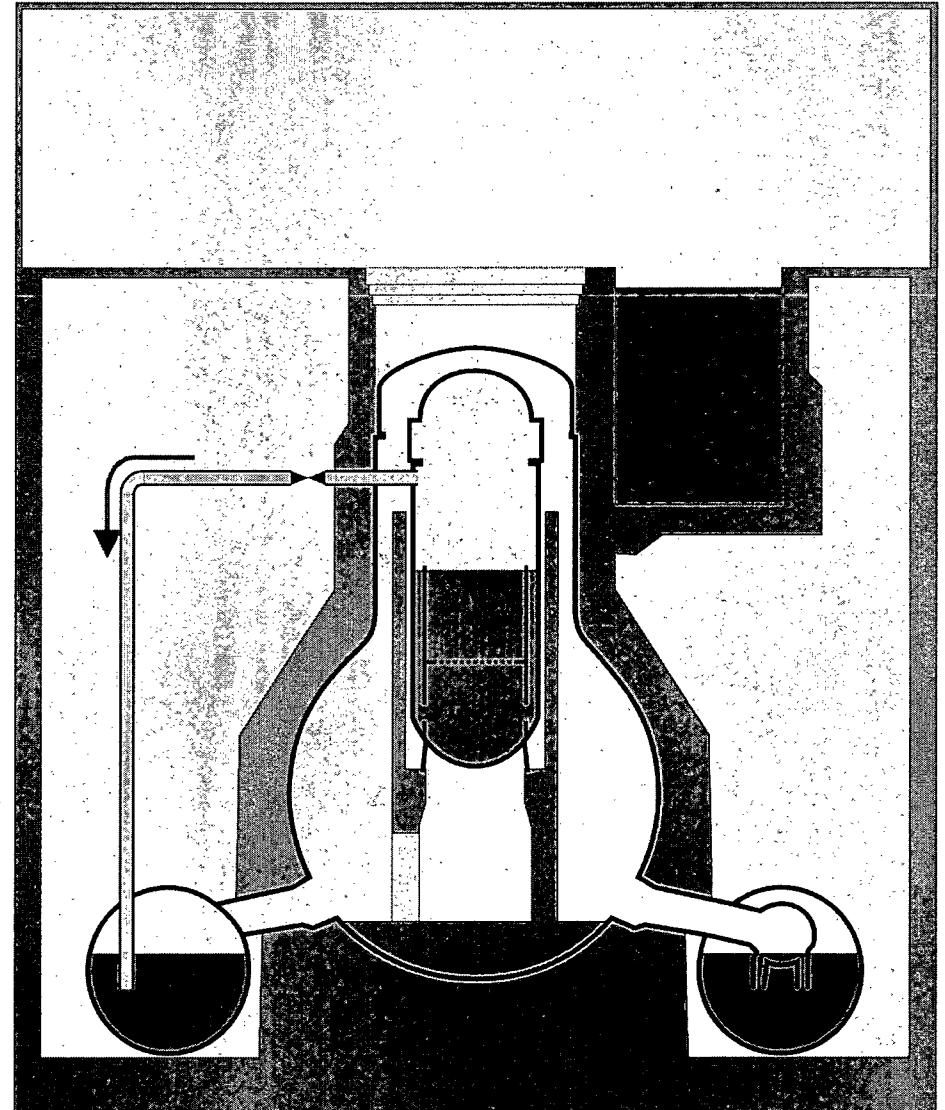
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The Fukushima Daiichi Incident

2. Accident progression

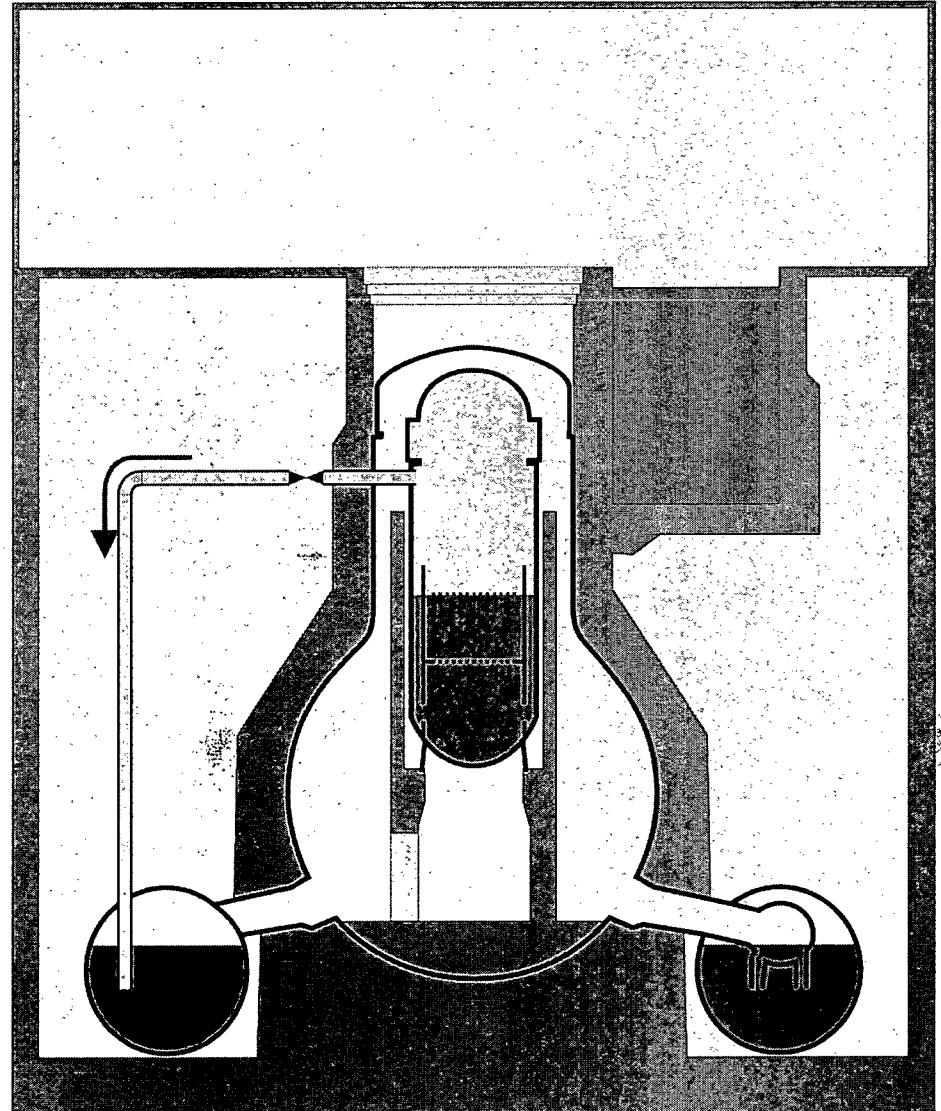
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The Fukushima Daiichi Incident

2. Accident progression

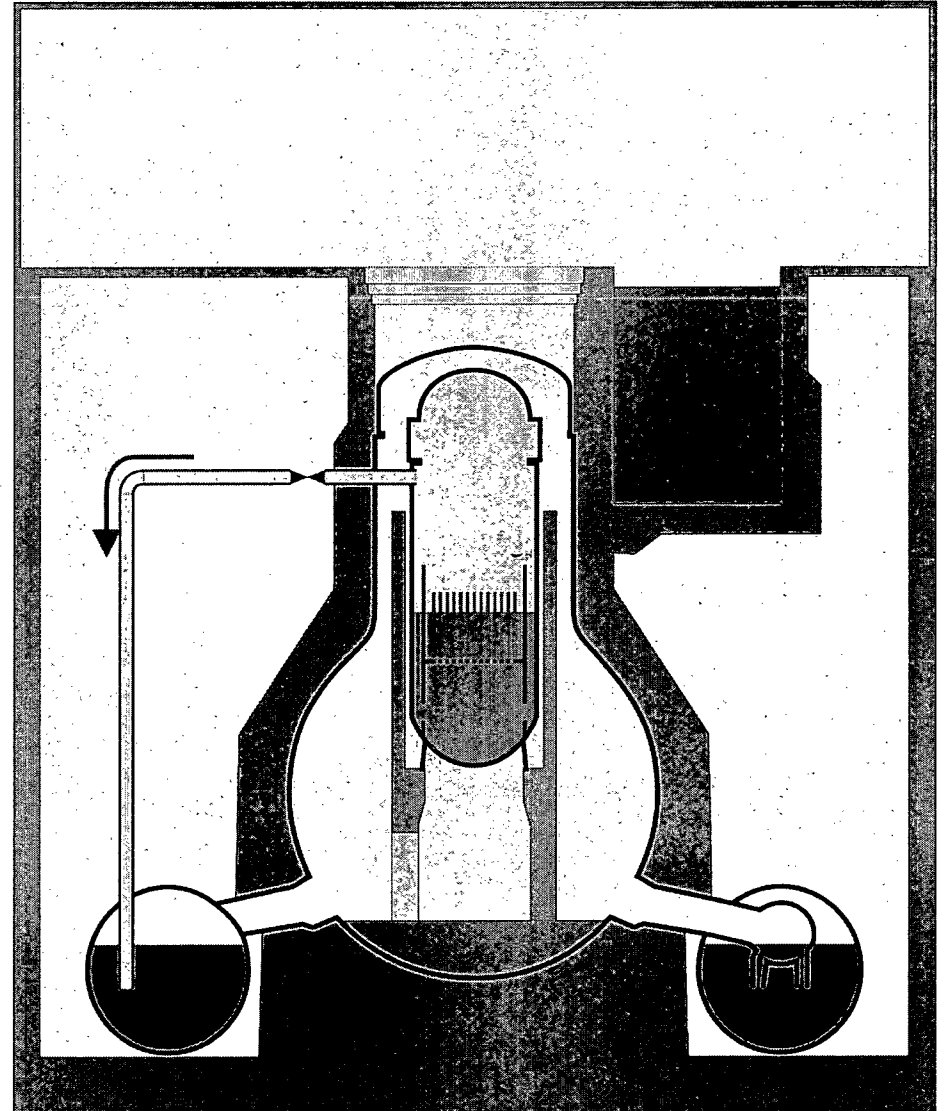
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The Fukushima Daiichi Incident

2. Accident progression

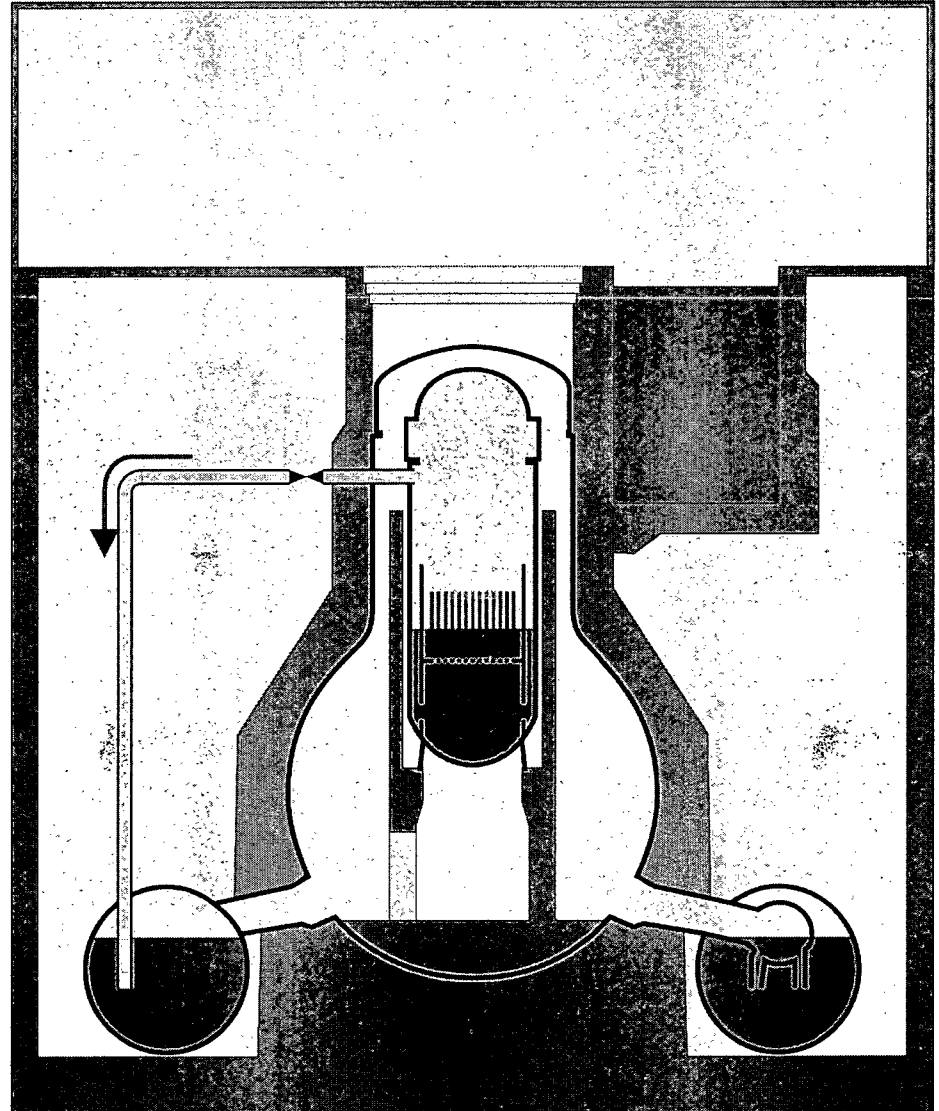
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The Fukushima Daiichi Incident

2. Accident progression

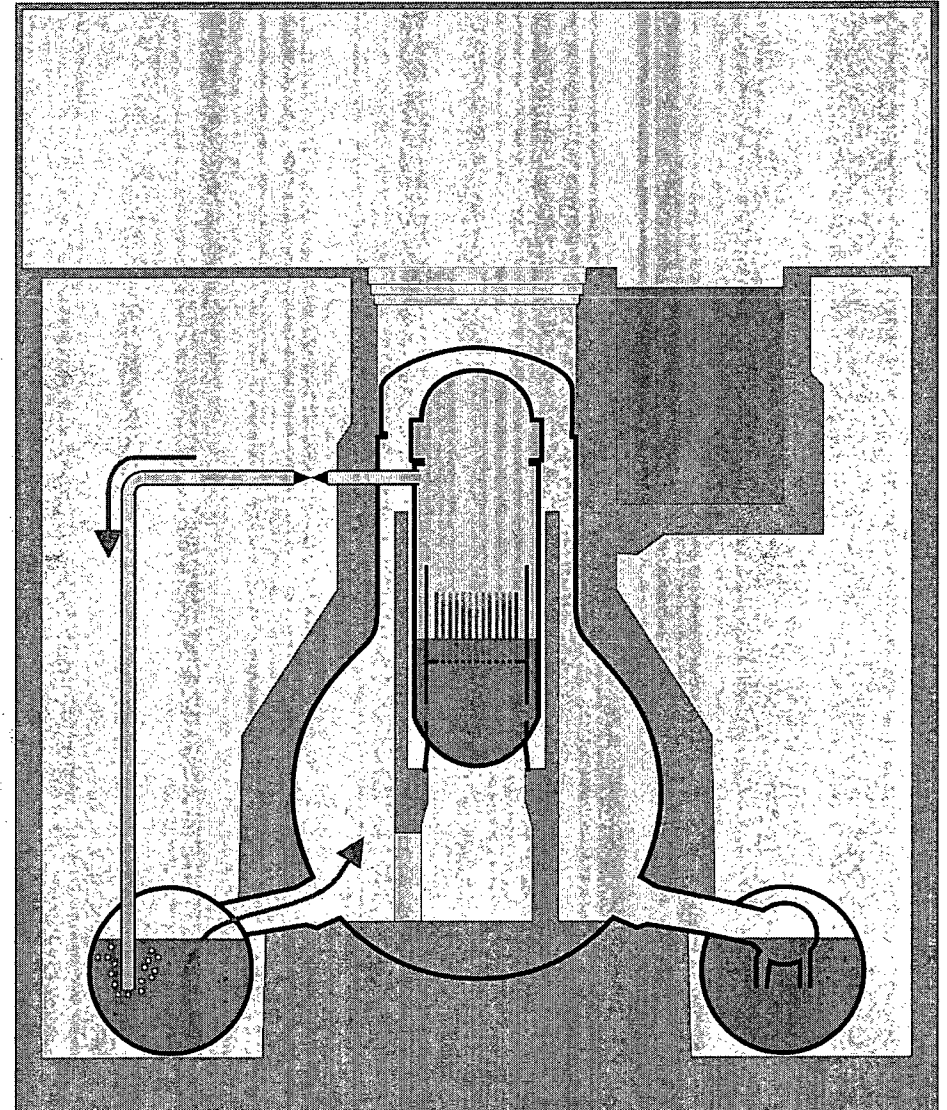
- ▶ Measured, and here referenced Liquid level is the collapsed level. The actual liquid level lies higher due to the steam bubbles in the liquid
- ▶ ~50% of the core exposed
 - ◆ Cladding temperatures rise, but still no significant core damage
- ▶ ~2/3 of the core exposed
 - ◆ Cladding temperature exceeds $\sim 900^{\circ}\text{C}$
 - ◆ Ballooning / Breaking of the cladding
 - ◆ Release of fission products from the fuel rod gaps



The Fukushima Daiichi Incident

2. Accident progression

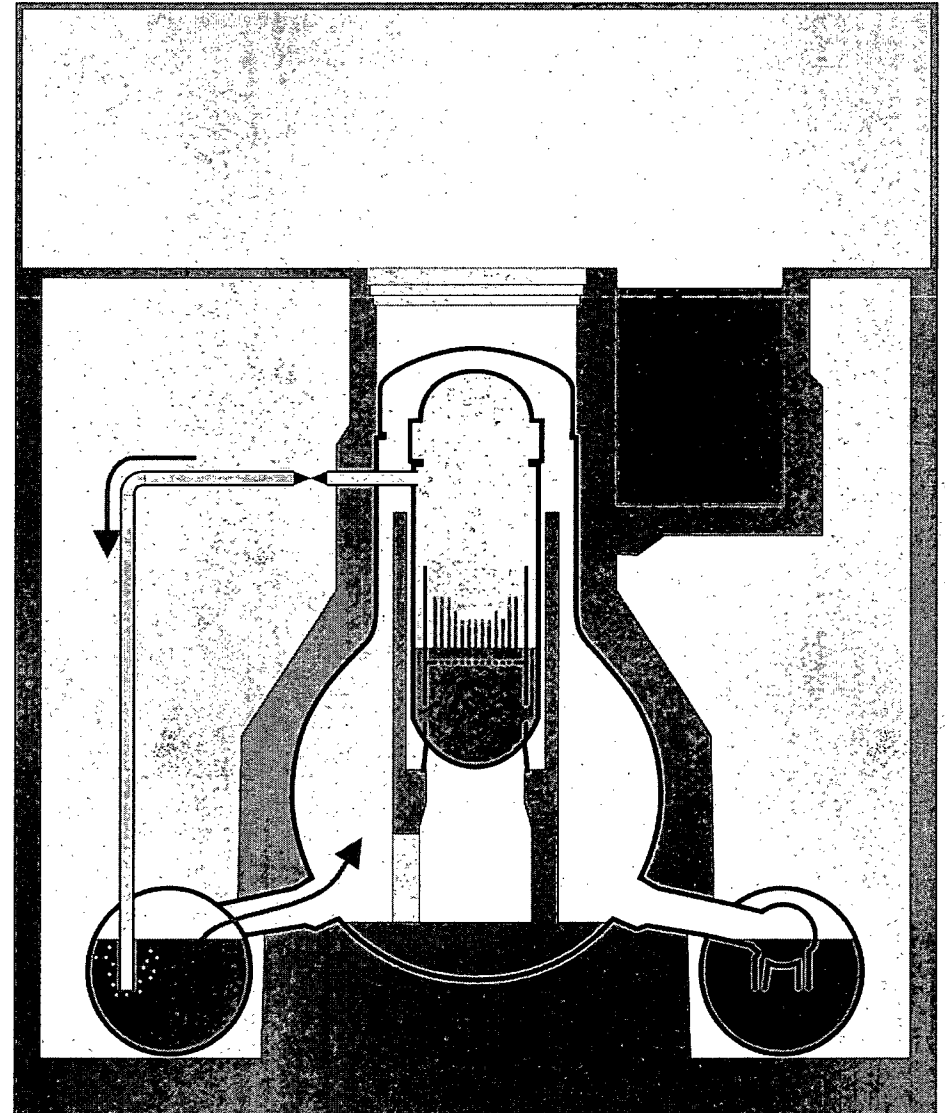
- ▶ ~3/4 of the core exposed
 - ◆ Cladding exceeds ~1200°C
 - ◆ Zirconium in the cladding starts to burn under Steam atmosphere
 - ◆ $\text{Zr} + 2\text{H}_2\text{O} \rightarrow \text{ZrO}_2 + 2\text{H}_2$
 - ◆ Exothermal reaction further heats the core
 - ◆ Generation of hydrogen
 - Unit 1: 300-600kg
 - Unit 2/3: 300-1000kg
 - ◆ Hydrogen gets pushed via the wet-well, the wet-well vacuum breakers into the dry-well



The Fukushima Daiichi Incident

2. Accident progression

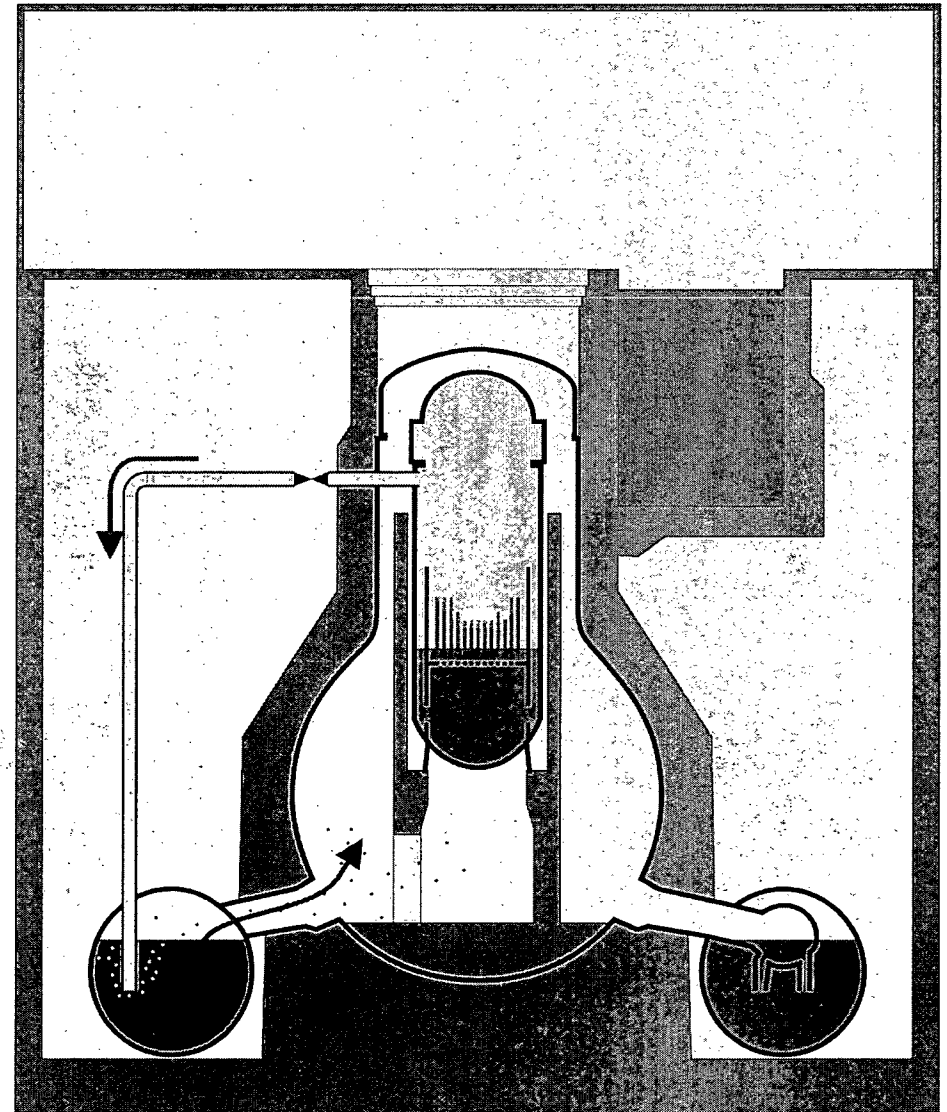
- ▶ at ~1800°C [Unit 1,2,3]
 - ◆ Melting of the Cladding
 - ◆ Melting of the steel structures
- ▶ at ~2500°C [Block 1,2]
 - ◆ Breaking of the fuel rods
 - ◆ debris bed inside the core
- ▶ at ~2700°C [Block 1]
 - ◆ Melting of Uranium-Zirconium eutectics
- ▶ Restoration of the water supply stops accident in all 3 Units
 - ◆ Unit 1: 12.3. 20:20 (27h w.o. water)
 - ◆ Unit 2: 14.3. 20:33 (7h w.o. water)
 - ◆ Unit 3: 13.3. 9:38 (7h w.o. water)



The Fukushima Daiichi Incident

2. Accident progression

- ▶ Release of fission products during melt down
 - ◆ Xenon, Cesium, Iodine,...
 - ◆ Uranium/Plutonium remain in core
 - ◆ Fission products condensate to airborne Aerosols
- ▶ Discharge through valves into water of the condensation chamber
 - ◆ Pool scrubbing binds a fraction of Aerosols in the water
- ▶ Xenon and remaining aerosols enter the Dry-Well
 - ◆ Deposition of aerosols on surfaces further decontaminates air



The Fukushima Daiichi Incident

2. Accident progression

► Containment

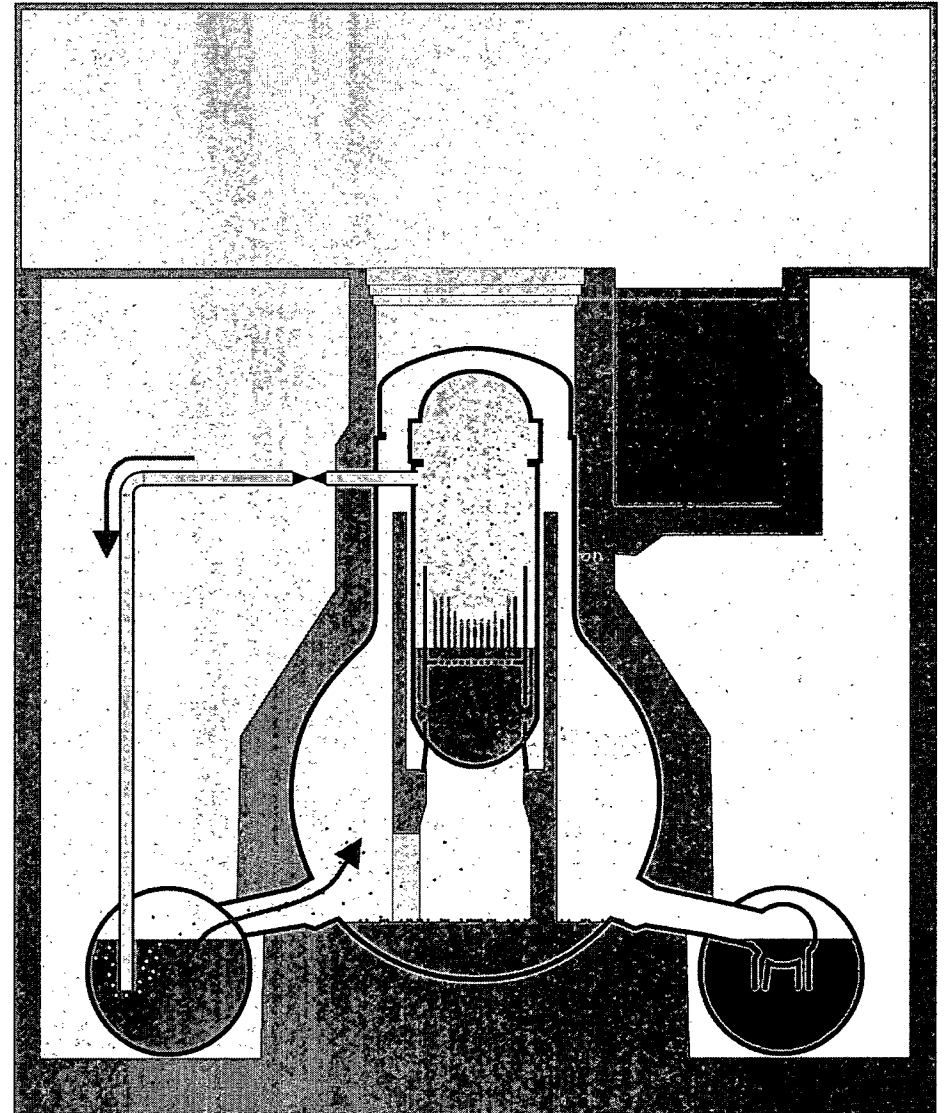
- ◆ Last barrier between Fission Products and Environment
- ◆ Wall thickness ~3cm
- ◆ Design Pressure 4-5bar

► Actual pressure up to 8 bars

- ◆ Normal inert gas filling (Nitrogen)
- ◆ Hydrogen from core oxidation
- ◆ Boiling condensation chamber (like a pressure cooker)

► Depressurization of the containment

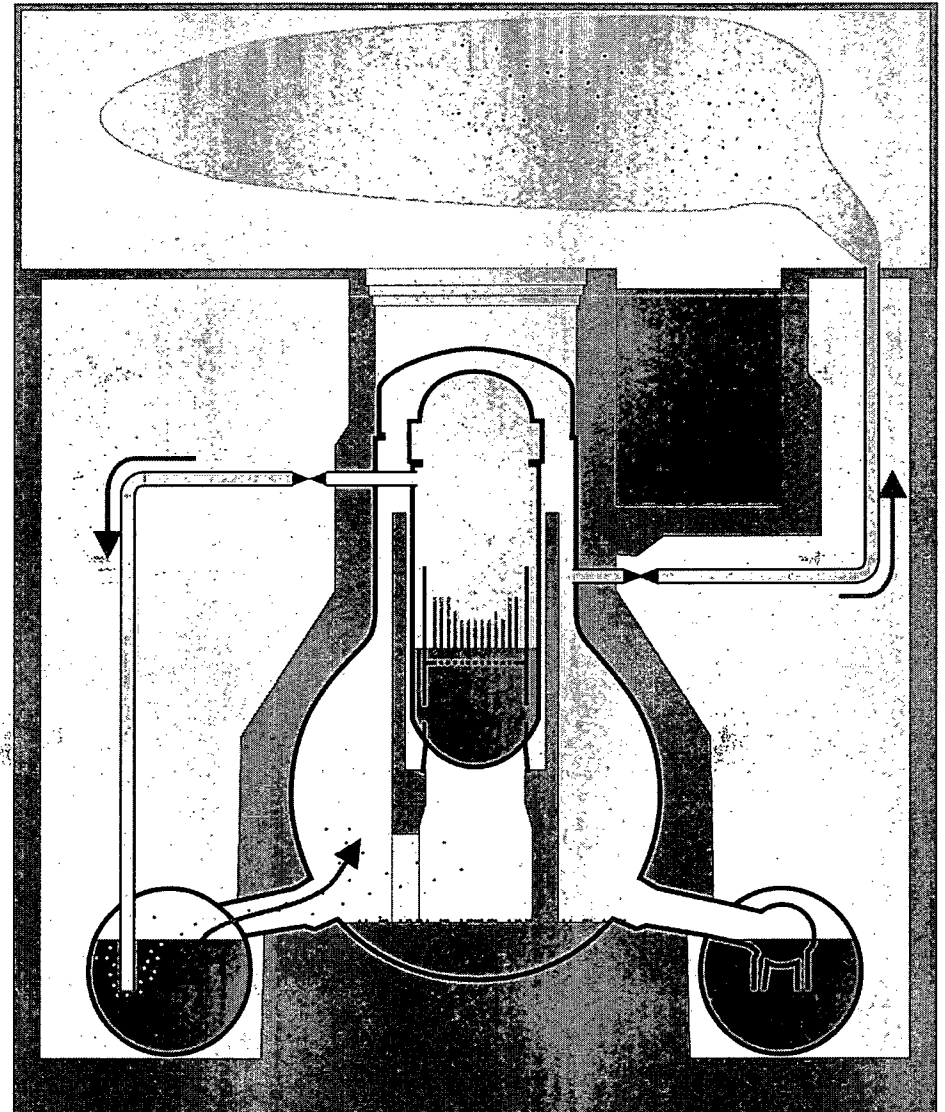
- ◆ Unit 1: 12.3. 4:00
- ◆ Unit 2: 13.3 00:00
- ◆ Unit 3: 13.3. 8.41



The Fukushima Daiichi Incident

2. Accident progression

- ▶ Positive und negative Aspects of depressurizing the containment
 - ◆ Removes Energy from the Reactor building (only way left)
 - ◆ Reducing the pressure to ~4 bar
 - ◆ Release of small amounts of Aerosols (Iodine, Cesium ~0.1%)
 - ◆ Release of all noble gases
 - ◆ Release of Hydrogen
- ▶ Gas is released into the reactor service floor
 - ◆ Hydrogen is flammable

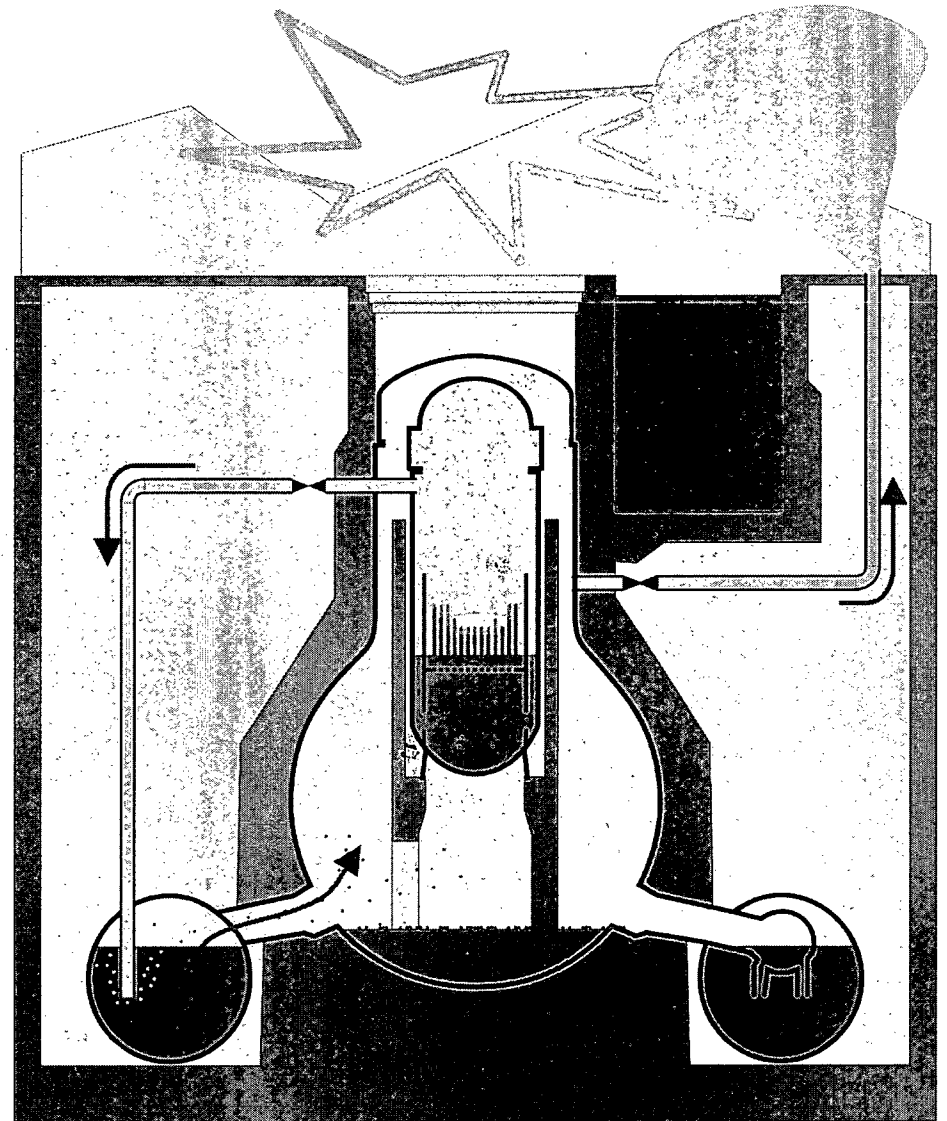
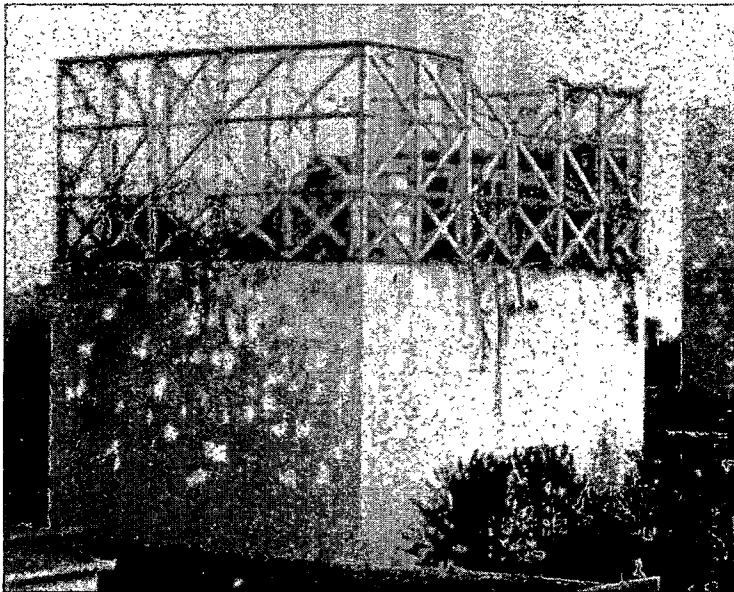


The Fukushima Daiichi Incident

2. Accident progression

► Unit 1 und 3

- ◆ Hydrogen burn inside the reactor service floor
- ◆ Destruction of the steel-frame roof
- ◆ Reinforced concrete reactor building seems undamaged
- ◆ Spectacular but minor safety relevant



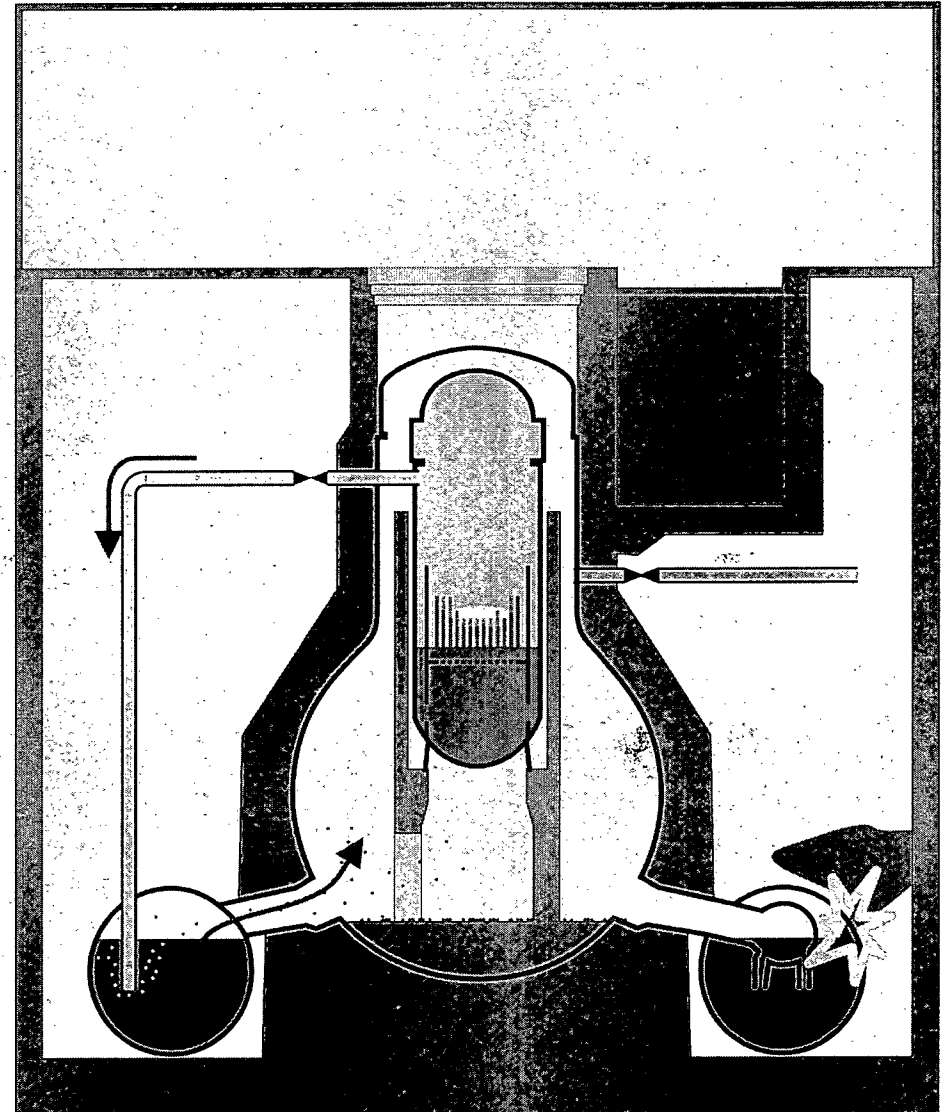
The Fukushima Daiichi Incident

2. Accident progression

► Unit 2

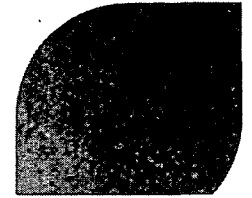
- ◆ Hydrogen burn inside the reactor building
- ◆ Probably damage to the condensation chamber (highly contaminated water)
- ◆ Uncontrolled release of gas from the containment
- ◆ **Release of fission products**
- ◆ Temporal evacuation of the plant
- ◆ High local dose rates on the plant site due to wreckage hinder further recovery work

- No clear information's why Unit 2 behaved differently

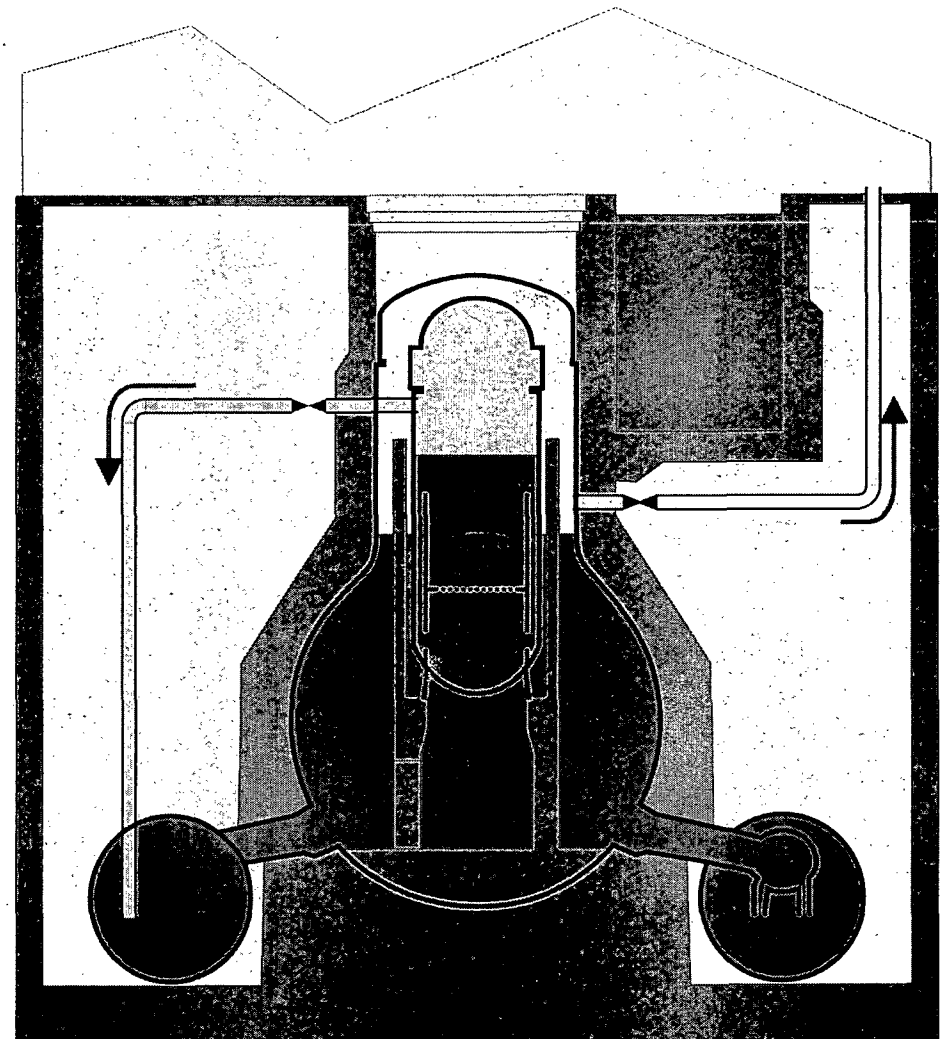


The Fukushima Daiichi Incident

2. Accident progression

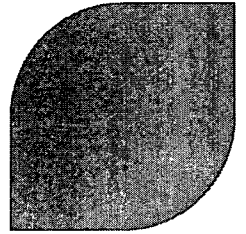


- ▶ Current status of the Reactors
 - ◆ Core Damage in Unit 1,2, 3
 - ◆ Building damage due to various burns Unit 1-4
 - ◆ Reactor pressure vessels flooded in all Units with mobile pumps
 - ◆ At least containment in Unit 1 flooded
- ▶ Further cooling of the Reactors by releasing steam to the atmosphere
- ▶ Only small further releases of fission products can be expected



The Fukushima Daiichi Incident

3. Radiological releases



► Directly on the plant site

◆ Before Explosion in Unit Block 2

- Below 2mSv / h
- Mainly due to released radioactive noble gases
- Measuring posts on west side. Maybe too small values measured due to wind

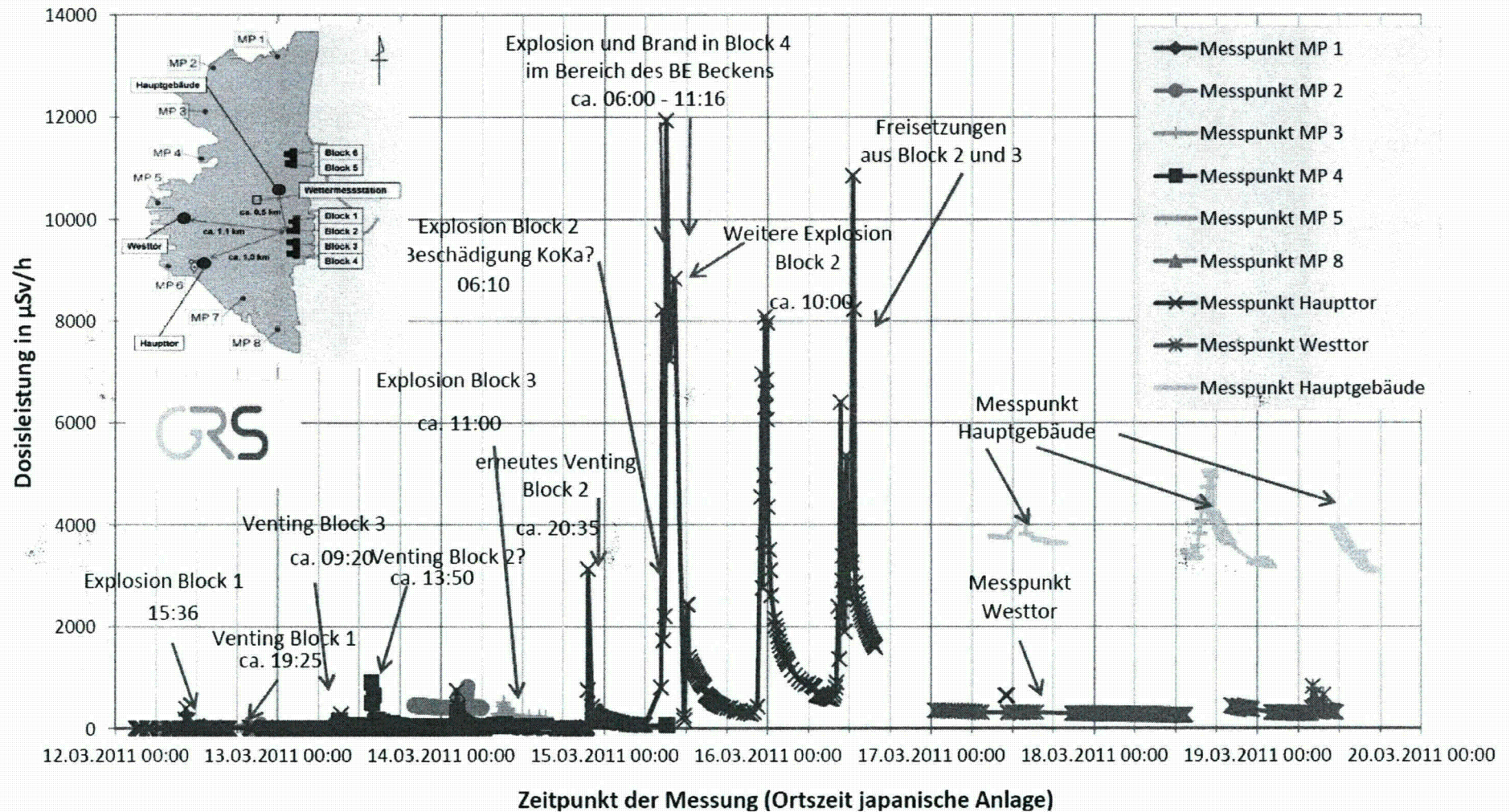
◆ After Explosion in Unit 2 (Damage of the Containment)

- Temporal peak values 12mSv / h
- (Origin not entirely clear)
- Local peak values on site up to 400mSv /h (wreckage / fragments?)
- Currently stable dose on site at 5mSv /h
- Inside the buildings a lot more

◆ Limiting time of exposure of the workers necessary

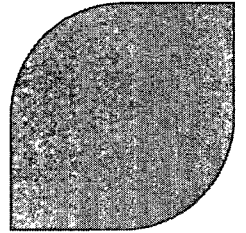
The Fukushima Daiichi Incident

3. Radiological releases



The Fukushima Daiichi Incident

3. Radiological releases



► Outside the Plant site

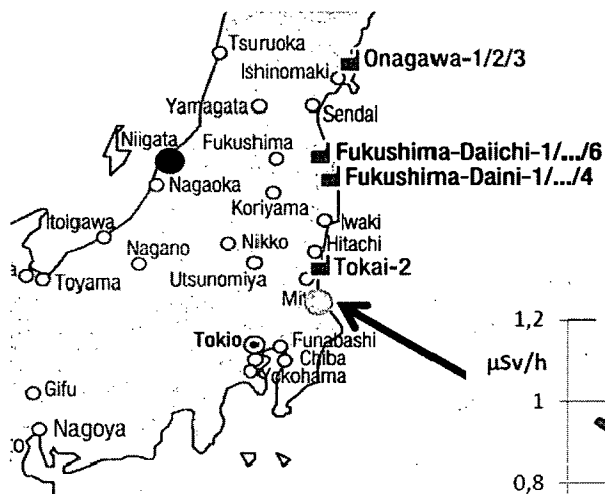
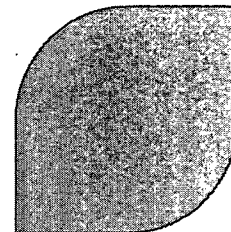
- ◆ As reactor building mostly intact
=> reduced release of Aerosols (not Chernobyl-like)
- ◆ Fission product release in steam
=> fast Aerosol grows, large fraction falls down in the proximity of the plant
- ◆ Main contribution to the radioactive dose outside plant are the radioactive noble gases
- ◆ Carried / distributed by the wind, decreasing dose with time
- ◆ No „Fall-out“ of the noble gases, so no local high contamination of soil

► ~20km around the plant

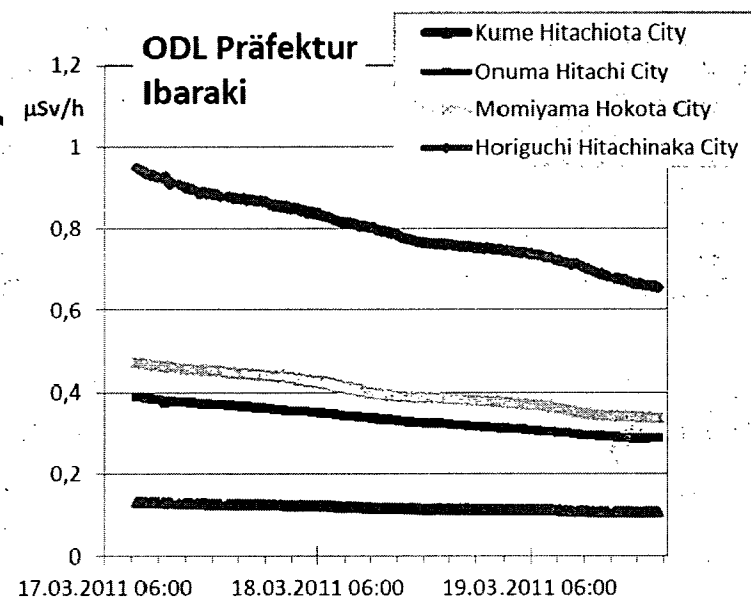
- ◆ Evacuations were adequate
- ◆ Measured dose up to 0.3mSv/h for short times
- ◆ Maybe destruction of crops / dairy products this year
- ◆ Probably no permanent evacuation of land necessary

The Fukushima Daiichi Incident

3. Radiological releases



GRS.de



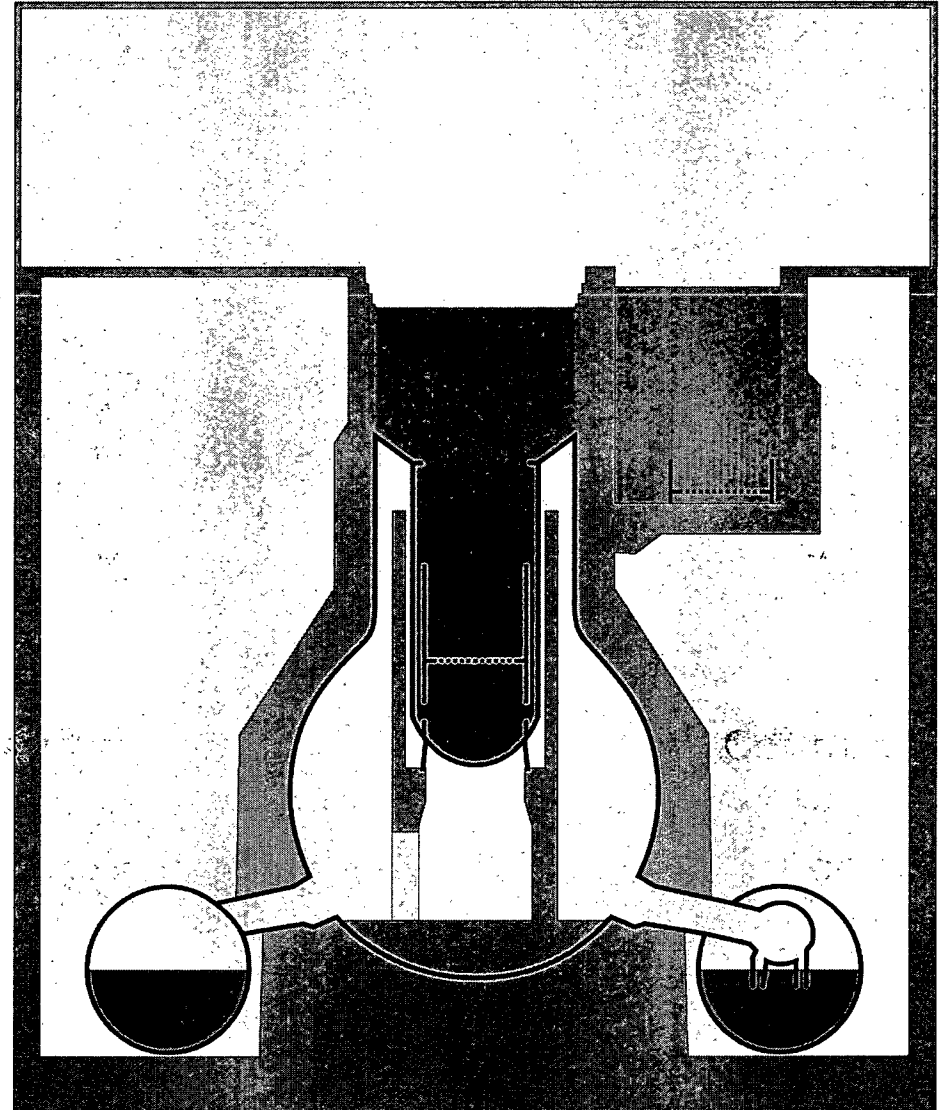
► ~50km around the plant

- ◆ Control of Crop / Dairy products
- ◆ Usage of Iodine pills
(Caution, pills can interfere with heart medicine)

The Fukushima Daiichi Incident

4. Spent fuel pools

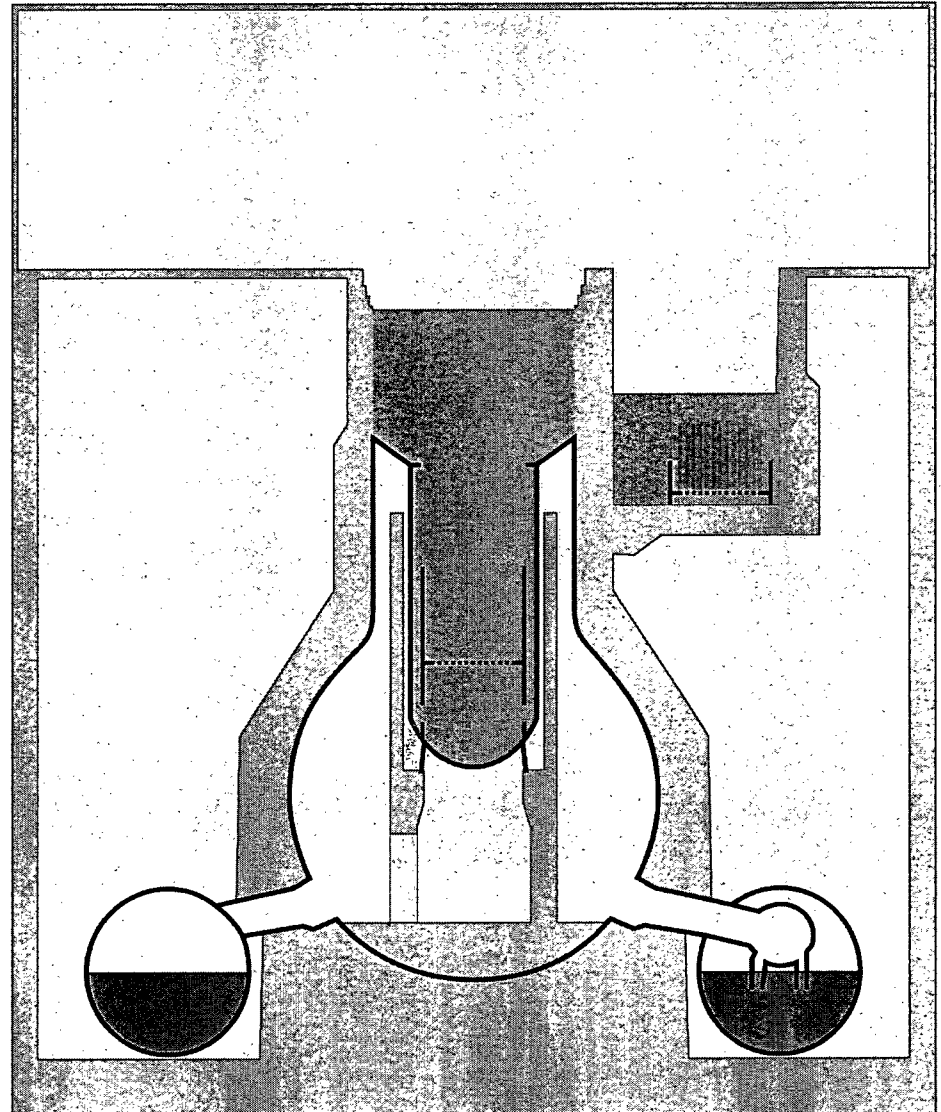
- ▶ Spent fuel stored in Pool on Reactor service floor
 - ◆ Due to maintenance in Unit 4 entire core stored in Fuel pool
 - ◆ Dry-out of the pools
 - Unit 4: in 10 days
 - Unit 1-3,5,6 in few weeks
 - ◆ **Leakage of the pools due to Earthquake?**
- ▶ Consequences
 - ◆ Core melt „on fresh air “
 - ◆ Nearly no retention of fission products
 - ◆ Large release



The Fukushima Daiichi Incident

4. Spent fuel pools

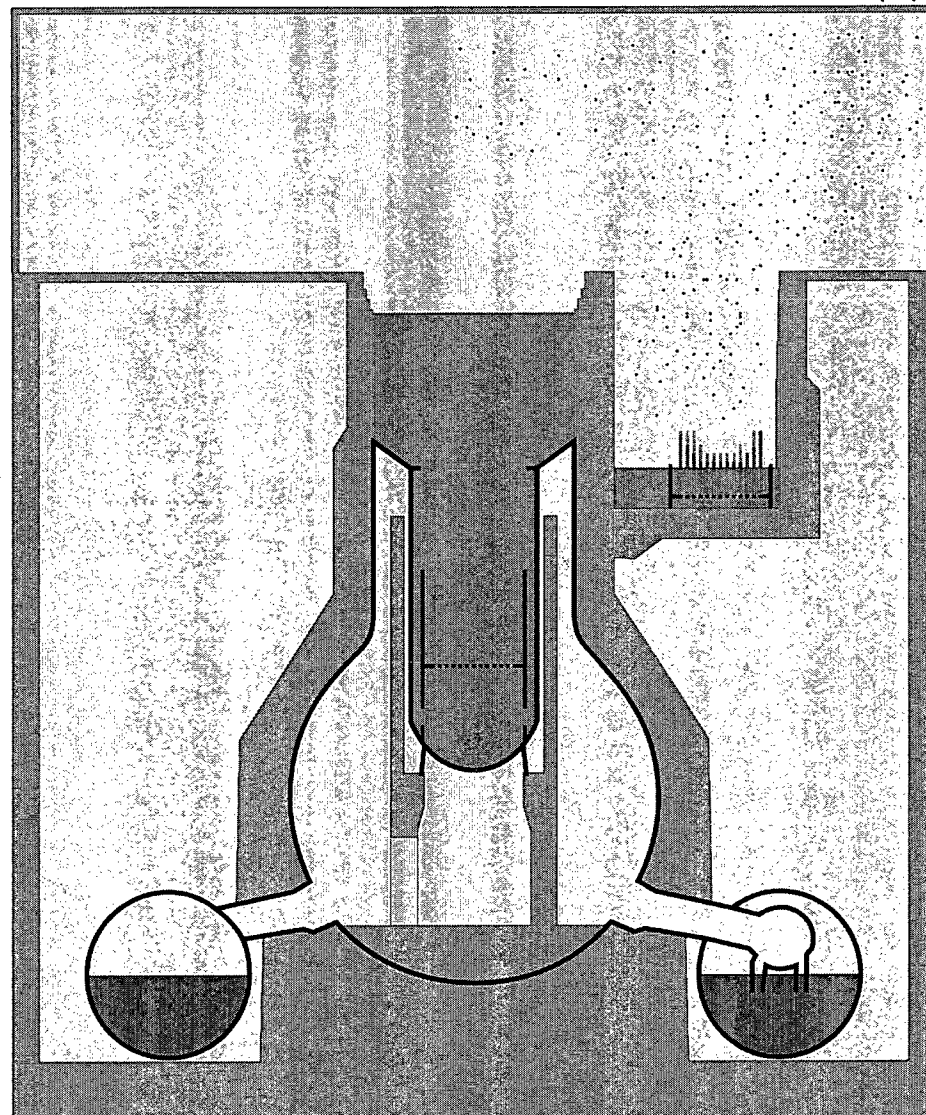
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The Fukushima Daiichi Incident

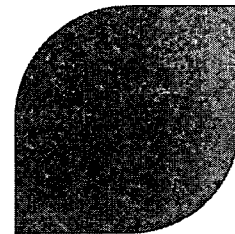
4. Spent fuel pools

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- ▶ Consequences
 - ◆ Core melt „on fresh air “
 - ◆ Nearly no retention of fission products
 - ◆ Large release
- ▶ **It is currently unclear if release from fuel pool already happened**



The Fukushima Daiichi Incident

5. Sources of Information



► Good sources of Information

◆ Gesellschaft für Reaktorsicherheit [GRS.de]

- Up to date
- Radiological measurements published
- German translation of japanese/englisch web pages

◆ Japan Atomic Industrial Forum [jaif.or.jp/english/]

- Current Status of the plants
- Measurement values of the reactors (pressure liquid level)

◆ Tokyo Electric Power Company [Tepco.co.jp]

- Status of the recovery work
- Casualties

► May too few information are released by TEPCO, the operator of the plant

pls
From: [Case, Michael](#)
To: [Skeen, David](#); [Gray, Kathy](#); [Uhle, Jennifer](#); [Brown, Frederick](#); [Ruland, William](#); [Hiland, Patrick](#)
Cc: [Thorp, John](#); [Thomas, Eric](#); [Cunningham, Liza](#)
Subject: RE: ACTION: Confirmation requested for RST Director Schedule - 3/26-4/2/2011
Date: Tuesday, March 22, 2011 2:53:59 PM

It looks like I'm very moveable since we're both on mids. Just propose which ones you want to do and I'll do the rest.

mark
From: Skeen, David
Sent: Tuesday, March 22, 2011 2:48 PM
To: Gray, Kathy; Uhle, Jennifer; Brown, Frederick; Ruland, William; Hiland, Patrick; Case, Michael
Cc: Thorp, John; Thomas, Eric; Cunningham, Liza
Subject: RE: ACTION: Confirmation requested for RST Director Schedule - 3/26-4/2/2011

All,

I will be unable to support the RST from April 1 – April 14, since I will be in Vienna for the Convention on Nuclear Safety. I can swap with someone and take one of the shifts earlier in the week, if someone would care to swap (maybe Fred or Mike?).

Thanks!

mark *release*
From: Gray, Kathy
Sent: Tuesday, March 22, 2011 12:04 PM
To: Skeen, David; Uhle, Jennifer; Brown, Frederick; Ruland, William; Hiland, Patrick; Case, Michael
Cc: Thorp, John; Thomas, Eric; Cunningham, Liza; Gray, Kathy
Subject: ACTION: Confirmation requested for RST Director Schedule - 3/26-4/2/2011
Importance: High

Please confirm that you are available to provide coverage in the Ops Center, as the RST Director, as follows:

Reactor Safety Team (RST) Director Schedule

March 26 – April 2, 2011

Shift	3/26 (Sat)	3/27 (Sun)	3/28 (Mon)	3/29 (Tues)	3/30 (Wed)	3/31 (Thur)	4/1 (Fri)	4/2 (Sat)
7am– 3pm	Pat Hiland	Pat Hiland	Pat Hiland	Jennifer Uhle	Jennifer Uhle	Jennifer Uhle	Jennifer Uhle	Brian Holian
3pm– 11pm	Bill Ruland	Fred Brown	Fred Brown	Fred Brown	Fred Brown	Bill Ruland	Bill Ruland	Bill Ruland
11pm– 7am	Mike Case	Mike Case	Mike Case	Mike Case	Dave Skeen	Dave Skeen	Dave Skeen	Dave Skeen

Thanks very much.

release

Japan
Related

From: Flory, Shirley
To: Rini, Brett; Ibarra, Jose; Rivera-Lugo, Richard; Armstrong, Kenneth; Case, Michael; Coe, Doug; Coyne, Kevin; Gibson, Kathy; Richards, Stuart; Sangimino, Donna-Marie; Scott, Michael; Sheron, Brian; Uhle, Jennifer; Valentin, Andrea
Subject: FW: EDO Alignment/Pre-briefs for Commission Meetings
Date: Tuesday, March 22, 2011 2:14:56 PM
Attachments: EDO Alignment, Prebriefs for CM Meetings.doc

NOTE MEETINGS RE JAPANESE EVENTS – THANKS -SHIRLEY

From: Taylor, Renee (EDO)
Sent: Tuesday, March 22, 2011 2:09 PM
To: Andersen, James; Ash, Darren; Blount, Tom; Boger, Bruce; Borchardt, Bill; Bowman, Adriane; Boyce, Thomas (OIS); Boyd, Lena; Buckley, Patricia; Cannady, Ashley; Carpenter, Cynthia; Casby, Marcia; Casto, Chuck; Cianci, Sandra; Cohen, Miriam; Collins, Elmo; Collins, Jay; Cooper, LaToya; Corley, Cherrie; Damiano, Debra; Dapas, Marc; Dean, Bill; Dubose, Sheila; EDO_ETAs; Evans, Michele; Flory, Shirley; Garland, Stephanie; Givvines, Mary; Greene, LaTosha; Grobe, Jack; Haney, Catherine; Hasan, Nasreen; Higginbotham, Tina; Holahan, Gary; Howard, Patrick; Johnson, Michael; Kelley, Corentis; Landau, Mindy; Lee, Pamela; Leeds, Eric; Lockhart, Denise; Lubinski, John; Mamish, Nader; Matakas, Gina; Mayberry, Theresa; McClain, Nicole; McCrary, Cheryl; McCree, Victor; McGinty, Tim; Miles, Patricia; Miller, Charles; Mitchell, Matthew; Muessle, Mary; ODaniell, Cynthia; Owen, Lucy; Pederson, Cynthia; Penny, Melissa; Plisco, Loren; Quesenberry, Jeannette; Riddick, Nicole; Ronewicz, Lynn; Ross, Brenda; Salus, Amy; Satorius, Mark; Scarbrough, Thomas; Schaeffer, James; Schumann, Stacy; Schwarz, Sherry; Sheron, Brian; Sprogeris, Patricia; Tannenbaum, Anita; Taylor, Renee; Terry, Leslie; Thomas, Loretta; Tomczak, Tammy; Uhle, Jennifer; Veltri, Debra; Virgilio, Martin; Walker, Dwight; Weber, Michael; Wiggins, Jim; Williams, Barbara; Zimmerman, Roy
Subject: EDO Alignment/Pre-briefs for Commission Meetings

An updated EDO Alignment/Pre-brief listing is attached. Please ensure that your calendar reflects the changes as needed.

Thank you,
Renee

✓/136

EDO ALIGNMENT/PRE-BRIEFS FOR COMMISSION MEETINGS

Updated: 03/22/11

03/24/11 (POSTPONED – New Date TBD)

(9:00 – 12:30)

Part 50.46a Rulemaking Risk-Informed ECCS Rule

EDO Alignment: 01/31/11 @ 4:00 pm

EDO Pre-brief: 03/14/11 @ 4:00 pm

03/29/11

(9:00 – 12:00)

Small Modular Reactors

EDO Alignment: 01/27/11 @ 1:30 pm

EDO Pre-brief: 03/17/11 @ 3:00 pm

03/31/11 (Closed)

(2:30 – 3:30)

Discussion of Management Issues

EDO Alignment: CANCELLED NOT NEEDED - 02/01/11 @ 3:00 pm

EDO Pre-brief: CANCELLED NOT NEEDED - 03/21/11 @ 3:00 pm

04/14/11

(TBD)

Japanese Earthquake Status – Focus on Health Effects of Radiation

EDO Alignment: 03/28/11 @ 3:00 pm (Joint meeting with 4/28 CM Alignment)

EDO Pre-brief: 04/06/11 @ 4:00 pm

04/19/11

(9:00 – 12:00)

Part 37 Rulemaking – Physical Protection & Byproduct Material

EDO Alignment: 02/10/11 @ 1:00 pm

EDO Pre-brief: 03/31/11 @ 10:00 am

04/28/11

(TBD)

Japanese Earthquake Status – Focus on Station Black-Out

EDO Alignment: 03/28/11 @ 3:00 pm (Joint meeting with 4/14 CM Alignment)
EDO Pre-brief: 04/14/11 @ 10:00 am

04/28/11 (POSTPONED – New Date TBD)

(9:00 – 12:15)

ITAAC Related Activities

EDO Alignment: CANCELLED - 02/28/11 @ 3:30 pm
EDO Pre-brief: CANCELLED - 04/18/11 @ 4:00 pm

05/03/11

(TBD)

Near Term Tasking – 30 Day Quick Look

EDO Alignment: 04/07/11 @ 4:00 pm
(Tentative – Joint meeting with 6/16 CM Alignment)
EDO Pre-brief: 04/18/11 @ 4:00 pm

05/12/11 (Rescheduled from 06/02/11)

(9:00 – 12:00)

Final EP Rule

EDO Alignment: 04/07/11 @ 1:00 pm (Rescheduled from 04/06/11)
EDO Pre-brief: 05/02/11 @ 3:00 pm (Rescheduled from 05/17/11)

05/12/11 (POSTPONED – New Date TBD)

(9:00 – 12:00)

Cumulative Effects of Reactor Regulation

EDO Alignment: CANCELLED - 03/22/11 @ 9:00 am
EDO Pre-brief: CANCELLED - 05/02/11 @ 3:00 pm

05/27/11

(9:00 – 12:00)

Briefing on Results of AARM

EDO Alignment: CANCELLED NOT NEEDED - 03/28/11 @ 3:00 pm
EDO Pre-brief: 05/12/11 @ 3:00 pm

06/02/11 (Rescheduled from 05/03/11)

(9:30 – 10:30)

Human Capital and EEO

EDO Alignment: 03/17/11 @ 1:00 pm

EDO Pre-brief: 05/04/11 @ 4:00 pm (Rescheduled from 04/26/11)

06/06/11

(9:00 – 12:00)

Potential Meeting w/ACRS

EDO Alignment: 03/29/11 @ 4:00 pm

EDO Pre-brief: 05/19/11 @ 3:00 pm

06/16/11

(TBD)

Near Term Tasking – 60 Day Quick Look

EDO Alignment: 04/07/11 @ 4:00 pm

(Tentative – Joint meeting with 5/3 CM Alignment)

EDO Pre-brief: 06/02/11 @ 4:00 pm

(POSTPONED – Date TBD) 06/16/11

(9:00 – 12:00)

International Activities or Potential Meeting w/ACRS

EDO Alignment: CANCELLED - 04/26/11 @ 1:00 pm

EDO Pre-brief: CANCELLED - 06/06/11 @ 3:00 pm

NOTE: Please be aware that this list is organized by the Commission meeting date. EDO Alignment meetings are generally scheduled approximately 60 days prior to the Commission meeting. EDO Pre-briefs are scheduled approximately 2 weeks prior to the Commission meeting. All meetings are scheduled based on the availability of the EDO/DEDOs calendars. All meetings are held in conference room O-17B4.

Kauffman, John

From: OST02 HOC
Sent: Tuesday, March 22, 2011 12:52 PM
To: Abrams, Charlotte; Abu-Eid, Bobby; Adams, John; Afshar-Tous, Mugeh; Ahn, Hosung; Alemu, Bezakulu; Alter, Peter; Anderson, Brian; Anderson, James; Arribas-Colon, Maria; Ashkeboussi, Nima; Athey, George; Baker, Stephen; Ballam, Nick; Barnhurst, Daniel; Barr, Cynthia; Barss, Dan; Bazian, Samuel; Bens, Michelle; Bergman, Thomas; Berry, Rollie; Bhachu, Ujagar; Bloom, Steven; Blount, Tom; Boger, Bruce; Bonnette, Cassandra; Borchardt, Bill; Bowers, Anthony; Bowman, Gregory; Boyce, Tom (RES); Brandon, Lou; Brandt, Philip; Brenner, Eliot; Brock, Kathryn; Brown, Cris; Brown, David; Brown, Eva; Brown, Frederick; Brown, Michael; Bukharin, Oleg; Burnell, Scott; Bush-Goddard, Stephanie; Campbell, Stephen; Camper, Larry; Carpenter, Cynthia; Carter, Mary; Case, Michael; Casto, Greg; Cecere, Bethany; Cervera, Margaret; Chazell, Russell; Chen, Yen-Ju; Cheok, Michael; Chokshi, Nilesh; Chowdhury, Prosanta; Circle, Jeff; Clement, Richard; Clinton, Rebecca; Coggins, Angela; Collins, Frank; Cool, Donald; Correia, Richard; Costa, Arlon; Couret, Ivonne; Crutchley, Mary Glenn; Cruz, Zahira; Cuadrado, Leira; Dacus, Eugene; DeCicco, Joseph; Decker, David; Dembek, Stephen; Devlin, Stephanie; Dimmick, Lisa; Doane, Margaret; Dorman, Dan; Dorsey, Cynthia; Dozier, Jerry; Drake, Margaret; Droggitis, Spiros; Dube, Donald; Dudes, Laura; Eads, Johnny; Emche, Danielle; English, Lance; Erlanger, Craig; Esmaili, Hossein; Figueroa, Roberto; Fiske, Jonathan; Flannery, Cindy; Floyd, Daphene; Foggie, Kirk; Foster, Jack; Fragoyannis, Nancy; Franovich, Rani; Frazier, Alan; Freshman, Steve; Fuller, Edward; Galletta, Thomas; Gambone, Kimberly; Gibson, Kathy; Giitter, Joseph; Gilmer, James; Gordon, Dennis; Gott, William; Grant, Jeffery; Greenwood, Carol; Grimes, Kelly; Grobe, Jack; Gross, Allen; Gulla, Gerald; Hale, Jerry; Hardesty, Duane; Harrington, Holly; Harris, Tim; Hart, Ken; Hart, Michelle; Harvey, Brad; Hasselberg, Rick; Hayden, Elizabeth; Helton, Donald; Henderson, Karen; Hiland, Patrick; Holahan, Patricia; Holahan, Vincent; Holian, Brian; Howard, Tabitha; Huffert, Anthony; Hurd, Sapna; Huyck, Doug; Imboden, Andy; Isom, James; Jackson, Karen; Jacobson, Jeffrey; Jerve, Richard; Jessie, Janelle; Johnson, Michael; Jolicoeur, John; Jones, Andrea; Jones, Cynthia; Jones, Henry; Kahler, Carolyn; Kammerer, Annie; Karas, Rebecca; Kauffman, John; Khan, Omar; Kolb, Timothy; Kotzalas, Margie; Kowalczyk, Jeffrey; Kratchman, Jessica; Kugler, Andrew; Lamb, Christopher; Lane, John; Larson, Emily; Laur, Steven; LaVie, Steve; Lewis, Robert; Li, Yong; Lichatz, Taylor; Lising, Jason; Lombard, Mark; Lubinski, John; Lui, Christiana; Lukes, Kim; Lynch, Jeffery; Ma, John; Mamish, Nader; Manahan, Michelle; Marksberry, Don; Marshall, Jane; Masao, Nagai; Maupin, Cardelia; Mayros, Lauren; Mazaika, Michael; McConnell, Keith; McCoppin, Michael; McDermott, Brian; McGinty, Tim; McGovern, Denise; McIntyre, David; McMurtry, Anthony; Merritt, Christina; Meyer, Karen; Miller, Charles; Miller, Chris; Milligan, Patricia; Miranda, Samuel; Mohseni, Aby; Moore, Scott; Morlang, Gary; Morris, Scott; Mroz (Sahm), Sara; Munson, Clifford; Murray, Charles; Nerret, Amanda; Nguyen, Caroline; Norris, Michael; Norton, Charles; Ordaz, Vonna; Owens, Janice; Padovan, Mark; Parillo, John; Patel, Jay; Patel, Pravin; Patrick, Mark; Perin, Vanice; Pope, Tia; Powell, Amy; Purdy, Gary; Quinlan, Kevin; Raddatz, Michael; Ragland, Robert; Ralph, Melissa; Ramsey, Jack; Reed, Elizabeth; Reed, Sara; Reed, Wendy; Reis, Terrence; Resner, Mark; Riley (OCA), Timothy; Riner, Kelly; Rini, Brett; Robinson, Edward; Rodriguez-Luccioni, Hector; Roggenbrodt, William; Ropon, Kimberly; Rosenberg, Stacey; Ross-Lee, MaryJane; Roundtree, Amy; Ruland, William; Ryan, Michelle; Salay, Michael; Salter, Susan; Salus, Amy; Sanfilippo, Nathan; Scarbrough, Thomas; Schaperow, Jason; Schmidt, Duane; Schmidt, Rebecca; Schoenebeck, Greg; Schrader, Eric; Schwartzman, Jennifer; Seber, Dogan; See, Kenneth; Shane, Raeann; Shea, James; Shepherd, Jill; Sheron, Brian; Skarda, Raymond; Skeen, David; Sloan, Scott; Smioldo, Elizabeth; Smith, Brooke; Smith, Stacy; Smith, Theodore; Stahl, Eric; Stang, Annette; Steger (Tucci), Christine; Stieve, Alice; Stone, Rebecca; Stransky, Robert; Sturz, Fritz; Sullivan, Randy; Summers, Robert; Sun, Casper; Tappert, John; Tegeler, Bret; Temple, Jeffrey; Thaggard, Mark; Thomas, Eric; Thorp, John; Tiruneh, Nebiyu; Tobin, Jennifer; Trefethen, Jean; Tschiltz, Michael; Turtill, Richard; Uhle, Jennifer; Valencia, Sandra; Vaughn, James; Versluis, Robert; Vick, Lawrence; Virgilio, Martin; Virgilio, Rosetta; Ward, Leonard; Ward, William; Wastler, Sandra; Watson, Bruce; Webber, Robert; Weber, Michael; White, Bernard; Wiggins, Jim; Williams, Donna; Williams, Joseph; Williamson, Linda; Willis, Dori; Wimbush, Andrea; Wittick, Brian; Wray, John; Wright, Lisa (Gibney); Wright, Ned; Wunder, George; Young, Francis; Zimmerman, Jacob; Zimmerman, Roy

Attachments: MASTER RESPONDER SCHEDULE FOR MAR 19-25-11- JAPAN EARTHQUAKE (2).pdf

Please disregard the last copy which was the template.

Revised Copy

Attached is the OPS Center watchbill for March 18-26th, you will be receiving the watchbill for the week of March 26-April 2nd, in the future. If you need to change the schedule, please send an email to OST02 HOC.

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE
MARCH 18-26

Position	Date	Time	Staff
Executive Team			
ET Director			
Fri-Sat	3/18-3/19	11pm-7am	Roy Zimmerman
Sat	19-Mar	7am - 3pm	Jim Wiggins
Sat	19-Mar	3pm-11pm	Brian Sheron
Sat-Sun	3/19-3/20	11pm - 7am	Mike Johnson
Sun	20-Mar	7am - 3pm	Jim Wiggins
Sun	20-Mar	3pm-11pm	Brian Sheron
Sun-Mon	3/20-3/21	11pm - 7am	Mike Johnson
Mon	21-Mar	7am - 3pm	Mike Weber
Mon	21-Mar	3pm-11pm	Jim Wiggins
Mon-Tues	3/21-3/22	11pm - 7am	Mike Johnson
Tues	22-Mar	7am - 3pm	Mike Weber
Tues	22-Mar	3pm-11pm	Jim Wiggins
Tues-Wed	3/22-3/23	11pm - 7am	Bruce Boger
Wed	23-Mar	7am - 3pm	Mike Weber
Wed	23-Mar	3pm-11pm	Roy Zimmerman
Wed-Thur	3/23-3/24	11pm - 7am	Bruce Boger
Thur	24-Mar	7am - 3pm	Mike Weber
Thur	24-Mar	3pm-11pm	Roy Zimmerman
Thur-Fri	3/24-3/25	11pm - 7am	Jennifer Uhle
Fri	25-Mar	7am - 3pm	Mike Weber
Fri	25-Mar	3pm-11pm	Roy Zimmerman
Fri-Sat	3/25-3/26	11pm-7am	Jennifer Uhle
ET Response Advisor			
Fri-Sat	3/18-3/19	11pm-7am	Scott Morris
Sat	19-Mar	7am - 3pm	Brian McDermott
Sat	19-Mar	3pm-11pm	Mary Jane (MJ) Ross-Lee
Sat-Sun	3/19-3/20	11pm - 7am	Scott Morris
Sun	20-Mar	7am - 3pm	Chris Miller
Sun	20-Mar	3pm-11pm	Mary Jane (MJ) Ross-Lee
Sun-Mon	3/20-3/21	11pm - 7am	Scott Morris
Mon	21-Mar	7am - 3pm	Brian McDermott
Mon	21-Mar	3pm-11pm	Chris Miller
Mon-Tues	3/21-3/22	11pm - 7am	Scott Morris
Tues	22-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Tues	22-Mar	3pm-11pm	Chris Miller
Tues-Wed	3/22-3/23	11pm - 7am	Tim McGinty
Wed	23-Mar	7am - 3pm	Brian McDermott
Wed	23-Mar	3pm-11pm	Joe Gitter
Wed-Thur	3/23-3/24	11pm - 7am	Tim McGinty
Thur	24-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Thur	24-Mar	3pm-11pm	Joe Gitter
Thur-Fri	3/24-3/25	11pm - 7am	Tim McGinty
Fri	25-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Fri	25-Mar	3pm-11pm	Joe Gitter
Fri-Sat	3/25-3/26	11pm-7am	Tim McGinty
ET Rx Prot Measures & State Coordinator			

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Fri-Sat	3/18-3/19	11pm-7am	Scott Moore
Sat	19-Mar	7am - 3pm	Larry Camper
Sat	19-Mar	3pm-11pm	Patricia Holahan
Sat-Sun	3/19-3/20	11pm - 7am	Rob Lewis
Sun	20-Mar	7am - 3pm	Vonna Ordaz
Sun	20-Mar	3pm-11pm	Larry Camper
Sun-Mon	3/20-3/21	11pm - 7am	Cynthia Carpenter
Mon	21-Mar	7am - 3pm	Charlie Miller
Mon	21-Mar	3pm-11pm	Larry Camper
Mon-Tues	3/21-3/22	11pm - 7am	Rob Lewis
Tues	22-Mar	7am - 3pm	Charlie Miller
Tues	22-Mar	3pm-11pm	Patricia Holahan
Tues-Wed	3/22-3/23	11pm - 7am	Cynthia Carpenter
Wed	23-Mar	7am - 3pm	Charlie Miller
Wed	23-Mar	3pm-11pm	Patricia Holahan
Wed-Thur	3/23-3/24	11pm - 7am	Cynthia Carpenter
Thur	24-Mar	7am - 3pm	Charlie Miller
Thur	24-Mar	3pm-11pm	Larry Camper
Thur-Fri	3/24-3/25	11pm - 7am	Cynthia Carpenter
Fri	25-Mar	7am - 3pm	Charlie Miller
Fri	25-Mar	3pm-11pm	Patricia Holahan
Fri-Sat	3/25-3/26	11pm-7am	Cynthia Carpenter

Executive Briefing Team

EBT Admin. Assistant			
Fri-Sat	3/18-3/19	11pm-7am	Sapna Hurd
Sat	19-Mar	7am - 3pm	Carolyn Kahler
Sat	19-Mar	3pm-11pm	Annette Stang
Sat-Sun	3/19-3/20	11pm - 9am	Sapna Hurd
Sun	20-Mar	9am - 7pm	Annette Stang
Sun-Mon	3/20-3/21	7pm-7am	Carolyn Kahler
Mon	21-Mar	7am - 3pm	A. Stang (7-11) / Sapna Hurd (11-3)
Mon	21-Mar	3pm-11pm	Tia Pope
Mon-Tues	3/21-3/22	11pm - 7am	Christina Merritt
Tues	22-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Tues	22-Mar	3pm-11pm	Jon Fiske
Tues-Wed	3/22-3/23	11pm - 7am	Tia Pope
Wed	23-Mar	7am - 3pm	Jon Fiske
Wed	23-Mar	3pm-11pm	Annette Stang
Wed-Thur	3/23-3/24	11pm - 7am	Christina Merritt
Thur	24-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Thur	24-Mar	3pm-11pm	Andrea Wimbush
Thur-Fri	3/24-3/25	11pm - 7am	Tia Pope
Fri	25-Mar	7am - 3pm	Jon Fiske
Fri	25-Mar	3pm-11pm	Sapna Hurd
Fri-Sat	3/25-3/26	11pm-7am	Carolyn Kahler
EBT Coordinator			
Fri-Sat	3/18-3/19	11pm-7am	Christine Steger
Sat	19-Mar	7am - 3pm	Caroline Nguyen
Sat	19-Mar	3pm-11pm	Sara Mroz

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Sat-Sun	3/19-3/20	11pm - 7am	Jim Andersen
Sun	20-Mar	7am - 3pm	Yen-Ju Chen
Sun	20-Mar	3pm-11pm	Caroline Nguyen
Sun-Mon	3/20-3/21	11pm - 7am	Jim Andersen
Mon	21-Mar	7am - 3pm	Yen-Ju Chen
Mon	21-Mar	3pm-11pm	Sara Mroz
Mon-Tues	3/21-3/22	11pm - 7am	Jim Andersen
Tues	22-Mar	7am - 3pm	Caroline Nguyen
Tues	22-Mar	3pm-11pm	Sara Mroz
Tues-Wed	3/22-3/23	11pm - 7am	Jim Andersen
Wed	23-Mar	7am - 3pm	Yen-Ju Chen
Wed	23-Mar	3pm-11pm	Sara Mroz
Wed-Thur	3/23-3/24	11pm - 7am	Jim Andersen
Thur	24-Mar	7am - 3pm	Yen-Ju Chen
Thur	24-Mar	3pm-11pm	Sara Mroz
Thur-Fri	3/24-3/25	11pm - 7am	Jim Andersen
Fri	25-Mar	7am - 3pm	Yen-Ju Chen
Fri	25-Mar	3pm-11pm	Sara Mroz
Fri-Sat	3/25-3/26	11pm-7am	Jim Andersen
Executive Support Team			
EST Status Officer			
Fri-Sat	3/18-3/19	11pm-7am	Doug Huyck
Sat	19-Mar	7am - 3pm	Craig Erlanger
Sat	19-Mar	3pm-11pm	John Jolicoeur
Sat-Sun	3/19-3/20	11pm - 7am	Doug Huyck
Sun	20-Mar	7am - 3pm	Craig Erlanger
Sun	20-Mar	3pm-11pm	John Jolicoeur
Sun-Mon	3/20-3/21	11pm - 7am	Doug Huyck
Mon	21-Mar	7am - 3pm	Jane Marshall
Mon	21-Mar	3pm-11pm	Bill Gott
Mon-Tues	3/21-3/22	11pm - 7am	Jeff Grant
Tues	22-Mar	7am - 3pm	John Jolicoeur
Tues	22-Mar	3pm-11pm	Bill Gott
Tues-Wed	3/22-3/23	11pm - 7am	Jeff Grant
Wed	23-Mar	7am - 3pm	Sally Billings/Jane Marshall
Wed	23-Mar	3pm-11pm	Bill Gott
Wed-Thur	3/23-3/24	11pm - 7am	Jeff Grant
Thur	24-Mar	7am - 3pm	Jane Marshall
Thur	24-Mar	3pm-11pm	Bill Gott
Thur-Fri	3/24-3/25	11pm - 7am	Jeff Grant
Fri	25-Mar	7am - 3pm	Jane Marshall
Fri	25-Mar	3pm-11pm	Bill Gott
Fri-Sat	3/25-3/26	11pm-7am	Jeff Grant
EST Actions Officer			
Fri-Sat	3/18-3/19	11pm-7am	Amy Roundtree
Sat	19-Mar	7am - 3pm	Bezakulu Alemu
Sat	19-Mar	3pm-11pm	Melissa Ralph
Sat-Sun	3/19-3/20	11pm - 7am	Jonathan Fiske
Sun	20-Mar	7am - 3pm	Melissa Ralph

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Sun	20-Mar	3pm-11pm	Jonathan Fiske
Sun-Mon	3/20-3/21	11pm - 7am	Dori Votolato-Willis
Mon	21-Mar	7am - 3pm	Melissa Ralph
Mon	21-Mar	3pm-11pm	Amanda Nerret
Mon-Tues	3/21-3/22	11pm - 7am	Kelly Grimes
Tues	22-Mar	7am - 3pm	Melissa Ralph
Tues	22-Mar	3pm-11pm	Dori Votolato-Willis
Tues-Wed	3/22-3/23	11pm - 7am	Kelly Grimes
Wed	23-Mar	7am - 3pm	Melissa Ralph
Wed	23-Mar	3pm-11pm	Dori Votolato-Willis
Wed-Thur	3/23-3/24	11pm - 7am	Kelly Grimes
Thur	24-Mar	7am - 3pm	Wendy Reed
Thur	24-Mar	3pm-11pm	Dori Votolato-Willis
Thur-Fri	3/24-3/25	11pm - 7am	Jonathan Fiske
Fri	25-Mar	7am - 3pm	Amanda Nerret
Fri	25-Mar	3pm-11pm	Melissa Ralph
Fri-Sat	3/25-3/26	11pm-7am	Jonathan Fiske

EST Coordinator

Fri-Sat	3/18-3/19	11pm-7am	Rebecca Stone
Sat	19-Mar	7am - 3pm	Clyde Ragland
Sat	19-Mar	3pm-11pm	Tony Bowers
Sat-Sun	3/19-3/20	11pm - 7am	Rebecca Stone
Sun	20-Mar	7am - 3pm	Clyde Ragland
Sun	20-Mar	3pm-11pm	Tony Bowers
Sun-Mon	3/20-3/21	11pm - 7am	Rebecca Stone
Mon	21-Mar	7am - 3pm	Tony McMurtray
Mon	21-Mar	3pm-11pm	Tony Bowers
Mon-Tues	3/21-3/22	11pm - 7am	Rebecca Stone
Tues	22-Mar	7am - 3pm	Tony McMurtray
Tues	22-Mar	3pm-11pm	Clyde Ragland
Tues-Wed	3/22-3/23	11pm - 7am	Rebecca Stone
Wed	23-Mar	7am - 3pm	Tony McMurtray
Wed	23-Mar	3pm-11pm	Clyde Ragland
Wed-Thur	3/23-3/24	11pm - 7am	Rebecca Stone
Thur	24-Mar	7am - 3pm	Tony McMurtray
Thur	24-Mar	3pm-11pm	Clyde Ragland
Thur-Fri	3/24-3/25	11pm - 7am	Steve Campbell
Fri	25-Mar	7am - 3pm	Taylor Lichatz
Fri	25-Mar	3pm-11pm	Tony McMurtray
Fri-Sat	3/25-3/26	11pm-7am	Steve Campbell

EST Chronology Officer

Fri-Sat	3/18-3/19	11pm-7am	Dennis Gordon
Sat	19-Mar	7am - 3pm	Vanice Perrin
Sat	19-Mar	3pm-11pm	Rebecca Karas
Sat-Sun	3/19-3/20	11pm - 7am	Cynthia Dorsey
Sun	20-Mar	7am - 3pm	James Vaughn
Sun	20-Mar	3pm-11pm	Rebecca Karas
Sun-Mon	3/20-3/21	11pm - 7am	Mark Resner
Mon	21-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Mon	21-Mar	3pm-11pm	Rebecca Karas

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Mon-Tues	3/21-3/22	11pm - 7am	Thomas Scarbrough
Tues	22-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Tues	22-Mar	3pm-11pm	Rebecca Karas
Tues-Wed	3/22-3/23	11pm - 7am	Thomas Scarbrough
Wed	23-Mar	7am - 3pm	James Vaughn
Wed	23-Mar	3pm-11pm	Rebecca Karas
Wed-Thur	3/23-3/24	11pm - 7am	Nick Ballam
Thur	24-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Thur	24-Mar	3pm-11pm	Rebecca Karas
Thur-Fri	3/24-3/25	11pm - 7am	Thomas Scarbrough
Fri	25-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Fri	25-Mar	3pm-11pm	Rebecca Karas
Fri-Sat	3/25-3/26	11pm-7am	Thomas Scarbrough
EST Response Ops Mgr			
Fri-Sat	3/18-3/19	11pm-7am	Omar Khan
Sat	19-Mar	7am - 3pm	Cris Brown
Sat	19-Mar	3pm-11pm	Bob Stransky
Sat-Sun	3/19-3/20	11pm - 7am	Jean Trefethan
Sun	20-Mar	7am - 3pm	Karen Jackson
Sun	20-Mar	3pm-11pm	Roberto Figueroa
Sun-Mon	3/20-3/21	11pm - 7am	Jean Trefethan
Mon	21-Mar	7am - 3pm	Bob Stransky
Mon	21-Mar	3pm-11pm	Omar Khan
Mon-Tues	3/21-3/22	11pm - 7am	Cris Brown
Tues	22-Mar	7am - 3pm	Bob Stransky
Tues	22-Mar	3pm-11pm	Karen Jackson
Tues-Wed	3/22-3/23	11pm - 7am	Roberto Figueroa
Wed	23-Mar	7am - 3pm	Bob Stransky
Wed	23-Mar	3pm-11pm	Jean Trefethan
Wed-Thur	3/23-3/24	11pm - 7am	Cris Brown
Thur	24-Mar	7am - 3pm	Karen Jackson
Thur	24-Mar	3pm-11pm	Omar Khan
Thur-Fri	3/24-3/25	11pm - 7am	Roberto Figueroa
Fri	25-Mar	7am - 3pm	Jean Trefethan
Fri	25-Mar	3pm-11pm	Cris Brown
Fri-Sat	3/25-3/26	11pm-7am	Roberto Figueroa
EST Admin. Assistant			
Fri-Sat	3/18-3/19	11pm-7am	Tabitha Howard
Sat	19-Mar	7am - 3pm	Karen Meyer
Sat	19-Mar	3pm-11pm	Amy Salus
Sat-Sun	3/19-3/20	11pm - 7am	Chris Lamb
Sun	20-Mar	7am - 3pm	Karen Meyer
Sun	20-Mar	3pm-11pm	Linda Williamson
Sun-Mon	3/20-3/21	11pm - 7am	Chris Lamb
Mon	21-Mar	7am - 3pm	Karen Meyer
Mon	21-Mar	3pm-11pm	Mary Glenn Crutchley
Mon-Tues	3/21-3/22	11pm - 7am	Andrea Wimbush
Tues	22-Mar	7am - 3pm	Cynthia Dorsey
Tues	22-Mar	3pm-11pm	Mary Glenn Crutchley
Tues-Wed	3/22-3/23	11pm - 7am	Michelle Manahan

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE
MARCH 18-26

Wed	23-Mar	7am - 3pm	Karen Meyer
Wed	23-Mar	3pm-11pm	Mary Glenn Crutchley
Wed-Thur	3/23-3/24	11pm - 7am	Andrea Wimbush
Thur	24-Mar	7am - 3pm	Cynthia Dorsey
Thur	24-Mar	3pm-11pm	Mary Glenn Crutchley
Thur-Fri	3/24-3/25	11pm - 7am	Tabitha Howard
Fri	25-Mar	7am - 3pm	Karen Meyer
Fri	25-Mar	3pm-11pm	Michelle Manahan
Fri-Sat	3/25-3/26	11pm-7am	Linda Williamson

Liaison Team

LT Director			
Fri-Sat	3/18-3/19	11pm-7am	Tom Blount
Sat	19-Mar	7am - 3pm	Tom Bergman
Sat	19-Mar	3pm-11pm	Bob Webber
Sat-Sun	3/19-3/20	11pm - 7am	John Adams
Sun	20-Mar	7am - 3pm	Tom Bergman
Sun	20-Mar	3pm-11pm	Bob Webber
Sun-Mon	3/20-3/21	11pm - 7am	John Adams
Mon	21-Mar	7am - 3pm	Tom Bergman
Mon	21-Mar	3pm-11pm	Bob Webber
Mon-Tues	3/21-3/22	11pm - 7am	John Adams
Tues	22-Mar	7am - 3pm	Tom Bergman
Tues	22-Mar	3pm-11pm	Bob Webber
Tues-Wed	3/22-3/23	11pm - 7am	John Adams
Wed	23-Mar	7am - 3pm	Michael Tschiltz
Wed	23-Mar	3pm-11pm	Rich Correia
Wed-Thur	3/23-3/24	11pm - 7am	Jake Zimmerman
Thur	24-Mar	7am - 3pm	Michael Tschiltz
Thur	24-Mar	3pm-11pm	Rich Correia
Thur-Fri	3/24-3/25	11pm - 7am	Jake Zimmerman
Fri	25-Mar	7am - 3pm	Michael Tschiltz
Fri	25-Mar	3pm-11pm	Rich Correia
Fri-Sat	3/25-3/26	11pm-7am	Jake Zimmerman

LT Coordinator			
Fri-Sat	3/18-3/19	11pm-7am	Janelle Jessie
Sat	19-Mar	7am - 3pm	Jeff Temple
Sat	19-Mar	3pm-11pm	Rani Franovich
Sat-Sun	3/19-3/20	11pm - 7am	Janelle Jessie
Sun	20-Mar	7am - 3pm	Jeff Temple
Sun	20-Mar	3pm-11pm	Nathan Sanfilippo
Sun-Mon	3/20-3/21	11pm - 7am	Milt Murray
Mon	21-Mar	7am - 3pm	Jeff Temple
Mon	21-Mar	3pm-11pm	Nathan Sanfilippo
Mon-Tues	3/21-3/22	11pm - 7am	Milt Murray
Tues	22-Mar	7am - 3pm	Rani Franovich
Tues	22-Mar	3pm-11pm	Nathan Sanfilippo
Tues-Wed	3/22-3/23	11pm - 7am	Milt Murray
Wed	23-Mar	7am - 3pm	Rani Franovich
Wed	23-Mar	3pm-11pm	Jeff Temple

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Wed-Thur	3/23-3/24	11pm - 7am	Milt Murray
Thur	24-Mar	7am - 3pm	Rani Franovich
Thur	24-Mar	3pm-11pm	Jeff Temple
Thur-Fri	3/24-3/25	11pm - 7am	Milt Murray
Fri	25-Mar	7am - 3pm	Janelle Jessie
Fri	25-Mar	3pm-11pm	Rani Franovich
Fri-Sat	3/25-3/26	11pm-7am	Milt Murray
LT State Liaison			
Thur-Fri	3/17-3/18	9pm-7am	Ryan/Turtill (ON CALL ONLY)
Fri	18-Mar	7am-2pm	Lukes/Flannery
Fri	18-Mar	2pm-9pm	Turtill/Maupin
Fri-Sat	3/18-3/19	9pm-7am	Ryan/Turtill (ON CALL ONLY)
Sat	19-Mar	7am-2pm	Ryan/Turtill (ON CALL ONLY)
Sat	19-Mar	2pm-9pm	Ryan/Turtill (ON CALL ONLY)
Sat-Sun	3/19-3/20	9pm-7am	Ryan/Turtill (ON CALL ONLY)
Sun	20-Mar	7am-2pm	Ryan/Turtill (ON CALL ONLY)
Sun	20-Mar	2pm-9pm	Ryan/Turtill (ON CALL ONLY)
Sun-Mon	3/20-3/21	9pm-7am	Ryan/Turtill (ON CALL ONLY)
Mon	21-Mar	7am-2pm	Flannery (Riveria-On Call)
Mon	21-Mar	2pm-9pm	Easson (Turtill-On Call)
Mon-Tue	3/21-3/22	9pm-7am	Ryan/Turtill
Tue	22-Mar	7am-2pm	Flannery (Riveria-On Call)
Tue	22-Mar	2pm-9pm	Easson (Turtill-On Call)
Tue-Wed	3/22-3/23	9pm-7am	Ryan/Turtill
Wed	23-Mar	7am-2pm	Maupin (Lukes-On Call)
Wed	23-Mar	2pm-9pm	Rivera (Easson-On Call)
Wed-Thur	3/23-3/24	9pm-7am	Ryan/Turtill
Thur	24-Mar	7am-2pm	Lukes (Flannery-On Call)
Thur	24-Mar	2pm-9pm	Maupin (Riveria-On Call)
Thur-Fri	3/24-3/25	9pm-7am	Ryan/Turtill
Fri	25-Mar	7am-2pm	Ryan (Maupin-On Call)
Fri	25-Mar	2pm-9pm	Turtill (Riveria-On Call)
Fri-Sat	3/25-3/26	9pm-7am	Ryan/Turtill (ON CALL ONLY)
LT Federal Liaison (2)			
Fri-Sat	3/18-3/19	11pm-7am	Scott Sloan
Sat	19-Mar	7am - 3pm	Russ Chazell
Sat	19-Mar	3pm-11pm	Jeff Lynch
Sat-Sun	3/19-3/20	11pm - 7am	Scott Sloan
Sun	20-Mar	7am - 3pm	Ned Wright
Sun	20-Mar	3pm-11pm	Jerry Hale
Sun-Mon	3/20-3/21	11pm - 7am	Lisa Wright
Mon	21-Mar	7am - 3pm	Beth Reed/Ted Smith
Mon	21-Mar	3pm-11pm	Ned Wright
Mon-Tues	3/21-3/22	11pm - 7am	Lisa Wright
Tues	22-Mar	7am - 3pm	Beth Reed/Ted Smith
Tues	22-Mar	3pm-11pm	Ned Wright
Tues-Wed	3/22-3/23	11pm - 7am	Lisa Wright
Wed	23-Mar	7am - 3pm	Jerry Hale/Ted Smith
Wed	23-Mar	3pm-11pm	Ned Wright
Wed-Thur	3/23-3/24	11pm - 7am	Lisa Wright

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Thur	24-Mar	7am - 3pm	Ted Smith/Bethany Cecere
Thur	24-Mar	3pm-11pm	Jerry Hale
Thur-Fri	3/24-3/25	11pm - 7am	Scott Sloan
Fri	25-Mar	7am - 3pm	Ted Smith/Bethany Cecere
Fri	25-Mar	3pm-11pm	Jerry Hale
Fri-Sat	3/25-3/26	11pm-7am	Scott Sloan

LT Congressional Liaison (2)

Sat	19-Mar	7am - 2pm	Spiros Droggitis
	19-Mar	2pm-9pm	Tim Riley
Sun	20-Mar	7am - 2pm	Rebecca Schmidt
	20-Mar	2pm-9pm	Reanne Shane
Mon	21-Mar	7am - 2pm	Spiros Droggitis
	21-Mar	2pm-9pm	Tim Riley
Tues	22-Mar	7am - 2pm	Tim Riley
	22-Mar	2pm-9pm	Spiros Droggitis
Wed	23-Mar	7am - 2pm	Gene Dacus
	23-Mar	2pm-9pm	Raeann Shane
Thur	24-Mar	7am - 2pm	Spiros Droggitis
	24-Mar	2pm-9pm	Raeann Shane
Fri	25-Mar	7am - 2pm	Gene Dacus
	25-Mar	2pm-9pm	Amy Powell

LT International Liaison (2)

Fri-Sat	3/18-3/19	11pm-7am	Elizabeth Smiroldo/Danielle Emche
Sat	19-Mar	7am - 3pm	Lance English/Steve Bloom
Sat	19-Mar	3pm-11pm	Jenny Tobin/Jill Shephard
Sat-Sun	3/19-3/20	11pm - 7am	Elizabeth Smiroldo/Danielle Emche
Sun	20-Mar	7am - 3pm	Karen Henderson/Steve Baker
Sun	20-Mar	3pm-11pm	Eric Stahl/Nancy Fragoyanis
Sun-Mon	3/20-3/21	11pm - 7am	Elizabeth Smiroldo/Jenny Tobin
Mon	21-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3)
Mon	21-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Mon-Tues	3/21-3/22	11pm - 7am	Eric Stahl/Mugeh Afshar-Tous
Tues	22-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3)
Tues	22-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Tues-Wed	3/22-3/23	11pm - 7am	Eric Stahl/Mugeh
Wed	23-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3)
Wed	23-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Wed-Thur	3/23-3/24	11pm - 7am	Eric Stahl/Mugeh
Thur	24-Mar	7am - 3pm	Steve Bloom/Lance English
Thur	24-Mar	3pm-11pm	Janice/Jenny Tobin
Thur-Fri	3/24-3/25	11pm - 7am	Andrea/Elizabeth Smiroldo
Fri	25-Mar	7am - 3pm	Steve Bloom/Lance English
Fri	25-Mar	3pm-11pm	Janice/Jenny Tobin
Fri-Sat	3/25-3/26	11pm-7am	Andrea/Elizabeth Smiroldo

Protective Measures Team

PMTR Director			
Fri-Sat	3/18-3/19	11pm-7am	Kathy Gibson
Sat	19-Mar	7am - 3pm	John Lubinski

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Sat	19-Mar	3pm-11pm	Don Cool
Sat-Sun	3/19-3/20	11pm - 7am	Kathy Gibson
Sun	20-Mar	7am - 3pm	John Lubinski
Sun	20-Mar	3pm-11pm	Don Cool
Sun-Mon	3/20-3/21	11pm - 7am	Kathy Gibson
Mon	21-Mar	7am - 3pm	John Lubinski
Mon	21-Mar	3pm-11pm	Don Cool
Mon-Tues	3/21-3/22	11pm - 7am	John Tappert
Tues	22-Mar	7am - 3pm	John Lubinski
Tues	22-Mar	3pm-11pm	Don Cool
Tues-Wed	3/22-3/23	11pm - 7am	John Tappert
Wed	23-Mar	7am - 3pm	Terry Reis
Wed	23-Mar	3pm-11pm	Cindy Jones
Wed-Thur	3/23-3/24	11pm - 7am	Randy Sullivan
Thur	24-Mar	7am - 3pm	Terry Reis
Thur	24-Mar	5pm-11pm	Cindy Jones
Thur-Fri	3/24-3/25	11pm - 7am	Randy Sullivan
Fri	25-Mar	7am - 3pm	Terry Reis
Fri	25-Mar	5pm-11pm	Cindy Jones
Fri-Sat	3/25-3/26	11pm-7am	Randy Sullivan
PMTR Coordinator			
Fri-Sat	3/18-3/19	11pm-7am	Mike Norris
Sat	19-Mar	7am - 3pm	Duane Hardesty
Sat	19-Mar	3pm-11pm	Jay Patel
Sat-Sun	3/19-3/20	11pm - 7am	Lou Brandon
Sun	20-Mar	7am - 3pm	Nima Ashkeboussi
Sun	20-Mar	3pm-11pm	Jay Patel
Sun-Mon	3/20-3/21	11pm - 7am	Lou Brandon
Mon	21-Mar	7am - 3pm	Prosanta Chowdhury (8 am)
Mon	21-Mar	3pm-11pm	Jay Patel
Mon-Tues	3/21-3/22	11pm - 7am	Lou Brandon
Tues	22-Mar	7am - 3pm	Prosanta Chowdhury (8 am)
Tues	22-Mar	3pm-11pm	Nima Ashkeboussi
Tues-Wed	3/22-3/23	11pm - 7am	Mike Norris
Wed	23-Mar	7am - 3pm	John Wray
Wed	23-Mar	3pm-11pm	Nima Ashkeboussi
Wed-Thur	3/23-3/24	11pm - 7am	Mike Norris
Thur	24-Mar	7am - 3pm	John Wray
Thur	24-Mar	3pm-11pm	Nima Ashkeboussi
Thur-Fri	3/24-3/25	11pm - 7am	Mike Norris
Fri	25-Mar	7am - 3pm	Duane Hardesty
Fri	25-Mar	3pm-11pm	Jay Patel
Fri-Sat	3/25-3/26	11pm-7am	Lou Brandon
PMTR Prot Actions Asst Dir			
Fri-Sat	3/18-3/19	11pm-7am	Greg Casto
Sat	19-Mar	7am - 3pm	Kathryn Brock
Sat	19-Mar	3pm-11pm	Kevin Williams
Sat-Sun	3/19-3/20	11pm - 7am	Greg Casto
Sun	20-Mar	7am - 3pm	Kathryn Brock
Sun	20-Mar	3pm-11pm	Tim Harris

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Sun-Mon	3/20-3/21	11pm - 7am	Greg Casto (Jessica Kratchman - to shadow)
Mon	21-Mar	7am - 3pm	Kathryn Brock
Mon	21-Mar	3pm-11pm	Dan Barss
Mon-Tues	3/21-3/22	11pm - 7am	Jessica Kratchman
Tues	22-Mar	7am - 3pm	Kathryn Brock
Tues	22-Mar	3pm-11pm	Tim Harris
Tues-Wed	3/22-3/23	11pm - 7am	Jessica Kratchman
Wed	23-Mar	7am - 3pm	Sandra Wastler
Wed	23-Mar	3pm-11pm	Vince Holahan
Wed-Thur	3/23-3/24	11pm - 7am	Jessica Kratchman
Thur	24-Mar	7am - 3pm	Sandra Wastler
Thur	24-Mar	3pm-11pm	Stacey Rosenberg
Thur-Fri	3/24-3/25	11pm - 7am	Jessica Kratchman
Fri	25-Mar	7am - 3pm	Kathryn Brock
Fri	25-Mar	3pm-11pm	Vince Holahan
Fri-Sat	3/25-3/26	11pm-7am	Greg Casto
PMTR RAAD			
Fri-Sat	3/18-3/19	11pm-7am	Randy Sullivan
Sat	19-Mar	7am - 3pm	Bruce Watson
Sat	19-Mar	3pm-11pm	Michelle Hart
Sat-Sun	3/19-3/20	11pm - 7am	Patricia Milligan
Sun	20-Mar	7am - 3pm	Eric Schrader
Sun	20-Mar	3pm-11pm	Steve LaVie
Sun-Mon	3/20-3/21	11pm - 7am	Mike Norris
Mon	21-Mar	7am - 3pm	Michelle Hart
Mon	21-Mar	3pm-11pm	Steve Lavie
Mon-Tues	3/21-3/22	11pm - 7am	Boby Abu-Eid
Tues	22-Mar	7am - 3pm	Bruce Watson
Tues	22-Mar	3pm-11pm	Steve LaVie
Tues-Wed	3/22-3/23	11pm - 7am	Boby Abu-Eid
Wed	23-Mar	7am - 3pm	Bruce Watson
Wed	23-Mar	3pm-11pm	Michelle Hart
Wed-Thur	3/23-3/24	11pm - 7am	Patricia Milligan
Thur	24-Mar	7am - 3pm	Bruce Watson
Thur	24-Mar	3pm-11pm	Steve LaVie
Thur-Fri	3/24-3/25	11pm - 7am	Cynthia Barr
Fri	25-Mar	7am - 3pm	Randy Sullivan
Fri	25-Mar	3pm-11pm	Michelle Hart
Fri-Sat	3/25-3/26	11pm-7am	Cynthia Barr
PMTR Dose Assessment (RASCAL)			
Fri-Sat	3/18-3/19	11pm-7am	Duane Schmidt/Tony Huffert
Sat	19-Mar	7am - 3pm	Casper Sun / Joe DeCicco (10am arrive)
Sat	19-Mar	3pm-11pm	Margaret Cervera / Joe DeCicco
Sat-Sun	3/19-3/20	11pm - 7am	Kimberly Gambone/John Parillo
Sun	20-Mar	7am - 3pm	Casper Sun / Duane Schmidt
Sun	20-Mar	3pm-11pm	Margaret Cervera / Tony Huffert
Sun-Mon	3/20-3/21	11pm - 7am	Kimberly Gambone/John Parillo
Mon	21-Mar	7am - 3pm	Eric Schrader/Rich Clement
Mon	21-Mar	3pm-11pm	Margaret Cervera/Tony Huffert
Mon-Tues	3/21-3/22	11pm - 7am	John Parillo / Bernie White

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Tues	22-Mar	7am - 3pm	Eric Schrader/Rich Clement
Tues	22-Mar	3pm-11pm	Gary Purdy/Casper Sun
Tues-Wed	3/22-3/23	11pm - 7am	Margaret Cervera/Tony Huffert
Wed	23-Mar	7am - 3pm	Eric Schrader/Rich Clement
Wed	23-Mar	3pm-11pm	Kimberly Gambone/Casper Sun
Wed-Thur	3/23-3/24	11pm - 7am	Tony Huffert/John Parillo
Thur	24-Mar	7am - 3pm	Eric Schrader/Rich Clement
Thur	24-Mar	3pm-11pm	Kimberly Gambone/Casper Sun
Thur-Fri	3/24-3/25	11pm - 7am	Tony Huffert/John Parillo
Fri	25-Mar	7am - 3pm	Eric Schrader/Rich Clement
Fri	25-Mar	3pm-11pm	Gary Purdy/Casper Sun
Fri-Sat	3/25-3/26	11pm-7am	John Parillo / Bernie White
PMTR GIS Analyst			
Fri-Sat	3/18-3/19	11pm-7am	Stephanie Devlin
Sat	19-Mar	7am - 3pm	Nebiyu Tiruneh
Sat	19-Mar	3pm-11pm	Yong Li
Sat-Sun	3/19-3/20	11pm - 7am	Alice Stieve
Sun	20-Mar	7am - 3pm	Phil Brandt
Sun	20-Mar	3pm-11pm	Ken See
Sun-Mon	3/20-3/21	11pm - 7am	Alice Stieve
Mon	21-Mar	7am - 3pm	Nebiyu Tiruneh
Mon	21-Mar	3pm-11pm	Stephanie Devlin
Mon-Tues	3/21-3/22	11pm - 7am	Alice Stieve
Tues	22-Mar	7am - 3pm	Yong Li
Tues	22-Mar	3pm-11pm	Stephanie Devlin
Tues-Wed	3/22-3/23	11pm - 7am	Alice Stieve
Wed	23-Mar	7am - 3pm	Allen Gross
Wed	23-Mar	3pm-11pm	Stephanie Devlin
Wed-Thur	3/23-3/24	11pm - 7am	Phil Brandt
Thur	24-Mar	7am - 3pm	Yong Li
Thur	24-Mar	3pm-11pm	Stephanie Devlin
Thur-Fri	3/24-3/25	11pm - 7am	Dogan Seber
Fri	25-Mar	7am - 3pm	Hosang Ahn
Fri	25-Mar	3pm-11pm	Stephanie Devlin
Fri-Sat	3/25-3/26	11pm-7am	Phil Brandt
PMTR Meteorologist			
Fri-Sat	18-Mar	3pm-11pm	Mike Mazaika
Sat	3/18-3/19	11pm-7am	Dave Brown
Sat	19-Mar	7am - 3pm	Kevin Quinlan
Sat-Sun	19-Mar	3pm-11pm	Mike Mazaika
Sun	3/19-3/20	11pm - 7am	David Brown
Sun	20-Mar	7am - 3pm	Kevin Quinlan
Sun	20-Mar	3pm-11pm	Mike Mazaika
Sun-Mon	3/20-3/21	11pm - 7am	David Brown
Mon	21-Mar	7am - 3pm	Mike Mazaika
Mon	21-Mar	3pm-11pm	Brad Harvey
Mon-Tues	3/21-3/22	11pm - 7am	Kevin Quinlan
Tues	22-Mar	7am - 3pm	David Brown
Tues	22-Mar	3pm-11pm	Brad Harvey
Tues-Wed	3/22-3/23	11pm - 7am	Andy Imboden/Kevin Quinlan

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Wed	23-Mar	7am - 3pm	Mike Mazaika
Wed	23-Mar	3pm-11pm	Brad Harvey
Wed-Thur	3/23-3/24	11pm - 7am	Kevin Quinlan
Thur	24-Mar	7am - 3pm	David Brown
Thur	24-Mar	3pm-11pm	Brad Harvey
Thur-Fri	3/24-3/25	11pm - 7am	Kevin Quinlan
Fri	25-Mar	7am - 3pm	Mike Mazaika
Fri	25-Mar	3pm-11pm	Brad Harvey
Fri-Sat	3/25-3/26	11pm-7am	Kevin Quinlan
Reactor Safety Team			
RST Director			
Fri-Sat	3/18-3/19	11pm-7am	Jennifer Uhle
Sat	19-Mar	7am - 3pm	Laura Dudes
Sat	19-Mar	3pm-11pm	Dave Skeen
Sat-Sun	3/19-3/20	11pm - 7am	Jennifer Uhle
Sun	20-Mar	7am - 3pm	Laura Dudes
Sun	20-Mar	3pm-11pm	Dave Skeen
Sun-Mon	3/20-3/21	11pm - 7am	Jennifer Uhle
Mon	21-Mar	7am - 3pm	Fred Brown
Mon	21-Mar	3pm-11pm	Dave Skeen
Mon-Tues	3/21-3/22	11pm - 7am	Jennifer Uhle
Tues	22-Mar	7am - 3pm	Fred Brown
Tues	22-Mar	3pm-11pm	Dave Skeen
Tues-Wed	3/22-3/23	11pm - 7am	Brian Holian
Wed	23-Mar	7am - 3pm	Fred Brown
Wed	23-Mar	3pm-11pm	Bill Ruland
Wed-Thur	3/23-3/24	11pm - 7am	Brian Holian
Thur	24-Mar	7am - 3pm	Fred Brown
Thur	24-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/24-3/25	11pm - 7am	Brian Holian
Fri	25-Mar	7am - 3pm	Pat Hiland
Fri	25-Mar	3pm-11pm	Bill Ruland
Fri-Sat	3/25-3/26	11pm-7am	Brian Holian
Sat	26-Mar	7am - 3pm	Pat Hiland
Sat	26-Mar	3pm-11pm	Bill Ruland
Sat	3/26-27/2011	11pm - 7am	Mike Case
RST Coordinator			
Fri-Sat	3/18-3/19	11pm-7am	Rollie Berry
Sat	19-Mar	7am - 3pm	Scott Sloan
Sat	19-Mar	3pm-11pm	Oleg Bukharin
Sat-Sun	3/19-3/20	11pm - 7am	Frank Collins
Sun	20-Mar	7am - 3pm	Peter Alter
Sun	20-Mar	3pm-11pm	Eric Thomas
Sun-Mon	3/20-3/21	11pm - 7am	Mike Morlang
Mon	21-Mar	7am - 3pm	Peter Alter
Mon	21-Mar	3pm-11pm	Greg Schoenebeck
Mon-Tues	3/21-3/22	11pm - 7am	Frank Collins
Tues	22-Mar	7am - 3pm	Rick Hasselberg
Tues	22-Mar	3pm-11pm	Mike Morlang

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Tues-Wed	3/22-3/23	11pm - 7am	Oleg Bukharin
Wed	23-Mar	7am - 3pm	Eric Thomas
Wed	23-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/23-3/24	11pm - 7am	Frank Collins
Thur	24-Mar	7am - 3pm	Rick Hasselberg
Thur	24-Mar	3pm-11pm	Brett Rini
Thur-Fri	3/24-3/25	11pm - 7am	Tom Boyce (RES)
Fri	25-Mar	7am - 3pm	Eric Thomas
Fri	25-Mar	3pm-11pm	Brett Rini
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Severe Accident/PRA			
Fri-Sat	3/18-3/19	11pm - 7am	Don Marksberry
Sat	19-Mar	7am - 3pm	Len Ward
Sat	19-Mar	3pm-11pm	Ed Fuller
Sat-Sun	3/19-3/20	11pm - 7am	Mike Salay
Sun	20-Mar	7am - 3pm	John Lane
Sun	20-Mar	3pm-11pm	Jim Gilmer
Sun-Mon	3/20-3/21	11pm - 7am	Don Dube
Mon	21-Mar	7am - 3pm	Jeff Circle
Mon	21-Mar	3pm-11pm	Hossein Esmaili
Mon-Tues	3/21-3/22	11pm - 7am	Jim Gilmer
Tues	22-Mar	7am - 3pm	Ed Fuller
Tues	22-Mar	3pm-11pm	Len Ward
Tues-Wed	3/22-3/23	11pm - 7am	Hossein Esmaili
Wed	23-Mar	7am - 3pm	Jeff Circle
Wed	23-Mar	3pm-11pm	Sam Miranda
Wed-Thur	3/23-3/24	11pm - 7am	Mike Salay
Thur	24-Mar	7am - 3pm	Jeff Circle
Thur	24-Mar	3pm-11pm	Steve Laur
Thur-Fri	3/24-3/25	11pm - 7am	Don Helton
Fri	25-Mar	7am - 3pm	Steven Arndt
Fri	25-Mar	3pm-11pm	Steve Laur
Fri-Sat	3/25-3/26	11pm-7am	Don Helton
BWR Expertise			
Fri-Sat	3/18-3/19	11pm-7am	Mike Brown
Sat	19-Mar	7am - 3pm	Peter Alter
Sat	19-Mar	3pm-11pm	Chuck Norton
Sat-Sun	3/19-3/20	11pm - 7am	John Kauffman
Sun	20-Mar	7am - 3pm	Larry Vick
Sun	20-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/20-3/21	11pm - 7am	Mike Brown
Mon	21-Mar	7am - 3pm	Bob Summers
Mon	21-Mar	3pm-11pm	Chuck Norton
Mon-Tues	3/21-3/22	11pm - 7am	Mike Brown
Tues	22-Mar	7am - 3pm	Tom Boyce (RES)
Tues	22-Mar	3pm-11pm	Chuck Norton
Tues-Wed	3/22-3/23	11pm - 7am	Mike Brown
Wed	23-Mar	7am - 3pm	Larry Vick
Wed	23-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/23-3/24	11pm - 7am	Eva Brown

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Thur	24-Mar	7am - 3pm	Peter Alter
Thur	24-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/24-3/25	11pm - 7am	Eva Brown
Fri	25-Mar	7am - 3pm	Bob Summers
Fri	25-Mar	3pm-11pm	Chuck Norton
Fri-Sat	3/25-3/26	11pm-7am	Eva Brown
RST Comm/ERDS Operator			
Fri-Sat	3/18-3/19	11pm-7am	Andy Kugler
Sat	19-Mar	7am - 3pm	Joseph Williams
Sat	19-Mar	3pm-11pm	John Thorp
Sat-Sun	3/19-3/20	11pm - 7am	Ujagar Bhachu
Sun	20-Mar	7am - 3pm	Denise McGovern
Sun	20-Mar	3pm-11pm	Donna Williams
Sun-Mon	3/20-3/21	11pm - 7am	Ujagar Bhachu
Mon	21-Mar	7am - 3pm	Joseph Williams
Mon	21-Mar	3pm-11pm	John Thorp
Mon-Tues	3/21-3/22	11pm - 7am	Bill Roggenbrodt
Tues	22-Mar	7am - 3pm	Steve Bloom
Tues	22-Mar	3pm-11pm	Jim Isom
Tues-Wed	3/22-3/23	11pm - 7am	Bill Roggenbrodt
Wed	23-Mar	7am - 3pm	Joseph Williams
Wed	23-Mar	3pm-11pm	Ken Hart
Wed-Thur	3/23-3/24	11pm - 7am	Bill Roggenbrodt
Thur	24-Mar	7am - 3pm	Andrew Kugler
Thur	24-Mar	3pm-11pm	John Thorp
Thur-Fri	3/24-3/25	11pm - 7am	Bill Roggenbrodt
Fri	25-Mar	7am - 3pm	Donna Williams
Fri	25-Mar	3pm-11pm	Jim Isom
Fri-Sat	3/25-3/26	11pm-7am	David Solorio
RST Support (Seismology Q&A)			
Fri-Sat	3/18-3/19	11pm-7am	Off (On Call)
Sat	19-Mar	7am - 3pm	Off (On Call)
Sat	19-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/19-3/20	11pm - 7am	Alice Stieve (On Call) Working as PMT GIS
Sun	20-Mar	7am - 3pm	Cliff Munson (On Call)
Sun	20-Mar	3pm-11pm	Annie Kammerer (On Call)
Sun-Mon	3/20-3/21	11pm - 7am	Stephanie Devlin (On Call)
Mon	21-Mar	7am - 3pm	Cliff Munson (On Call)
Mon	21-Mar	3pm-11pm	A. Kammerer 3-11; M. Bensi 3-6 (On Call)
Mon-Tues	3/21-3/22	11pm - 7am	Dogan Seber (On Call)
Tues	22-Mar	7am - 3pm	Nilesh Chokchi On Call)
Tues	22-Mar	3pm-11pm	S. Devlin 3-11; M. Bensi 3-6 (On Call)
Tues-Wed	3/22-3/23	11pm - 7am	Cliff Munson (On Call)
Wed	23-Mar	7am - 3pm	Nilesh Chokchi On Call)
Wed	23-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Wed-Thur	3/23-3/24	11pm - 7am	Annie Kammerer (On Call)
Thur	24-Mar	7am - 3pm	Cliff Munson (On Call)
Thur	24-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Thur-Fri	3/24-3/25	11pm - 7am	Dogan Seber (On Call)
Fri	25-Mar	7am - 3pm	Dogan Seber (On Call)

JAPAN EARTHQUAKE - ERO STAFFING SCHEDULE

MARCH 18-26

Fri	25-Mar	3pm-11pm	A.Kammerer 3-11, M. Bensi 3-6 (On Call)
Fri-Sat	3/25-3/26	11pm-7am	Dogan Seber (On Call)
RST Support (Structural)			
Fri-Sat	3/18-3/19	11pm-7am	Off (On Call)
Sat	19-Mar	7am - 3pm	Off (On Call)
Sat	19-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/19-3/20	11pm - 7am	Off (On Call)
Sun	20-Mar	7am - 3pm	Off (On Call)
Sun	20-Mar	3pm-11pm	Off (On Call)
Sun-Mon	3/20-3/21	11pm - 7am	Off (On Call)
Mon	21-Mar	7am - 3pm	Off (On Call)
Mon	21-Mar	3pm-11pm	Bret Tegeler (On Call)
Mon-Tues	3/21-3/22	11pm - 7am	Bret Tegeler (On Call)
Tues	22-Mar	7am - 3pm	Pravin Patel (On Call)
Tues	22-Mar	3pm-11pm	Bret Tegeler (On Call)
Tues-Wed	3/22-3/23	11pm - 7am	Bret Tegeler (On Call)
Wed	23-Mar	7am - 3pm	Pravin Patel (On Call)
Wed	23-Mar	3pm-11pm	Samir Chakrabart (On Call)
Wed-Thur	3/23-3/24	11pm - 7am	Samir Chakrabart (On Call)
Thur	24-Mar	7am - 3pm	Pravin Patel (On Call)
Thur	24-Mar	3pm-11pm	Jerry Chung (On Call)
Thur-Fri	3/24-3/25	11pm - 7am	Jerry Chung(On Call)
Fri	25-Mar	7am - 3pm	Pravin Patel (On Call)
Fri	25-Mar	3pm-11pm	Manas Chakravorty (On Call)
Fri-Sat	3/25-3/26	11pm-7am	Manas Chakravorty (On Call)

mw
From: [Wilson, George](#)
To: [Hiland, Patrick](#); [Skeen, David](#); [Grobe, Jack](#); [Leeds, Eric](#); [Meighan, Sean](#); [Nguyen, Quynh](#); [Mathew, Roy](#); [Wittick, Brian](#); [Andersen, James](#)
Subject: Draft scheduling note for SBO
Date: Tuesday, March 22, 2011 3:36:20 PM
Attachments: [Draft.sbo.note.docx](#)

See attached

George Wilson
USNRC
EICB Branch Chief, Division of Engineering
Mail Stop O12H2
301-415-1711

V/138

Draft: 03/22/11

SCHEDULING NOTE

Title: **BRIEFING ON Status of Events in Japan and U.S. Fleet status on Station Blackout (Public)**

Purpose: To provide the Commission with an updated status of the Japanese Event and to provide an overview of the Station Blackout Rule.

Scheduled: **April 28, 2011
0900 a.m.**

Duration: Approx. 1 hour and 45 minutes

Location: Commissioners' Conference Room, 1st floor OWFN

Participants:	Presentation
<u>NRC Staff Panel</u>	50 mins.*
R. William Borchardt , Executive Director for Operations <u>Topic:</u> Update to Japanese Response	15 mins.*
Jack Grobe , Deputy Director for Engineering and Support Office of Nuclear Reactor Regulation <u>Topic:</u> Station Blackout Overview	5 mins.*
Patrick Hiland , Director for Engineering, Office of Nuclear Reactor Regulation <u>Topic:</u> Station Blackout Rule Background	10 mins.*
George Wilson , Chief of Instrumentation and Control Branch, Division of Engineering, Office of Nuclear Reactor Regulation <u>Topic:</u> Station Blackout Review and Approval Process	20 mins.*
Commission Q & A	50 mins.
Discussion – Wrap-up	

release

From: [EDO Update](#)
To: [Taylor, Renee](#)
Subject: EDO Update
Date: Tuesday, March 15, 2011 10:16:27 AM

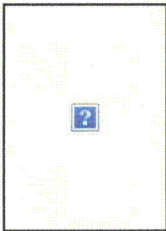
EDO Banner



EDO Update



Tuesday, March 15, 2011



We are all saddened about the tragic events in Japan. Our thoughts and prayers go out to all of those affected by the earthquake and tsunami. The serious nuclear power plant issues have obviously been a special focus of the NRC. Rest assured, we are closely monitoring the situation and providing requested assistance. Senior managers and staff have been manning the Operations Center in rotations 24 hours a day since the earthquake. Over the weekend, we sent two staff members to Japan who are boiling-water reactor experts (the technology used at the Fukushima site). At the Japanese government's request, we have also sent nine additional NRC staff to help the American embassy in Tokyo and to support the Japanese regulators. Not surprisingly, the Congressional hearing scheduled for this Wednesday, which was originally to focus on our Fiscal Year 2012 budget, will now be primarily focused on the events in Japan.

It is not for the NRC to speak for the Japanese or United States governments, so I won't comment on the situation in any greater detail. Additional information can be obtained from the International Atomic Energy Agency and the U.S. Agency for International Development, a part of the State Department that is coordinating the U.S. response and assistance efforts.

It is possible that some of you will be requested by colleagues in another country to provide technical advice and assistance during this emergency. It is essential that all such communications be handled through the NRC Operations Center. If you receive such a request, contact the NRC Operations Officer (301-816-5100 or via the NRC Operator) immediately. All media calls should be forwarded to the Office of Public Affairs (301-415-8200). If you receive information regarding this or any emergency (foreign or domestic) and you are not certain that the NRC's Incident Response Operations Officer is already aware of that information, you should contact the NRC Operations Officer (301-816-5100 or via the NRC Operator) and provide that information.

Notwithstanding the significance of what is occurring in Japan, we still have our domestic mission to carry out, and with the exception of the small number of people who have been directly called upon to respond to this situation we should all proceed with previously planned activities. We will continue to process licensing actions, conduct inspections, and fulfill our regulatory responsibilities.

In accordance with NRC regulations, every American nuclear power plant is designed with multiple, redundant safety systems to be robust enough to withstand the seismic and natural event risks associated with its specific location. In other words, the NRC analyzes every reactor site for own specific features and potential hazards, and requires the plant to be designed and operated accordingly. But in calculating risks, a certain level of uncertainty is always present. To compensate for these uncertainties, the NRC utilizes the concept of "defense in depth"—an approach to safety where multiple, diverse, and redundant layers of protection are used to prevent accidents and mitigate consequences. While it is inappropriate to speculate on what would happen to an American nuclear power plant under similar circumstances to the Japan event, we do know that U.S. nuclear facilities are among the most robust and well-protected civilian structures in the country.

Let me express my thanks to the NRC staff that have served in or supported the Operations Center since the earthquake hit. I'd also like to thank those who have had to compensate for their colleagues who have been called away from their regular duties.

I will keep you informed of ongoing developments.



Bill Borchardt, EDO

From: [EDO Update](#)
To: [Taylor, Renee](#)
Subject: EDO Update
Date: Wednesday, March 23, 2011 4:23:46 PM

EDO Banner

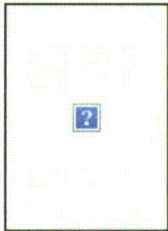


EDO Banner

EDO Update



Wednesday, March 23, 2011



The NRC (as well as many other parts of the U.S. government) is continuing to provide assistance to Japan. Nearly every NRC employee has been affected, in one way or another, by our response to the Japan tragedy. We are beginning to send replacement staff to Japan for our team of NRC experts and 24/7 staffing of the operations center continues. I thank you for your adaptability, flexibility and willingness to contribute your efforts to our important work. Despite the fact that so much public attention is being directed to our Japan efforts, we continue to meet our primary responsibility of ensuring U.S. public health and safety.

Fukushima Event and Normal NRC Operations

Although the situation is still dynamic, events at the Fukushima reactor site appear to be on the road to stabilizing. A wide range of complex technical challenges are being addressed in Japan including the restoration of "normal" electric power to the reactor plant equipment. I would like to reiterate my thanks and those of the Chairman and Commission both to those of you who are responding to the events in Japan and to those of you who continue to carry out our mission of ensuring the safe and secure civilian uses of nuclear materials in the U.S. I am impressed by the commitment and flexibility you have shown in challenging circumstances. Nearly everyone in the agency has had to step up with extra effort as many managers and staff have taken on additional duties. I would ask you all to continue demonstrating the same dedication for a bit longer, and to continue upholding the NRC Values and the principles of an Open, Collaborative Work Environment.

The Office of Human Resources has distributed information to supervisors and timekeepers to summarize the options and guidelines for determining work schedules and premium pay for employees serving in and supporting the Operations Center, or working in Japan. I ask supervisors to exercise flexibility and understanding as they

accommodate responders' often unpredictable work schedule and premium pay needs.

For those who did not have a chance to watch last Friday's All Employees meeting, the video is available here:

<http://r2.nrc.gov/videoarchive/ViewVideo.cfm?vlink=275>

The video, as well as the PowerPoint files and transcript, of Monday's Commission meeting are available on this NRC public website page dedicated to the Fukushima events. I encourage the staff to periodically check this link for other updated information on the event.

<http://www.nrc.gov/japan/japan-info.html>

Continuing Resolution

Congress has passed, and the President signed, another Continuing Resolution, extending federal government funding through April 8th. We continue to be prepared for a variety of scenarios.

Ann Thomas Retirement

Ann Thomas, a long-time NRC employee known to many of you as the editor of the *NRC Reporter* (and before that, the *NR&C* newsletter) and a pillar of the Employees Welfare and Recreation Association, will be retiring at the end of this month. Please join me in extending to Ann our best wishes for an enjoyable retirement in her new home.



Bill Borchardt, EDO

From: Gavrilas, Mirela
To: Richards, Stuart; Case, Michael
Cc: Csontos, Aladar; Tregoning, Robert; Dunn, Darrell
Subject: Fw: Feedback on Issues Related to Sea Water in a BWR Plant
Date: Wednesday, March 23, 2011 8:53:28 AM

Fyi. This combined with the fact that most likely there is salt on every internal and external surface in the containment requires us to revisit the conclusions of yesterday morning.

I'm sure Darrell or Al or Rob will brief you, if they have not done so already.

M.

From: Dunn, Darrell
To: Gavrilas, Mirela
Sent: Wed Mar 23 08:01:58 2011
Subject: FW: Feedback on Issues Related to Sea Water in a BWR Plant

From: Csontos, Aladar
Sent: Tuesday, March 22, 2011 9:53 PM
To: Klein, Paul; Mendiola, Anthony; Ward, Leonard; Taylor, Robert; Tregoning, Robert; Hardies, Robert; Makar, Gregory; Dunn, Darrell
Subject: RE: Feedback on Issues Related to Sea Water in a BWR Plant

Folks,

I looked over the CNWRA 92-021 report that Darrell Dunn suggested, particularly Figure 3-15 on page 3-36. The SCC crack growth rates are not on the order of 0.001"/year as suggested in the salt paper that we got this am. Looking at Figure 3-15 for 316 in a creviced condition, CGRs are on the order of 0.1 mm/hr at 80C and at 3% NaCl or 0.01 mm/hr at 0.03% NaCl at a stress intensity of 15 kgf/mm^{3/2}. I'll have to do the conversion to MPa m^{1/2} to get a real gauge of the K relationship. Also, 304 would probably have a faster CGR than 316 (not sure but a trend between the two alloys).

Darrell returns tomorrow and I'll discuss this with him in the morning. If you want, we can get some preliminary calcs for component integrity for some stainless steel piping similar to the BWRs in Japan. Let me know if you want that.

Al

From: Klein, Paul
Sent: Tuesday, March 22, 2011 1:32 PM
To: Mendiola, Anthony; Ward, Leonard; Taylor, Robert
Cc: Tregoning, Robert; Hardies, Robert; Makar, Gregory; Klein, Paul; Csontos, Aladar
Subject: Feedback on Issues Related to Sea Water in a BWR Plant

Tony,

Rob Taylor requested I send our comments (from the staff on cc distribution) on the subject

paper to you. Please see the attached file.

Paul Klein
USNRC
301-415-4030

From: [Harris, Charles](#)
To: [Sangimino, Donna-Marie](#)
Cc: [Case, Michael](#); [Richards, Stuart](#)
Subject: FW: JNES - Tokyo Electricity, Infrastructure
Date: Wednesday, March 23, 2011 9:53:02 AM

Hello Donna-Marie,

Please note below my JNES colleague's comments on Tokyo infrastructure. The damage to fossil power plants, I guess, was not news-worthy; I had not heard that before.

Charlie

From: arai-kensaku@jnes.go.jp [arai-kensaku@jnes.go.jp]
Sent: Tuesday, March 22, 2011 10:48 PM
To: Harris, Charles
Cc: kono-katsumi@jnes.go.jp; sakamoto-hiroshi@jnes.go.jp; sakamoto-kazunobu@jnes.go.jp
Subject: RE: Hello

Dear Charles,

Thank you very much for your sympathy.
All of my family and colleges are safe fortunately.

As for the TIP4 meeting, I heard your government recommend people to refrain traveling to Japan for the time being.

In addition, Tokyo metropolitan area is suffering serious electricity shortage, since not only NPP but also many thermal power plants are severely damaged.

So infrastructures including transportation system have limitation.

This electricity shortage will not improved by the end of April.

Under the circumstance, we would like to propose you to cancel the TIP-4 meeting this time.

Hope you could understand the situation.

Best regards,
Kensaku

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

From: Harris, Charles [<mailto:Charles.Harris@nrc.gov>]
Sent: Tuesday, March 22, 2011 10:23 PM
To: arai-kensaku@jnes.go.jp
Subject: Hello

Dear Kensaku,

All TIP-4 members wish you and your family to be safe regarding the recent events in your country.

Of course, we know all JNES is very busy, so this message is not a priority.

When you and your managers have time, could you please consider the status of our TIP meeting planned for next month?

V/140

Thank you,

Charles

From: Richards, Stuart
To: Gibson, Kathy
Cc: Zaki, Tarek; Lee, Richard; Bush-Goddard, Stephanie; Case, Michael; Rini, Brett; Bowman, Gregory
Subject: FW: Ops Center Action Item for Ticketing
Date: Wednesday, March 23, 2011 1:23:48 PM
Importance: High

Kathy

I highlighted two items below that I think DSA should address (in green and red highlight).

If you disagree, let's talk.

Note the 6 pm tonight due date for a response (either the answer, or an estimate of when we can provide an answer).

Thanks
Stu

From: RST01 Hoc (NSIE)
Sent: Wednesday, March 23, 2011 11:23 AM
To: Andersen, James; Muesle, Mary
Cc: Brown, Frederick
Subject: Ops Center Action Item for Ticketing

Jim and Mary,

Per Fred Brown, RST Director here in the Ops Center, Please ticket the following item to RES and FSME:

"Respond to Dan Dorman's email on long-term issue questions from Japan. Provide responses or estimates of when the responses can be expected to Dan by 18:00 EDT. If additional information is needed, let the site team know of any questions that can be brought back to NISA.

-Regarding the best type of enclosure for the plant, does NRC have any thoughts? Do we have any regulations applicable to this condition or thoughts on the role of the regulatory authority in this decision?

-What licensing requirements apply to decommissioning and regulatory review of the decommissioning plan?

-What should the Japanese be considering with respect to criticality prevention and decay heat removal during the entombment period? (Richard Lee's Branch?)

-The NRC's TMI fact sheet notes that the first manned entry into the Unit 2 reactor building occurred after a venting of Krypton in July 1980 (16 months after the accident). What actions occurred during those 16 months that could inform their planning?" (Richard Lee and Stephanie's branches??)

✓/141

Dan Dorman's email pasted below:

From: Dorman, Dan
Sent: Tuesday, March 22, 2011 3:05 AM
To: OST01 HOC; Casto, Greg; Monninger, John; ET07 Hoc
Subject: RE:

Additional tasks from meeting with NISA et al this morning. Lower priority than the Cabinet level issues we just discussed on the phone, but any responses available by 1800 EDT on 3/22 would be greatly appreciated along with an estimate of when the remainder may be expected. If you need additional info, please identify any questions we can bring back to NISA (keeping in mind please that their plant data is also very limited, i.e., keep your data expectations modest).

1. Sea water injection continues to reactors 1-3. NISA is concerned about the radiolytic disassociation of H2 and O2. NISA would like NRC's perspective on the significance of this concern and how to treat this concern as they transition to freshwater injection.
2. At what point does salt deposits become a problem for flow during pending freshwater injection?
3. NISA is conducting simulations to project the extent of damage to fuel in the reactors. Has NRC developed any views on the extent of fuel damage?
4. NISA is interested to obtain any reference material regarding core-concrete interaction (not because they think they have a current issue but against that eventuality) including the conditions under which that occurs and any associated data.
5. In addition to the H2/O2 disassociation in item 1 above, they are concerned that there may be residual H2 in the containments and welcome NRC's thoughts on how to treat such a condition.

NISA is beginning to look at long term issues and has the following Qs in this area (note some of these may only apply to Japan's regulatory framework, but if we have insights from our post-TMI actions they would be greatly appreciated):

6. Regarding the best type of enclosure for the plant, does NRC have any thoughts? Do we have any regulations applicable to this condition or thoughts on the role of the regulatory authority in this decision?
7. What licensing requirements apply to decommissioning and regulatory review of the decommissioning plan?
8. What should they be considering with respect to criticality prevention and decay heat removal during the entombment period?
9. The NRC's TMI Fact Sheet notes that the first manned entry into the Unit 2 reactor building occurred after a venting of Krypton in July 1980 (16 months after the accident). What actions occurred during those 16 months that could inform their planning?

Regarding the spent fuel pools, NISA asserted that the Unit 1 SFP is above TAF with over 20 days margin due to low decay heat. They are not injecting to the Unit 1 SFP. For Unit 2, they are injecting seawater to the SFP via installed piping. For Units 3 and 4, they are spraying from pumper trucks within the RBs to put water on the top of the pools (In response to a question, they indicated that these sprays were put in place after the explosive events in those buildings.) Based on this information, NISA is assuming that the SFPs are all below 100C. The team here has questions relative to the latter buildings and other information available, for example, lack of visual evidence of steaming on Unit 4. We would appreciate HQ's thoughts on the SFPs and apparent inconsistencies with the status provided by NISA.

Dan Dorman

Thanks,
Eric Thomas
RST Coordinator

Benner, Eric

From: Ordaz, Vonna
Sent: Wednesday, March 23, 2011 3:22 PM
To: Benner, Eric
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
Subject: FW: Ops Center Action Item for Ticketing
Importance: High

Related to the action email that I just sent...

From: Richards, Stuart
Sent: Wednesday, March 23, 2011 2:33 PM
To: Mohseni, Aby; Davis, Jack; Weaver, Doug; Waters, Michael
Cc: Rini, Brett; Case, Michael; Ordaz, Vonna
Subject: FW: Ops Center Action Item for Ticketing
Importance: High

The original request.

Stu

From: Bowman, Gregory
Sent: Wednesday, March 23, 2011 12:08 PM
To: Case, Michael; Richards, Stuart; Gibson, Kathy; Scott, Michael
Subject: FW: Ops Center Action Item for Ticketing
Importance: High

FYI – I just sent this information request from the Ops Center to Brett. I sent it to him because I wasn't sure which division in RES would be the right one to help with this, but I figured I'd pass it along to you, as well, given that the Ops Center is looking for a response by the end of the day.

From: Bowman, Gregory
Sent: Wednesday, March 23, 2011 11:51 AM
To: Rini, Brett; Deegan, George
Cc: Frazier, Alan; Brock, Kathryn
Subject: FW: Ops Center Action Item for Ticketing
Importance: High

Brett and George,

We got the request below from the Ops Center. We think there should be one coordinated response back to the Ops Center from RES and FSME, but none of us are sure which division would be best able to respond. Can you help with this? Note that the Ops Center has asked for a response by 18:00 tonight.

Greg

From: RST01 Hoc
Sent: Wednesday, March 23, 2011 11:23 AM
To: Andersen, James; Muesle, Mary

Cc: Brown, Frederick
Subject: Ops Center Action Item for Ticketing

Jim and Mary,

Per Fred Brown, RST Director here in the Ops Center, Please ticket the following item to RES and FSME:

"Respond to Dan Dorman's email on long-term issue questions from Japan. Provide responses or estimates of when the responses can be expected to Dan by 18:00 EDT. If additional information is needed, let the site team know of any questions that can be brought back to NISA.

-Regarding the best type of enclosure for the plant, does NRC have any thoughts? Do we have any regulations applicable to this condition or thoughts on the role of the regulatory authority in this decision?

-What licensing requirements apply to decommissioning and regulatory review of the decommissioning plan?

-What should the Japanese be considering with respect to criticality prevention and decay heat removal during the entombment period?

-The NRC's TMI fact sheet notes that the first manned entry into the Unit 2 reactor building occurred after a venting of Krypton in July 1980 (16 months after the accident). What actions occurred during those 16 months that could inform their planning?"

Dan Dorman's email pasted below:

From: Dorman, Dan
Sent: Tuesday, March 22, 2011 3:05 AM
To: OST01 HOC; Casto, Greg; Monninger, John; ET07 Hoc
Subject: RE:

Additional tasks from meeting with NISA et al this morning. Lower priority than the Cabinet level issues we just discussed on the phone, but any responses available by 1800 EDT on 3/22 would be greatly appreciated along with an estimate of when the remainder may be expected. If you need additional info, please identify any questions we can bring back to NISA (keeping in mind please that their plant data is also very limited, i.e., keep your data expectations modest).

1. Sea water injection continues to reactors 1-3. NISA is concerned about the radiolytic disassociation of H2 and O2. NISA would like NRC's perspective on the significance of this concern and how to treat this concern as they transition to freshwater injection.
2. At what point does salt deposits become a problem for flow during pending freshwater injection?
3. NISA is conducting simulations to project the extent of damage to fuel in the reactors. Has NRC developed any views on the extent of fuel damage?
4. NISA is interested to obtain any reference material regarding core-concrete interaction (not because they think they have a current issue but against that eventuality) including the conditions under which that occurs and any associated data.
5. In addition to the H2/O2 disassociation in item 1 above, they are concerned that there may be residual H2 in the containments and welcome NRC's thoughts on how to treat such a condition.

NISA is beginning to look at long term issues and has the following Qs in this area (note some of these may only apply to Japan's regulatory framework, but if we have insights from our post-TMI actions they would be greatly appreciated):

6. Regarding the best type of enclosure for the plant, does NRC have any thoughts? Do we have any regulations applicable to this condition or thoughts on the role of the regulatory authority in this decision?
7. What licensing requirements apply to decommissioning and regulatory review of the decommissioning plan?
8. What should they be considering with respect to criticality prevention and decay heat removal during the entombment period?

9. The NRC's TMI Fact Sheet notes that the first manned entry into the Unit 2 reactor building occurred after a venting of Krypton in July 1980 (16 months after the accident). What actions occurred during those 16 months that could inform their planning?

Regarding the spent fuel pools, NISA asserted that the Unit 1 SFP is above TAF with over 20 days margin due to low decay heat. They are not injecting to the Unit 1 SFP. For Unit 2, they are injecting seawater to the SFP via installed piping. For Units 3 and 4, they are spraying from pumper trucks within the RBs to put water on the top of the pools (In response to a question, they indicated that these sprays were put in place after the explosive events in those buildings.) Based on this information, NISA is assuming that the SFPs are all below 100C. The team here has questions relative to the latter buildings and other information available, for example, lack of visual evidence of steaming on Unit 4. We would appreciate HQ's thoughts on the SFPs and apparent inconsistencies with the status provided by NISA.

Dan Dorman

Thanks,
Eric Thomas
RST Coordinator

Barto, Andrew

From: Davis, Jack
Sent: Wednesday, March 23, 2011 5:52 PM
To: Sippel, Timothy; Rahimi, Meraj
Cc: Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

I agree with Tim. Also, implementation of any of these options is going to be an extremely challenging industrial operation.

Jack

From: Sippel, Timothy
Sent: Wednesday, March 23, 2011 5:47 PM
To: Rahimi, Meraj
Cc: Davis, Jack; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Meraj,

We should emphasize that the decay heat removal concern is really more significant in controlling the decision than criticality.

Although criticality is much more of a concern in the spent fuel pools as Drew mentioned. We should also recommend that the condition of the fuel and fixed absorbers in the pools be determined.

For any option that involves directly adding material (concrete, glass, etc) to the core: It would be extremely difficult due to ensure the properties of the final material.

- Tim.

From: Davis, Jack
Sent: Wednesday, March 23, 2011 5:38 PM
To: Rahimi, Meraj; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Meraj,

My comments for consideration are in redline/strikeout.

Thanks,

Jack

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:24 PM
To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: any comments on the proposed response?

Any comments?

We would not recommend early entombment considerations due to the high thermal loads and associated negative effects on entombment material properties. In fact, we ~~The staff~~ believes it might not be prudent ~~not~~ to entomb at all. We believe that Japan should consider ~~and~~ waiting until the core or spent fuel debris can be cooled sufficiently and then removed similar to TMI. We would initially recommend ~~The first action is to~~ pumping in borated water into the molten core or spent fuel pool. Longer term, if entombment is considered by Japan, it is our opinion that entombment would be less problematic (with respect to criticality issues) if the entombment is around the molten core or pool, rather than directly onto the fuel and in the primary containment vessel. ~~core there should not be any impact on the systems reactivity.~~ We believe that heat transfer will be a significant challenge and thus ~~With respect to heat transfer capability,~~ it would be best if the entombment was ~~should be~~ built with low and high vents that would enable the transfer of heat through air convection. If the entombment is considered by pouring some type of material on the molten core or spent fuel pool the system reactivity and heat transfer capability is highly dependent on the material of use. We believe the temperature in the reactor core or the dried spent fuel pool is too high for the concrete to cure. Another option may be the use of sand with boron frits which would turn into glass when contacted with the molten core. This would immobilize the radionuclides. However, the temperature at which the sand is added must be at the point that the glass can solidify. This may require longer cooling time.

In the interim while options are considered, it ~~Another option,~~ might be advisable to confine the core or the pool with a filtered flexible enclosure.

Meraj Rahimi
Chief of Criticality, Shielding, and Dose Assessment Branch
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6003 Executive Blvd., Suite 301
Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

Barto, Andrew

From: Jordan, Natreon
Sent: Wednesday, March 23, 2011 11:45 PM
To: Barto, Andrew; Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Meraj,

I concur as well with the following consideration to add. With potential impacts to configuration due to thermal degradation, it may prove important to ensure an appropriate means of recirculating any borated material being used. If the plan is to pour concrete in the process, we may need to consider any reflective properties given by concrete unless borated.

Nate

From: Barto, Andrew
Sent: Wednesday, March 23, 2011 5:33 PM
To: Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Meraj,

I concur with what Chris just sent. I spoke to Kent Wood after yesterday's TAG meeting regarding spent fuel pool criticality in the Japan event. He noted that aluminum based fixed neutron absorbers (Boral, Metamic, borated aluminum), which are commonly used in spent fuel pools, may have melted if the fuel in the pool had become uncovered and heated up significantly. Therefore, any reflooding or entombment should rely heavily on additional neutron absorber material to prevent criticality.

Drew

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:24 PM
To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: any comments on the proposed response?

Any comments?

The first action is to pour borated water into core or the spent fuel pool. If the entombment is to build a structure around the molten core or pool, there should not be any impact on the system reactivity. With respect to heat transfer, the entombment should be built in such a way that lower and upper vents would allow heat removal through air convection. If the entombment is to pour some type of materials directly on the molten core or spent fuel in dried pool, it depends on the material. The staff believes, the environment is probably too hot for the concrete to cure. The other option may be the use of sand with boron frits which could turn into glass if added at the appropriate temperature. This would immobilize the radionuclides but longer cooling time might be required.

The staff believes it might be prudent to wait for longer cooling time in order to allow the removal of core and spent fuel debris in the pool similar to the TMI recovery.

Another option might be the use of a filtered flexible confinement barrier around the core and the spent fuel pool.

Meraj Rahimi
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Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

(NSIR)
Japan
Related

From: Sheron, Brian
To: Case, Michael; Coe, Doug; Correia, Richard; Gibson, Kathy; Richards, Stuart; Scott, Michael; Uhle, Jennifer; Valentin, Andrea
Subject: FW: Heads up: Japan evacuations
Date: Wednesday, March 23, 2011 2:31:53 PM
Attachments: Japan evacuation.doc

From: Leeds, Eric (NRR)
Sent: Wednesday, March 23, 2011 2:24 PM
To: Brenner, Eliot; Hayden, Elizabeth
Cc: Borchardt, Bill; Virgilio, Martin; Weber, Michael; Johnson, Michael; Holahan, Gary; Wiggins, Jim; Evans, Michele; Miller, Charles; Sheron, Brian; Uhle, Jennifer; Doane, Margaret; Mamish, Nader; Grobe, Jack; Boger, Bruce; Ruland, William; Dean, Bill; McCree, Victor; Pederson, Cynthia; Howell, Art; Batkin, Joshua
Subject: Heads up: Japan evacuations

FYI - I asked our contact at the NEA for info on other countries evacuating around Fukushima. Some other members of the international community followed the US recommendation. Some did other things See below and attached.

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

From: Diane.JACKSON@oecd.org [mailto:Diane.JACKSON@oecd.org]
Sent: Wednesday, March 23, 2011 1:22 PM
To: Leeds, Eric
Subject: Your question about Japan evacuations

Eric -

I did some web searching. Canada, South Korea, UK and Australia stated an evacuation distance of 80 km/ 50 miles.

Many countries, such as France, urged their citizens in the north-east Japan and Tokyo to evacuate. In most reports, most countries do not state the reason is nuclear and they do not give a defined distance.

Attached are excerpts from reports with web sources.

Hope that helps,
Diane

✓/145

CANADIAN NUCLEAR SAFETY COMMISSION (CNSC): March 17, 2011 19:08 EDT:

"Given the evolving situation, Canadians located within 80 km of the Fukushima Nuclear Power Plant should consider, as a further precautionary measure, evacuating this area. The directions of the Japanese government and local emergency response personnel should also be followed by all Canadians in Japan."

CANADA FOREIGN AFFAIRS AND INTERNATIONAL TRADE: 23 March, 2011

"Following damage to the Fukushima nuclear power station in Okumacho, Canadians are strongly advised to follow the advice issued by the Japanese authorities. An evacuation order is in effect for the zone within 20 km of the Fukushima Nuclear Power Plant. Japanese authorities recommend that people between 20 km and 30 km from the plant remain indoors with windows and doors closed and refrain from using ventilation systems. Given the evolving situation, Canadians located within 80 km of the plant are advised that they should, as a further precautionary measure, evacuate this area. The directions of the Japanese government and local emergency response personnel should also be followed by all Canadians in Japan. "

Kyodo News: March 18, Kyodo

<http://english.kyodonews.jp/news/2011/03/79157.html>

"S. Korea to mobilize military planes to evacuate nationals from Japan"

On Thursday, South Korea upgraded a safety advisory telling its citizens in Japan to stay at least 80 kilometers away from the crippled nuclear reactors in Fukushima Prefecture, more than doubling the previous evacuation distance of 30 km amid rising fears of exposure to radiation.

Australian Business Traveller: 18 March 2011

<http://www.ausbt.com.au/australian-government-to-japan-travellers-leave-now-tokyo-unsafe>

ARPANSA [the Australian Radiation Protection and Nuclear Safety Agency] recommended that Australians within 80 kilometres of the Fukushima Nuclear Power Plant move out of the area as a precautionary measure.

Travel Weekly: Mar 17, 2011 07:43

"Nuclear fears in Japan prompt FCO warning"

<http://www.travelweekly.co.uk/Articles/2011/03/17/36516/nuclear-fears-in-japan-prompt-fco-warning.html>

The Government is chartering aircraft to evacuate Britons from Japan to Hong Kong as concerns heighten over fallout from the stricken Fukushima nuclear plant.

The Foreign and Commonwealth Office updated its travel advice today, saying: "Due to the evolving situation at the Fukushima nuclear facility and potential disruptions to the supply of goods, transport, communications, power and other infrastructure, British nationals currently in Tokyo and to the north of Tokyo should consider leaving the area.

"The UK government is chartering flights from Tokyo to Hong Kong to supplement commercially available options for those wishing to leave Japan."

Britons were urged to remain outside an 80km radius of the nuclear plant "as an additional precautionary measure," saying the call was in line with the US government's advice to its citizens in Japan.

"If you are currently between 30km and 80km from the facility, we advise you to leave the area or take shelter indoors if you are unable to travel," the FCO said. Britons seeking to leave Japan were advised to use commercial flights as their first option or register interest in the charter option to Hong Kong.

BBC report: 18 march 2011

<http://www.bbc.co.uk/news/world-asia-pacific-12775329>

"Foreign evacuations"

- US - providing flights for people who wish to leave, advising 50-mile exclusion zone around Fukushima
- France - urging people to leave northern Japan and Tokyo, sending government planes to fly French out
- UK - advising nationals to leave north-east and Tokyo, chartering flights out
- China - bringing thousands to Niigata for evacuation
- Australia - people with non-essential roles to leave Japan

China says it has evacuated more than 6,000 of its nationals from quake-hit areas, mostly to Niigata on Japan's west coast, and is laying on six to eight additional flights to bring them home.

South Korea has said it will mobilise military ships and aircraft to evacuate its citizens if the situation worsens. At the moment it has told its nationals to stay 50 miles away from the plant.

Most other countries have also advised their nationals to evacuate from the north-eastern region of Japan or to leave the country altogether if they can.

Financial Times report Published: March 17 2011 17:14

"Foreign governments step up evacuations"

<http://www.ft.com/cms/s/0/592cdc28-50b1-11e0-9227-00144feab49a.html#axzz1HRMbjqdg>

In the clearest sign yet that foreign governments are losing confidence in the Japanese government's ability to contain radioactivity from the crippled reactors, embassies including Australia, China, South Korea and Thailand upgraded their warnings to nationals in Japan.

The US and UK governments on Thursday said they were arranging charter flights for their nationals to leave Japan. The UK and Australia also expanded the evacuation zone to 80km in line with advice from the US to its nationals.

World News Company report: March 17 2011

<http://www.worldnewsco.com/4528/residents-radius-80-km-fukushima-nuclear-power-plant/>

The government of United States called on their citizens within a radius of 80 kilometers from the Fukushima nuclear power plant to leave the area. U.S. warning shows the evacuation radius which is wider than the evacuation order issued by Japanese government.

The Japanese government had previously urged people living within a radius of 20 kilometers from the Fukushima nuclear power plant to flee to other places.

The Japanese government also urged people residing within a radius of 32 kilometers from the Fukushima nuclear power plant to not leave the house if they can not leave the area.

While the British Foreign Office said, English people should now consider to go from Tokyo and the northeast region of Japan.

"Concerning the situation in the Fukushima nuclear facilities, the last suggestion of The UK Government Chief Scientific Adviser (GCSA) is for those who are outside the exclusion zone established by the Japanese authorities, no real problems to worry about the **health** of human society. This advice is kept under review constantly," the statement of British Foreign Office.

"However, due to the situation that developed at the Fukushima nuclear facilities and potential disruptions to supply of goods, transportation, communications, electricity and other infrastructure, British citizens who currently resides in Tokyo and the north of Tokyo to consider leaving the area," thus, the official statement of British Foreign Office as reported by the Daily Telegraph on Thursday (March 17, 2011).

The Swiss government also urged its citizens to leave Tokyo and northeastern Japan. Previously, the Australian government had also urged its citizens residing in Tokyo, near Fukushima nuclear power plant and other areas affected by earthquake and tsunami to go to

evacuate. The call of evacuation of residents also issued by the governments of South Korea and France.

International Business Time: March 17, 2011 9:45 PM AEST

<http://au.ibtimes.com/articles/123822/20110318/uk-japan.htm>

As foreigners in Japan become increasingly desperate to flee the country, the British government has chartered planes to fly Britons in the country from Tokyo to Hong Kong.

"The UK government is chartering flights from Tokyo to Hong Kong to supplement commercially available options for those wishing to leave Japan," said a spokesman for the Foreign Office.

"Due to the evolving situation at the Fukushima nuclear facility and potential disruptions to the supply of goods, transport, communications, power and other infrastructure, British nationals in Tokyo and to the north of Tokyo should consider leaving the area," a UK government spokesman stated.

Britain follows other nations, including France, Turkey and China, which have already advised its nations to leave Japan

NSIR
(Japan)

From: Breskovic, Clarence (OIP)
To: Breskovic, Clarence
Subject: Fukushima: Panel discussion by Wisconsin Institutes for Discovery (March 22)
Date: Wednesday, March 23, 2011 7:56:29 AM

Online video (1.45 hrs): <http://mediasite.ics.uwex.edu/mediasite5/Viewer/?peid=aa0340142f4448c3969ee005e68331b11d>

Description:

"This panel discussion provides a technical and medical background to the emerging situation at Japan's damaged Fukushima Daiichi nuclear plant. Experts in nuclear engineering and medical physics will describe the chain of events that led to damage at the nuclear plant and what the risks are to public health of radiation releases."

About the Wisconsin Institutes for Discovery:

<http://discovery.wisc.edu/home/discovery/about-us/about-us.cmsx>

I can't vouch for the scientific or news value of this event but I am sure many others will follow.

Clarence Breskovic
International Policy Analyst
U.S. Nuclear Regulatory Commission
Office of International Programs
11555 Rockville Pike
Rockville, MD 20852, USA
Tel: 1-301-415-2364
Fax: 1-301-415-2395
Alternate Email: cal.breskovic@gmail.com

V/1146

Japan

From: Hoc, PMT12
To: Jaczko, Gregory
Cc: Carpenter, Cynthia; Lewis, Robert; Ordaz, Vonna; Camper, Larry; Holahan, Patricia; Miller, Charles; Gibson, Kathy; Sullivan, Randy; Jones, Cynthia; Reis, Terrence; Cool, Donald; Holahan, Vincent; Milligan, Patricia; Tappert, John; Lui, Christiana; Lubinski, John; Coe, Doug; Zimmerman, Roy; Wiggins, Jim; Sheron, Brian; Johnson, Michael; Virgilio, Martin; Weber, Michael; Boger, Bruce; Batkin, Joshua; Coggins, Angela; Borchardt, Bill; Weber, Michael; Casto, Chuck; Hoc, PMT12; Dorman, Dan; FOIA Response.hoc Resource
Subject: Deputies Meeting
Date: Wednesday, March 23, 2011 5:10:00 AM

Mr. Chairman,

At the Deputies Meeting this morning, it is possible that questions may be raised about thresholds for protective actions such as KI use and evacuation/sheltering. The staff believes that the existing Protective Action Guidelines (PAGs) are the best source of any recommendation thresholds. However, the potential chronic nature of the current release may warrant further assessment.

Based on discussion early this morning, it is expected that the State Department will recommend to the White House that a team of relevant federal agencies (including NRC) be assembled to quickly look at the applicable PAGs in the context of a potential chronic release in Japan and make any alternative recommendations as necessary.

Another topic that may be raised is the sharing of modeling assumptions and results, which is currently not being shared outside the DOE, NRC, and the White House.

✓/147

Barto, Andrew

From: Call, Michel
Sent: Wednesday, March 23, 2011 5:35 PM
To: Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Meraj,

Pouring of borated water should not be just a one-time thing. I think there should be something set up to circulate borated water through the core/pool for an extended time during an entombment period that uses a structure around the reactor and/or pool. I also agree with Chris's comment for any material being put into the pool/core needing to be poisoned (w/ boron).

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:24 PM
To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: any comments on the proposed response?

Any comments?

The first action is to pour borated water into core or the spent fuel pool. If the entombment is to build a structure around the molten core or pool, there should not be any impact on the system reactivity. With respect to heat transfer, the entombment should be built in such a way that lower and upper vents would allow heat removal through air convection. If the entombment is to pour some type of materials directly on the molten core or spent fuel in dried pool, it depends on the material. The staff believes, the environment is probably too hot for the concrete to cure. The other option may be the use of sand with boron frits which could turn into glass if added at the appropriate temperature. This would immobilize the radionuclides but longer cooling time might be required.

The staff believes it might be prudent to wait for longer cooling time in order to allow the removal of core and spent fuel debris in the pool similar to the TMI recovery.

Another option might be the use of a filtered flexible confinement barrier around the core and the spent fuel pool.

Meraj Rahimi
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Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

Barto, Andrew

From: Hrabal, Craig
Sent: Wednesday, March 23, 2011 6:00 PM
To: Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

You should emphasize that any entombment involving pouring borated concrete or and will require removing the pressure vessel head, which could introduce more problems e.g., radioactive release) than it solves

Also, any borated water added to the core must be via pumping

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:23 PM
To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: any comments on the proposed response?

Any comments?

The first action is to pour borated water into core or the spent fuel pool. If the entombment is to build a structure around the molten core or pool, there should not be any impact on the system reactivity. With respect to heat transfer, the entombment should be built in such a way that lower and upper vents would allow heat removal through air convection. If the entombment is to pour some type of materials directly on the molten core or spent fuel in dried pool, it depends on the material. The staff believes, the environment is probably too hot for the concrete to cure. The other option may be the use of sand with boron frits which could turn into glass if added at the appropriate temperature. This would immobilize the radionuclides but longer cooling time might be required.

The staff believes it might be prudent to wait for longer cooling time in order to allow the removal of core and spent fuel debris in the pool similar to the TMI recovery.

Another option might be the use of a filtered flexible confinement barrier around the core and the spent fuel pool.

Meraj Rahimi
Chief of Criticality, Shielding, and Dose Assessment Branch Division of Spent Fuel Storage and Transportation Office of Nuclear Materials Safety and Safeguard U.S. Nuclear Regulatory Commission
6003 Executive Blvd., Suite 301
Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

Barto, Andrew

From: Li, Zhian
Sent: Wednesday, March 23, 2011 5:35 PM
To: Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Meraj,

I would suggest to make the recommended actions into two phases. The first phase is to switch from seawater to borated to continue cooling the reactor core and spent fuel to sufficiently low temperatures so that entombment or removal of the damaged fuels becomes possible.

In the second phase, a decision is made to either entomb the core at the reactor site or remove the core to a remote ISFSI. Environmental impact and city rebuilding should be the two most primary concerns. Once decision is made, practical limit such as enclosure of the reactor with passive heat removal should be considered. However, the word of caution is that the phase II decision should not be done in a rush.

Zhian

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:24 PM
To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: any comments on the proposed response?

Any comments?

The first action is to pour borated water into core or the spent fuel pool. If the entombment is to build a structure around the molten core or pool, there should not be any impact on the system reactivity. With respect to heat transfer, the entombment should be built in such a way that lower and upper vents would allow heat removal through air convection. If the entombment is to pour some type of materials directly on the molten core or spent fuel in dried pool, it depends on the material. The staff believes, the environment is probably too hot for the concrete to cure. The other option may be the use of sand with boron frits which could turn into glass if added at the appropriate temperature. This would immobilize the radionuclides but longer cooling time might be required.

The staff believes it might be prudent to wait for longer cooling time in order to allow the removal of core and spent fuel debris in the pool similar to the TMI recovery.

Another option might be the use of a filtered flexible confinement barrier around the core and the spent fuel pool.

Meraj Rahimi
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Barto, Andrew

From: Tripp, Christopher
Sent: Wednesday, March 23, 2011 5:29 PM
To: Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

Please see comments below.

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:24 PM
To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natrean; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: any comments on the proposed response?

Any comments?

The first action is to pour borated water into core or the spent fuel pool. If the entombment is to build a structure around the molten core or pool, there should not be any impact on the system reactivity. With respect to heat transfer, the entombment should be built in such a way that lower and upper vents would allow heat removal through air convection. If the entombment is to pour some type of materials directly on the molten core or spent fuel in dried pool, it depends on the material. The staff believes, the environment is probably too hot for the concrete to cure. The other option may be the use of sand with boron frits which could turn into glass if added at the appropriate temperature. **Both concrete (especially wet) and sand would be a neutron moderator and could raise criticality concerns. Whatever is used should be carefully evaluated. Due to the unknown configuration in the core, any medium should conservatively be heavily borated.** This would immobilize the radionuclides but longer cooling time might be required.

The staff believes it might be prudent to wait for longer cooling time in order to allow the removal of core and spent fuel debris in the pool similar to the TMI recovery.

Another option might be the use of a filtered flexible confinement barrier around the core and the spent fuel pool.

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Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

Kauffman, John

From: Coyne, Kevin
Sent: Wednesday, March 23, 2011 10:19 AM
To: RES_DRA
Cc: Correia, Richard
Subject: Thanks to all DRA Staff

Doug and I want to express our sincere appreciation for everyone's support of the agency's ongoing response to the Japanese event over the last two weeks. Several folks have directly supported the Incident Response Center and briefings for various stakeholders, including the news media and congressional staff. As a Division, we have been able to provide accurate, timely, and much needed information at a critical time. In addition, we also want to thank everyone who has kept the core Division activities running smoothly despite the additional challenges imposed by both these events and the ongoing continuing resolution. We value all the work that is being churned out by the Division and want to make sure you know that your efforts during these challenging times are noted and very much appreciated.

The hard work will continue over the coming weeks and we look forward to seeing the continued high level performance from DRA.

Kauffman, John

From: Kauffman, John
Sent: Wednesday, March 23, 2011 3:15 PM
To: Khanna, Meena
Cc: Beasley, Benjamin
Subject: RE: GI-199 Talking Points
Attachments: image001.gif

Meena,

I have the following suggestions for your consideration:

Key message #3 add the following parenthetical at the end: (the increased probability is primarily in the high structural response frequencies, so buildings and equipment should not be affected (seismic amplitudes at lower frequencies are the primary contributors to building and equipment damage))

4th bullet under "Status of Operating Plants...": Additional background/supporting info. This determination is based on NRC staff reviews associated with Early Site Permits, the conclusions of the Generic Issue 199 Screening Panel (comprised of technical experts), and the conclusions of the Safety/Risk Assessment Panel (also comprised of technical experts). The CDF from internal events (estimated using the staff-developed Standardized Plant Analysis of Risk models) and fires (as reported by licensees during the IPEEE process and documented in NUREG-1742), when added to the seismic CDF estimates results in the total risk for each plant to be, at most, 4×10^{-4} (0.0004) per year or below. This is well below the threshold (a CDF of 10^{-3} [0.001] per year) for taking immediate action. Based on the determination that there is no need for immediate action, and that this issue has not changed the licensing basis for any operating plant, the CEUS operating nuclear power plants are considered safe.



John V. Kauffman

Senior Reactor Systems Engineer
US NRC/RES/DRA/OEGIB
Washington, DC 20555 Mail Stop: C-2A07M
Phone: 301-251-7465
Fax: 301-251-7410

Please visit the [internal GIP web page](#) or [external GIP web page](#).

From: Hiland, Patrick
Sent: Wednesday, March 23, 2011 2:35 PM
To: Beasley, Benjamin; Kauffman, John; Stutzke, Martin; Munson, Clifford; Manoly, Kamal
Cc: Khanna, Meena; Skeen, David; Manoly, Kamal
Subject: GI-199 Talking Points
Importance: High

Below is my shot at crafting simple talking points for OPA. Please provide comments to Meena Khanna COB.

GENERIC ISSUE 199, "IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES ON EXISTING PLANTS"

Objective of GI-199

The objective of the GI-199 Safety/Risk Assessment was to perform a conservative, screening-level assessment to evaluate if further investigations of seismic safety for operating reactors in the central and eastern U.S. (CEUS) was warranted consistent with NRC directives.

- Results of the GI-199 safety risk assessment are not final estimates of plant-specific seismic risk.
- The seismic hazard data and plant-level fragility assumptions were conservative estimates useful as a screening tool.
- The NRC does not rank plants by seismic risk.

Key Messages:

1. Safety/Risk Assessment for GI-199 was completed in August 2010. It is publically available in ADAMS at ML100270582. That assessment found that plants have adequate safety margin for seismic issues and are within their licensing basis.
2. Overall seismic risk estimates remain small and adequate protection is maintained.
3. Updates to seismic data and models indicate increased seismic hazard estimates for some operating nuclear power plant sites in the Central and Eastern United States.
4. NRC has separate criteria for evaluating whether plant improvements may be imposed through a back-fit.
5. The Safety/Risk Assessment used readily available information and found that for about one-quarter of the currently operating plants, the change in seismic hazard is enough to warrant further NRC review.
6. Action may include obtaining additional, updated information and developing methods to determine if plant improvements to reduce seismic risk are warranted.

Status of Operating Plants and Need for Actions due to Japanese Event:

- Existing plants were designed with considerable margin to be able to withstand the ground motions from the largest earthquake expected in the area around the plant.
- During the mid-to late-1990s, the NRC staff reassessed the margin beyond the design basis as part of the Individual Plant Examination of External Events [IPEEE] program.
- The NRC's safety/risk assessment concluded that the probability of exceeding the design basis ground motion may have increased by a small amount at some plants. Those results also indicate that the probabilities of damage are lower than NRC's guidelines for taking immediate action.
- US plants are designed for appropriate earthquake levels and are safe.

The NRC is conducting a regulatory assessment, which includes reviewing the seismic capacity for plants located in central and eastern United States based on the latest data and analysis techniques.

Timeline for Preparation and Issuance of Generic Letter:

- The NRC is working on developing a Generic Letter (GL) to request information from all affected plants (96 plants that are east of the Rockies).
- The GL is planned to be issued in draft form for public comment in the late spring.
- Processes that are planned for review of the GL include a review by the NRC's Committee to Review Generic Requirements, the Advisory Committee on Reactor Safeguards (ACRS), and the GL will be issued as a draft for public comments (60 days), followed by a second meeting with ACRS.
- GL should be issued by end of 2011, as the new consensus seismic hazard models become available.
- Consensus hazard models are being developed by NRC, DOE, and EPRI. In addition the USGS will review the model.
- Information requested from licensees will likely require 3 to 6 months to prepare. NRC's review will be on-going as information is collected.
- Based on NRC's review, a determination will be made regarding beneficial back-fits.

From: Mathew, Roy *nrk*
To: Wilson, George; Hiland, Patrick; Skeen, David
Subject: RE: Draft scheduling note for SBO
Date: Wednesday, March 23, 2011 9:25:51 AM

I was looking at the conclusion of SORCA insights for peach bottom. These are some of the conclusions:

Long term SBO – CDF is 1-5 E-6 and short term SBO – CDF is 1-5 E-7.

The risk to the public from long term exposure is extraordinarily small. Also, it says risk to the people in the EPZ zone is thousands of times smaller than the NRC safety goal.

My observation is that based on the Japanese event, this analysis may not be conservative.

release

From: Sheron, Brian *nrk*
Sent: Tuesday, March 22, 2011 4:19 PM
To: Grobe, Jack; Hiland, Patrick; Skeen, David; Leeds, Eric; Meighan, Sean; Nguyen, Quynh; Mathew, Roy; Wittick, Brian; Andersen, James; Wilson, George; Uhle, Jennifer; Johnson, Michael; Holahan, Gary; Boger, Bruce
Subject: RE: Draft scheduling note for SBO

We could report on the SOARCA SBO analysis of Peach Bottom, which is a BWR Mk I plant, since the scenario is similar to the Japanese event.

From: Grobe, Jack *nrk*
Sent: Tuesday, March 22, 2011 4:13 PM
To: Hiland, Patrick; Skeen, David; Grobe, Jack; Leeds, Eric; Meighan, Sean; Nguyen, Quynh; Mathew, Roy; Wittick, Brian; Andersen, James; Wilson, George; Sheron, Brian; Uhle, Jennifer; Johnson, Michael; Holahan, Gary; Boger, Bruce
Subject: FW: Draft scheduling note for SBO

Couple thoughts.

Not sure we need Pat and me both.

Should we have some perspective from new reactors?

Is there anything that RES is doing that should be addressed?

What about routing baseline inspection and how it addresses station blackout?

Who should address these topics if we include them?

release

From: Wilson, George *nrk*
Sent: Tuesday, March 22, 2011 3:36 PM
To: Hiland, Patrick; Skeen, David; Grobe, Jack; Leeds, Eric; Meighan, Sean; Nguyen, Quynh; Mathew, Roy; Wittick, Brian; Andersen, James
Subject: Draft scheduling note for SBO

See attached

George Wilson

USNRC

EICB Branch Chief, Division of Engineering

Mail Stop O12H2

301-415-1711

MRO

From: Bagchi, Goutam
To: Manoly, Kamal; Munson, Clifford
Cc: Chokshi, Nilesh; Khanna, Meena; Hiland, Patrick
Subject: RE: Japan Earthquake Green Ticket - March 22.docx
Date: Wednesday, March 23, 2011 10:08:53 AM
Attachments: image001.png
image002.png

I will send you my edited version some time today. In this answer we repeat the same statement "magnitude 8 is 10 times less than magnitude 9." Please note the information below and see that it is a factor of 31.6 less in the M_w scale – most widely used scale related to the moment of earthquake (total fault plane area times the elastic modulus times the fault displacement).

The symbol for the moment magnitude scale is M_w , with the subscript w meaning mechanical work accomplished. The moment magnitude M_w is a dimensionless number defined by

$$M_w = \frac{2}{3} \log_{10} M_0 - 10.7,$$

where M_0 is the magnitude of the seismic moment

Comparative energy released by two earthquakes

A closely related formula, obtained by solving the previous equation for M_0 , allows one to assess the proportional difference $f_{\Delta E}$ in energy release between earthquakes of two different moment magnitudes, say m_1 and m_2 :

$$f_{\Delta E} = \frac{10^{\left(\frac{3}{2}(m_1 + 10.7)\right)}}{10^{\left(\frac{3}{2}(m_2 + 10.7)\right)}} = 10^{\frac{3}{2}(m_1 - m_2)}.$$

Now assuming m_1 is equal to $m_2 + 1$, the result is 10 raised to the power 1.5 – equal to 31.6. Please let me know how I can explain the factor of 10.

Thank you,
Goutam Bagchi
Senior Advisor
Division of Site & Environmental Reviews
301-415-3305

From: Manoly, Kamal
Sent: Tuesday, March 22, 2011 4:49 PM
To: Bagchi, Goutam; Munson, Clifford
Cc: Chokshi, Nilesh; Khanna, Meena; Hiland, Patrick
Subject: Japan Earthquake Green Ticket - March 22.docx

Cliff/Goutam

I added addition text to the material in some items from the seismic Qs & As to develop responses to items No. 3 & 7 from the Green Ticket. Please let me know of any helpful changes. Thanks.

Kamal

release

✓/155

$$M_w = \frac{2}{3} \log_{10} M_0 - 10.7,$$

$$f_{\Delta E} = \frac{10^{\left(\frac{3}{2}(m_1 + 10.7)\right)}}{10^{\left(\frac{3}{2}(m_2 + 10.7)\right)}} = 10^{\frac{3}{2}(m_1 - m_2)}.$$

From: Chokshi, Niles *info*
To: Bagchi, Goutam; Manoly, Kamal; Munson, Clifford
Cc: Khanna, Meena; Hiland, Patrick
Subject: RE: Japan Earthquake Green Ticket - March 22.docx
Date: Wednesday, March 23, 2011 4:53:01 PM

Our answers to the questions appear to me be unnecessarily complex and not direct. I suggest that in first few sentences we answer in very direct terms, and then give a more details explanation with necessary caveats and conditions.

I would suggest that we answer the Q.3 in the following manner:

For any given type of plant design, the selection of safety significant structures, systems, and components(SSCs), is based on the intended safety functions (such as integrity of reactor coolant pressure boundary, capability to shut down the reactor and maintain it in a safe shutdown condition, and capability to prevent or mitigate consequences of accident that could result in a potential offsite exposure), that they have to perform under various design basis conditions, including seismic. These basic functions and associated SSCs do not change from site to site. Consequently, for a given design, the basic list of safety significant SSCs does not differ from a site to site. However, the level of ground motion to which these SSCs are designed depend on the seismic environment in which the site exists. Each plant is designed to a ground shaking level that is appropriate for its location considering geology, seismology, historical seismicity, and local subsurface conditions. This shaking level includes additional margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. In fact, NRC by regulation, requires that plants must be designed to a certain minimum level even in a very low seismic area. One seismic related difference, not directly related to the SSCs as discussed above, is that the two plants on the west coast (Diablo Canyon and San Onofre) have automatic shutdown mechanism at a specified ground motion level, no other plants in country has automatic shutdown.

I think the above can be further simplified and clarified. I suggest doing something similar to the next Q.

Niles

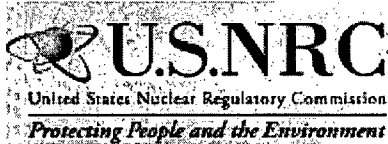
From: Bagchi, Goutam *info*
Sent: Wednesday, March 23, 2011 10:48 AM
To: Manoly, Kamal; Munson, Clifford
Cc: Chokshi, Niles; Khanna, Meena; Hiland, Patrick
Subject: RE: Japan Earthquake Green Ticket - March 22.docx

Here is my file I promised.

*Thank you,
Goutam*

Ireland, JoAnn

From: EDO Update [nrc.announcement@nrc.gov]
Sent: Wednesday, March 23, 2011 4:21 PM
To: Taylor, Renee
Subject: EDO Update



EDO Update

Wednesday, March 23, 2011



The NRC (as well as many other parts of the U.S. government) is continuing to provide assistance to Japan. Nearly every NRC employee has been affected, in one way or another, by our response to the Japan tragedy. We are beginning to send replacement staff to Japan for our team of NRC experts and 24/7 staffing of the operations center continues. I thank you for your adaptability, flexibility and willingness to contribute your efforts to our important work. Despite the fact that so much public attention is being directed to our Japan efforts, we continue to meet our primary responsibility of ensuring U.S. public health and safety.

Fukushima Event and Normal NRC Operations

Although the situation is still dynamic, events at the Fukushima reactor site appear to be on the road to stabilizing. A wide range of complex technical challenges are being addressed in Japan including the restoration of "normal" electric power to the reactor plant equipment. I would like to reiterate my thanks and those of the Chairman and Commission both to those of you who are responding to the events in Japan and to those of you who continue to carry out our mission of ensuring the safe and secure civilian uses of nuclear materials in the U.S. I am impressed by the commitment and flexibility you have shown in challenging circumstances. Nearly everyone in the agency has had to step up with extra effort as many managers and staff have taken on additional duties. I would ask you all to continue demonstrating the same dedication for a bit longer, and to continue upholding the NRC Values and the principles of an Open, Collaborative Work Environment.

The Office of Human Resources has distributed information to supervisors and timekeepers to summarize the options and guidelines for determining work schedules and premium pay for employees serving in and supporting the Operations Center, or working in Japan. I ask supervisors to exercise flexibility and understanding as they accommodate responders' often unpredictable work schedule and premium pay needs.

For those who did not have a chance to watch last Friday's All Employees meeting, the video is available here:

<http://r2.nrc.gov/videoarchive/ViewVideo.cfm?vlink=275>

The video, as well as the PowerPoint files and transcript, of Monday's Commission meeting are available on this NRC public website page dedicated to the Fukushima events. I encourage the staff to periodically check this link for other updated information on the event.

<http://www.nrc.gov/japan/japan-info.html>

Continuing Resolution

Congress has passed, and the President signed, another Continuing Resolution, extending federal government funding through April 8th. We continue to be prepared for a variety of scenarios.

Ann Thomas Retirement

Ann Thomas, a long-time NRC employee known to many of you as the editor of the *NRC Reporter* (and before that, the *NR&C* newsletter) and a pillar of the Employees Welfare and Recreation Association, will be retiring at the end of this month. Please join me in extending to Ann our best wishes for an enjoyable retirement in her new home.



Bill Borchardt, EDO

From: [MARION, Alex](#) *DET*
To: [Hiland, Patrick](#)
Subject: FW: Question about GI-199 in the news
Date: Wednesday, March 23, 2011 10:05:55 AM

Pat,

We are prepared to engage you and your staff on the proposed generic letter request when you are prepared to do so. And, for the record, we do take this matter seriously with a "sense of urgency." We just need to get together and get on with it.

Alex

From: KEITHLINE, Kimberly *DET*
Sent: Wednesday, March 23, 2011 8:15 AM
To: MARION, Alex; BRADLEY, Biff
Subject: Fw: Question about GI-199 in the news

We should discuss this today.

From: Hiland, Patrick [<mailto:Patrick.Hiland@nrc.gov>] *NRK*
Sent: Wednesday, March 23, 2011 04:51 AM
To: KEITHLINE, Kimberly
Cc: Beasley, Benjamin <Benjamin.Beasley@nrc.gov>; Manoly, Kamal <Kamal.Manoly@nrc.gov>
Subject: RE: Question about GI-199 in the news

It's still our intent to send out the GL and request information from all facilities in CEUS. Obviously, we would give priority to plants in the 10-5 to 10-4 range. What Scott was trying to convey was that the 27 plants in the "continue region" taken as a whole, was our basis for continuing with this regulatory assessment. I have heard of interest from PG&E to be a "Pilot" in the GI-199 effort, and I'm asking myself why we continue to exclude the 8 western plants? Seems to me, that under current events, industry would have a greater sense of urgency regarding the subject? *release*

From: KEITHLINE, Kimberly [<mailto:kak@nei.org>] *nei*
Sent: Tuesday, March 22, 2011 9:21 PM
To: Hiland, Patrick
Cc: Beasley, Benjamin; Manoly, Kamal
Subject: Question about GI-199 in the news

Pat,

This showed up in a Platt's new flash. Have you decided to limit your GI-199 review to the top 27 plants (those in the continue zone)?

The NRC will conduct a seismic risk assessment of Entergy's Indian Point plant next year, the first of 27 such reviews of nuclear power units at 17 plants, agency spokeswoman Beth Hayden said March 22.

The units to receive a seismic review next year, the NRC said, are Indian Point-2 and -3; Limerick-1 and -2; Peach Bottom-2 and -3; Seabrook; Crystal River-3; Farley-1 and -2; North Anna-1 and -2; Oconee-1, -2, and -3; St. Lucie-1 and -2; Sequoyah-1 and -2; Summer; Watts Bar 1; Dresden-2 and -3; Duane Arnold; Perry-1; River Bend; and Wolf Creek.

The earthquake risk review is part of a new assessment, a generic issue known as GI-199, that NRC is reviewing based on 2008 revised US Geological Survey data on seismic activity in central and eastern US, NRC spokesman Scott Burnell said in a March 22 interview. The review pre-dates the earthquake and tsunami that struck the Fukushima I nuclear plant in Japan this month.

The NRC is planning to send letters to plant operators late this year directing them to incorporate the USGS data to revise their units' operating plans. "The expectation is this analysis would show where plants could improve what already is an acceptable response to seismic events," Burnell said.

The 27 units selected for review showed the largest increases in seismic risk from risks estimated for those plants in a USGS study conducted in the 1980s, he said.

Kimberly A. Keithline
Senior Project Manager, New Plant Deployment

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P: 202-739-8121
F: 202-533-0143
E: kak@nei.org



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Kauffman, John

From: Beasley, Benjamin
Sent: Wednesday, March 23, 2011 7:52 AM
To: Kauffman, John
Subject: FW: Question about GI-199 in the news

From: Hiland, Patrick
Sent: Wednesday, March 23, 2011 7:52 AM
To: KEITHLINE, Kimberly
Cc: Beasley, Benjamin; Manoly, Kamal
Subject: RE: Question about GI-199 in the news

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From: KEITHLINE, Kimberly [<mailto:kak@nei.org>]
Sent: Tuesday, March 22, 2011 9:21 PM
To: Hiland, Patrick
Cc: Beasley, Benjamin; Manoly, Kamal
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Kimberly A. Keithline
Senior Project Manager, New Plant Deployment

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Sent through mail.messaging.microsoft.com

From: Nuclear Plant Journal [anu@goinfo.com]
Sent: Wednesday, March 23, 2011 3:14 PM
To: Bajwa, Chris
Subject: NPJ E-News March 23, 2011 Fukushima Update

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Nuclear Plant Journal

An International Publication
Published in the United States

Nuclear Plant Journal E-News

Japan Update
March 23, 2011

Dear CHRIS,

In this issue of NPJ E-News you'll find an update of the Fukushima Nuclear Plants in Japan. Information is current as of March 23, 2011, 13:00 CDT. All items are directly quoted, without any editing.

In this issue

[TEPCO Update](#)

[JAIF Status Update](#)

[Status Document](#)

TEPCO Update

From the [TEPCO website](#):

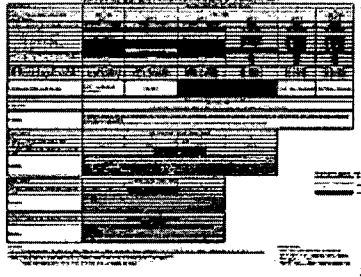
- At 11:00 am on March 23rd, the injection of sea water to spent fuel pool was conducted, and finished approximately at 1:20 pm on the same day.
- At 4:20 pm on March 23rd, light gray smoke was observed belching from Unit 3 building. The situation was reported to the fire department at 4:25 pm on March 23rd. The parameters of the reactor, the reactor containment vessel of Unit 3, and monitored figures around the site's immediate surroundings remained stable without significant change. To be safe, workers in the main control room of Unit 3 and around Unit 3 evacuated to a safe location.
- From approximately 10:00 am on March 23rd, water discharge from the concrete pumping vehicle was conducted and ended at approximately 1:00 pm on the same day.

[Click for more...](#)

Status Updates of TEPCO Facilities (from the [JAIF website](#))

- Tokyo Fire Department will spray water to Unit-3 in this afternoon through cooperation with Osaka Fire Department.
- The operation to inject water to the spent fuel pool of Unit-4 was started with special vehicle around 10:00. This vehicle has a long arm that enables to pour water to a target. (11:10, March 23).
- TEPCO will conduct test operation for pumps, which are to inject water into the reactor at unit-3. External AC power to the main control room of Unit-3 became available at 13:43 of March 22. (10:55, March 23).

[Click for more...](#)



JAIF Status Update

A [PDF document](#) provides a simple summary of each of the units at Fukushima nuclear power plants. This is a multi-page document that also provides a chronology of events and a map that details the status of each of the Japanese nuclear units.

Quick Links...

- [NPJ Website](#)
- [Cost-free Subscription](#) (to NPJ)
- [JAIF](#)
- [TEPCO](#)
- [U.S. NRC Actions on Japan](#)

Contact Information

phone: 630-313-6739

email: NPJ@goinfo.com

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Nuclear Plant Journal | 1400 Opus Place, Suite 904 | Downers Grove | IL | 60515

Benner, Eric

From: Benner, Eric
Sent: Wednesday, March 23, 2011 5:28 PM
To: Ordaz, Vonna; Rahimi, Meraj
Subject: Re: ACTION - Decommissioning Type Information for Ops Center

Perfect...thanks.
Sent via NRC Blackberry

From: Ordaz, Vonna
To: Benner, Eric; Rahimi, Meraj
Sent: Wed Mar 23 17:27:15 2011
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

You can reply to all on the incoming email request and also include:

ET05
RST01 HOC
Stu Richards

Thanks,
Vonna

From: Benner, Eric
Sent: Wednesday, March 23, 2011 3:55 PM
To: Ordaz, Vonna
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael; RST01 Hoc
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Thanks, Vonna.

Will do. We're currently working on a response.

Regarding providing the response to the Reactor Safety Team and the ET Response Coordinator, are there names or an e-mail resource? I've cc'ed "RST01 Hoc" as that e-mail resource was included on much of the e-mail string.

Eric

From: Ordaz, Vonna
Sent: Wednesday, March 23, 2011 3:21 PM
To: Benner, Eric
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
Subject: ACTION - Decommissioning Type Information for Ops Center
Importance: High

Eric,

SFST has the lead to coordinate a response with HLW and FCSS, and respond to the Reactor Safety Team, the ET Response Coordinator, and Stu Richards in the Operations Center with a CC to Dan Dorman by 6pm.

Thanks,
Vonna

From: Ordaz, Vonna
Sent: Wednesday, March 23, 2011 3:13 PM
To: Richards, Stuart; Weaver, Doug; Mohseni, Aby; Davis, Jack
Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce; Camper, Larry; Deegan, George; Waters, Michael
Subject: RE: Decommissioning Type Information

Thanks, Stu. We'll get back to you.

Vonna

From: Richards, Stuart
Sent: Wednesday, March 23, 2011 2:32 PM
To: Weaver, Doug; Mohseni, Aby; Davis, Jack
Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce; Camper, Larry; Deegan, George; Ordaz, Vonna; Waters, Michael
Subject: RE: Decommissioning Type Information
Importance: High

Dan Dorman has asked the Ops Center to respond to a number of questions related to the Japanese event.

Can NMSS respond to the following?

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Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce
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To: Camper, Larry
Cc: Deegan, George; RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael
Subject: RE: Decommissioning Type Information

Larry

RES might be able to help you with Question #8. Richard Lee in DSA is our POC on this one.

We can provide you some thoughts on enclosures, but I agree that a good answer will take a lot of time and a lot more information on the status of the units.

Stu

From: Camper, Larry
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To: Dorman, Dan
Cc: Deegan, George; RST01 Hoc; Bowman, Gregory; Hickman, John
Subject: Decommissioning Type Information

Dan,
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Benner, Eric

From: Benner, Eric
Sent: Wednesday, March 23, 2011 4:09 PM
To: Mohseni, Aby; Bailey, Marissa; Davis, Jack
Cc: Rahimi, Meraj; Silva, Patricia
Subject: Re: ACTION - Decommissioning Type Information for Ops Center

Thank you, all.
Sent via NRC Blackberry

From: Mohseni, Aby
To: Benner, Eric; Bailey, Marissa; Davis, Jack
Cc: Rahimi, Meraj; Silva, Patricia
Sent: Wed Mar 23 16:07:54 2011
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Jack davis and Tim Sippel are working with Meraj as we speak...
aby

From: Benner, Eric
Sent: Wednesday, March 23, 2011 3:47 PM
To: Bailey, Marissa; Mohseni, Aby; Davis, Jack
Cc: Rahimi, Meraj; Silva, Patricia
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Thanks, Marissa.

Jack & Aby, what involvement do you expect HLW to have, either on the criticality or decay heat removal components?

From: Bailey, Marissa
Sent: Wednesday, March 23, 2011 3:22 PM
To: Ordaz, Vonna; Benner, Eric
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Tschiltz, Michael; Silva, Patricia
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Eric, Patti Silva would be your POC here in FCSS.

From: Ordaz, Vonna
Sent: Wednesday, March 23, 2011 3:21 PM
To: Benner, Eric
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
Subject: ACTION - Decommissioning Type Information for Ops Center
Importance: High

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Subject: RE: Decommissioning Type Information
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To: Dorman, Dan
Cc: Deegan, George; RST01 Hoc; Bowman, Gregory; Hickman, John
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Dan,
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Kauffman, John

From: Hiland, Patrick
Sent: Wednesday, March 23, 2011 8:02 AM
To: Beasley, Benjamin
Cc: Manoly, Kamal; Kauffman, John; Munson, Clifford; Stutzke, Martin; Ake, Jon
Subject: RE: Question about GI-199 in the news

Bring up at next panel meeting. In the beginning we excluded western plants for specific reasons. If we now include those plants, we should explain why? I'm not against, but keep in mind the EDO's comments at the Commission brief that this is not a time to insert "good ideas" into our process. What I'd expect to see is some evidence that seismic hazards in the west have increased. Remember, this is what started the effort for CEUS.

From: Beasley, Benjamin
Sent: Wednesday, March 23, 2011 7:57 AM
To: Hiland, Patrick
Cc: Manoly, Kamal; Kauffman, John
Subject: RE: Question about GI-199 in the news

Pat,

I think Doug has conveyed to you that we feel that the western plants should be included in the Generic Letter. Although different than the CEUS effort, the western plants have updated seismic hazards and those updates should be considered. In our view, only Diablo Canyon has a reason to be excluded from the letter, since they already consider updated seismic hazards as a license condition.

Ben

From: Hiland, Patrick
Sent: Wednesday, March 23, 2011 7:52 AM
To: KEITHLINE, Kimberly
Cc: Beasley, Benjamin; Manoly, Kamal
Subject: RE: Question about GI-199 in the news

It's still our intent to send out the GL and request information from all facilities in CEUS. Obviously, we would give priority to plants in the 10-5 to 10-4 range. What Scott was trying to convey was that the 27 plants in the "continue region" taken as a whole, was our basis for continuing with this regulatory assessment. I have heard of interest from PG&E to be a "Pilot" in the GI-199 effort, and I'm asking myself why we continue to exclude the 8 western plants? Seems to me, that under current events, industry would have a greater sense of urgency regarding the subject?

From: KEITHLINE, Kimberly [mailto:kak@nei.org]
Sent: Tuesday, March 22, 2011 9:21 PM
To: Hiland, Patrick
Cc: Beasley, Benjamin; Manoly, Kamal
Subject: Question about GI-199 in the news

Pat,

This showed up in a Platt's new flash. Have you decided to limit your GI-199 review to the top 27 plants (those in the continue zone)?

The NRC will conduct a seismic risk assessment of Entergy's Indian Point plant next year, the first of 27 such reviews of nuclear power units at 17 plants, agency spokeswoman Beth Hayden said March 22.

The units to receive a seismic review next year, the NRC said, are Indian Point-2 and -3; Limerick-1 and -2; Peach Bottom-2 and -3; Seabrook; Crystal River-3; Farley-1 and -2; North Anna-1 and -2; Oconee-1, -2, and -3; St. Lucie-1 and -2; Sequoyah-1 and -2; Summer; Watts Bar 1; Dresden-2 and -3; Duane Arnold; Perry-1; River Bend; and Wolf Creek.

The earthquake risk review is part of a new assessment, a generic issue known as GI-199, that NRC is reviewing based on 2008 revised US Geological Survey data on seismic activity in central and eastern US, NRC spokesman Scott Burnell said in a March 22 interview. The review pre-dates the earthquake and tsunami that struck the Fukushima I nuclear plant in Japan this month.

The NRC is planning to send letters to plant operators late this year directing them to incorporate the USGS data to revise their units' operating plans. "The expectation is this analysis would show where plants could improve what already is an acceptable response to seismic events," Burnell said.

The 27 units selected for review showed the largest increases in seismic risk from risks estimated for those plants in a USGS study conducted in the 1980s, he said.

Kimberly A. Keithline
Senior Project Manager, New Plant Deployment

Nuclear Energy Institute
1776 I St. N.W., Suite 400
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P: 202-739-8121
F: 202-533-0143
E: kak@nei.org

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Putting Clean Air Energy to Work.

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Sent through mail.messaging.microsoft.com

Benner, Eric

From: Benner, Eric
Sent: Wednesday, March 23, 2011 5:54 PM
To: Rahimi, Meraj
Subject: Re: ACTION - Decommissioning Type Information for Ops Center

Thanks...great response!
Sent via NRC Blackberry

From: Rahimi, Meraj
To: Ordaz, Vonna; Benner, Eric; ET05 Hoc; RST01 Hoc; Richards, Stuart
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
Sent: Wed Mar 23 17:50:42 2011
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Here is the proposed SFST/FCCS/HLW coordinated response:

We would not recommend early entombment considerations due to the high thermal loads and associated negative effects on entombment material properties. In fact, we believe it might not be prudent to entomb at all. We believe that Japan should consider waiting until the core or spent fuel debris can be cooled sufficiently and then removed similar to TMI. We would initially recommend pumping continuously borated water into the molten core or spent fuel pool. Longer term, if entombment is considered by Japan, it is our opinion that entombment would be less problematic (with respect to criticality issues) if the entombment is around the molten core or pool, rather than directly onto the fuel and in the primary containment vessel. We believe that heat transfer will be a significant challenge and thus it would be best if the entombment was built with low and high vents that would enable the transfer of heat through air convection. If the entombment is considered by pouring some type of material on the molten core or spent fuel pool the system reactivity and heat transfer capability is highly dependent on the material of use. We believe, the temperature in the reactor core or the dried spent fuel pool is too high for the concrete to cure. Both concrete (especially wet) and sand would be a neutron moderator and could raise criticality concerns. Whatever is used should be carefully evaluated. Due to the unknown configuration in the core, any medium should conservatively be heavily borated. Another option maybe the use of sand with boron frits which would turn into glass when contacted with the molten core. This would immobilize the radionuclides. However, the temperature at which the sand is added must be at the point that the glass can solidified. This may require longer cooling time.

In the interim while options are considered, it might be advisable to confine the core or the pool with filtered flexible enclosure.

Meraj Rahimi
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Office of Nuclear Materials Safety and Safeguard
U.S. Nuclear Regulatory Commission
6003 Executive Blvd., Suite 301
Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

From: Ordaz, Vonna

Sent: Wednesday, March 23, 2011 3:21 PM

To: Benner, Eric

Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael

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Subject: RE: Decommissioning Type Information

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To: Richards, Stuart; Camper, Larry

Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce

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Benner, Eric

From: Benner, Eric
Sent: Thursday, March 24, 2011 7:43 AM
To: Bailey, Marissa; Davis, Jack
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

I'm available until 8:00 to discuss. Jack and I participated in the development of the recommendation.

From: Bailey, Marissa
Sent: Thursday, March 24, 2011 7:40 AM
To: Benner, Eric; Davis, Jack
Cc: Mohseni, Aby; Weaver, Doug; Kinneman, John; Tschiltz, Michael; Ordaz, Vonna; Kinneman, John; Haney, Catherine
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Are we onboard with this recommendation? We should take a minute to discuss ...

From: Rahimi, Meraj
Sent: Wednesday, March 23, 2011 5:51 PM
To: Ordaz, Vonna; Benner, Eric; ET05 Hoc; RST01 Hoc; Richards, Stuart
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
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Sent: Thursday, March 24, 2011 11:16 AM
To: Rahimi, Meraj; Benner, Eric; White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
Cc: Haney, Catherine; Dorman, Dan
Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Thank you all for coordinating and responding on short order. I did call over to the ET Response Coordinator this morning to confirm that the information was received and provided to Dan in Japan, and whether any additional information was needed. They will check and get back to us.

Vonna

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Sent: Wednesday, March 23, 2011 5:51 PM
To: Ordaz, Vonna; Benner, Eric; ET05 Hoc; RST01 Hoc; Richards, Stuart
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Subject: RE: ACTION - Decommissioning Type Information for Ops Center

Here is the proposed SFST/FCCS/HLW coordinated response:

We would not recommend early entombment considerations due to the high thermal loads and associated negative effects on entombment material properties. In fact, we believe it might not be prudent to entomb at all. We believe that Japan should consider waiting until the core or spent fuel debris can be cooled sufficiently and then removed similar to TMI. We would initially recommend pumping continuously borated water into the molten core or spent fuel pool. Longer term, if entombment is considered by Japan, it is our opinion that entombment would be less problematic (with respect to criticality issues) if the entombment is around the molten core or pool, rather than directly onto the fuel and in the primary containment vessel. We believe that heat transfer will be a significant challenge and thus it would be best if the entombment was built with low and high vents that would enable the transfer of heat through air convection. If the entombment is considered by pouring some type of material on the molten core or spent fuel pool the system reactivity and heat transfer capability is highly dependent on the material of use. We believe, the temperature in the reactor core or the dried spent fuel pool is too high for the concrete to cure. Both concrete (especially wet) and sand would be a neutron moderator and could raise criticality concerns. Whatever is used should be carefully evaluated. Due to the unknown configuration in the core, any medium should conservatively be heavily borated. Another option maybe the use of sand with boron frits which would turn into glass when contacted with the molten core. This would immobilize the radionuclides. However, the temperature at which the sand is added must be at the point that the glass can solidified. This may require longer cooling time.

In the interim while options are considered, it might be advisable to confine the core or the pool with filtered flexible enclosure.

Meraj Rahimi
Chief of Criticality, Shielding, and Dose Assessment Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Materials Safety and Safeguard
U.S. Nuclear Regulatory Commission
6003 Executive Blvd., Suite 301
Rockville, MD 20852

Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

From: Ordaz, Vonna
Sent: Wednesday, March 23, 2011 3:21 PM
To: Benner, Eric
Cc: White, Bernard; Mohseni, Aby; Davis, Jack; Weaver, Doug; Rahimi, Meraj; Doolittle, Elizabeth; Waters, Michael; Kinneman, John; Bailey, Marissa; Tschiltz, Michael
Subject: ACTION - Decommissioning Type Information for Ops Center
Importance: High

Eric,

SFST has the lead to coordinate a response with HLW and FCSS, and respond to the Reactor Safety Team, the ET Response Coordinator, and Stu Richards in the Operations Center with a CC to Dan Dorman by 6pm.

Thanks,
Vonna

From: Ordaz, Vonna
Sent: Wednesday, March 23, 2011 3:13 PM
To: Richards, Stuart; Weaver, Doug; Mohseni, Aby; Davis, Jack
Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce; Camper, Larry; Deegan, George; Waters, Michael
Subject: RE: Decommissioning Type Information

Thanks, Stu. We'll get back to you.

Vonna

From: Richards, Stuart
Sent: Wednesday, March 23, 2011 2:32 PM
To: Weaver, Doug; Mohseni, Aby; Davis, Jack
Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce; Camper, Larry; Deegan, George; Ordaz, Vonna; Waters, Michael
Subject: RE: Decommissioning Type Information
Importance: High

Dan Dorman has asked the Ops Center to respond to a number of questions related to the Japanese event.

Can NMSS respond to the following?

8. What should they be considering with respect to criticality prevention and decay heat removal during the entombment period?

The goal is to provide the response to the Ops Center by 6 pm tonight.

I will forward you the original request, which may help.

Thanks
Stu

From: Deegan, George
Sent: Wednesday, March 23, 2011 2:05 PM

To: Richards, Stuart; Camper, Larry

Cc: RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael; McConnell, Keith; Watson, Bruce

Subject: RE: Decommissioning Type Information

Stu- As your email came in, Brett Rini and I were speaking with one another. I indicated that FSME will be working on #7 (licensing requirements) and #9 (whatever relevant info we can pull together from the TMI event), but that the best shop for criticality type issues (Question #8) is probably NMSS.

From: Richards, Stuart

Sent: Wednesday, March 23, 2011 1:51 PM

To: Camper, Larry

Cc: Deegan, George; RST01 Hoc; Bowman, Gregory; Hickman, John; Lee, Richard; Rini, Brett; Case, Michael

Subject: RE: Decommissioning Type Information

Larry

RES might be able to help you with Question #8. Richard Lee in DSA is our POC on this one.

We can provide you some thoughts on enclosures, but I agree that a good answer will take a lot of time and a lot more information on the status of the units.

Stu

From: Camper, Larry

Sent: Wednesday, March 23, 2011 12:49 PM

To: Dorman, Dan

Cc: Deegan, George; RST01 Hoc; Bowman, Gregory; Hickman, John

Subject: Decommissioning Type Information

Dan,
Greetings! Trust you are holding up well over there! Regarding your message of earlier today, we will be able to provide feedback on Question number 6 today by the 18:00 timeframe. Questions 6,8 and 9 will require a bit of review and interface with RES but we will start that process today. Standby for a better timeline on those. The staff did some work on the entombment issue via a couple of SECY's but the approach died out because it became clear that industry was not going to utilize it in the US. Of course, the situation in Japan is quite different etc. Regardless, our earlier work should be of some benefit but we just have to resurrect it and review etc. In thinking ahead just a bit, I suspect that we will need to put together some sort of Task Force or think tank type group to analyze possible paths forward for the overall decommissioning of the site and for the related waste management etc. Of course, we have some time to think about this issue but not too long etc.

Hrabal, Craig

From: Rahimi, Meraj
Sent: Thursday, March 24, 2011 5:05 PM
To: Tripp, Christopher; Jordan, Natreon; Barto, Andrew; Davis, Jack; Sippel, Timothy; Guttman, Jack; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

I sent it last night. Here is the response:

We would not recommend early entombment considerations due to the high thermal loads and associated negative effects on entombment material properties. In fact, we believe it might not be prudent to entomb at all. We believe that Japan should consider waiting until the core or spent fuel debris can be cooled sufficiently and then removed similar to TMI. We would initially recommend pumping continuously borated water into the molten core or spent fuel pool. Longer term, if entombment is considered by Japan, it is our opinion that entombment would be less problematic (with respect to criticality issues) if the entombment is around the molten core or pool, rather than directly onto the fuel and in the primary containment vessel. We believe that heat transfer will be a significant challenge and thus it would be best if the entombment was built with low and high vents that would enable the transfer of heat through air convection. If the entombment is considered by pouring some type of material on the molten core or spent fuel pool the system reactivity and heat transfer capability is highly dependent on the material of use. We believe, the temperature in the reactor core or the dried spent fuel pool is too high for the concrete to cure. Both concrete (especially wet) and sand would be a neutron moderator and could raise criticality concerns. Whatever is used should be carefully evaluated. Due to the unknown configuration in the core, any medium should conservatively be heavily borated. Another option maybe the use of sand with boron frits which would turn into glass when contacted with the molten core. This would immobilize the radionuclides. However, the temperature at which the sand is added must be at the point that the glass can solidified. This may require longer cooling time.

In the interim while options are considered, it might be advisable to confine the core or the pool with filtered flexible enclosure.

Meraj Rahimi
Chief of Criticality, Shielding, and Dose Assessment Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Materials Safety and Safeguard
U.S. Nuclear Regulatory Commission
6003 Executive Blvd., Suite 301
Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

From: Tripp, Christopher
Sent: Thursday, March 24, 2011 5:43 AM
To: Jordan, Natreon; Barto, Andrew; Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Li, Zhian; Smith, Jeremy; Wilson, Veronica
Subject: RE: any comments on the proposed response?

I assume Meraj sent a response to the Op Center yesterday. Can someone forward what was provided, in case there are follow-up questions? -Chris

From: Jordan, Natreon

Sent: Wednesday, March 23, 2011 11:45 PM

To: Barto, Andrew; Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Li, Zhian; Smith, Jeremy; Wilson, Veronica

Subject: RE: any comments on the proposed response?

Meraj,

I concur as well with the following consideration to add. With potential impacts to configuration due to thermal degradation, it may prove important to ensure an appropriate means of recirculating any borated material being used. If the plan is to pour concrete in the process, we may need to consider any reflective properties given by concrete unless borated.

Nate

From: Barto, Andrew

Sent: Wednesday, March 23, 2011 5:33 PM

To: Rahimi, Meraj; Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica

Subject: RE: any comments on the proposed response?

Meraj,

I concur with what Chris just sent. I spoke to Kent Wood after yesterday's TAG meeting regarding spent fuel pool criticality in the Japan event. He noted that aluminum based fixed neutron absorbers (Boral, Metamic, borated aluminum), which are commonly used in spent fuel pools, may have melted if the fuel in the pool had become uncovered and heated up significantly. Therefore, any reflooding or entombment should rely heavily on additional neutron absorber material to prevent criticality.

Drew

From: Rahimi, Meraj

Sent: Wednesday, March 23, 2011 5:24 PM

To: Davis, Jack; Sippel, Timothy; Guttman, Jack; Tripp, Christopher; Barto, Andrew; Call, Michel; Forsyth, Daniel; Hrabal, Craig; Jordan, Natreon; Li, Zhian; Smith, Jeremy; Wilson, Veronica

Subject: any comments on the proposed response?

Any comments?

The first action is to pour borated water into core or the spent fuel pool. If the entombment is to build a structure around the molten core or pool, there should not be any impact on the system reactivity. With respect to heat transfer, the entombment should be built in such a way that lower and upper vents would allow heat removal through air convection. If the entombment is to pour some type of materials directly on the molten core or spent fuel in dried pool, it depends on the material. The staff believes, the environment is probably too hot for the concrete to cure. The other option may be the use of sand with boron frits which could turn into glass if added at the appropriate temperature. This would immobilize the radionuclides but longer cooling time might be required.

The staff believes it might be prudent to wait for longer cooling time in order to allow the removal of core and spent fuel debris in the pool similar to the TMI recovery.

Another option might be the use of a filtered flexible confinement barrier around the core and the spent fuel pool.

Meraj Rahimi
Chief of Criticality, Shielding, and Dose Assessment Branch
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Rockville, MD 20852
Phone: 301-492-3338
Fax: 301-492-3348
e-mail: meraj.rahimi@nrc.gov

From: [Rivera-Lugo, Richard](#)
To: [Murphy, Andrew](#); [Pires, Jose](#); [Sircar, Madhumita](#); [Dion, Jeanne](#); [Kammerer, Annie](#); [Ake, Jon](#); [Jervay, Richard](#); [Hurd, Sapna](#); [Ali, Syed](#); [Rodriguez-Luccioni, Hector](#); [Case, Michael](#); [Hardin, Leroy](#); [Boyce, Tom \(RES\)](#)
Cc: [Case, Michael](#); [Richards, Stuart](#); [Valentin, Andrea](#)
Subject: FYI: Premium Pay Guidance
Date: Friday, March 25, 2011 8:07:37 AM

In case that you didn't see this NRC Announcement... Here is some guidance on the Premium Pay for those providing support to the NRC after the Japan events.

Richie

Employee Resources: Work Schedule and Premium Pay Guidance for Response to Events in Japan

NRC has implemented various work schedule and premium pay flexibilities as it strives to accommodate the challenging and often unpredictable work schedule and premium pay needs of employees responding to events in Japan. The Office of Human Resources (HR) has distributed information to managers, supervisors, responders, and timekeepers to summarize the options and guidelines for determining work schedules and premium pay for employees serving in and supporting the Operations Center, or working in Japan. The guidance applies to employees whose Offices/Regions determine that the employees directly support response efforts in the Operations Center and Japan even if the employees do not physically work in the Operations Center.

HR has posted the [Work Schedule and Premium Pay Guidance](#) on its intranet page and expects to add frequently asked questions. Based on questions received so far, HR notes that:

- For employees on a NEWFlex schedule, HRMS will not accept more than 11.25 hours of regular work per day. Any amount worked beyond that on a single work day must be entered as overtime or compensatory time worked rather than regular time. (Employees on Expanded Compressed schedules may work more than 11.25 regular hours per day.)
- The maximum number of credit hours that an employee may carry over from one pay period to the next remains 24 credit hours. This is restricted by a governmentwide rule.
- Although the guidance applies to Senior Executive Service members (executives), executives remain ineligible for premium pay or credit hours as a matter of governmentwide law.

For further information about selecting work schedules and authorizing premium pay for responders, please contact [Lawrence.Davidson](#), 301-492-2286.

V/168

From: OST02 HOC
To: Abrams, Charlotte; Abu-Fid, Bobby; Adams, John; Afshar-Tous, Mugeh; Ahn, Hosung; Alemu, Bezakulu; Algama, Don; Alter, Peter; Anderson, Brian; Anderson, James; Arndt, Steven; Arribas-Colon, Maria; Ashkeboussi, Nima; Athey, George; Baker, Stephen; Ballam, Nick; Barnhurst, Daniel; Barr, Cynthia; Barss, Dan; Bazian, Samuel; Bensi, Michelle; Bergman, Thomas; Berry, Rollic; Bhachu, Ujagar; Bloom, Steven; Blount, Tom; Boger, Bruce; Bonnette, Cassandra; Borchardt, Bill; Bowers, Anthony; Bowman, Gregory; Boyce, Tom (RES); Brandon, Lou; Brandt, Philip; Brenner, Elliot; Brock, Kathryn; Brown, Cris; Brown, David; Brown, Eva; Brown, Frederick; Brown, Michael; Bukharin, Oleg; Burnell, Scott; Bush-Goddard, Stephanie; Campbell, Stephen; Camper, Larry; Carpenter, Cynthia; Carter, Mary; Case, Michael; Casto, Greg; Cecere, Bethany; Cervera, Margaret; Chazell, Russell; Chen, Yen-Ju; Cheok, Michael; Chokshi, Niles; Chowdhury, Prosanta; Chung, Donald; Circle, Jeff; Clement, Richard; Clinton, Rebecca; Coggins, Angela; Collins, Frank; Cool, Donald; Correia, Richard; Corson, James; Costa, Arlon; Couret, Ivonne; Craffey, Ryan; Crutchley, Mary Glenn; Cruz, Zahira; Cuadrado, Leira; Dacus, Eugene; DeCicco, Joseph; Decker, David; Dembek, Stephen; Devlin, Stephanie; Dimmick, Lisa; Doane, Margaret; Dorman, Dan; Dorsey, Cynthia; Dozier, Jerry; Drake, Margaret; Droggitts, Spiros; Dube, Donald; Dudes, Laura; Eads, Johnny; Emche, Danielle; English, Lance; Erlanger, Craig; Esmaili, Hossein; Figueroa, Roberto; Fiske, Jonathan; Flanders, Scott; Flannery, Cindy; Floyd, Daphene; Foggie, Kirk; Foster, Jack; Fragoyannis, Nancy; Franovich, Rani; Frazier, Alan; Freshman, Steve; Fuller, Edward; Galletta, Thomas; Gambone, Kimberly; Gardocki, Stanley; Gartman, Michael; Gibson, Kathy; Glitter, Joseph; Gilmer, James; Glenn, Nichole; Gordon, Dennis; Gott, William; Grant, Jeffery; Greenwood, Carol; Greenwood, Carol; Grimes, Kelly; Grobe, Jack; Gross, Allen; Gulla, Gerald; Hale, Jerry; Hardesty, Duane; Hardin, Kimberly; Hardin, Leroy; Harrington, Holly; Harris, Tim; Harrison, Donnie; Hart, Ken; Hart, Michelle; Harvey, Brad; Hasselberg, Rick; Hayden, Elizabeth; Helton, Donald; Henderson, Karen; Hiland, Patrick; Holahan, Patricia; Holahan, Vincent; Holian, Brian; HOO Hoc; Horn, Brian; Howard, Tabitha; Huffert, Anthony; Hurd, Sapna; Huyck, Doug; Imboden, Andy; Isom, James; Jackson, Karen; Jacobson, Jeffrey; Jervey, Richard; Jessie, Janelle; Johnson, Michael; Jolicœur, John; Jones, Andrea; Jones, Cynthia; Jones, Henry; Kahler, Carolyn; Kammerer, Annie; Karas, Rebecca; Kauffman, John; Khan, Omar; Kolb, Timothy; Kotzalas, Margie; Kowalczyk, Jeffrey; Kratchman, Jessica; Kugler, Andrew; Lamb, Christopher; Lane, John; Larson, Emily; Laur, Steven; LaVie, Steve; Lewis, Robert; Li, Yong; Lichatz, Taylor; Lising, Jason; Lombard, Mark; Lubinski, John; Lui, Christina; Lukes, Kim; Lynch, Jeffery; Ma, John; Mamish, Nader; Manahan, Michelle; Marksberry, Don; Marshall, Jane; Masao, Nagai; Maupin, Cardelia; Mayros, Lauren; Mazaika, Michael; McConnell, Keith; McCoppin, Michael; McDermott, Brian; McGinty, Tim; McGovern, Denise; McIntyre, David; McMurtry, Anthony; Merritt, Christina; Meyer, Karen; Miller, Charles; Miller, Chris; Milligan, Patricia; Miranda, Samuel; Mohseni, Aby; Moore, Scott; Morlang, Gary; Morris, Scott; Mroz (Sahm), Sara; Munson, Clifford; Murray, Charles; Nerret, Amanda; Nguyen, Caroline; Norris, Michael; Norton, Charles; Opara, Stella; Ordaz, Vonna; Owens, Janice; Padovan, Mark; Parillo, John; Patel, Jay; Patel, Pravin; Patrick, Mark; Perin, Vanice; Pope, Tia; Powell, Amy; Purdy, Gary; Quinlan, Kevin; Raddatz, Michael; Ragland, Robert; Ralph, Melissa; Ramsey, Jack; Reed, Elizabeth; Reed, Sara; Reed, Wendy; Reeves, Rosemary; Reis, Terrence; Resner, Mark; Riley (OCA), Timothy; Riner, Kelly; Rini, Brett; Robinson, Edward; Rodriguez-Luccioni, Hector; Roggenbrodt, William; Ropon, Kimberly; Rosales-Cooper, Cindy; Rosenberg, Stacey; Ross-Lee, MaryJane; Roundtree, Amy; Ruland, William; Russell, Tonya; Ryan, Michelle; Salay, Michael; Salter, Susan; Salus, Amy; Sanfilippo, Nathan; Santos, Daniel; Scarbrough, Thomas; Schaperow, Jason; Schmidt, Duane; Schmidt, Rebecca; Schoenebeck, Greg; Schrader, Eric; Schwartzman, Jennifer; Seber, Dogan; See, Kenneth; Shane, Raeann; Shea, James; Shepherd, Jill; Sheron, Brian; Skarda, Raymond; Skeen, David; Sloan, Scott; Smiroldo, Elizabeth; Smith, Brooke; Smith, Stacy; Smith, Theodore; Stahl, Eric; Stang, Annette; Stark, Johnathan; Steger (Tucci), Christine; Stieve, Alice; Stone, Rebecca; Stransky, Robert; Sturz, Fritz; Sullivan, Randy; Summers, Robert; Sun, Casper; Tappert, John; Tegeler, Bret; Temple, Jeffrey; Thaggard, Mark; Thomas, Eric; Thorp, John; Tiruneh, Nebiyu; Tobin, Jennifer; Trefethen, Jean; Tschiltz, Michael; Turtill, Richard; Uhle, Jennifer; Valencia, Sandra; Vaughn, James; Vick, Lawrence; Virgilio, Martin; Virgilio, Rosetta; Ward, Leonard; Ward, William; Wastler, Sandra; Watson, Bruce; Webber, Robert; Weber, Michael; White, Bernard; Wiggins, Jim; Williams, Donna; Williams, Joseph; Williamson, Linda; Willis, Dori; Wimbush, Andrea; Wittick, Brian; Wray, John; Wright, Lisa (Gibney); Wright, Ned; Wunder, George; Young, Francis; Zimmerman, Jacob; Zimmerman, Roy
Subject: Japanese Earthquake ERO Staffing March 20-26, 2011 (Pay Period 7, Week 2)
Date: Friday, March 25, 2011 12:31:19 PM
Attachments: Japan Earthquake - ERO Staffing Schedule - March 20-26.pdf

Good Afternoon,

Attached is the OPS Center revised watchbill for March 20-26. The watchbill for the week of March 27-April 2 will be sent by Saturday, March 27.

If you need to change the schedule, please send an email to OST02 HOC and your Teams Coordinator.

EST Admin Support

U/169

NRC Operations Center
eMail: OST02.HOC@nrc.gov
301-816-5100 x5600

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Position	Date	Time	Staff
Executive Team			
ET Director			
Sat-Sun	3/19-3/20	11pm - 7am	Mike Johnson
Sun	20-Mar	7am - 3pm	Jim Wiggins
Sun	20-Mar	3pm-11pm	Brian Sheron
Sun-Mon	3/20-3/21	11pm - 7am	Mike Johnson
Mon	21-Mar	7am - 3pm	Mike Weber
Mon	21-Mar	3pm-11pm	Jim Wiggins
Mon-Tues	3/21-3/22	11pm - 7am	Mike Johnson
Tues	22-Mar	7am - 3pm	Mike Weber
Tues	22-Mar	3pm-11pm	Jim Wiggins
Tues-Wed	3/22-3/23	11pm - 7am	Bruce Boger
Wed	23-Mar	7am - 3pm	Mike Weber
Wed	23-Mar	3pm-11pm	Roy Zimmerman
Wed-Thur	3/23-3/24	11pm - 7am	Bruce Boger
Thur	24-Mar	7am - 3pm	Mike Weber
Thur	24-Mar	3pm-11pm	Roy Zimmerman
Thur-Fri	3/24-3/25	11pm - 7am	Jennifer Uhle
Fri	25-Mar	7am - 3pm	Jim Dyer
Fri	25-Mar	3pm-11pm	Roy Zimmerman
Fri-Sat	3/25-3/26	11pm-7am	Jennifer Uhle
Sat	26-Mar	7am - 3pm	Jim Dyer
Sat	26-Mar	3pm-11pm	Brian Sheron
Sat-Sun	3/26-3/27	11pm - 7am	Jennifer Uhle
ET Response Advisor			
Sat-Sun	3/19-3/20	11pm - 7am	Scott Morris
Sun	20-Mar	7am - 3pm	Chris Miller
Sun	20-Mar	3pm-11pm	Mary Jane (MJ) Ross-Lee
Sun-Mon	3/20-3/21	11pm - 7am	Scott Morris
Mon	21-Mar	7am - 3pm	Brian McDermott
Mon	21-Mar	3pm-11pm	Chris Miller
Mon-Tues	3/21-3/22	11pm - 7am	Scott Morris
Tues	22-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Tues	22-Mar	3pm-11pm	Chris Miller
Tues-Wed	3/22-3/23	11pm - 7am	Tim McGinty
Wed	23-Mar	7am - 3pm	Brian McDermott
Wed	23-Mar	3pm-11pm	Joe Giitter
Wed-Thur	3/23-3/24	11pm - 7am	Tim McGinty
Thur	24-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Thur	24-Mar	3pm-11pm	Joe Giitter
Thur-Fri	3/24-3/25	11pm - 7am	Tim McGinty
Fri	25-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Fri	25-Mar	3pm-11pm	Joe Giitter
Fri-Sat	3/25-3/26	11pm-7am	Tim McGinty
Sat	26-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Sat	26-Mar	3pm-11pm	Joe Giitter
Sat-Sun	3/26-3/27	11pm - 7am	Chris Miller
ET Rx Prot Measures & State Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Rob Lewis

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Sun	20-Mar	7am - 3pm	Vonna Ordaz
Sun	20-Mar	3pm-11pm	Larry Camper
Sun-Mon	3/20-3/21	11pm - 7am	Cynthia Carpenter
Mon	21-Mar	7am - 3pm	Charlie Miller
Mon	21-Mar	3pm-11pm	Larry Camper
Mon-Tues	3/21-3/22	11pm - 7am	Rob Lewis
Tues	22-Mar	7am - 3pm	Charlie Miller
Tues	22-Mar	3pm-11pm	Patricia Holahan
Tues-Wed	3/22-3/23	11pm - 7am	Cynthia Carpenter
Wed	23-Mar	7am - 3pm	Charlie Miller
Wed	23-Mar	3pm-11pm	Patricia Holahan
Wed-Thur	3/23-3/24	11pm - 7am	N/A
Thur	24-Mar	7am - 3pm	Larry Camper
Thur	24-Mar	3pm-11pm	Cynthia Carpenter
Thur-Fri	3/24-3/25	11pm - 7am	N/A
Fri	25-Mar	7am - 3pm	Cynthia Carpenter
Fri	25-Mar	3pm-11pm	Patricia Holahan
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	N/A
Sat	26-Mar	3pm-11pm	N/A
Sat-Sun	3/26-3/27	11pm - 7am	N/A

Executive Briefing Team

EBT Admin. Assistant			
Sat-Sun	3/19-3/20	11pm - 9am	Sapna Hurd
Sun	20-Mar	9am - 7pm	Annette Stang
Sun-Mon	3/20-3/21	7pm-7am	Carolyn Kahler
Mon	21-Mar	7am - 3pm	A. Stang (7-11) / Sapna Hurd (11-3)
Mon	21-Mar	3pm-11pm	Tia Pope
Mon-Tues	3/21-3/22	11pm - 7am	Christina Merritt
Tues	22-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Tues	22-Mar	3pm-11pm	Jon Fiske
Tues-Wed	3/22-3/23	11pm - 7am	Tia Pope
Wed	23-Mar	7am - 3pm	Jon Fiske
Wed	23-Mar	3pm-11pm	Annette Stang
Wed-Thur	3/23-3/24	11pm - 7am	Christina Merritt
Thur	24-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Thur	24-Mar	3pm-11pm	Jonathan Fiske
Thur-Fri	3/24-3/25	11pm - 7am	Tia Pope
Fri	25-Mar	7am - 3pm	Jon Fiske
Fri	25-Mar	3pm-11pm	Sapna Hurd
Fri-Sat	3/25-3/26	11pm-7am	Carolyn Kahler
Sat	26-Mar	7am - 3pm	Kelly Riner
Sat	26-Mar	3pm-11pm	Louise Lovell
Sat-Sun	3/26-3/27	11pm - 7am	Jonathan Fiske
EBT Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Jim Andersen
Sun	20-Mar	7am - 3pm	Yen-Ju Chen
Sun	20-Mar	3pm-11pm	Caroline Nguyen
Sun-Mon	3/20-3/21	11pm - 7am	Jim Andersen
Mon	21-Mar	7am - 3pm	Yen-Ju Chen

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Mon	21-Mar	3pm-11pm	Sara Mroz
Mon-Tues	3/21-3/22	11pm - 7am	Jim Andersen
Tues	22-Mar	7am - 3pm	Caroline Nguyen
Tues	22-Mar	3pm-11pm	Sara Mroz
Tues-Wed	3/22-3/23	11pm - 7am	Jim Andersen
Wed	23-Mar	7am - 3pm	Yen-Ju Chen
Wed	23-Mar	3pm-11pm	Sara Mroz
Wed-Thur	3/23-3/24	11pm - 7am	Jim Andersen
Thur	24-Mar	7am - 3pm	Yen-Ju Chen
Thur	24-Mar	3pm-11pm	Sara Mroz
Thur-Fri	3/24-3/25	11pm - 7am	Jim Andersen
Fri	25-Mar	7am - 3pm	Caroline Nguyen
Fri	25-Mar	3pm-11pm	Sara Mroz
Fri-Sat	3/25-3/26	11pm-7am	Jim Andersen
Sat	26-Mar	7am - 3pm	Yen-Ju Chen/Tonya Russell
Sat	26-Mar	3pm-11pm	Sara Mroz
Sat-Sun	3/26-3/27	11pm - 7am	Jim Anderson

Executive Support Team

EST Status Officer			
Sat-Sun	3/19-3/20	11pm - 7am	Doug Huyck
Sun	20-Mar	7am - 3pm	Craig Erlanger
Sun	20-Mar	3pm-11pm	John Jolicoeur
Sun-Mon	3/20-3/21	11pm - 7am	Doug Huyck
Mon	21-Mar	7am - 3pm	Jane Marshall
Mon	21-Mar	3pm-11pm	Bill Gott
Mon-Tues	3/21-3/22	11pm - 7am	Jeff Grant
Tues	22-Mar	7am - 3pm	John Jolicoeur
Tues	22-Mar	3pm-11pm	Bill Gott
Tues-Wed	3/22-3/23	11pm - 7am	Jeff Grant
Wed	23-Mar	7am - 3pm	Sally Billings/Jane Marshall
Wed	23-Mar	3pm-11pm	Bill Gott
Wed-Thur	3/23-3/24	11pm - 7am	Jeff Grant
Thur	24-Mar	7am - 3pm	Jane Marshall
Thur	24-Mar	3pm-11pm	Bill Gott
Thur-Fri	3/24-3/25	11pm - 7am	Jeff Grant
Fri	25-Mar	7am - 3pm	Jane Marshall
Fri	25-Mar	3pm-11pm	Bill Gott
Fri-Sat	3/25-3/26	11pm-7am	Jeff Grant
Sat	26-Mar	7am - 3pm	Jane Marshall ?
Sat	26-Mar	3pm-11pm	Bill Gott
Sat-Sun	3/26-3/27	11pm - 7am	Jeff Grant

EST Actions Officer			
Sat-Sun	3/19-3/20	11pm - 7am	Jonathan Fiske
Sun	20-Mar	7am - 3pm	Melissa Ralph
Sun	20-Mar	3pm-11pm	Jonathan Fiske
Sun-Mon	3/20-3/21	11pm - 7am	Dori Votolato-Willis
Mon	21-Mar	7am - 3pm	Melissa Ralph
Mon	21-Mar	3pm-11pm	Amanda Nerret
Mon-Tues	3/21-3/22	11pm - 7am	Kelly Grimes
Tues	22-Mar	7am - 3pm	Melissa Ralph

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Tues	22-Mar	3pm-11pm	Dori Votolato-Willis
Tues-Wed	3/22-3/23	11pm - 7am	Kelly Grimes
Wed	23-Mar	7am - 3pm	Melissa Ralph
Wed	23-Mar	3pm-11pm	Dori Votolato-Willis
Wed-Thur	3/23-3/24	11pm - 7am	Kelly Grimes
Thur	24-Mar	7am - 3pm	Wendy Reed
Thur	24-Mar	3pm-11pm	Dori Votolato-Willis
Thur-Fri	3/24-3/25	11pm - 7am	N/A
Fri	25-Mar	7am - 3pm	Amanda Nerret
Fri	25-Mar	3pm-11pm	Melissa Ralph
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	James Corson
Sat	26-Mar	3pm-11pm	Don Algama
Sat-Sun	3/26-3/27	11pm - 7am	N/A

EST Coordinator

Sat-Sun	3/19-3/20	11pm - 7am	Rebecca Stone
Sun	20-Mar	7am - 3pm	Clyde Ragland
Sun	20-Mar	3pm-11pm	Tony Bowers
Sun-Mon	3/20-3/21	11pm - 7am	Rebecca Stone
Mon	21-Mar	7am - 3pm	Tony McMurtray
Mon	21-Mar	3pm-11pm	Tony Bowers
Mon-Tues	3/21-3/22	11pm - 7am	Rebecca Stone
Tues	22-Mar	7am - 3pm	Tony McMurtray
Tues	22-Mar	3pm-11pm	Clyde Ragland
Tues-Wed	3/22-3/23	11pm - 7am	Rebecca Stone
Wed	23-Mar	7am - 3pm	Tony McMurtray
Wed	23-Mar	3pm-11pm	Clyde Ragland
Wed-Thur	3/23-3/24	11pm - 7am	Rebecca Stone
Thur	24-Mar	7am - 3pm	Tony McMurtray
Thur	24-Mar	3pm-11pm	Clyde Ragland
Thur-Fri	3/24-3/25	11pm - 7am	Steve Campbell
Fri	25-Mar	7am - 3pm	Taylor Lichatz
Fri	25-Mar	3pm-11pm	Tony McMurtray
Fri-Sat	3/25-3/26	11pm-7am	Steve Campbell
Sat	26-Mar	7am - 3pm	Tonya Russell
Sat	26-Mar	3pm-11pm	Tony McMurtray
Sat-Sun	3/26-3/27	11pm - 7am	Steve Campbell

EST Chronology Officer

Sat-Sun	3/19-3/20	11pm - 7am	Cynthia Dorsey
Sun	20-Mar	7am - 3pm	James Vaughn
Sun	20-Mar	3pm-11pm	Rebecca Karas
Sun-Mon	3/20-3/21	11pm - 7am	Mark Resner
Mon	21-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Mon	21-Mar	3pm-11pm	Rebecca Karas
Mon-Tues	3/21-3/22	11pm - 7am	Thomas Scarbrough
Tues	22-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Tues	22-Mar	3pm-11pm	Rebecca Karas
Tues-Wed	3/22-3/23	11pm - 7am	Thomas Scarbrough
Wed	23-Mar	7am - 3pm	James Vaughn
Wed	23-Mar	3pm-11pm	Rebecca Karas

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Wed-Thur	3/23-3/24	11pm - 7am	Nick Ballam
Thur	24-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Thur	24-Mar	3pm-11pm	Rebecca Karas
Thur-Fri	3/24-3/25	11pm - 7am	Thomas Scarbrough
Fri	25-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Fri	25-Mar	3pm-11pm	Rebecca Karas
Fri-Sat	3/25-3/26	11pm-7am	Thomas Scarbrough
Sat	26-Mar	7am - 3pm	Nick Ballam
Sat	26-Mar	3pm-11pm	Rebecca Karas
Sat-Sun	3/26-3/27	11pm - 7am	Thomas Scarbrough

EST Response Ops Mgr

Sat-Sun	3/19-3/20	11pm - 7am	Jean Trefethan
Sun	20-Mar	7am - 3pm	Karen Jackson
Sun	20-Mar	3pm-11pm	Roberto Figueroa
Sun-Mon	3/20-3/21	11pm - 7am	Jean Trefethan
Mon	21-Mar	7am - 3pm	Bob Stransky
Mon	21-Mar	3pm-11pm	Omar Khan
Mon-Tues	3/21-3/22	11pm - 7am	Cris Brown
Tues	22-Mar	7am - 3pm	Bob Stransky
Tues	22-Mar	3pm-11pm	Karen Jackson
Tues-Wed	3/22-3/23	11pm - 7am	Roberto Figueroa
Wed	23-Mar	7am - 3pm	Bob Stransky
Wed	23-Mar	3pm-11pm	Jean Trefethan
Wed-Thur	3/23-3/24	11pm - 7am	Cris Brown
Thur	24-Mar	7am - 3pm	Karen Jackson
Thur	24-Mar	3pm-11pm	Omar Khan
Thur-Fri	3/24-3/25	11pm - 7am	Roberto Figueroa
Fri	25-Mar	7am - 3pm	Jean Trefethan
Fri	25-Mar	3pm-11pm	Cris Brown
Fri-Sat	3/25-3/26	11pm-7am	Roberto Figueroa
Sat	26-Mar	7am - 3pm	Omar Khan
Sat	26-Mar	3pm-11pm	Cris Brown
Sat-Sun	3/26-3/27	11pm - 7am	Roberto Figueroa

EST Admin. Assistant

Sat-Sun	3/19-3/20	11pm - 7am	Chris Lamb
Sun	20-Mar	7am - 3pm	Karen Meyer
Sun	20-Mar	3pm-11pm	Linda Williamson
Sun-Mon	3/20-3/21	11pm - 7am	Chris Lamb
Mon	21-Mar	7am - 3pm	Karen Meyer
Mon	21-Mar	3pm-11pm	Mary Glenn Crutchley
Mon-Tues	3/21-3/22	11pm - 7am	Andrea Wimbush
Tues	22-Mar	7am - 3pm	Cynthia Dorsey
Tues	22-Mar	3pm-11pm	Mary Glenn Crutchley
Tues-Wed	3/22-3/23	11pm - 7am	Michelle Manahan
Wed	23-Mar	7am - 3pm	Karen Meyer
Wed	23-Mar	3pm-11pm	Mary Glenn Crutchley
Wed-Thur	3/23-3/24	11pm - 7am	Andrea Wimbush
Thur	24-Mar	7am - 3pm	Cynthia Dorsey
Thur	24-Mar	3pm-11pm	Mary Glenn Crutchley
Thur-Fri	3/24-3/25	11pm - 7am	N/A

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Fri	25-Mar	7am - 3pm	Karen Meyer
Fri	25-Mar	3pm-11pm	Cynthia Dorsey
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	Karen Meyer
Sat	26-Mar	3pm-11pm	Cynthia Dorsey
Sat-Sun	3/26-3/27	11pm - 7am	N/A

Liaison Team

LT Director			
Sat-Sun	3/19-3/20	11pm - 7am	John Adams
Sun	20-Mar	7am - 3pm	Tom Bergman
Sun	20-Mar	3pm-11pm	Bob Webber
Sun-Mon	3/20-3/21	11pm - 7am	John Adams
Mon	21-Mar	7am - 3pm	Tom Bergman
Mon	21-Mar	3pm-11pm	Bob Webber
Mon-Tues	3/21-3/22	11pm - 7am	John Adams
Tues	22-Mar	7am - 3pm	Tom Bergman
Tues	22-Mar	3pm-11pm	Bob Webber
Tues-Wed	3/22-3/23	11pm - 7am	John Adams
Wed	23-Mar	7am - 3pm	Michael Tschiltz
Wed	23-Mar	3pm-11pm	Rich Correia
Wed-Thur	3/23-3/24	11pm - 7am	Jake Zimmerman
Thur	24-Mar	7am - 3pm	Michael Tschiltz
Thur	24-Mar	3pm-11pm	Rich Correia
Thur-Fri	3/24-3/25	11pm - 7am	Jake Zimmerman
Fri	25-Mar	7am - 3pm	Michael Tschiltz
Fri	25-Mar	3pm-11pm	Rich Correia
Fri-Sat	3/25-3/26	11pm-7am	Jake Zimmerman
Sat	26-Mar	7am - 3pm	Michael Tschiltz
Sat	26-Mar	3pm-11pm	Rich Correia
Sat-Sun	3/26-3/27	11pm - 7am	Marissa Bailey

LT Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Janelle Jessie
Sun	20-Mar	7am - 3pm	Jeff Temple
Sun	20-Mar	3pm-11pm	Nathan Sanfilippo
Sun-Mon	3/20-3/21	11pm - 7am	Milt Murray
Mon	21-Mar	7am - 3pm	Jeff Temple
Mon	21-Mar	3pm-11pm	Nathan Sanfilippo
Mon-Tues	3/21-3/22	11pm - 7am	Milt Murray
Tues	22-Mar	7am - 3pm	Rani Franovich
Tues	22-Mar	3pm-11pm	Nathan Sanfilippo
Tues-Wed	3/22-3/23	11pm - 7am	Milt Murray
Wed	23-Mar	7am - 3pm	Rani Franovich
Wed	23-Mar	3pm-11pm	Jeff Temple
Wed-Thur	3/23-3/24	11pm - 7am	Milt Murray
Thur	24-Mar	7am - 3pm	Rani Franovich
Thur	24-Mar	3pm-11pm	Jeff Temple
Thur-Fri	3/24-3/25	11pm - 7am	Milt Murray
Fri	25-Mar	7am - 3pm	Janelle Jessie
Fri	25-Mar	3pm-11pm	Rani Franovich
Fri-Sat	3/25-3/26	11pm-7am	Milt Murray

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Sat	26-Mar	7am - 3pm	Janelle Jessie
Sat	26-Mar	3pm-11pm	Rani Franovich
Sat-Sun	3/26-3/27	11pm - 7am	Milt Murray
LT State Liaison			
Sat-Sun	3/19-3/20	9pm-7am	Michelle Ryan/Rich Turtill (ON CALL ONLY)
Sun	20-Mar	7am-2pm	Michelle Ryan/Rich Turtill (ON CALL ONLY)
Sun	20-Mar	2pm-9pm	Michelle Ryan/Rich Turtill (ON CALL ONLY)
Sun-Mon	3/20-3/21	9pm-7am	Michelle Ryan/Rich Turtill (ON CALL ONLY)
Mon	21-Mar	7am-2pm	Flannery (Riveria-On Call)
Mon	21-Mar	2pm-9pm	Easson (Turtill-On Call)
Mon-Tue	3/21-3/22	9pm-7am	Michelle Ryan/Rich Turtill (ON CALL ONLY)
Tue	22-Mar	7am-2pm	Maupin
Tue	22-Mar	2pm-9pm	Easson/Michelle Ryan
Tue-Wed	3/22-3/23	9pm-7am	Alison Rivera/Amanda Noonan (ON CALL ONLY)
Wed	23-Mar	7am-2pm	Maupin
Wed	23-Mar	2pm-9pm	Alison Rivera
Wed-Thur	3/23-3/24	9pm-7am	Michelle Ryan/Turtill (ON CALL ONLY)
Thur	24-Mar	7am-2pm	Flannery
Thur	24-Mar	2pm-9pm	Amanda Noonan
Thur-Fri	3/24-3/25	9pm-7am	Rivera/Turtill (ON CALL ONLY)
Fri	25-Mar	7am-2pm	Kim Lukes
Fri	25-Mar	2pm-9pm	Michelle Ryan
Fri-Sat	3/25-3/26	9pm-7am	Alison Rivera/Amanda Noonan (ON CALL ONLY)
Sat	26-Mar	7am-2pm	Michelle Ryan/Amanda Noonan (ON CALL ONLY)
Sat	26-Mar	2pm-9pm	Michelle Ryan/Amanda Noonan (ON CALL ONLY)
Sat-Sun	3/26-3/27	9pm-7am	Michelle Rivera/Amanda Noonan (ON CALL ONLY)
LT Federal Liaison (2)			
Sun	20-Mar	7am - 3pm	Ned Wright
Sun	20-Mar	3pm-11pm	Jeff Temple
Sun-Mon	3/20-3/21	11pm - 7am	Scott Sloan
Sun-Mon	3/20-3/21	11pm - 7am	Lisa Wright
Mon	21-Mar	7am - 3pm	Beth Reed/Ted Smith
Mon	21-Mar	3pm-11pm	Ned Wright
Mon-Tues	3/21-3/22	11pm - 7am	Lisa Wright
Tues	22-Mar	7am - 3pm	Beth Reed/Ted Smith
Tues	22-Mar	3pm-11pm	Ned Wright
Tues-Wed	3/22-3/23	11pm - 7am	Lisa Wright
Wed	23-Mar	7am - 3pm	Jerry Hale/Ted Smith
Wed	23-Mar	3pm-11pm	Ned Wright
Wed-Thur	3/23-3/24	11pm - 7am	Lisa Wright
Thur	24-Mar	7am - 3pm	Ted Smith/Bethany Cecere
Thur	24-Mar	3pm-11pm	Jerry Hale
Thur-Fri	3/24-3/25	11pm - 7am	Scott Sloan
Fri	25-Mar	7am - 3pm	Ted Smith/Bethany Cecere
Fri	25-Mar	3pm-11pm	Jason Lising
Fri-Sat	3/25-3/26	11pm-7am	Scott Sloan
Sat	26-Mar	7am - 3pm	Jason Lising/Lisa Gibney
Sat	26-Mar	3pm-11pm	Jeff Temple
Sat-Sun	3/26-3/27	11pm - 7am	Scott Sloan

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LT Congressional Liaison (2)			
Sun	20-Mar	7am - 2pm	Rebecca Schmidt
	20-Mar	2pm-9pm	Reanne Shane
Mon	21-Mar	7am - 2pm	Spiros Droggitis
	21-Mar	2pm-9pm	Tim Riley
Tues	22-Mar	7am - 2pm	Tim Riley
	22-Mar	2pm-9pm	Spiros Droggitis
Wed	23-Mar	7am - 2pm	Gene Dacus
	23-Mar	2pm-9pm	Raeann Shane
Thur	24-Mar	7am - 2pm	Spiros Droggitis
	24-Mar	2pm-9pm	Raeann Shane
Fri	25-Mar	7am - 2pm	Gene Dacus
	25-Mar	2pm-9pm	Amy Powell
Sat	26-Mar	7am - 3pm	Amy Powell (ON CALL ONLY)
Sat	26-Mar	3pm-11pm	Amy Powell (ON CALL ONLY)
Sun	3/26-3/27	11pm - 7am	Amy Powell (ON CALL ONLY)
LT International Liaison (2)			
Sat-Sun	3/19-3/20	11pm - 7am	Elizabeth Smioldo/Danielle Emche
Sun	20-Mar	7am - 3pm	Karen Henderson/Steve Baker
Sun	20-Mar	3pm-11pm	Eric Stahl/Nancy Fragoyanis
Sun-Mon	3/20-3/21	11pm - 7am	Elizabeth Smioldo/Jenny Tobin
Mon	21-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3
Mon	21-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Mon-Tues	3/21-3/22	11pm - 7am	Eric Stahl/Mugeh Afshar-Tous
Tues	22-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3
Tues	22-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Tues-Wed	3/22-3/23	11pm - 7am	Eric Stahl/Mugeh
Wed	23-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3
Wed	23-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Wed-Thur	3/23-3/24	11pm - 7am	Eric Stahl/Mugeh
Thur	24-Mar	7am - 3pm	Steve Bloom/Lance English
Thur	24-Mar	3pm-11pm	Janice/Jenny Tobin
Thur-Fri	3/24-3/25	11pm - 7am	Andrea/Elizabeth Smioldo
Fri	25-Mar	7am - 3pm	Steve Bloom/Lance English
Fri	25-Mar	3pm-11pm	Janice/Jenny Tobin
Fri-Sat	3/25-3/26	11pm-7am	Andrea/Elizabeth Smioldo
Sat	26-Mar	7am - 3pm	Steve Bloom / Lance English
Sat	26-Mar	3pm-11pm	Janice Owens / Jenny Tobin
Sat-Sun	3/26-3/27	11pm - 7am	Cindy Rosales/ Elizabeth Smioldo
Protective Measures Team			
PMTR Director			
Sat-Sun	3/19-3/20	11pm - 7am	Kathy Gibson
Sun	20-Mar	7am - 3pm	John Lubinski
Sun	20-Mar	3pm-11pm	Don Cool
Sun-Mon	3/20-3/21	11pm - 7am	Kathy Gibson
Mon	21-Mar	7am - 3pm	John Lubinski
Mon	21-Mar	3pm-11pm	Don Cool
Mon-Tues	3/21-3/22	11pm - 7am	John Tappert
Tues	22-Mar	7am - 3pm	John Lubinski
Tues	22-Mar	3pm-11pm	Don Cool

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Tues-Wed	3/22-3/23	11pm - 7am	John Tappert
Wed	23-Mar	7am - 3pm	Terry Reis
Wed	23-Mar	3pm-11pm	Cindy Jones
Wed-Thur	3/23-3/24	11pm - 7am	Randy Sullivan
Thur	24-Mar	7am - 3pm	Terry Reis
Thur	24-Mar	5pm-11pm	Cindy Jones
Thur-Fri	3/24-3/25	11pm - 7am	Randy Sullivan
Fri	25-Mar	7am - 3pm	Terry Reis
Fri	25-Mar	5pm-11pm	Cindy Jones
Fri-Sat	3/25-3/26	11pm-7am	Randy Sullivan
Sat	26-Mar	7am - 3pm	Terry Reis
Sat	26-Mar	3pm-11pm	Cindy Jones
Sat-Sun	3/26-3/27	11pm - 7am	Randy Sullivan

PMTR Coordinator

Sat-Sun	3/19-3/20	11pm - 7am	Lou Brandon
Sun	20-Mar	7am - 3pm	Nima Ashkeboussi
Sun	20-Mar	3pm-11pm	Jay Patel
Sun-Mon	3/20-3/21	11pm - 7am	Lou Brandon
Mon	21-Mar	7am - 3pm	Prosanta Chowdhury (8 am)
Mon	21-Mar	3pm-11pm	Jay Patel
Mon-Tues	3/21-3/22	11pm - 7am	Lou Brandon
Tues	22-Mar	7am - 3pm	Prosanta Chowdhury (8 am)
Tues	22-Mar	3pm-11pm	Nima Ashkeboussi
Tues-Wed	3/22-3/23	11pm - 7am	Mike Norris
Wed	23-Mar	7am - 3pm	John Wray
Wed	23-Mar	3pm-11pm	Nima Ashkeboussi
Wed-Thur	3/23-3/24	11pm - 7am	Mike Norris
Thur	24-Mar	7am - 3pm	John Wray
Thur	24-Mar	3pm-11pm	Jay Patel/Joe DeCicco
Thur-Fri	3/24-3/25	11pm - 7am	Mike Norris
Fri	25-Mar	7am - 3pm	Duane Hardesty/Joe DeCicco
Fri	25-Mar	3pm-11pm	Ryan Craffey
Fri-Sat	3/25-3/26	11pm-7am	Lou Brandon
Sat	26-Mar	7am - 3pm	Arlon Costa
Sat	26-Mar	3pm-11pm	Kimberly Hardin
Sat-Sun	3/26-3/27	11pm - 7am	Lou Brandon

PMTR Prot Actions Asst Dir

Sat-Sun	3/19-3/20	11pm - 7am	Greg Casto
Sun	20-Mar	7am - 3pm	Kathryn Brock
Sun	20-Mar	3pm-11pm	Tim Harris
Sun-Mon	3/20-3/21	11pm - 7am	Greg Casto (Jessica Kratchman - to shadow)
Mon	21-Mar	7am - 3pm	Kathryn Brock
Mon	21-Mar	3pm-11pm	Dan Barss
Mon-Tues	3/21-3/22	11pm - 7am	Jessica Kratchman
Tues	22-Mar	7am - 3pm	Kathryn Brock
Tues	22-Mar	3pm-11pm	Tim Harris
Tues-Wed	3/22-3/23	11pm - 7am	Jessica Kratchman
Wed	23-Mar	7am - 3pm	Sandra Wastler
Wed	23-Mar	3pm-11pm	Vince Holahan
Wed-Thur	3/23-3/24	11pm - 7am	Jessica Kratchman

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Thur	24-Mar	7am - 3pm	Sandra Wastler
Thur	24-Mar	3pm-11pm	Stacey Rosenberg
Thur-Fri	3/24-3/25	11pm - 7am	Jessica Kratchman
Fri	25-Mar	7am - 3pm	Kathryn Brock
Fri	25-Mar	3pm-11pm	Vince Holahan
Fri-Sat	3/25-3/26	11pm-7am	Greg Casto
Sat	26-Mar	7am - 3pm	Dan Barss
Sat	26-Mar	3pm-11pm	Sandra Wastler
Sat-Sun	3/26-3/27	11pm - 7am	Greg Casto/Jessica Kratchman

PMTR RAAD

Sat-Sun	3/19-3/20	11pm - 7am	Patricia Milligan
Sun	20-Mar	7am - 3pm	Eric Schrader
Sun	20-Mar	3pm-11pm	Steve LaVie
Sun-Mon	3/20-3/21	11pm - 7am	Mike Norris
Mon	21-Mar	7am - 3pm	Michelle Hart
Mon	21-Mar	3pm-11pm	Steve Lavie
Mon-Tues	3/21-3/22	11pm - 7am	Boby Abu-Eid
Tues	22-Mar	7am - 3pm	Bruce Watson
Tues	22-Mar	3pm-11pm	Steve LaVie
Tues-Wed	3/22-3/23	11pm - 7am	Boby Abu-Eid
Wed	23-Mar	7am - 3pm	Bruce Watson
Wed	23-Mar	3pm-11pm	Michelle Hart
Wed-Thur	3/23-3/24	11pm - 7am	Duane Schmidt
Thur	24-Mar	7am - 3pm	Bruce Watson
Thur	24-Mar	3pm-11pm	Steve LaVie
Thur-Fri	3/24-3/25	11pm - 7am	Cynthia Barr
Fri	25-Mar	7am - 3pm	Bruce Watson
Fri	25-Mar	3pm-11pm	Michelle Hart
Fri-Sat	3/25-3/26	11pm-7am	Cynthia Barr
Sat	26-Mar	7am - 3pm	Bruce Watson
Sat	26-Mar	3pm-11pm	Steve LaVie
Sat-Sun	3/26-3/27	11pm - 7am	Mike Norris

PMTR Dose Assessment (RASCAL) - Need 2

Sat-Sun	3/19-3/20	11pm - 7am	Kimberly Gambone/John Parillo
Sun	20-Mar	7am - 3pm	Casper Sun / Duane Schmidt
Sun	20-Mar	3pm-11pm	Margaret Cervera / Tony Huffert
Sun-Mon	3/20-3/21	11pm - 7am	Kimberly Gambone/John Parillo
Mon	21-Mar	7am - 3pm	Eric Schrader/Rich Clement
Mon	21-Mar	3pm-11pm	Margaret Cervera/Tony Huffert
Mon-Tues	3/21-3/22	11pm - 7am	John Parillo / Bernie White
Tues	22-Mar	7am - 3pm	Eric Schrader/Rich Clement
Tues	22-Mar	3pm-11pm	Gary Purdy/Casper Sun
Tues-Wed	3/22-3/23	11pm - 7am	Margaret Cervera/Tony Huffert
Wed	23-Mar	7am - 3pm	Eric Schrader/Rich Clement
Wed	23-Mar	3pm-11pm	Kimberly Gambone/Casper Sun
Wed-Thur	3/23-3/24	11pm - 7am	Tony Huffert/John Parillo
Thur	24-Mar	7am - 3pm	Eric Schrader/Rich Clement
Thur	24-Mar	3pm-11pm	Kimberly Gambone/Casper Sun
Thur-Fri	3/24-3/25	11pm - 7am	Tony Huffert/John Parillo
Fri	25-Mar	7am - 3pm	Eric Schrader/Rich Clement

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Fri	25-Mar	3pm-11pm	Gary Purdy/Casper Sun
Fri-Sat	3/25-3/26	11pm-7am	John Parillo / Bernie White
Sat	26-Mar	7am - 3pm	Tony Huffert/Charlie Hinson
Sat	26-Mar	3pm-11pm	Leroy Hardin/Gary Purdy?
Sat-Sun	3/26-3/27	11pm - 7am	John Parillo/Ron LaVera
PMTR GIS Analyst			
Sun-Mon	3/20-3/21	11pm - 7am	Alice Stieve
Mon	21-Mar	7am - 3pm	Nebiyu Tiruneh
Mon	21-Mar	3pm-11pm	Stephanie Devlin
Mon-Tues	3/21-3/22	11pm - 7am	Alice Stieve
Tues	22-Mar	7am - 3pm	Yong Li
Tues	22-Mar	3pm-11pm	Stephanie Devlin
Tues-Wed	3/22-3/23	11pm - 7am	Alice Stieve
Wed	23-Mar	7am - 3pm	Allen Gross
Wed	23-Mar	3pm-11pm	Stephanie Devlin
Wed-Thur	3/23-3/24	11pm - 7am	Phil Brandt
Thur	24-Mar	7am - 3pm	Yong Li
Thur	24-Mar	3pm-11pm	Stephanie Devlin
Thur-Fri	3/24-3/25	11pm - 7am	Dogan Seber
Fri	25-Mar	7am - 3pm	Allen Gross
Fri	25-Mar	3pm-11pm	N/A
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	N/A
Sat	26-Mar	3pm-11pm	N/A
Sat-Sun	3/26-3/27	11pm - 7am	N/A
PMTR Meteorologist			
Sat-Sun	19-Mar	3pm-11pm	Mike Mazaika
Sun	3/19-3/20	11pm - 7am	David Brown
Sun	20-Mar	7am - 3pm	Kevin Quinlan
Sun	20-Mar	3pm-11pm	Mike Mazaika
Sun-Mon	3/20-3/21	11pm - 7am	David Brown
Mon	21-Mar	7am - 3pm	Mike Mazaika
Mon	21-Mar	3pm-11pm	Brad Harvey
Mon-Tues	3/21-3/22	11pm - 7am	Kevin Quinlan
Tues	22-Mar	7am - 3pm	David Brown
Tues	22-Mar	3pm-11pm	Brad Harvey
Tues-Wed	3/22-3/23	11pm - 7am	Andy Imboden/Kevin Quinlan
Wed	23-Mar	7am - 3pm	Mike Mazaika
Wed	23-Mar	3pm-11pm	Brad Harvey
Wed-Thur	3/23-3/24	11pm - 7am	Kevin Quinlan
Thur	24-Mar	7am - 3pm	David Brown
Thur	24-Mar	3pm-11pm	Brad Harvey
Thur-Fri	3/24-3/25	11pm - 7am	Kevin Quinlan
Fri	25-Mar	7am - 3pm	Mike Mazaika
Fri	25-Mar	3pm-11pm	N/A
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	N/A
Sat	26-Mar	3pm-11pm	N/A
Sat-Sun	3/26-3/27	11pm - 7am	N/A

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Reactor Safety Team			
RST Director			
Sat-Sun	3/19-3/20	11pm - 7am	Jennifer Uhle
Sun	20-Mar	7am - 3pm	Laura Dudes
Sun	20-Mar	3pm-11pm	Dave Skeen
Sun-Mon	3/20-3/21	11pm - 7am	Jennifer Uhle
Mon	21-Mar	7am - 3pm	Fred Brown
Mon	21-Mar	3pm-11pm	Dave Skeen
Mon-Tues	3/21-3/22	11pm - 7am	Jennifer Uhle
Tues	22-Mar	7am - 3pm	Fred Brown
Tues	22-Mar	3pm-11pm	Dave Skeen
Tues-Wed	3/22-3/23	11pm - 7am	Brian Holian
Wed	23-Mar	7am - 3pm	Fred Brown
Wed	23-Mar	3pm-11pm	Bill Ruland
Wed-Thur	3/23-3/24	11pm - 7am	Brian Holian
Thur	24-Mar	7am - 3pm	Fred Brown
Thur	24-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/24-3/25	11pm - 7am	Brian Holian
Fri	25-Mar	7am - 3pm	Pat Hiland
Fri	25-Mar	3pm-11pm	Bill Ruland
Fri-Sat	3/25-3/26	11pm-7am	Brian Holian
Sat	26-Mar	7am - 3pm	Pat Hiland
Sat	26-Mar	3pm-11pm	Bill Ruland
Sat	3/26-27/2011	11pm - 7am	Dave Skeen
RST Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Frank Collins
Sun	20-Mar	7am - 3pm	Peter Alter
Sun	20-Mar	3pm-11pm	Eric Thomas
Sun-Mon	3/20-3/21	11pm - 7am	Mike Morlang
Mon	21-Mar	7am - 3pm	Peter Alter
Mon	21-Mar	3pm-11pm	Greg Schoenebeck
Mon-Tues	3/21-3/22	11pm - 7am	Frank Collins
Tues	22-Mar	7am - 3pm	Rick Hasselberg
Tues	22-Mar	3pm-11pm	Mike Morlang
Tues-Wed	3/22-3/23	11pm - 7am	Oleg Bukharin
Wed	23-Mar	7am - 3pm	Eric Thomas
Wed	23-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/23-3/24	11pm - 7am	Frank Collins
Thur	24-Mar	7am - 3pm	Rick Hasselberg
Thur	24-Mar	3pm-11pm	Brett Rini
Thur-Fri	3/24-3/25	11pm - 7am	Tom Boyce (RES)
Fri	25-Mar	7am - 3pm	Eric Thomas
Fri	25-Mar	3pm-11pm	Brett Rini
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Sat	26-Mar	7am - 3pm	Eric Thomas
Sat	26-Mar	3pm-11pm	Mark Orr
Sat-Sun	3/26-3/27	11pm - 7am	Brett Rini
Severe Accident/PRA			
Sat-Sun	3/19-3/20	11pm - 7am	Mike Salay
Sun	20-Mar	7am - 3pm	John Lane

Japan Earthquake ERO Staffing Roster
March 20-26, 2011
Pay Period 7 - Week 2

Sun	20-Mar	3pm-11pm	Jim Gilmer
Sun-Mon	3/20-3/21	11pm - 7am	Don Dube
Mon	21-Mar	7am - 3pm	Jeff Circle
Mon	21-Mar	3pm-11pm	Hossein Esmaili
Mon-Tues	3/21-3/22	11pm - 7am	Jim Gilmer
Tues	22-Mar	7am - 3pm	Ed Fuller
Tues	22-Mar	3pm-11pm	Len Ward
Tues-Wed	3/22-3/23	11pm - 7am	Sam Miranda
Wed	23-Mar	7am - 3pm	Jeff Circle
Wed	23-Mar	3pm-11pm	Steven Arndt
Wed-Thur	3/23-3/24	11pm - 7am	Mike Salay
Thur	24-Mar	7am - 3pm	Jeff Circle
Thur	24-Mar	3pm-11pm	Steve Laur
Thur-Fri	3/24-3/25	11pm - 7am	Don Helton
Fri	25-Mar	7am - 3pm	Steven Arndt
Fri	25-Mar	3pm-11pm	Steve Laur
Fri-Sat	3/25-3/26	11pm-7am	Don Helton
Sat	26-Mar	7am - 3pm	Steven Arndt
Sat	26-Mar	3pm-11pm	Jerry Dozier
Sat-Sun	3/26-3/27	11pm - 7am	Ray Skarda
BWR Expertise			
Sat-Sun	3/19-3/20	11pm - 7am	John Kauffman
Sun	20-Mar	7am - 3pm	Larry Vick
Sun	20-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/20-3/21	11pm - 7am	Mike Brown
Mon	21-Mar	7am - 3pm	Bob Summers
Mon	21-Mar	3pm-11pm	Chuck Norton
Mon-Tues	3/21-3/22	11pm - 7am	Mike Brown
Tues	22-Mar	7am - 3pm	Tom Boyce (RES)
Tues	22-Mar	3pm-11pm	Chuck Norton
Tues-Wed	3/22-3/23	11pm - 7am	Mike Brown
Wed	23-Mar	7am - 3pm	Larry Vick
Wed	23-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/23-3/24	11pm - 7am	Eva Brown
Thur	24-Mar	7am - 3pm	Peter Alter
Thur	24-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/24-3/25	11pm - 7am	Eva Brown
Fri	25-Mar	7am - 3pm	Bob Summers
Fri	25-Mar	3pm-11pm	Chuck Norton
Fri-Sat	3/25-3/26	11pm-7am	Eva Brown
Sat	26-Mar	7am - 3pm	Mike Brown
Sat	26-Mar	3pm-11pm	Chuck Norton
Sat-Sun	3/26-3/27	11pm - 7am	Eva Brown
RST Comm/ERDS Operator			
Sat-Sun	3/19-3/20	11pm - 7am	Ujagar Bhachu
Sun	20-Mar	7am - 3pm	Denise McGovern
Sun	20-Mar	3pm-11pm	Donna Williams
Sun-Mon	3/20-3/21	11pm - 7am	Ujagar Bhachu
Mon	21-Mar	7am - 3pm	Joseph Williams
Mon	21-Mar	3pm-11pm	John Thorp

Japan Earthquake ERO Staffing Roster
March 20-26, 2011
Pay Period 7 - Week 2

Mon-Tues	3/21-3/22	11pm - 7am	Bill Roggenbrodt
Tues	22-Mar	7am - 3pm	Steve Bloom
Tues	22-Mar	3pm-11pm	Jim Isom
Tues-Wed	3/22-3/23	11pm - 7am	Bill Roggenbrodt
Wed	23-Mar	7am - 3pm	Joseph Williams
Wed	23-Mar	3pm-11pm	Ken Hart
Wed-Thur	3/23-3/24	11pm - 7am	Bill Roggenbrodt
Thur	24-Mar	7am - 3pm	John Thorp
Thur	24-Mar	3pm-11pm	Ken Hart
Thur-Fri	3/24-3/25	11pm - 7am	Bill Roggenbrodt
Fri	25-Mar	7am - 3pm	Donna Williams
Fri	25-Mar	3pm-11pm	David Solorio
Fri-Sat	3/25-3/26	11pm-7am	Rick Hasselberg
Sat	26-Mar	7am - 3pm	John Thorp
Sat	26-Mar	3pm-11pm	Stan Gardocki
Sat-Sun	3/26-3/27	11pm - 7am	Denise McGovern
RST Support (Seismology Q&A)			
Fri-Sat	3/18-3/19	11pm-7am	Off (On Call)
Sat	19-Mar	7am - 3pm	Off (On Call)
Sat	19-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/19-3/20	11pm - 7am	Alice Stieve (On Call) Working as PMT GIS
Sun	20-Mar	7am - 3pm	Cliff Munson (On Call)
Sun	20-Mar	3pm-11pm	Annie Kammerer (On Call)
Sun-Mon	3/20-3/21	11pm - 7am	Stephanie Devlin (On Call)
Mon	21-Mar	7am - 3pm	Cliff Munson (On Call)
Mon	21-Mar	3pm-11pm	A. Kammerer 3-11; M. Bensi 3-6 (On Call)
Mon-Tues	3/21-3/22	11pm - 7am	Dogan Seber (On Call)
Tues	22-Mar	7am - 3pm	Nilesh Chokchi On Call)
Tues	22-Mar	3pm-11pm	S. Devlin 3-11; M. Bensi 3-6 (On Call)
Tues-Wed	3/22-3/23	11pm - 7am	Cliff Munson (On Call)
Wed	23-Mar	7am - 3pm	Nilesh Chokchi On Call)
Wed	23-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Wed-Thur	3/23-3/24	11pm - 7am	Annie Kammerer (On Call)
Thur	24-Mar	7am - 3pm	Cliff Munson (On Call)
Thur	24-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Thur-Fri	3/24-3/25	11pm - 7am	Dogan Seber (On Call)
Fri	25-Mar	7am - 3pm	Dogan Seber (On Call)
Fri	25-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Fri-Sat	3/25-3/26	11pm-7am	Dogan Seber (On Call)
Sat	26-Mar	7am - 3pm	A. Kammerer (On Call)
Sat	26-Mar	3pm-11pm	A. Kammerer (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	A. Kammerer (On Call)
RST Support (Structural)			
Fri-Sat	3/18-3/19	11pm-7am	Off (On Call)
Sat	19-Mar	7am - 3pm	Off (On Call)
Sat	19-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/19-3/20	11pm - 7am	Off (On Call)
Sun	20-Mar	7am - 3pm	Off (On Call)
Sun	20-Mar	3pm-11pm	Off (On Call)
Sun-Mon	3/20-3/21	11pm - 7am	Off (On Call)

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Mon	21-Mar	7am - 3pm	Off (On Call)
Mon	21-Mar	3pm-11pm	Bret Tegeler (On Call)
Mon-Tues	3/21-3/22	11pm - 7am	Bret Tegeler (On Call)
Tues	22-Mar	7am - 3pm	Pravin Patel (On Call)
Tues	22-Mar	3pm-11pm	Bret Tegeler (On Call)
Tues-Wed	3/22-3/23	11pm - 7am	Bret Tegeler (On Call)
Wed	23-Mar	7am - 3pm	Pravin Patel (On Call)
Wed	23-Mar	3pm-11pm	Samir Chakrabart (On Call)
Wed-Thur	3/23-3/24	11pm - 7am	Samir Chakrabart (On Call)
Thur	24-Mar	7am - 3pm	Pravin Patel (On Call)
Thur	24-Mar	3pm-11pm	Jerry Chung (On Call)
Thur-Fri	3/24-3/25	11pm - 7am	Jerry Chung (On Call)
Fri	25-Mar	7am - 3pm	Pravin Patel (On Call)
Fri	25-Mar	3pm-11pm	Manas Chakravorty (On Call)
Fri-Sat	3/25-3/26	11pm-7am	Manas Chakravorty (On Call)
Sat	26-Mar	7am - 3pm	Off (On Call)
Sat	26-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	Off (On Call)

From: OST02 HOC

To: Abrams, Charlotte; Abu-Eid, Bobby; Adams, John; Afshar-Tous, Mugeh; Ahn, Hosung; Alemu, Bezakulu; Algama, Don; Alter, Peter; Anderson, Brian; Anderson, James; Arndt, Steven; Arribas-Colon, Maria; Ashkeboussi, Nima; Athey, George; Baker, Stephen; Ballam, Nick; Barnhurst, Daniel; Barr, Cynthia; Barss, Dan; Bazian, Samuel; Bens, Michelle; Bergman, Thomas; Berry, Rolie; Bhachu, Ujagar; Bloom, Steven; Blount, Tom; Boger, Bruce; Bonnette, Cassandra; Borchardt, Bill; Bowers, Anthony; Bowman, Gregory; Boyce, Tom (RES); Brandon, Lou; Brandt, Philip; Brenner, Eliot; Brock, Kathryn; Brown, Cris; Brown, David; Brown, Eva; Brown, Frederick; Brown, Michael; Bukharin, Oleg; Burnell, Scott; Bush-Goddard, Stephanie; Campbell, Stephen; Camper, Larry; Carpenter, Cynthia; Carter, Mary; Case, Michael; Casto, Greg; Cecere, Bethany; Cervera, Margaret; Chazell, Russell; Chen, Yen-Ju; Cheok, Michael; Chokshi, Niles; Chowdhury, Prosanta; Chung, Donald; Circle, Jeff; Clement, Richard; Clinton, Rebecca; Coggins, Angela; Collins, Frank; Cool, Donald; Correia, Richard; Corson, James; Costa, Arlon; Couret, Ivonne; Craffey, Ryan; Crutchley, Mary Glenn; Cruz, Zahira; Cuadrado, Leira; Dacus, Eugene; DeCicco, Joseph; Decker, David; Dembek, Stephen; Devlin, Stephanie; Dimmick, Lisa; Doane, Margaret; Dorman, Dan; Dorsey, Cynthia; Dozier, Jerry; Drake, Margaret; Droggitis, Spiros; Dube, Donald; Dudes, Laura; Eads, Johnny; Emche, Danielle; English, Lance; Erlanger, Craig; Esmali, Hossein; Figueroa, Roberto; Fiske, Jonathan; Flanders, Scott; Flannery, Cindy; Floyd, Daphene; Foggie, Kirk; Foster, Jack; Fragovannis, Nancy; Franovich, Rani; Frazier, Alan; Freshman, Steve; Fuller, Edward; Galletta, Thomas; Gambone, Kimberly; Gardocki, Stanley; Gartman, Michael; Gibson, Kathy; Glitter, Joseph; Gilmer, James; Glenn, Nichole; Gordon, Dennis; Gott, William; Grant, Jeffery; Greenwood, Carol; Greenwood, Carol; Grimes, Kelly; Grobe, Jack; Gross, Allen; Gulla, Gerald; Hale, Jerry; Hardesty, Duane; Hardin, Kimberly; Hardin, Leroy; Harrington, Holly; Harris, Tim; Harrison, Donnie; Hart, Ken; Hart, Michelle; Harvey, Brad; Hasselberg, Rick; Hayden, Elizabeth; Helton, Donald; Henderson, Karen; Hiland, Patrick; Holahan, Patricia; Holahan, Vincent; Holian, Brian; HOO Hoc; Horn, Brian; Howard, Tabitha; Huffert, Anthony; Hurd, Sapna; Huyck, Doug; Imboden, Andy; Isom, James; Jackson, Karen; Jacobson, Jeffrey; Jervey, Richard; Jessie, Janelle; Johnson, Michael; Jolicoeur, John; Jones, Andrea; Jones, Cynthia; Jones, Henry; Kahler, Carolyn; Kammerer, Annie; Karas, Rebecca; Kauffman, John; Khan, Omar; Kolb, Timothy; Kotzalas, Margie; Kowalczyk, Jeffrey; Kratchman, Jessica; Kudler, Andrew; Lamb, Christopher; Lane, John; Larson, Emily; Laur, Steven; LaVie, Steve; Lewis, Robert; Li, Yong; Lichtz, Taylor; Lising, Jason; Lombard, Mark; Lubinski, John; Lui, Christina; Lukes, Kim; Lynch, Jeffery; Ma, John; Mamish, Nader; Manahan, Michelle; Marksberry, Don; Marshall, Jane; Masao, Nagai; Maupin, Cardelia; Mayros, Lauren; Mazaika, Michael; McConnell, Keith; McCoppin, Michael; McDermott, Brian; McGinty, Tim; McGovern, Denise; McIntyre, David; McMurtray, Anthony; Merritt, Christina; Meyer, Karen; Miller, Charles; Miller, Chris; Milligan, Patricia; Miranda, Samuel; Mohseni, Aby; Moore, Scott; Morlang, Gary; Morris, Scott; Mroz (Sahm), Sara; Munson, Clifford; Murray, Charles; Nerret, Amanda; Nguyen, Caroline; Norris, Michael; Norton, Charles; Opara, Stella; Ordaz, Vonna; Owens, Janice; Padovan, Mark; Parillo, John; Patel, Jay; Patel, Pravin; Patrick, Mark; Perin, Vanice; Pope, Tia; Powell, Amy; Purdy, Gary; Quinlan, Kevin; Raddatz, Michael; Ragland, Robert; Ralph, Melissa; Ramsey, Jack; Reed, Elizabeth; Reed, Sara; Reed, Wendy; Reeves, Rosemary; Reis, Terrence; Resner, Mark; Riley (OCA), Timothy; Riner, Kelly; Rini, Brett; Roach, Edward; Robinson, Edward; Rodriguez-Luccioni, Hector; Roggenbrodt, William; Ropon, Kimberly; Rosales-Cooper, Cindy; Rosenberg, Stacey; Ross-Lee, MaryJane; Roundtree, Amy; Ruland, William; Russell, Tonya; Ryan, Michelle; Salay, Michael; Salter, Susan; Salus, Amy; Sanfilippo, Nathan; Santos, Daniel; Scarbrough, Thomas; Schaperow, Jason; Schmidt, Duane; Schmidt, Rebecca; Schoenebeck, Greg; Schrader, Eric; Schwartzman, Jennifer; Seber, Dogan; See, Kenneth; Shane, Raean; Shea, James; Shepherd, Jill; Sheron, Brian; Skarda, Raymond; Skeen, David; Sloan, Scott; Smiroldo, Elizabeth; Smith, Brooke; Smith, Stacy; Smith, Theodore; Stahl, Eric; Stang, Annette; Stark, Johnathan; Steger (Tucci), Christine; Stieve, Alice; Stone, Rebecca; Stransky, Robert; Sturz, Fritz; Sullivan, Randy; Summers, Robert; Sun, Casper; Tappert, John; Tegeler, Bret; Temple, Jeffrey; Thaggard, Mark; Thomas, Eric; Thorp, John; Tiruneh, Nebiyu; Tobin, Jennifer; Trefethen, Jean; Tschiltz, Michael; Turtill, Richard; Uhle, Jennifer; Valencia, Sandra; Vaughn, James; Vick, Lawrence; Virgilio, Martin; Virgilio, Rosetta; Ward, Leonard; Ward, William; Wastler, Sandra; Watson, Bruce; Webber, Robert; Weber, Michael; White, Bernard; Wiggins, Jim; Williams, Donna; Williams, Joseph; Williamson, Linda; Willis, Dori; Wimbush, Andrea; Wittick, Brian; Wray, John; Wright, Lisa (Gibney); Wright, Ned; Wunder, George; Young, Francis; Zimmerman, Jacob; Zimmerman, Roy

Subject: JAPANESE EARTHQUAKE ERO STAFFING MARCH 27 - APRIL 2 (PAYPERIOD 8, WEEK 1)

Date: Friday, March 25, 2011 6:16:56 PM

Attachments: MASTER RESPONDER SCHEDULE FOR JAPAN EARTHQUAKE.pdf

Attached is the OPS Center Watchbill for Sunday, March 27 – Saturday, April 2. All positions except the PMTR RAAD, Sunday, 3pm – 11pm, are filled through Monday days (7:00am-3:00pm). Please contact the various Team Coordinators and OST02.HOC@nrc.gov if you would like to work any open slots.

If you need to change the schedule please send an email to OST02.HOC@nrc.gov and your teams coordinator

EST Admin Support
NRC Operations Center

V/170

301-816-5100 x5600

EST Admin Support
NRC Operations Center
eMail: OST02.HOC@nrc.gov

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Position	Date	Time	Staff
Executive Team			
ET Director			
Sat-Sun	3/26-3/27	11pm - 7am	Jennifer Uhle
Sun	27-Mar	7am - 3pm	Jim Dyer
Sun	27-Mar	3pm-11pm	Brian Sheron
Sun-Mon	3/27-3/28	11pm - 7am	Jim Wiggins
Mon	28-Mar	7am - 3pm	Mike Weber
Mon	28-Mar	3pm-11pm	Roy Zimmerman
Mon-Tue	3/28-3/29	11pm - 7am	Jim Wiggins
Tue	29-Mar	7am - 3pm	Mike Weber
Tue	29-Mar	3pm-11pm	Roy Zimmerman
Tue-Wed	3/29-3/30	11pm - 7am	Jim Wiggins
Wed	30-Mar	7am - 3pm	
Wed	30-Mar	3pm-11pm	Roy Zimmerman
Wed-Thur	3/30-3/31	11pm - 7am	Jim Wiggins
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	Brian Sheron
Thur-Fri	3/31-4/1	11pm - 7am	Cynthia Carpenter
Fri	1-Apr	7am - 3pm	Mike Weber
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Cynthia Carpenter
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	Cynthia Carpenter
ET Response Advisor			
Sat-Sun	3/26-3/27	11pm - 7am	Chris Miller
Sun	27-Mar	7am - 3pm	Tom Blount
Sun	27-Mar	3pm-11pm	Brian McDermott
Sun-Mon	3/27-3/28	11pm - 7am	Scott Morris
Mon	28-Mar	7am - 3pm	Tom Blount
Mon	28-Mar	3pm-11pm	Brian McDermott
Mon-Tue	3/28-3/29	11pm - 7am	Chris Miller
Tue	29-Mar	7am - 3pm	Tom Blount
Tue	29-Mar	3pm-11pm	Brian McDermott
Tue-Wed	3/29-3/30	11pm - 7am	Scott Morris
Wed	30-Mar	7am - 3pm	Tom Blount
Wed	30-Mar	3pm-11pm	Brian McDermott
Wed-Thur	3/30-3/31	11pm - 7am	Scott Morris
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	Mark Thaggard
Thur-Fri	3/31-4/1	11pm - 7am	Scott Morris
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	Mark Thaggard
Fri-Sat	4/1-4/2	11pm-7am	Scott Morris
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm-7am	Brian McDermott

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

ET Rx Prot Measures & State Coordinator			
Sat-Sun	3/26-3/27	11pm - 7am	N/A
Sun	27-Mar	7am - 3pm	N/A
Sun	27-Mar	3pm-11pm	N/A
Sun-Mon	3/27-3/28	11pm - 7am	N/A
Mon	28-Mar	7am - 3pm	N/A
Mon	28-Mar	3pm-11pm	N/A
Mon-Tue	3/28-3/29	11pm - 7am	N/A
Tue	29-Mar	7am - 3pm	N/A
Tue	29-Mar	3pm-11pm	N/A
Tue-Wed	3/29-3/30	11pm - 7am	N/A
Wed	30-Mar	7am - 3pm	N/A
Wed	30-Mar	3pm-11pm	N/A
Wed-Thur	3/30-3/31	11pm - 7am	N/A
Thur	31-Mar	7am - 3pm	N/A
Thur	31-Mar	3pm-11pm	N/A
Thur-Fri	3/31-4/1	11pm - 7am	N/A
Fri	1-Apr	7am - 3pm	N/A
Fri	1-Apr	3pm-11pm	N/A
Fri-Sat	4/1-4/2	11pm-7am	N/A
Sat	2-Apr	7am - 3pm	N/A
Sat	2-Apr	3pm-11pm	N/A
Sat-Sun	4/2-4/3	11pm - 7am	N/A
Executive Briefing Team			
EBT Admin. Assistant			
Sat-Sun	3/26-3/27	11pm - 7am	Jonathan Fiske
Sun	27-Mar	7am - 3pm	Annette Stang
Sun	27-Mar	3pm-11pm	Carolyn Kahler
Sun-Mon	3/27-3/28	11pm - 7am	Christina Merritt
Mon	28-Mar	7am - 3pm	Louise Lovell
Mon	28-Mar	3pm-11pm	Annette Stang
Mon-Tue	3/28-3/29	11pm - 9am	Jonathan Fiske
Tue	29-Mar	9am - 3pm	Sapna Hurd
Tue	29-Mar	3pm-11pm	Tonya Russell
Tue-Wed	3/29-3/30	11pm - 7am	Christina Merritt
Wed	30-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Wed	30-Mar	3pm-11pm	Tonya Russell
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Louise Lovell
Thur	31-Mar	3pm-11pm	Sapna Hurd
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Annette Stang
Fri	1-Apr	3pm-11pm	Sapna Hurd
Fri-Sat	4/1-4/2	11pm-7am	
EBT Coordinator			
Sat-Sun	3/26-3/27	11pm - 7am	Jim Anderson
Sun	27-Mar	7am - 3pm	Eddie Robinson

Japan Earthquake ERO Staffing Roster

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Pay Period 8 - Week 1

Sun	27-Mar	3pm-11pm	Nicole Glenn
Sun-Mon	3/27-3/28	11pm - 7am	Caroline Nguyen
Mon	28-Mar	7am - 3pm	Yen Chen
Mon	28-Mar	3pm-11pm	Sara Mroz
Mon-Tue	3/28-3/29	11pm - 7am	Jim Anderson
Tue	29-Mar	7am - 3pm	Yen Chen
Tue	29-Mar	3pm-11pm	Sara Mroz
Tue-Wed	3/29-3/30	11pm - 7am	Jim Anderson
Wed	30-Mar	7am - 3pm	Yen Chen
Wed	30-Mar	3pm-11pm	Sara Mroz
Wed-Thur	3/30-3/31	11pm - 7am	Jim Anderson
Thur	31-Mar	7am - 3pm	Yen Chen
Thur	31-Mar	3pm-11pm	Sara Mroz
Thur-Fri	3/31-4/1	11pm - 7am	Jim Anderson
Fri	1-Apr	7am - 3pm	Yen Chen
Fri	1-Apr	3pm-11pm	Sara Mroz
Fri-Sat	4/1-4/2	11pm-7am	Jim Anderson
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	

Executive Support Team**EST Status Officer**

Sat-Sun	3/26-3/27	11pm - 7am	Jeff Grant
Sun	27-Mar	7am - 3pm	Jane Marshall
Sun	27-Mar	3pm-11pm	Bill Gott
Sun-Mon	3/27-3/28	11pm - 7am	Jeff Grant
Mon	28-Mar	7am - 3pm	Jane Marshall
Mon	28-Mar	3pm-11pm	Bill Gott
Mon-Tue	3/28-3/29	11pm - 7am	Jeff Grant
Tue	29-Mar	7am - 3pm	Jane Marshall
Tue	29-Mar	3pm-11pm	Bill Gott
Tue-Wed	3/29-3/30	11pm - 7am	Jeff Grant
Wed	30-Mar	7am - 3pm	Jane Marshall
Wed	30-Mar	3pm-11pm	Bill Gott
Wed-Thur	3/30-3/31	11pm - 7am	Jeff Grant
Thur	31-Mar	7am - 3pm	Jane Marshall
Thur	31-Mar	3pm-11pm	Bill Gott
Thur-Fri	3/31-4/1	11pm - 7am	Jeff Grant
Fri	1-Apr	7am - 3pm	Jane Marshall ?
Fri	1-Apr	3pm-11pm	Bill Gott
Fri-Sat	4/1-4/2	11pm-7am	Jeff Grant
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	

EST Actions Officer

Sat-Sun	3/26-3/27	11pm - 7am	N/A
Sun	27-Mar	7am - 3pm	Kelly Grimes

Japan Earthquake ERO Staffing Roster

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Pay Period 8 - Week 1

Sun	27-Mar	3pm-11pm	Melissa Ralph
Sun-Mon	3/27-3/28	11pm - 7am	N/A
Mon	28-Mar	7am - 3pm	Zahira Cruz
Mon	28-Mar	3pm-11pm	Melissa Ralph
Mon-Tue	3/28-3/29	11pm - 7am	N/A
Tue	29-Mar	7am - 3pm	
Tue	29-Mar	3pm-11pm	Melissa Ralph
Tue-Wed	3/29-3/30	11pm - 7am	N/A
Wed	30-Mar	7am - 3pm	Wendy Reed
Wed	30-Mar	3pm-11pm	Melissa Ralph
Wed-Thur	3/30-3/31	11pm - 7am	N/A
Thur	31-Mar	7am - 3pm	Jonathan Fiske
Thur	31-Mar	3pm-11pm	Melissa Ralph
Thur-Fri	3/31-4/1	11pm - 7am	N/A
Fri	1-Apr	7am - 3pm	Wendy Reed
Fri	1-Apr	3pm-11pm	Melissa Ralph
Fri-Sat	4/1-4/2	11pm-7am	Don Algama
Sat	2-Apr	7am - 3pm	Anthony Bowers
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	N/A
EST Coordinator			
Sat-Sun	3/26-3/27	11pm - 7am	Steve Campbell
Sun	27-Mar	7am - 3pm	Tonya Russell
Sun	27-Mar	3pm-11pm	Stella Opara
Sun-Mon	3/27-3/28	11pm - 7am	Taylor Lichatz
Mon	28-Mar	7am - 3pm	Tony McMurtray
Mon	28-Mar	3pm-11pm	Rebecca Stone
Mon-Tue	3/28-3/29	11pm - 7am	Stacy Smith
Tue	29-Mar	7am - 3pm	Anthony Bowers
Tue	29-Mar	3pm-11pm	Tony McMurtray
Tue-Wed	3/29-3/30	11pm - 7am	Rebecca Stone
Wed	30-Mar	7am - 3pm	Taylor Lichatz
Wed	30-Mar	3pm-11pm	Tony McMurtray
Wed-Thur	3/30-3/31	11pm - 7am	Rebecca Stone
Thur	31-Mar	7am - 3pm	Anthony Bowers
Thur	31-Mar	3pm-11pm	Tony McMurtray
Thur-Fri	3/31-4/1	11pm - 7am	Rebecca Stone
Fri	1-Apr	7am - 3pm	Steve Campbell
Fri	1-Apr	3pm-11pm	Tony McMurtray
Fri-Sat	4/1-4/2	11pm-7am	Rebecca Stone
Sat	2-Apr	7am - 3pm	Stacy Smith
Sat	2-Apr	3pm-11pm	Steve Campbell
Sat-Sun	4/2-4/3	11pm - 7am	Rebecca Stone
EST Chronology Officer			
Sat-Sun	3/26-3/27	11pm - 7am	Thomas Scarbrough
Sun	27-Mar	7am - 3pm	Hector Rodriguez
Sun	27-Mar	3pm-11pm	Rebecca Karas

Japan Earthquake ERO Staffing Roster

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Pay Period 8 - Week 1

Sun-Mon	3/27-3/28	11pm - 7am	Thomas Scarbrough
Mon	28-Mar	7am - 3pm	Hector Rodriguez
Mon	28-Mar	3pm-11pm	Rebecca Karas
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Vanice Perin
Tue	29-Mar	3pm-11pm	Rebecca Karas
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Hector Rodriguez
Wed	30-Mar	3pm-11pm	Rebecca Karas
Wed-Thur	3/30-3/31	11pm - 7am	Thomas Scarbrough
Thur	31-Mar	7am - 3pm	Vanice Perin
Thur	31-Mar	3pm-11pm	Rebecca Karas
Thur-Fri	3/31-4/1	11pm - 7am	Nick Ballam
Fri	1-Apr	7am - 3pm	Sandra Valencia
Fri	1-Apr	3pm-11pm	Rebecca Karas
Fri-Sat	4/1-4/2	11pm-7am	Nick Ballam
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	
EST Response Ops Mgr			
Sat-Sun	3/26-3/27	11pm - 7am	Roberto Figueroa
Sun	27-Mar	7am - 3pm	Omar Khan
Sun	27-Mar	3pm-11pm	Cris Brown
Sun-Mon	3/27-3/28	11pm - 7am	Roberto Figueroa
Mon	28-Mar	7am - 3pm	Karen Jackson
Mon	28-Mar	3pm-11pm	Cris Brown
Mon-Tue	3/28-3/29	11pm - 7am	Omar Khan
Tue	29-Mar	7am - 3pm	Bob Stransky
Tue	29-Mar	3pm-11pm	Cris Brown
Tue-Wed	3/29-3/30	11pm - 7am	Karen Jackson
Wed	30-Mar	7am - 3pm	Omar Khan
Wed	30-Mar	3pm-11pm	Cris Brown
Wed-Thur	3/30-3/31	11pm - 7am	Bob Stransky
Thur	31-Mar	7am - 3pm	Karen Jackson
Thur	31-Mar	3pm-11pm	Omar Khan
Thur-Fri	3/31-4/1	11pm - 7am	Bob Stransky
Fri	1-Apr	7am - 3pm	Roberto Figueroa
Fri	1-Apr	3pm-11pm	Karen Jackson
Fri-Sat	4/1-4/2	11pm-7am	Omar Khan
Sat	2-Apr	7am - 3pm	Roberto Figueroa
Sat	2-Apr	3pm-11pm	Karen Jackson
Sat-Sun	4/2-4/3	11pm - 7am	Omar Khan
EST Admin. Assistant			
Sat-Sun	3/26-3/27	11pm - 7am	N/A
Sun	27-Mar	7am - 3pm	Karen Meyer
Sun	27-Mar	3pm-11pm	Cynthia Dorsey
Sun-Mon	3/27-3/28	11pm - 7am	N/A

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Pay Period 8 - Week 1

Mon	28-Mar	7am - 3pm	Michelle Manahan
Mon	28-Mar	3pm-11pm	Carol Greenwood
Mon-Tue	3/28-3/29	11pm - 7am	N/A
Tue	29-Mar	7am - 3pm	Michelle Manahan
Tue	29-Mar	3pm-11pm	Mary Glenn Crutchley
Tue-Wed	3/29-3/30	11pm - 7am	N/A
Wed	30-Mar	7am - 3pm	Cynthia Dorsey
Wed	30-Mar	3pm-11pm	Mary Glenn Crutchley
Wed-Thur	3/30-3/31	11pm - 7am	N/A
Thur	31-Mar	7am - 3pm	Amy Salus
Thur	31-Mar	3pm-11pm	Tabitha Howard
Thur-Fri	3/31-4/1	11pm - 7am	N/A
Fri	1-Apr	7am - 3pm	Carol Greenwood
Fri	1-Apr	3pm-11pm	Tabitha Howard
Fri-Sat	4/1-4/2	11pm-7am	N/A
Sat	2-Apr	7am - 3pm	Karen Meyer
Sat	2-Apr	3pm-11pm	Cynthia Dorsey
Sat-Sun	4/2-4/3	11pm - 7am	N/A
Liaison Team			
LT Director			
Sat-Sun	3/26-3/27	11pm - 7am	Marissa Bailey
Sun	27-Mar	7am - 3pm	Mike Tschiltz
Sun	27-Mar	3pm-11pm	Marrisa Bailey
Sun-Mon	3/27-3/28	11pm - 7am	Mark Thaggard
Mon	28-Mar	7am - 3pm	Allen Howe
Mon	28-Mar	3pm-11pm	Marrisa Bailey
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Allen Howe
Tue	29-Mar	3pm-11pm	Marrisa Bailey
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Allen Howe
Wed	30-Mar	3pm-11pm	Marrisa Bailey
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	John Adams
Thur	31-Mar	3pm-11pm	Mark Lombard
Thur-Fri	3/31-4/1	11pm - 7am	Bob Webber
Fri	1-Apr	7am - 3pm	John Adams
Fri	1-Apr	3pm-11pm	Mark Lombard
Fri-Sat	4/1-4/2	11pm-7am	Tom Bergman
Sat	2-Apr	7am - 3pm	John Adams
Sat	2-Apr	3pm-11pm	Mark Lombard
Sat-Sun	4/2-4/3	11pm - 7am	Tom Bergman
LT Coordinator			
Sat-Sun	3/26-3/27	11pm - 7am	Milt Murray
Sun	27-Mar	7am - 3pm	Lisa Gibney
Sun	27-Mar	3pm-11pm	Jeff Temple
Sun-Mon	3/27-3/28	11pm - 7am	Milt Murray

Japan Earthquake ERO Staffing Roster

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Pay Period 8 - Week 1

Mon	28-Mar	7am - 3pm	Jeff Temple
Mon	28-Mar	3pm-11pm	Rani Franovich
Mon-Tue	3/28-3/29	11pm - 7am	Janelle Jessie
Tue	29-Mar	7am - 3pm	Milt Murray
Tue	29-Mar	3pm-11pm	Rani Franovich
Tue-Wed	3/29-3/30	11pm - 7am	Janelle Jessie
Wed	30-Mar	7am - 3pm	Milt Murray
Wed	30-Mar	3pm-11pm	Jeff Temple
Wed-Thur	3/30-3/31	11pm - 7am	Janelle Jessie
Thur	31-Mar	7am - 3pm	Milt Murray
Thur	31-Mar	3pm-11pm	Jeff Temple
Thur-Fri	3/31-4/1	11pm - 7am	Rani Franovich
Fri	1-Apr	7am - 3pm	Jeff Temple
Fri	1-Apr	3pm-11pm	Janelle Jessie
Fri-Sat	4/1-4/2	11pm-7am	Rani Franovich
Sat	2-Apr	7am - 3pm	Jeff Temple
Sat	2-Apr	3pm-11pm	Milt Murray
Sat-Sun	4/2-4/3	11pm - 7am	
LT State Liaison			
Sat-Sun	3/26-3/27	9pm-7am	A. Rivera/A. Noonan (ON CALL)
Sun	27-Mar	7am-2pm	Alison Rivera (ON CALL)
Sun	27-Mar	2pm-9pm	Alison Rivera (ON CALL)
Sun-Mon	3/27-3/28	9pm-7am	Alison Rivera (ON CALL)
Mon	28-Mar	7am-2pm	C. Maupin/C. Flannery (ON CALL)
Mon	28-Mar	2pm-9pm	Stuart Easson
Mon-Tue	3/28-3/29	9pm-7am	R. Virgilio (ON CALL)
Tue	29-Mar	7am-2pm	C. Maupin/C. Flannery (ON CALL)
Tue	29-Mar	2pm-9pm	Stuart Easson
Tue-Wed	3/29-3/30	9pm-7am	Richard Turtill (ON CALL)
Wed	30-Mar	7am-2pm	Cindy Flannery
Wed	30-Mar	2pm-9pm	Michelle Ryan
Wed-Thur	3/30-3/31	9pm-7am	Richard Turtill (ON CALL)
Thur	31-Mar	7am-2pm	Amanda Noonan
Thur	31-Mar	2pm-9pm	Michelle Ryan
Thur-Fri	3/31-4/1	9pm-7am	Richard Turtill (ON CALL)
Fri	1-Apr	7am-2pm	Kim Lukes
Fri	1-Apr	2pm-9pm	Alison Rivera
Fri-Sat	4/1-4/2	9pm-7am	Richard Turtill (ON CALL)
Sat	2-Apr	7am-2pm	Amanda Noonan (ON CALL)
Sat	2-Apr	2pm-9pm	Amanda Noonan (ON CALL)
Sat-Sun	2-Apr	9pm-7am	Amanda Noonan (ON CALL)
LT Federal Liaison (2)			
Sat-Sun	3/26-3/27	11pm - 7am	Scott Sloan
Sun	27-Mar	7am - 3pm	Susan Salter / Lisa Gibney
Sun	27-Mar	3pm-11pm	Jerry Hale
Sun-Mon	3/27-3/28	11pm - 7am	Scott Sloan
Mon	28-Mar	7am - 3pm	Susan Salter / Lisa Gibney

Japan Earthquake ERO Staffing Roster

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Pay Period 8 - Week 1

Mon	28-Mar	3pm-11pm	Lisa Wright
Mon-Tue	3/28-3/29	11pm - 7am	Ned Wright
Tue	29-Mar	7am - 3pm	Susan Salter / Jerry Hale
Tue	29-Mar	3pm-11pm	Lisa Wright
Tue-Wed	3/29-3/30	11pm - 7am	Ned Wright
Wed	30-Mar	7am - 3pm	Bethany Cecere / Jerry Hale
Wed	30-Mar	3pm-11pm	Lisa Wright
Wed-Thur	3/30-3/31	11pm - 7am	Ned Wright
Thur	31-Mar	7am - 3pm	Jeff Temple / Jason Lising
Thur	31-Mar	3pm-11pm	Ted Smith
Thur-Fri	3/31-4/1	11pm - 7am	Ned Wright
Fri	1-Apr	7am - 3pm	Jeff Lynch / Beth Reed
Fri	1-Apr	3pm-11pm	Jerry Hale
Fri-Sat	4/1-4/2	11pm-7am	Jason Lising
Sat	2-Apr	7am - 3pm	Beth Reed
Sat	2-Apr	3pm-11pm	Bethany Cecere
Sat-Sun	4/2-4/3	11pm - 7am	Jason Lising

LT Congressional Liaison (2)

Sat-Sun	3/26-3/27	11pm - 7am	Amy Powell (ON CALL)
Sun	27-Mar	7am - 3pm	Amy Powell (ON CALL)
Sun	27-Mar	3pm-11pm	Amy Powell (ON CALL)
Sun-Mon	3/27-3/28	11pm - 7am	Amy Powell (ON CALL)
Mon	28-Mar	7am - 3pm	Amy Powell (ON CALL)
Mon	28-Mar	3pm-11pm	Amy Powell (ON CALL)
Mon-Tue	3/28-3/29	11pm - 7am	Amy Powell (ON CALL)
Tue	29-Mar	7am - 3pm	Amy Powell (ON CALL)
Tue	29-Mar	3pm-11pm	Amy Powell (ON CALL)
Tue-Wed	3/29-3/30	11pm - 7am	Amy Powell (ON CALL)
Wed	30-Mar	7am - 3pm	Amy Powell (ON CALL)
Wed	30-Mar	3pm-11pm	Amy Powell (ON CALL)
Wed-Thur	3/30-3/31	11pm - 7am	Amy Powell (ON CALL)
Thur	31-Mar	7am - 3pm	Amy Powell (ON CALL)
Thur	31-Mar	3pm-11pm	Amy Powell (ON CALL)
Thur-Fri	3/31-4/1	11pm - 7am	Amy Powell (ON CALL)
Fri	1-Apr	7am - 2pm	Amy Powell (ON CALL)
Fri	1-Apr	2pm-9pm	Amy Powell (ON CALL)
Sat	2-Apr	7am - 2pm	Amy Powell (ON CALL)
Sat	2-Apr	2pm-9pm	Amy Powell (ON CALL)
Sun	3-Apr	7am-2pm	Amy Powell (ON CALL)

LT International Liaison (2)

Sat-Sun	3/26-3/27	11pm - 7am	Cindy Rosales/ Elizabeth Smioldo
Sun	27-Mar	7am - 3pm	Jill Shepard/ Karen Henderson
Sun	27-Mar	3pm-11pm	Nancy Fragoyannis/ Jenny Tobin
Sun-Mon	3/27-3/28	11pm - 7am	Steve Baker / Brian Wittick
Mon	28-Mar	7am - 3pm	Jill Shepard/ Karen Henderson
Mon	28-Mar	3pm-11pm	Nancy Fragoyannis / Cindy Rosales
Mon-Tue	3/28-3/29	11pm - 7am	Steve Baker / Brian Wittick

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Pay Period 8 - Week 1

Tue	29-Mar	7am - 3pm	Jill Shepard/ Karen Henderson
Tue	29-Mar	3pm-11pm	Nancy Fragoyannis / Gerri Fehst
Tue-Wed	3/29-3/30	11pm - 7am	Steve Baker / Brian Wittick
Wed	30-Mar	7am - 3pm	Eric Stahl / Lauren Mayros (J. Tobin 12-3)
Wed	30-Mar	3pm-11pm	Danielle Emche / Mugah Afshar-Tous
Wed-Thur	3/30-3/31	11pm - 7am	Jen Schwartzman / Charlotte Abrams
Thur	31-Mar	7am - 3pm	Jill Shepard / Lauren Mayros
Thur	31-Mar	3pm-11pm	Gerri / Mugah Afshar-Tous
Thur-Fri	3/31-4/1	11pm - 7am	Jen Schwartzman / Charlotte Abrams
Fri	1-Apr	7am - 3pm	Cindy Rosales/ Lauren Mayros
Fri	1-Apr	3pm-11pm	Gerri/ Mugah Afshar-Tous
Fri-Sat	4/1-4/2	11pm-7am	Jen Schwartzman / Charlotte Abrams
Sat	2-Apr	7am - 3pm	Steve Bloom/ Karen Henderson
Sat	2-Apr	3pm-11pm	Janice Owens / Jenny Tobin
Sat-Sun	4/2-4/3	11pm - 7am	Gerri Fehst / Elizabeth Smioldo

Protective Measures Team

PMTR Director

Sat-Sun	3/26-3/27	11pm - 7am	Randy Sullivan
Sun	27-Mar	7am - 3pm	Don Cool
Sun	27-Mar	3pm-11pm	Vince Holahan
Sun-Mon	3/27-3/28	11pm - 7am	John Tappert
Mon	28-Mar	7am - 3pm	Don Cool
Mon	28-Mar	3pm-11pm	Vince Holahan
Mon-Tue	3/28-3/29	11pm - 7am	John Tappert
Tue	29-Mar	7am - 3pm	Terry Reis
Tue	29-Mar	3pm-11pm	Vince Holahan
Tue-Wed	3/29-3/30	11pm - 7am	Patricia Milligan
Wed	30-Mar	7am - 3pm	Terry Reis
Wed	30-Mar	3pm-11pm	Vince Holahan
Wed-Thur	3/30-3/31	11pm - 7am	Patricia Milligan
Thur	31-Mar	7am - 3pm	Randy Sullivan
Thur	31-Mar	3pm-11pm	Terry Reis
Thur-Fri	3/31-4/1	11pm - 7am	Christiana Lui
Fri	1-Apr	7am - 3pm	Randy Sullivan
Fri	1-Apr	3pm-11pm	Don Cool
Fri-Sat	4/1-4/2	11pm-7am	Christiana Lui
Sat	2-Apr	7am - 3pm	Randy Sullivan
Sat	2-Apr	3pm-11pm	Don Cool
Sat-Sun	4/2-4/3	11pm - 7am	Christiana Lui

PMTR Coordinator

Sat-Sun	3/26-3/27	11pm - 7am	Lou Brandon
Sun	27-Mar	7am - 3pm	Ryan Craffey
Sun	27-Mar	3pm-11pm	Jay Patel
Sun-Mon	3/27-3/28	11pm - 7am	Lou Brandon
Mon	28-Mar	7am - 3pm	Duane Hardesty
Mon	28-Mar	3pm-11pm	Nima Ashkeboussi
Mon-Tue	3/28-3/29	11pm - 7am	Lou Brandon

Japan Earthquake ERO Staffing Roster

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Pay Period 8 - Week 1

Tue	29-Mar	7am - 3pm	Duane Hardesty
Tue	29-Mar	3pm-11pm	Nima Ashkeboussi
Tue-Wed	3/29-3/30	11pm - 7am	Lou Brandon
Wed	30-Mar	7am - 3pm	Michael Raddatz
Wed	30-Mar	3pm-11pm	Jay Patel
Wed-Thur	3/30-3/31	11pm - 7am	Ryan Craffey
Thur	31-Mar	7am - 3pm	Duane Hardesty
Thur	31-Mar	3pm-11pm	Michael Raddatz
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Duane Hardesty
Fri	1-Apr	3pm-11pm	Nima Ashkeboussi
Fri-Sat	4/1-4/2	11pm-7am	
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	

PMTR Prot Actions Asst Dir

Sat-Sun	3/26-3/27	11pm - 7am	Greg Casto
Sun	27-Mar	7am - 3pm	Kevin Williams
Sun	27-Mar	3pm-11pm	Tim Harris
Sun-Mon	3/27-3/28	11pm - 7am	Greg Casto/Jessical Kratchman
Mon	28-Mar	7am - 3pm	Sandra Wastler
Mon	28-Mar	3pm-11pm	Mike McCoppin
Mon-Tue	3/28-3/29	11pm - 7am	Greg Casto/Jessical Kratchman
Tue	29-Mar	7am - 3pm	
Tue	29-Mar	3pm-11pm	Tim Harris
Tue-Wed	3/29-3/30	11pm - 7am	Greg Casto
Wed	30-Mar	7am - 3pm	Alemu Bezakulu
Wed	30-Mar	3pm-11pm	Sandra Wastler
Wed-Thur	3/30-3/31	11pm - 7am	Greg Casto
Thur	31-Mar	7am - 3pm	Jessica Kratchman
Thur	31-Mar	3pm-11pm	Tim Harris
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Sandra Wastler/Jessica Kratchman
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
Sat	2-Apr	7am - 3pm	Alemu Bezakulu
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	

PMTR RAAD

Sat-Sun	3/26-3/27	11pm - 7am	Mike Norris
Sun	27-Mar	7am - 3pm	Michelle Hart
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	Mike Norris
Mon	28-Mar	7am - 3pm	Steve LaVie
Mon	28-Mar	3pm-11pm	Michelle Hart
Mon-Tue	3/28-3/29	11pm - 7am	Mike Norris
Tue	29-Mar	7am - 3pm	

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	Mike Norris
Wed	30-Mar	7am - 3pm	
Wed	30-Mar	3pm-11pm	Steve LaVie
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Michelle Hart
Thur	31-Mar	3pm-11pm	
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	Steve LaVie
Fri-Sat	4/1-4/2	11pm-7am	Michelle Hart
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	

PMTR Dose Assessment (RASCAL) - Need 2

Sat-Sun	3/26-3/27	11pm - 7am	John Parillo/Ron LaVera
Sun	27-Mar	7am - 3pm	Tony Huffert
Sun	27-Mar	3pm-11pm	Casper Sun/Ed Roach
Sun-Mon	3/27-3/28	11pm - 7am	Margaret Cervera/John Parillo
Mon	28-Mar	7am - 3pm	Rich Clement/Tony Huffert
Mon	28-Mar	3pm-11pm	Bernie White/Casper Sun
Mon-Tue	3/28-3/29	11pm - 7am	Margaret Cervera/John Parillo
Tue	29-Mar	7am - 3pm	Tony Huffert/Rich Clement
Tue	29-Mar	3pm-11pm	Casper Sun
Tue-Wed	3/29-3/30	11pm - 7am	Margaret Cervera/Bernie White
Wed	30-Mar	7am - 3pm	Tony Huffert/Rich Clement
Wed	30-Mar	3pm-11pm	Casper Sun
Wed-Thur	3/30-3/31	11pm - 7am	Margaret Cervera/John Parillo
Thur	31-Mar	7am - 3pm	Rich Clement/Joe DeCicco
Thur	31-Mar	3pm-11pm	Bernie White (Maybe)/Casper Sun
Thur-Fri	3/31-4/1	11pm - 7am	John Parillo
Fri	1-Apr	7am - 3pm	/Rich Clement
Fri	1-Apr	3pm-11pm	Casper Sun
Fri-Sat	4/1-4/2	11pm-7am	John Parillo
Sat	2-Apr	7am - 3pm	Tony Huffert
Sat	2-Apr	3pm-11pm	Casper Sun
Sat-Sun	4/2-4/3	11pm - 7am	

PMTR GIS Analyst

Sat-Sun	3/26-3/27	11pm - 7am	N/A
Sun	27-Mar	7am - 3pm	(ON CALL)
Sun	27-Mar	3pm-11pm	N/A
Sun-Mon	3/27-3/28	11pm - 7am	N/A
Mon	28-Mar	7am - 3pm	(ON CALL)
Mon	28-Mar	3pm-11pm	N/A
Mon-Tue	3/28-3/29	11pm - 7am	N/A
Tue	29-Mar	7am - 3pm	(ON CALL)
Tue	29-Mar	3pm-11pm	N/A

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Tue-Wed	3/29-3/30	11pm - 7am	N/A
Wed	30-Mar	7am - 3pm	(ON CALL)
Wed	30-Mar	3pm-11pm	N/A
Wed-Thur	3/30-3/31	11pm - 7am	N/A
Thur	31-Mar	7am - 3pm	(ON CALL)
Thur	31-Mar	3pm-11pm	N/A
Thur-Fri	3/31-4/1	11pm - 7am	N/A
Fri	1-Apr	7am - 3pm	(ON CALL)
Fri	1-Apr	3pm-11pm	N/A
Fri-Sat	4/1-4/2	11pm-7am	N/A
Sat	2-Apr	7am - 3pm	(ON CALL)
Sat	2-Apr	3pm-11pm	N/A
Sat-Sun	4/2-4/3	11pm - 7am	N/A

PMTR Meteorologist

Sat-Sun	3/26-3/27	11pm - 7am	N/A
Sun	27-Mar	7am - 3pm	(ON CALL)
Sun	27-Mar	3pm-11pm	N/A
Sun-Mon	3/27-3/28	11pm - 7am	N/A
Mon	28-Mar	7am - 3pm	(ON CALL)
Mon	28-Mar	3pm-11pm	N/A
Mon-Tue	3/28-3/29	11pm - 7am	N/A
Tue	29-Mar	7am - 3pm	(ON CALL)
Tue	29-Mar	3pm-11pm	N/A
Tue-Wed	3/29-3/30	11pm - 7am	N/A
Wed	30-Mar	7am - 3pm	(ON CALL)
Wed	30-Mar	3pm-11pm	N/A
Wed-Thur	3/30-3/31	11pm - 7am	N/A
Thur	31-Mar	7am - 3pm	(ON CALL)
Thur	31-Mar	3pm-11pm	N/A
Thur-Fri	3/31-4/1	11pm - 7am	N/A
Fri	1-Apr	7am - 3pm	(ON CALL)
Fri	1-Apr	3pm-11pm	N/A
Fri-Sat	4/1-4/2	11pm-7am	N/A
Sat	2-Apr	7am - 3pm	(ON CALL)
Sat	2-Apr	3pm-11pm	N/A
Sat-Sun	4/2-4/3	11pm - 7am	N/A

Reactor Safety Team**RST Director**

Sat-Sun	3/26-3/27	11pm - 7am	Dave Skeen
Sun	27-Mar	7am - 3pm	Pat Hiland
Sun	27-Mar	3pm-11pm	Fred Brown
Sun-Mon	3/27-3/28	11pm - 7am	Dave Skeen
Mon	28-Mar	7am - 3pm	Pat Hiland
Mon	28-Mar	3pm-11pm	Fred Brown
Mon-Tue	3/28-3/29	11pm - 7am	Dave Skeen
Tue	29-Mar	7am - 3pm	Jennifer Uhle
Tue	29-Mar	3pm-11pm	Fred Brown

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Tue-Wed	3/29-3/30	11pm - 7am	Dave Skeen
Wed	30-Mar	7am - 3pm	Jennifer Uhle
Wed	30-Mar	3pm-11pm	Fred Brown
Wed-Thur	3/30-3/31	11pm - 7am	Mike Case
Thur	31-Mar	7am - 3pm	Jennifer Uhle
Thur	31-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/31-4/1	11pm - 7am	Mike Case
Fri	1-Apr	7am - 3pm	Jennifer Uhle
Fri	1-Apr	3pm-11pm	Bill Ruland
Fri-Sat	4/1-4/2	11pm-7am	Mike Case
Sat	2-Apr	7am - 3pm	Brian Holian
Sat	2-Apr	3pm-11pm	Bill Ruland
Sat-Sun	4/2-4/3	11pm - 7am	Mike Case

RST Coordinator

Sat-Sun	3/26-3/27	11pm - 7am	Brett Rini
Sun	27-Mar	7am - 3pm	Peter Alter
Sun	27-Mar	3pm-11pm	Rick Hasselberg
Sun-Mon	3/27-3/28	11pm - 7am	Frank Collins
Mon	28-Mar	7am - 3pm	Peter Alter
Mon	28-Mar	3pm-11pm	Rick Hasselberg
Mon-Tue	3/28-3/29	11pm - 7am	Mike Morlang
Tue	29-Mar	7am - 3pm	Peter Alter
Tue	29-Mar	3pm-11pm	Greg Schoenebeck
Tue-Wed	3/29-3/30	11pm - 7am	Mike Morlang
Wed	30-Mar	7am - 3pm	Peter Alter
Wed	30-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/30-3/31	11pm - 7am	Frank Collins
Thur	31-Mar	7am - 3pm	Peter Alter
Thur	31-Mar	3pm-11pm	Greg Schoenebeck
Thur-Fri	3/31-4/1	11pm - 7am	Frank Collins
Fri	1-Apr	7am - 3pm	Brett Rini
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Frank Collins
Sat	2-Apr	7am - 3pm	Peter Alter
Sat	2-Apr	3pm-11pm	Brett Rini
Sat-Sun	4/2-4/3	11pm - 7am	Oleg Bukharin

Severe Accident/PRA

Sat-Sun	3/26-3/27	11pm - 7am	Ray Skarda
Sun	27-Mar	7am - 3pm	Andy Howe
Sun	27-Mar	3pm-11pm	Jeff Mitman
Sun-Mon	3/27-3/28	11pm - 7am	Jim Gilmer
Mon	28-Mar	7am - 3pm	Jeff Circle
Mon	28-Mar	3pm-11pm	Len Ward
Mon-Tue	3/28-3/29	11pm - 7am	Steve Arndt
Tue	29-Mar	7am - 3pm	Hossein Esmaili
Tue	29-Mar	3pm-11pm	Ed Fuller
Tue-Wed	3/29-3/30	11pm - 7am	Steve Arndt

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Wed	30-Mar	7am - 3pm	Jim Gilmer
Wed	30-Mar	3pm-11pm	Hossein Esmaili
Wed-Thur	3/30-3/31	11pm - 7am	Steve Arndt
Thur	31-Mar	7am - 3pm	Don Chung
Thur	31-Mar	3pm-11pm	Hossein Esmaili
Thur-Fri	3/31-4/1	11pm - 7am	Steve Arndt
Fri	1-Apr	7am - 3pm	Jeff Mitman
Fri	1-Apr	3pm-11pm	Don Hilton
Fri-Sat	4/1-4/2	11pm-7am	Ray Skarda
Sat	2-Apr	7am - 3pm	
Sat	2-Apr	3pm-11pm	
Sat-Sun	4/2-4/3	11pm - 7am	

BWR Expertise

Sat-Sun	3/26-3/27	11pm - 7am	Eva Brown
Sun	27-Mar	7am - 3pm	Mike Brown
Sun	27-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/27-3/28	11pm - 7am	Eva Brown
Mon	28-Mar	7am - 3pm	Mike Brown
Mon	28-Mar	3pm-11pm	Chuck Norton
Mon-Tue	3/28-3/29	11pm - 7am	Jim Shea
Tue	29-Mar	7am - 3pm	Mike Brown
Tue	29-Mar	3pm-11pm	Chuck Norton
Tue-Wed	3/29-3/30	11pm - 7am	Jim Shea
Wed	30-Mar	7am - 3pm	Mike Brown
Wed	30-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/30-3/31	11pm - 7am	Jim Shea
Thur	31-Mar	7am - 3pm	Mike Brown
Thur	31-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/31-4/1	11pm - 7am	Jim Shea
Fri	1-Apr	7am - 3pm	Mike Brown
Fri	1-Apr	3pm-11pm	Chuck Norton
Fri-Sat	4/1-4/2	11pm-7am	Eva Brown
Sat	2-Apr	7am - 3pm	Mike Brown
Sat	2-Apr	3pm-11pm	Chuck Norton
Sat-Sun	4/2-4/3	11pm - 7am	Eva Brown

RST Comm/ERDS Operator

Sat-Sun	3/26-3/27	11pm - 7am	Denise McGovern
Sun	27-Mar	7am - 3pm	Mark Padovan
Sun	27-Mar	3pm-11pm	Bill Roggenbrodt
Sun-Mon	3/27-3/28	11pm - 7am	Denise McGovern
Mon	28-Mar	7am - 3pm	Mark Padovan
Mon	28-Mar	3pm-11pm	Rick Jervey
Mon-Tue	3/28-3/29	11pm - 7am	Brian Horn
Tue	29-Mar	7am - 3pm	John Thorp
Tue	29-Mar	3pm-11pm	Andy Kugler
Tue-Wed	3/29-3/30	11pm - 7am	Brian Horn
Wed	30-Mar	7am - 3pm	Steve Bloom

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Wed	30-Mar	3pm-11pm	Bill Roggenbrodt
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Jerry Dozier
Thur	31-Mar	3pm-11pm	John Thorp
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Andy Kugler
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Liliana Ramadan
Sat	2-Apr	7am - 3pm	John Thorp
Sat	2-Apr	3pm-11pm	Mark Padovan
Sat-Sun	4/2-4/3	11pm - 7am	

RST Support (Seismology Q&A)

Sat-Sun	3/26-3/27	11pm - 7am	(ON CALL)
Sun	27-Mar	7am - 3pm	(ON CALL)
Sun	27-Mar	3pm-11pm	(ON CALL)
Sun-Mon	3/27-3/28	11pm - 7am	(ON CALL)
Mon	28-Mar	7am - 3pm	(ON CALL)
Mon	28-Mar	3pm-11pm	(ON CALL)
Mon-Tue	3/28-3/29	11pm - 7am	(ON CALL)
Tue	29-Mar	7am - 3pm	(ON CALL)
Tue	29-Mar	3pm-11pm	(ON CALL)
Tue-Wed	3/29-3/30	11pm - 7am	(ON CALL)
Wed	30-Mar	7am - 3pm	(ON CALL)
Wed	30-Mar	3pm-11pm	(ON CALL)
Wed-Thur	3/30-3/31	11pm - 7am	(ON CALL)
Thur	31-Mar	7am - 3pm	(ON CALL)
Thur	31-Mar	3pm-11pm	(ON CALL)
Thur-Fri	3/31-4/1	11pm - 7am	(ON CALL)
Fri	1-Apr	7am - 3pm	(ON CALL)
Fri	1-Apr	3pm-11pm	(ON CALL)
Fri-Sat	4/1-4/2	11pm-7am	(ON CALL)
Sat	2-Apr	7am - 3pm	(ON CALL)
Sat	2-Apr	3pm-11pm	(ON CALL)
Sat-Sun	4/2-4/3	11pm - 7am	(ON CALL)

RST Support (Structural)

Sat-Sun	3/26-3/27	11pm - 7am	Off (ON CALL)
Sun	27-Mar	7am - 3pm	Off (ON CALL)
Sun	27-Mar	3pm-11pm	Off (ON CALL)
Sun-Mon	3/27-3/28	11pm - 7am	Off (ON CALL)
Mon	28-Mar	7am - 3pm	Off (ON CALL)
Mon	28-Mar	3pm-11pm	Off (ON CALL)
Mon-Tues	3/28-3/29	11pm - 7am	Off (ON CALL)
Tues	29-Mar	7am - 3pm	Off (ON CALL)
Tues	29-Mar	3pm-11pm	Off (ON CALL)
Tues-Wed	3/29-3/30	11pm - 7am	Off (ON CALL)
Wed	30-Mar	7am - 3pm	Off (ON CALL)
Wed	30-Mar	3pm-11pm	Off (ON CALL)

Japan Earthquake ERO Staffing Roster

Mar 27-Apr 2, 2011

Pay Period 8 - Week 1

Wed-Thur	3/30-3/31	11pm - 7am	Off (ON CALL)
Thur	31-Mar	7am - 3pm	Off (ON CALL)
Thur	31-Mar	3pm-11pm	Off (ON CALL)
Thur-Fri	3/31-4/1	11pm - 7am	Off (ON CALL)
Fri	1-Apr	7am - 3pm	Off (ON CALL)
Fri	1-Apr	3pm-11pm	Off (ON CALL)
Fri-Sat	4/1-4/2	11pm-7am	Off (ON CALL)

From: Csontos, Aladar
To: Richards, Stuart; Case, Michael
Subject: FYI News on Containment Breach
Date: Friday, March 25, 2011 9:35:47 AM

Don't know if its related to the seawater issue or not, but, I just got up this AM and read this.

<http://www.cnn.com/2011/WORLD/asiapcf/03/25/japan.nuclear.reactors/index.html>

Aladar A. Csontos, Ph.D
Chief, Component Integrity Branch
Division of Engineering
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
21 Church Street M/S 0507M
Rockville, MD 20852

Office: (301) 251-7640
Fax: (301) 251-7425
Email: aladar.csontos@nrc.gov

From: [Richards, Stuart](#)
To: [West, Stephanie](#)
Cc: [Case, Michael](#)
Subject: FW: Volunteers needed - Ops Center RST Schedule 3/26-4/2 (input needed by noon today)
Date: Friday, March 25, 2011 10:32:13 AM
Importance: High

Stephanie

Please see if you can understand the e-mail below? We may have to get clarification from Tom.

Thanks
Stu

From: Koshy, Thomas
Sent: Friday, March 25, 2011 10:28 AM
To: Richards, Stuart
Subject: FW: Volunteers needed - Ops Center RST Schedule 3/26-4/2 (input needed by noon today)
Importance: High

Darrell has given an open availability
Liliana Ramadan offers the availability for the following
3-11 pm RST Coordinator 28 March, & April 1 – Tkoshy

Thomas Koshy, Chief
Mechanical & Electrical Engineering Branch
Division of Engineering
Office of Research
U S Nuclear Regulatory Commission
Tel: (301) 251-7663

From: Ramadan, Liliana
Sent: Friday, March 25, 2011 9:46 AM
To: Koshy, Thomas
Subject: RE: Volunteers needed - Ops Center RST Schedule 3/26-4/2 (input needed by noon today)
Importance: High

Tom,
I would like to volunteer as the **RST Comm/ERDS Operator** for the following slots

Sun-Mon	3/27-3/28	11pm - 7am
Wed-Thur	3/30-3/31	11pm - 7am
Fri-Sat	4/1-4/2	11pm-7am

Please let me know if its okay with you.

Thanks,
Lily Ramadan
Project Manager-Electrical Engineering Branch
U.S. Nuclear Regulatory Commission
11555 Rockville Pike

V/172

Rockville, MD 20850
301-251-7642

From: Richards, Stuart
Sent: Friday, March 25, 2011 9:39 AM
To: RES_DE
Cc: Coe, Doug; Coyne, Kevin; Gibson, Kathy; Case, Michael; West, Stephanie
Subject: Volunteers needed - Ops Center RST Schedule 3/26-4/2 (input needed by noon today)
Importance: High

The Ops Center is seeking volunteers for the Reactor Safety Team.

The watchbill is in this e-mail below, with the slots needing to be filled indicated.

If you want to volunteer, please check with your BC and let Stephanie West know by noon today.

Thanks
Stu

From: RST01 Hoc
Sent: Wednesday, March 23, 2011 12:05 PM
To: Alter, Peter; Morlang, Gary; Hasselberg, Rick; Berry, Rollie; Collins, Frank; Thomas, Eric; Schoenebeck, Greg; McGovern, Denise; Rini, Brett; Bukharin, Oleg; Sloan, Scott; Circle, Jeff; Esmaili, Hossein; Ward, Leonard; Laur, Steven; Salay, Michael; Fuller, Edward; Schaperow, Jason; Marksberry, Don; Gilmer, James; Miranda, Samuel; Arndt, Steven; Helton, Donald; Norton, Charles; Kolb, Timothy; Brown, Eva; Shea, James; Vick, Lawrence; Brown, Michael; Williams, Donna; Roggenbrodt, William; Thorp, John; Kugler, Andrew; Williams, Joseph; Padovan, Mark; Isom, James; Hart, Ken; Bloom, Steven; Jervey, Richard
Subject: FW: RST Schedule 3/26-4/2

All,

Please look at current watchbills from the OST. Ed Fuller has signed up for swing shifts for Accident Analyst on 3/29 and 4/5. Other than that, please reply to RST01 so we can start filling in the holes on the watchbill.

Thanks for all of your support.

Eric Thomas
RST Coordinator

From: OST02 HOC
Sent: Wednesday, March 23, 2011 8:44 AM
To: RST01 Hoc
Subject: RST Schedule 3/26-4/2

Reactor Safety Team				
RST Director				
	Sat	26-Mar	7am - 3pm	Pat Hiland
	Sat	26-Mar	3pm-11pm	Bill Ruland
	Sat-Sun	3/26-3/27	11pm - 7am	Mike Case
	Sun	27-Mar	7am - 3pm	Pat Hiland
	Sun	27-Mar	3pm-11pm	Fred Brown

Sun-Mon	3/27-3/28	11pm - 7am	Mike Case
Mon	28-Mar	7am - 3pm	Pat Hiland
Mon	28-Mar	3pm-11pm	Fred Brown
Mon-Tue	3/28-3/29	11pm - 7am	Mike Case
Tue	29-Mar	7am - 3pm	Jennifer Uhle
Tue	29-Mar	3pm-11pm	Fred Brown
Tue-Wed	3/29-3/30	11pm - 7am	Mike Case
Wed	30-Mar	7am - 3pm	Jennifer Uhle
Wed	30-Mar	3pm-11pm	Fred Brown
Wed-Thur	3/30-3/31	11pm - 7am	Dave Skeen
Thur	31-Mar	7am - 3pm	Jennifer Uhle
Thur	31-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/31-4/1	11pm - 7am	Dave Skeen
Fri	1-Apr	7am - 3pm	Jennifer Uhle
Fri	1-Apr	3pm-11pm	Bill Ruland
Fri-Sat	4/1-4/2	11pm-7am	Dave Skeen
RST Coordinator			
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Sat	26-Mar	7am - 3pm	Eric Thomas
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Peter Alter
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	Frank Collins
Mon	28-Mar	7am - 3pm	Rick Hasselberg
Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	Mike Morlang
Tue	29-Mar	7am - 3pm	Peter Alter
Tue	29-Mar	3pm-11pm	Greg Schoenebeck
Tue-Wed	3/29-3/30	11pm - 7am	Mike Morlang
Wed	30-Mar	7am - 3pm	Rick Hasselberg
Wed	30-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/30-3/31	11pm - 7am	Frank Collins
Thur	31-Mar	7am - 3pm	Peter Alter
Thur	31-Mar	3pm-11pm	Greg Schoenebeck
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Rick Hasselberg
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Frank Collins
Severe Accident/PRA			
Sat	26-Mar	7am - 3pm	Steven Arndt
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	
Sun	27-Mar	3pm-11pm	

Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Jeff Circle
Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Hossein Esmaili
Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Jim Gilmer?
Wed	30-Mar	3pm-11pm	Hossein Esmaili
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	Hossein Esmaili
Thur-Fri	3/31-4/1	11pm - 7am	Ray Skarda
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Ray Skarda
BWR Expertise			
Sat	26-Mar	7am - 3pm	Mike Brown
Sat	26-Mar	3pm-11pm	Chuck Norton
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mike Brown
Sun	27-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Mike Brown
Mon	28-Mar	3pm-11pm	Chuck Norton
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Mike Brown
Tue	29-Mar	3pm-11pm	Chuck Norton
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Mike Brown
Wed	30-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Mike Brown
Thur	31-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mike Brown
Fri	1-Apr	3pm-11pm	Chuck Norton
Fri-Sat	4/1-4/2	11pm-7am	
RST Comm/ERDS Operator			
Sat	26-Mar	7am - 3pm	Donna Williams
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mark Padovan
Sun	27-Mar	3pm-11pm	Bill Roggenbrodt
Sun-Mon	3/27-3/28	11pm - 7am	

Mon	28-Mar	7am - 3pm	Mark Padovan
Mon	28-Mar	3pm-11pm	Bill Roggenbrodt
Mon-Tue	3/28-3/29	11pm - 7am	Andy Kugler
Tue	29-Mar	7am - 3pm	Mark Padovan
Tue	29-Mar	3pm-11pm	Bill Roggenbrodt
Tue-Wed	3/29-3/30	11pm - 7am	Andy Kugler
Wed	30-Mar	7am - 3pm	Mark Padovan
Wed	30-Mar	3pm-11pm	Bill Roggenbrodt
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Andy Kugler
Thur	31-Mar	3pm-11pm	Bill Roggenbrodt
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mark Padovan
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
RST Support (Seismology Q&A)			
Sat	26-Mar	7am - 3pm	
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	
Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	
Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	
Wed	30-Mar	3pm-11pm	
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
RST Support (Structural)			
Sat	26-Mar	7am - 3pm	Off (On Call)
Sat	26-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	Off (On Call)
Sun	27-Mar	7am - 3pm	Off (On Call)
Sun	27-Mar	3pm-11pm	Off (On Call)
Sun-Mon	3/27-3/28	11pm - 7am	Off (On Call)
Mon	28-Mar	7am - 3pm	Off (On Call)

Mon	28-Mar	3pm-11pm	Off (On Call)
Mon-Tues	3/28-3/29	11pm - 7am	Off (On Call)
Tues	29-Mar	7am - 3pm	Off (On Call)
Tues	29-Mar	3pm-11pm	Off (On Call)
Tues-Wed	3/29-3/30	11pm - 7am	Off (On Call)
Wed	30-Mar	7am - 3pm	Off (On Call)
Wed	30-Mar	3pm-11pm	Off (On Call)
Wed-Thur	3/30-3/31	11pm - 7am	Off (On Call)
Thur	31-Mar	7am - 3pm	Off (On Call)
Thur	31-Mar	3pm-11pm	Off (On Call)
Thur-Fri	3/31-4/1	11pm - 7am	Off (On Call)
Fri	1-Apr	7am - 3pm	Off (On Call)
Fri	1-Apr	3pm-11pm	Off (On Call)
Fri-Sat	4/1-4/2	11pm-7am	Off (On Call)

From: Richards, Stuart
To: RST01 Hoc
Cc: Coyne, Kevin; West, Stephanie; Case, Michael; Thomas, Eric; Rini, Brett; Cheok, Michael; Hardin, Leroy; Herrity, Thomas; Iyengar, Raj; Rathbun, Howard; Koshy, Thomas; Murdock, Darrell; Dion, Jeanne; Boyce, Tom (RES); Gavrilas, Mirela; Ramadan, Liliana; Uhle, Jennifer
Subject: FW: Volunteers needed - Ops Center RST Schedule 3/26-4/2 (input needed by noon today)
Date: Friday, March 25, 2011 12:17:38 PM

This e-mail is from the Division of Engineering in RES in response to the RST request for volunteers for the period of March 26 – April 2.

We have filled in some of the yellow open slots in the watchbill below with individual staff who are volunteering for those specific dates and times.

Additionally, below is a list of staff who volunteered, but were not specific about area, date or time:

Leroy Hardin
 Thom Herrity
 Raj Iyengar
 Howard Rathbun
 Tom Koshy
 Darrell Murdock

Please contact the individuals listed above and the individuals listed on the watchbill (filled in yellow slots) to arrange/confirm support for specific days and times.

Thanks
 Stu Richards
 301-251-7616

From: OST02 HOC
Sent: Wednesday, March 23, 2011 8:44 AM
To: RST01 Hoc
Subject: RST Schedule 3/26-4/2

Reactor Safety Team				
RST Director				
Sat	26-Mar	7am - 3pm	Pat Hiland	
Sat	26-Mar	3pm-11pm	Bill Ruland	
Sat-Sun	3/26-3/27	11pm - 7am	Mike Case	
Sun	27-Mar	7am - 3pm	Pat Hiland	
Sun	27-Mar	3pm-11pm	Fred Brown	
Sun-Mon	3/27-3/28	11pm - 7am	Mike Case	
Mon	28-Mar	7am - 3pm	Pat Hiland	
Mon	28-Mar	3pm-11pm	Fred Brown	
Mon-Tue	3/28-3/29	11pm - 7am	Mike Case	
Tue	29-Mar	7am - 3pm	Jennifer Uhle	
Tue	29-Mar	3pm-11pm	Fred Brown	
Tue-Wed	3/29-3/30	11pm - 7am	Mike Case	
Wed	30-Mar	7am - 3pm	Jennifer Uhle	
Wed	30-Mar	3pm-11pm	Fred Brown	
Wed-Thur	3/30-3/31	11pm - 7am	Dave Skeen	

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Thur	31-Mar	7am - 3pm	Jennifer Uhle
Thur	31-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/31-4/1	11pm - 7am	Dave Skeen
Fri	1-Apr	7am - 3pm	Jennifer Uhle
Fri	1-Apr	3pm-11pm	Bill Ruland
Fri-Sat	4/1-4/2	11pm-7am	Dave Skeen
RST Coordinator			
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Sat	26-Mar	7am - 3pm	Eric Thomas
Sat	26-Mar	3pm-11pm	Jeanne Dion
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Peter Alter
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	Frank Collins
Mon	28-Mar	7am - 3pm	Rick Hasselberg
Mon	28-Mar	3pm-11pm	Tom Boyce/Jeanne Dion
Mon-Tue	3/28-3/29	11pm - 7am	Mike Morlang
Tue	29-Mar	7am - 3pm	Peter Alter
Tue	29-Mar	3pm-11pm	Greg Schoenebeck
Tue-Wed	3/29-3/30	11pm - 7am	Mike Morlang
Wed	30-Mar	7am - 3pm	Rick Hasselberg
Wed	30-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/30-3/31	11pm - 7am	Frank Collins
Thur	31-Mar	7am - 3pm	Peter Alter
Thur	31-Mar	3pm-11pm	Greg Schoenebeck
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Rick Hasselberg
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Frank Collins
Severe Accident/PRA			
Sat	26-Mar	7am - 3pm	Steven Arndt
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mirela Gavrila
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Jeff Circle
Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Hossein Esmaili
Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Jim Gilmer?
Wed	30-Mar	3pm-11pm	Hossein Esmaili
Wed-Thur	3/30-3/31	11pm - 7am	

Thur	31-Mar	7am - 3pm	Mirela Gavrilas
Thur	31-Mar	3pm-11pm	Hossein Esmaili
Thur-Fri	3/31-4/1	11pm - 7am	Ray Skarda
Fri	1-Apr	7am - 3pm	Mirela Gavrilas
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Ray Skarda
BWR Expertise			
Sat	26-Mar	7am - 3pm	Mike Brown
Sat	26-Mar	3pm-11pm	Chuck Norton
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mike Brown
Sun	27-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Mike Brown
Mon	28-Mar	3pm-11pm	Chuck Norton
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Mike Brown
Tue	29-Mar	3pm-11pm	Chuck Norton
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Mike Brown
Wed	30-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Mike Brown
Thur	31-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mike Brown
Fri	1-Apr	3pm-11pm	Chuck Norton
Fri-Sat	4/1-4/2	11pm-7am	
RST Comm/ERDS Operator			
Sat	26-Mar	7am - 3pm	Donna Williams
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mark Padovan
Sun	27-Mar	3pm-11pm	Bill Roggenbrodt
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Mark Padovan
Mon	28-Mar	3pm-11pm	Bill Roggenbrodt
Mon-Tue	3/28-3/29	11pm - 7am	Andy Kugler
Tue	29-Mar	7am - 3pm	Mark Padovan
Tue	29-Mar	3pm-11pm	Bill Roggenbrodt
Tue-Wed	3/29-3/30	11pm - 7am	Andy Kugler
Wed	30-Mar	7am - 3pm	Mark Padovan
Wed	30-Mar	3pm-11pm	Bill Roggenbrodt
Wed-Thur	3/30-3/31	11pm - 7am	Liliana Ramadan
Thur	31-Mar	7am - 3pm	Andy Kugler

Thur	31-Mar	3pm-11pm	Bill Roggenbrodt
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mark Padovan
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Liliana Ramadan
RST Support (Seismology Q&A)			
Sat	26-Mar	7am - 3pm	
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	
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Wed	30-Mar	3pm-11pm	
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
RST Support (Structural)			
Sat	26-Mar	7am - 3pm	Off (On Call)
Sat	26-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	Off (On Call)
Sun	27-Mar	7am - 3pm	Off (On Call)
Sun	27-Mar	3pm-11pm	Off (On Call)
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Mon	28-Mar	3pm-11pm	Off (On Call)
Mon-Tues	3/28-3/29	11pm - 7am	Off (On Call)
Tues	29-Mar	7am - 3pm	Off (On Call)
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Tues-Wed	3/29-3/30	11pm - 7am	Off (On Call)
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Thur	31-Mar	7am - 3pm	Off (On Call)
Thur	31-Mar	3pm-11pm	Off (On Call)

Thur-Fri	3/31-4/1	11pm - 7am	Off (On Call)
Fri	1-Apr	7am - 3pm	Off (On Call)
Fri	1-Apr	3pm-11pm	Off (On Call)
Fri-Sat	4/1-4/2	11pm-7am	Off (On Call)

From: Coyne, Kevin
To: Gibson, Kathy; Case, Michael; Richards, Stuart
Cc: Coe, Doug
Subject: FW: RST Schedule 3/26-4/2
Date: Friday, March 25, 2011 9:19:35 AM

Kathy, Mike, Stu –

Here's the current RST watch bill – will help identify gaps in coverage highlighted in yellow...

Kevin

From: Marksberry, Don
Sent: Friday, March 25, 2011 9:13 AM
To: Coyne, Kevin
Subject: FW: RST Schedule 3/26-4/2

From: RST01 Hoc
Sent: Wednesday, March 23, 2011 12:05 PM
To: Alter, Peter; Morlang, Gary; Hasselberg, Rick; Berry, Rollie; Collins, Frank; Thomas, Eric; Schoenebeck, Greg; McGovern, Denise; Rini, Brett; Bukharin, Oleg; Sloan, Scott; Circle, Jeff; Esmaili, Hossein; Ward, Leonard; Laur, Steven; Salay, Michael; Fuller, Edward; Schaperow, Jason; Marksberry, Don; Gilmer, James; Miranda, Samuel; Arndt, Steven; Helton, Donald; Norton, Charles; Kolb, Timothy; Brown, Eva; Shea, James; Vick, Lawrence; Brown, Michael; Williams, Donna; Roggenbrodt, William; Thorp, John; Kugler, Andrew; Williams, Joseph; Padovan, Mark; Isom, James; Hart, Ken; Bloom, Steven; Jervy, Richard
Subject: FW: RST Schedule 3/26-4/2

All,

Please look at current watchbills from the OST. Ed Fuller has signed up for swing shifts for Accident Analyst on 3/29 and 4/5. Other than that, please reply to RST01 so we can start filling in the holes on the watchbill.

Thanks for all of your support.

Eric Thomas
RST Coordinator

From: OST02 HOC
Sent: Wednesday, March 23, 2011 8:44 AM
To: RST01 Hoc
Subject: RST Schedule 3/26-4/2

Reactor Safety Team				
RST Director				
	Sat	26-Mar	7am - 3pm	Pat Hiland
	Sat	26-Mar	3pm-11pm	Bill Ruland
	Sat-Sun	3/26-3/27	11pm - 7am	Mike Case
	Sun	27-Mar	7am - 3pm	Pat Hiland
	Sun	27-Mar	3pm-11pm	Fred Brown
	Sun-Mon	3/27-3/28	11pm - 7am	Mike Case
	Mon	28-Mar	7am - 3pm	Pat Hiland

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Mon	28-Mar	3pm-11pm	Fred Brown
Mon-Tue	3/28-3/29	11pm - 7am	Mike Case
Tue	29-Mar	7am - 3pm	Jennifer Uhle
Tue	29-Mar	3pm-11pm	Fred Brown
Tue-Wed	3/29-3/30	11pm - 7am	Mike Case
Wed	30-Mar	7am - 3pm	Jennifer Uhle
Wed	30-Mar	3pm-11pm	Fred Brown
Wed-Thur	3/30-3/31	11pm - 7am	Dave Skeen
Thur	31-Mar	7am - 3pm	Jennifer Uhle
Thur	31-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/31-4/1	11pm - 7am	Dave Skeen
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Fri	1-Apr	3pm-11pm	Bill Ruland
Fri-Sat	4/1-4/2	11pm-7am	Dave Skeen
RST Coordinator			
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Sat	26-Mar	7am - 3pm	Eric Thomas
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Sat-Sun	3/26-3/27	11pm - 7am	
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Fri	1-Apr	7am - 3pm	Rick Hasselberg
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Frank Collins
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Sat	26-Mar	7am - 3pm	Steven Arndt
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Jeff Circle

Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Hossein Esmaili
Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Jim Gilmer?
Wed	30-Mar	3pm-11pm	Hossein Esmaili
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	Hossein Esmaili
Thur-Fri	3/31-4/1	11pm - 7am	Ray Skarda
Fri	1-Apr	7am - 3pm	
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BWR Expertise			
Sat	26-Mar	7am - 3pm	Mike Brown
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Thur	31-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mike Brown
Fri	1-Apr	3pm-11pm	Chuck Norton
Fri-Sat	4/1-4/2	11pm-7am	
RST Comm/ERDS Operator			
Sat	26-Mar	7am - 3pm	Donna Williams
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mark Padovan
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Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Mark Padovan
Mon	28-Mar	3pm-11pm	Bill Roggenbrodt

Mon-Tue	3/28-3/29	11pm - 7am	Andy Kugler
Tue	29-Mar	7am - 3pm	Mark Padovan
Tue	29-Mar	3pm-11pm	Bill Roggenbrodt
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RST Support (Seismology Q&A)			
Sat	26-Mar	7am - 3pm	
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Thur	31-Mar	3pm-11pm	
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Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
RST Support (Structural)			
Sat	26-Mar	7am - 3pm	Off (On Call)
Sat	26-Mar	3pm-11pm	Off (On Call)
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Sun	27-Mar	7am - 3pm	Off (On Call)
Sun	27-Mar	3pm-11pm	Off (On Call)
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Mon	28-Mar	3pm-11pm	Off (On Call)
Mon-Tues	3/28-3/29	11pm - 7am	Off (On Call)

Tues	29-Mar	7am - 3pm	Off (On Call)
Tues	29-Mar	3pm-11pm	Off (On Call)
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Fri	1-Apr	7am - 3pm	Off (On Call)
Fri	1-Apr	3pm-11pm	Off (On Call)
Fri-Sat	4/1-4/2	11pm-7am	Off (On Call)

From: Coyne, Kevin
To: Gibson, Kathy; Case, Michael; Richards, Stuart
Cc: Coe, Doug; Sheron, Brian; Uhle, Jennifer; Rini, Brett; Dion, Jeanne
Subject: FW: Operations Center Reactor Safety Team Watchbill
Date: Friday, March 25, 2011 9:05:50 AM
Attachments: RES input IRCvolunteers.xlsx.msg
Importance: High

Kathy, Mike, Stu –

Just got calls from both Jerry Dozier and Mike Cheek from the Ops Center. They are starting to burn out their reactor safety team support and are looking for volunteers with expertise in severe accidents and PRA. They are currently looking at staffing through April 3, but have a few critical needs this weekend. DRA can coordinate getting a list back to Jerry, but could you provide any other volunteers from DE and DSA? I have the list that went up on March 17 (see attached) and can obviously provide this back to Jerry, but I wasn't sure if you had any changes or updates.

Obviously a quick turnaround – if we could get any additional feedback from you by noon, that would give the IRC time to coordinate coverage.

Thanks!

Kevin

From: Cheek, Michael ~~Cheek, Michael~~
Sent: Friday, March 25, 2011 8:45 AM
To: Wong, See-Meng; Mitman, Jeffrey; Zoulis, Antonios; Harrison, Donnie; Dozier, Jerry; Howe, Andrew
Cc: Laur, Steven; Circle, Jeff; Rodriguez, Veronica; Lee, Samson; Coyne, Kevin; Demoss, Gary; Lombard, Mark; Coe, Doug
Subject: Operations Center Reactor Safety Team Watchbill

To those on the "To" list: I have added your names as PRA/systems analysts to be used in the Reactor Safety Team (RST) watchbill. Jerry Dozier will be contacting you to coordinate times and dates when you will be available. The RST has several slots to fill this weekend. To those I already had a chance to talk to, thanks for volunteering. To the others who I have not talked to yet, you can still decline if you would like. The RST will be staffed (at the least) for the next several weeks.

Steve Laur and Jeff Circle – please inform Jerry if you are able/willing to continue.

Gary Demoss and Kevin Coyne – thanks for helping to look for RES volunteers. Please let me and Jerry Dozier know when you come up with a list.

Mark Lombard – would NRO have available PRA/systems type analysts who would be able to help staff the RST? The more staff we have on the list, the more we would spread out the work load.

Thanks

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Mike

Attachment RES_input_IRCvolunteers.xlsx.msg (2560 Bytes) cannot be converted to PDF format.

Forsyth, Daniel

From: Keefe, Molly
Sent: Friday, March 25, 2011 10:05 AM
To: Forsyth, Daniel
Subject: RE: what does this all mean??
Attachments: 11032411a.pdf

Molly J. Keefe
Human Factors Specialist
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
(301) 415-5717
Molly.Keefe@nrc.gov

From: Forsyth, Daniel
Sent: Friday, March 25, 2011 10:01 AM
To: Keefe, Molly
Subject: RE: what does this all mean??

Can you save a copy of the pdf and forward it to me? The IE plug-in on my computer won't read it.

From: Keefe, Molly
Sent: Friday, March 25, 2011 9:51 AM
To: Forsyth, Daniel
Subject: what does this all mean??

<http://www.tepco.co.jp/en/nu/monitoring/11032411a.pdf>

Molly J. Keefe
Human Factors Specialist
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
(301) 415-5717
Molly.Keefe@nrc.gov

[Appendix] Monitoring data by a monitoring car at Fukushima Daiichi Nuclear Power Station

Measurement Date : 03/24/2011

Measurement Time	Measured Place	γ Ray	Neutron Ray	Wind Direction	Wind Velocity (m/s)
9:00 PM	Main Gate	202.0 μ Sv/h	under 0.01 μ Sv/h	northwest	1.2
8:50 PM	Main Gate	202.2 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.2
8:40 PM	Main Gate	202.4 μ Sv/h	under 0.01 μ Sv/h	west	0.7
8:30 PM	Main Gate	202.4 μ Sv/h	under 0.01 μ Sv/h	west	0.9
8:20 PM	Main Gate	202.5 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.6
8:10 PM	Main Gate	202.6 μ Sv/h	under 0.01 μ Sv/h	west-northwest	0.7
8:00 PM	Main Gate	202.9 μ Sv/h	under 0.01 μ Sv/h	northwest	0.8
7:50 PM	Main Gate	202.9 μ Sv/h	under 0.01 μ Sv/h	west	1.4
7:40 PM	Main Gate	203.0 μ Sv/h	under 0.01 μ Sv/h	west	1.4
7:30 PM	Main Gate	203.5 μ Sv/h	under 0.01 μ Sv/h	northwest	1.3
7:20 PM	Main Gate	203.9 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.0
7:10 PM	Main Gate	204.2 μ Sv/h	under 0.01 μ Sv/h	west	0.7
7:00 PM	Main Gate	204.3 μ Sv/h	under 0.01 μ Sv/h	west-southwest	1.0
6:50 PM	Main Gate	204.4 μ Sv/h	under 0.01 μ Sv/h	west	0.8
6:40 PM	Main Gate	204.4 μ Sv/h	under 0.01 μ Sv/h	west	0.6
6:30 PM	Main Gate	204.5 μ Sv/h	under 0.01 μ Sv/h	west-southwest	0.6
6:20 PM	Main Gate	204.7 μ Sv/h	under 0.01 μ Sv/h	west	0.5
6:10 PM	Main Gate	204.9 μ Sv/h	under 0.01 μ Sv/h	south-southeast	1.0
6:00 PM	Main Gate	204.6 μ Sv/h	under 0.01 μ Sv/h	south	1.3
5:50 PM	Main Gate	205.3 μ Sv/h	under 0.01 μ Sv/h	south	1.4
5:40 PM	Main Gate	205.6 μ Sv/h	under 0.01 μ Sv/h	south	1.7
5:30 PM	Main Gate	206.0 μ Sv/h	under 0.01 μ Sv/h	south	1.3
5:20 PM	Main Gate	206.1 μ Sv/h	under 0.01 μ Sv/h	southwest	1.3
5:10 PM	Main Gate	206.3 μ Sv/h	under 0.01 μ Sv/h	south	1.7
5:00 PM	Main Gate	206.4 μ Sv/h	under 0.01 μ Sv/h	southeast	1.8
4:50 PM	Main Gate	206.5 μ Sv/h	under 0.01 μ Sv/h	southeast	2.5
4:40 PM	Main Gate	206.9 μ Sv/h	under 0.01 μ Sv/h	south	3.2
4:30 PM	Main Gate	207.0 μ Sv/h	under 0.01 μ Sv/h	south	4.3
4:20 PM	Main Gate	207.1 μ Sv/h	under 0.01 μ Sv/h	south	3.6
4:10 PM	Main Gate	207.3 μ Sv/h	under 0.01 μ Sv/h	south	4.0
4:00 PM	Main Gate	207.4 μ Sv/h	under 0.01 μ Sv/h	southeast	4.5
3:50 PM	Main Gate	207.6 μ Sv/h	under 0.01 μ Sv/h	south	4.3
3:40 PM	Main Gate	208.0 μ Sv/h	under 0.01 μ Sv/h	south	3.8
3:30 PM	Main Gate	208.8 μ Sv/h	under 0.01 μ Sv/h	south	4.3
3:20 PM	Main Gate	209.2 μ Sv/h	under 0.01 μ Sv/h	south	4.3
3:10 PM	Main Gate	209.4 μ Sv/h	under 0.01 μ Sv/h	southeast	4.4
3:00 PM	Main Gate	209.8 μ Sv/h	under 0.01 μ Sv/h	southeast	4.5
2:50 PM	Main Gate	210.0 μ Sv/h	under 0.01 μ Sv/h	south	5.8
2:30 PM	Seismic-isolated Building	427.0 μ Sv/h	under 0.01 μ Sv/h	south	1.4
2:20 PM	Seismic-isolated Building	429.5 μ Sv/h	under 0.01 μ Sv/h	south	2.3
2:10 PM	Main Gate	208.5 μ Sv/h	under 0.01 μ Sv/h	southeast	4.0
2:00 PM	Main Gate	209.0 μ Sv/h	under 0.01 μ Sv/h	southeast	4.1
1:50 PM	Main Gate	209.3 μ Sv/h	under 0.01 μ Sv/h	southeast	3.1
1:40 PM	Main Gate	207.2 μ Sv/h	under 0.01 μ Sv/h	south	4.2
1:30 PM	Main Gate	207.5 μ Sv/h	under 0.01 μ Sv/h	southeast	3.1
1:20 PM	Main Gate	207.5 μ Sv/h	under 0.01 μ Sv/h	south	3.7
1:10 PM	Main Gate	207.9 μ Sv/h	under 0.01 μ Sv/h	south	3.7
1:00 PM	Main Gate	208.1 μ Sv/h	under 0.01 μ Sv/h	southeast	3.1
0:50 PM	Main Gate	208.7 μ Sv/h	under 0.01 μ Sv/h	east-southeast	3.2
0:40 PM	Main Gate	208.8 μ Sv/h	under 0.01 μ Sv/h	south	3.1
0:30 PM	Main Gate	201.1 μ Sv/h	under 0.01 μ Sv/h	south	2.5
0:20 PM	Main Gate	209.2 μ Sv/h	under 0.01 μ Sv/h	southeast	2.8
0:10 PM	Main Gate	209.4 μ Sv/h	under 0.01 μ Sv/h	southeast	3.0
0:00 PM	Main Gate	209.4 μ Sv/h	under 0.01 μ Sv/h	south	3.0
11:50 AM	Main Gate	209.1 μ Sv/h	under 0.01 μ Sv/h	south-southeast	2.9
11:40 AM	Main Gate	209.6 μ Sv/h	under 0.01 μ Sv/h	east-southeast	2.7
11:30 AM	Main Gate	209.5 μ Sv/h	under 0.01 μ Sv/h	south	2.5
11:20 AM	Main Gate	209.5 μ Sv/h	under 0.01 μ Sv/h	east-southeast	2.7
11:10 AM	Main Gate	209.2 μ Sv/h	under 0.01 μ Sv/h	south	2.8
11:00 AM	Main Gate	209.3 μ Sv/h	under 0.01 μ Sv/h	south	2.5

Measurement Time	Measured Place	γ Ray	Neutron Ray	Wind Direction	Wind Velocity (m/s)
10:50 AM	Main Gate	209.6 μ Sv/h	under 0.01 μ Sv/h	southeast	2.8
10:40 AM	Main Gate	209.5 μ Sv/h	under 0.01 μ Sv/h	southeast	2.4
10:30 AM	Main Gate	209.7 μ Sv/h	under 0.01 μ Sv/h	east-southeast	2.7
10:20 AM	Main Gate	209.7 μ Sv/h	under 0.01 μ Sv/h	south-southeast	2.4
10:10 AM	Main Gate	210.0 μ Sv/h	under 0.01 μ Sv/h	southeast	2.7
10:00 AM	Main Gate	210.1 μ Sv/h	under 0.01 μ Sv/h	southeast	2.6
9:50 AM	Main Gate	210.5 μ Sv/h	under 0.01 μ Sv/h	southeast	2.2
9:40 AM	Main Gate	210.6 μ Sv/h	under 0.01 μ Sv/h	south-southeast	2.3
9:30 AM	Main Gate	210.7 μ Sv/h	under 0.01 μ Sv/h	east-southeast	2.5
9:20 AM	Main Gate	210.8 μ Sv/h	under 0.01 μ Sv/h	southeast	2.2
9:10 AM	Main Gate	210.8 μ Sv/h	under 0.01 μ Sv/h	east-southeast	2.5
9:00 AM	Main Gate	210.1 μ Sv/h	under 0.01 μ Sv/h	southeast	1.8
8:50 AM	Main Gate	211.1 μ Sv/h	under 0.01 μ Sv/h	southeast	1.5
8:40 AM	Main Gate	211.5 μ Sv/h	under 0.01 μ Sv/h	southeast	1.7
8:30 AM	Main Gate	211.2 μ Sv/h	under 0.01 μ Sv/h	southeast	1.7
8:20 AM	Main Gate	211.6 μ Sv/h	under 0.01 μ Sv/h	south	1.2
8:10 AM	Main Gate	211.6 μ Sv/h	under 0.01 μ Sv/h	south	1.2
8:00 AM	Main Gate	211.6 μ Sv/h	under 0.01 μ Sv/h	southwest	0.8
7:50 AM	Main Gate	211.7 μ Sv/h	under 0.01 μ Sv/h	south	0.8
7:40 AM	Main Gate	211.9 μ Sv/h	under 0.01 μ Sv/h	south	1.0
7:30 AM	Main Gate	211.9 μ Sv/h	under 0.01 μ Sv/h	southeast	1.2
7:20 AM	Main Gate	211.8 μ Sv/h	under 0.01 μ Sv/h	west	0.8
7:10 AM	Main Gate	212.0 μ Sv/h	under 0.01 μ Sv/h	west	1.1
7:00 AM	Main Gate	212.2 μ Sv/h	under 0.01 μ Sv/h	northwest	0.9
6:50 AM	Main Gate	212.3 μ Sv/h	under 0.01 μ Sv/h	west-northwest	0.7
6:40 AM	Main Gate	213.7 μ Sv/h	under 0.01 μ Sv/h	west-southwest	0.7
6:30 AM	Main Gate	230.9 μ Sv/h	under 0.01 μ Sv/h	east-southeast	0.8
6:20 AM	Main Gate	214.7 μ Sv/h	under 0.01 μ Sv/h	south-southeast	0.5
6:10 AM	Main Gate	212.8 μ Sv/h	under 0.01 μ Sv/h	north	0.7
6:00 AM	Main Gate	212.8 μ Sv/h	under 0.01 μ Sv/h	north	0.4
5:50 AM	Main Gate	213.6 μ Sv/h	under 0.01 μ Sv/h	west	0.7
5:40 AM	Main Gate	216.2 μ Sv/h	under 0.01 μ Sv/h	southwest	0.8
5:30 AM	Main Gate	213.8 μ Sv/h	under 0.01 μ Sv/h	east-southeast	0.8
5:20 AM	Main Gate	213.6 μ Sv/h	under 0.01 μ Sv/h	south	0.6
5:10 AM	Main Gate	214.0 μ Sv/h	under 0.01 μ Sv/h	south-southeast	0.7
5:00 AM	Main Gate	214.4 μ Sv/h	under 0.01 μ Sv/h	southeast	0.9
4:50 AM	Main Gate	214.3 μ Sv/h	under 0.01 μ Sv/h	west	1.2
4:40 AM	Main Gate	214.7 μ Sv/h	under 0.01 μ Sv/h	north-northwest	1.2
4:30 AM	Main Gate	214.5 μ Sv/h	under 0.01 μ Sv/h	north	0.2
4:20 AM	Main Gate	214.7 μ Sv/h	under 0.01 μ Sv/h	south	0.3
4:10 AM	Main Gate	215.0 μ Sv/h	under 0.01 μ Sv/h	north	0.6
4:00 AM	Main Gate	215.1 μ Sv/h	under 0.01 μ Sv/h	west-northwest	0.5
3:50 AM	Main Gate	215.4 μ Sv/h	under 0.01 μ Sv/h	west	1.0
3:40 AM	Main Gate	215.7 μ Sv/h	under 0.01 μ Sv/h	west	0.9
3:30 AM	Main Gate	215.5 μ Sv/h	under 0.01 μ Sv/h	southwest	0.7
3:20 AM	Main Gate	216.2 μ Sv/h	under 0.01 μ Sv/h	southwest	0.6
3:10 AM	Main Gate	216.5 μ Sv/h	under 0.01 μ Sv/h	west-southwest	0.9
3:00 AM	Main Gate	216.6 μ Sv/h	under 0.01 μ Sv/h	west	1.0
2:50 AM	Main Gate	216.6 μ Sv/h	under 0.01 μ Sv/h	west-southwest	0.5
2:40 AM	Main Gate	216.8 μ Sv/h	under 0.01 μ Sv/h	west	1.0
2:30 AM	Main Gate	217.2 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.2
2:20 AM	Main Gate	217.5 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.6
2:10 AM	Main Gate	218.7 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.7
2:00 AM	Main Gate	218.9 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.3
1:50 AM	Main Gate	219.2 μ Sv/h	under 0.01 μ Sv/h	west	0.8
1:40 AM	Main Gate	219.2 μ Sv/h	under 0.01 μ Sv/h	northwest	0.6
1:30 AM	Main Gate	219.7 μ Sv/h	under 0.01 μ Sv/h	north	0.8
1:20 AM	Main Gate	220.0 μ Sv/h	under 0.01 μ Sv/h	northwest	1.3
1:10 AM	Main Gate	220.4 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.6
1:00 AM	Main Gate	220.6 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.6

Measurement Time	Measured Place	γ Ray	Neutron Ray	Wind Direction	Wind Velocity (m/s)
0:50 AM	Main Gate	221.0 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.4
0:40 AM	Main Gate	221.7 μ Sv/h	under 0.01 μ Sv/h	west-northwest	1.3
0:30 AM	Main Gate	221.5 μ Sv/h	under 0.01 μ Sv/h	west	1.2
0:20 AM	Main Gate	221.8 μ Sv/h	under 0.01 μ Sv/h	north	0.5
0:10 AM	Main Gate	222.0 μ Sv/h	under 0.01 μ Sv/h	south	0.4
0:00 AM	Main Gate	222.3 μ Sv/h	under 0.01 μ Sv/h	northwest	0.3

From: Nuclear Plant Journal [anu@goinfo.com]
Sent: Friday, March 25, 2011 7:22 PM
To: Bajwa, Chris
Subject: NPJ E-News March 25, 2011 Fukushima Update

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Nuclear Plant Journal

An International Publication
Published in the United States

Nuclear Plant Journal E-News

Japan Update
March 25, 2011

Dear CHRIS,

In this issue of NPJ E-News you'll find an update of the Fukushima Nuclear Plants in Japan. Information is current as of March 25, 2011, 17:00 CDT. All items are directly quoted, without any editing.

In this issue

[TEPCO Update](#)

[IAEA DG Visit](#)

[Status Document](#)

[NISA Radionuclide Update](#)

TEPCO Update

From the [TEPCO website](#):

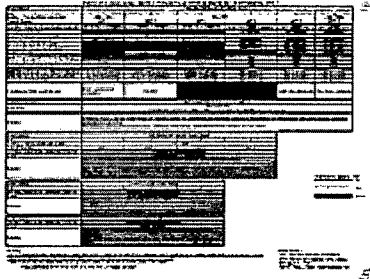
- From 7:05 PM to 10:07 PM, Mar 25, water discharge by concrete pumping vehicle to the spent fuel pool of Unit 4 was conducted.
- We measured radioactive materials (iodine etc.) inside of the nuclear power station area (outdoor) by monitoring car and confirmed that radioactive materials level is getting higher than ordinary level. As listed below, we have determined that specific incidents stipulated in article 15, clause 1 of Act on Special Measures Concerning Nuclear Emergency Preparedness (Abnormal increase in radiation dose measured at site boundary) have occurred.

[Click for more...](#)

IAEA DG Visit (JAIF)

- On the afternoon of March 18, Director General Yukiya Amano of the International Atomic Energy Agency (IAEA) spoke at the Japan National Press Club. He was making an emergency visit to Japan following the nuclear accidents caused by the Tohoku-Pacific Ocean Earthquake

occurred on March 11 and subsequent giant tsunami.
[Click for more...](#)



JAIF Status Update

A [PDF document](#) provides a simple summary of each of the units at Fukushima nuclear power plants. This is a multi-page document that also provides a chronology of events and a map that details the status of each of the Japanese nuclear units.

NISA Nuclear and Industrial Safety Agency

This [PDF file](#) provides concentration measurements of radionuclides in the stagnant water on the basement floor of the turbine building of Unit 1 of Fukushima Dai-ichi Nuclear Power Station.

Quick Links...

- [NPJ Website](#)
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- [JAIF](#)
- [TEPCO](#)
- [NISA](#)
- [U.S. NRC Actions on Japan](#)

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Kauffman, John

From: Coyne, Kevin
Sent: Friday, March 25, 2011 9:10 AM
To: RES_DRA
Subject: Volunteers Needed - Reactor Safety Team Support for Ops Center

Good morning –

We just received a request from the ops center for volunteers for reactor safety team support. The critical needs are for folks with a strong background in systems analysis (including containments), severe accidents, and Level 2/3 PRA.

If you can support, please provide your name and availability to me by 11:30 am. I know we collected names last week, but please go ahead and resubmit your name if you are still interested in helping out.

Thanks!

Kevin

Japan

From: Rini, Brett (RES/FO)
To: Richards, Stuart; Case, Michael; Coyne, Kevin; Coe, Doug; Gibson, Kathy; Elkins, Scott
Cc: Sheron, Brian; Uhle, Jennifer
Subject: FYI: RST Watch Bill through April 9th
Date: Friday, March 25, 2011 12:37:36 PM
Attachments: 03-24 to 04-09 RST Watch Bill.xlsx

Division Directors,

Here is the most up to date watch bill for the Reactor Safety Team. All the positions have been filled through day shift on Friday, April 1. For your staff that are interested in joining the RST, I recommend they shadow someone in their position for at least a ½ shift, if not a full shift, to ensure they understand the duties of the position. I'm working swing shift this afternoon, and I will discuss this with the RST schedulers. I will also send out the specific duties of the positions that are being staffed, so staff can identify what position(s) they are qualified for.

If it would make things easier, I'm willing to serve as the RES POC for coordinating staffing of RES employees during our response to this event.

Let me know if you have any questions.

Thanks,

Brett

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

From: RST13 Hoc (NSM)
Sent: Friday, March 25, 2011 11:37 AM
To: Brown, Frederick; Hasselberg, Rick; Circle, Jeff; Alter, Peter; Thorp, John; Ruland, William; Rini, Brett; Laur, Steven; Norton, Charles; Hart, Ken; Holian, Brian; Boyce, Tom (RES); Helton, Donald; Brown, Eva; Roggenbrodt, William; Hiland, Patrick; Thomas, Eric; Arndt, Steven; Summers, Raymond; Williams, Donna; Solorio, Dave; Collins, Frank; Reeves, Rosemary; Brown, Michael; Orr, Mark; Dozier, Jerry; Gardocki, Stanley; Skeen, David; Skarda, Raymond; McGovern, Denise; Howe, Andrew; Padovan, Mark; Mitman, Jeffrey; Gilmer, James; Ward, Leonard; Jerve, Richard; Morlang, Gary; Harrison, Donnie; Shea, James; Horn, Brian; Uhle, Jennifer; Esmaili, Hossein; Schoenebeck, Greg; Fuller, Edward; Kugler, Andrew; Bloom, Steven; Case, Michael; Chung, Donald; Bukharin, Oleg; Dudes, Laura; RST02 Hoc; RST03 Hoc; RST04 Hoc; RST05 Hoc; RST06 Hoc; RST07 Hoc; RST08 Hoc; RST09 Hoc; RST10 Hoc; RST11 Hoc; RST12 Hoc; RST13 Hoc; RST14 Hoc; RST15 Hoc
Cc: Dozier, Jerry; Gray, Kathy; Hasselberg, Rick; Alter, Peter; RST01 Hoc
Subject: URGENT RST Watch Bill through April 9th

Good Morning,

Attached and below is the Reactor Safety Team Watch Bill that goes through Saturday April 9 th [the end of the next pay period].

You have either signed up for or said you would cover the positions during the time/dates indicated.

If there are any mistakes on our part please email rst01.hoc@nrc.gov rick.hasselberg@nrc.gov peter.alter@nrc.gov as soon as possible. Also please volunteer for the RST Coordinator, BWR Expert, and RST Communicator positions that are blank.

If you wish to add to or change the RST Director Watch Bill, please contact Kathy.Gray@nrc.gov she is the POC for the RST Director Watch Bill. She will forward any changes to Rick and Peter [and RST01].

If you wish to add to or change the Accident Analyst Watch Bill, please contact Jerry.Dozier@nrc.gov he is the POC for the Accident Analyst Watch Bill. He is also trying to get some volunteers from Research and NRO. He will forward any changes to Rick and Peter [and RST01].

Rick & Peter

Date	Day	Time	Shift	RST Director	RST Coordinator	Accident Analyst	BWR Expert	RST Communicator
3/24/2011	Thursday	0700 - 1500	Day	Fred Brown	R Hasselberg	Jeff Circle	Peter Alter	John Thorp
3/24/2011	Thursday	1500 - 2300	Swing	Bill Ruland	Brett Rini	Steve Laur	Chuck Norton	Ken Hart
2/24/2011	Thursday	2300 - 0700	Midnight	Brian Holian	Tom Boyce	Don Helton	Eva Brown	Bill Roggenbrodt
3/25/2011	Friday	0700 - 1500	Day	Pat Hiland	Eric Thomas	Steve Arndt	Bob Summers	Donna Williams

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3/25/2011	Friday	1500 - 2300	Swing	Bill Ruland	Brett Rini	Steve Laur	Chuck Norton	Dave Solorio
3/25/2011	Friday	2300 - 0700	Midnight	Brian Holian	Frank Collins	Don Helton	Eva Brown	R Reeves
3/26/2011	Saturday	0700 - 1500	Day	Pat Hiland	Eric Thomas	Steve Arndt	Mike Brown	John Thorp
3/26/2011	Saturday	1500 - 2300	Swing	Bill Ruland	Mark Orr	Jerry Dozier	Chuck Norton	Stan Gardocki
3/26/2011	Saturday	2300 - 0700	Midnight	Dave Skeen	Bret Rini	Ray Skarda	Eva Brown	Denise McGovern
3/27/2011	Sunday	0700 - 1500	Day	Pat Hiland	Peter Alter	Andy Howe	Mike Brown	Mark Padovan
3/27/2011	Sunday	1500 - 2300	Swing	Fred Brown	R Hasselberg	Jeff Mitman	Chuck Norton	Bill Roggenbrodt
3/27/2011	Sunday	2300 - 0700	Midnight	Dave Skeen	Frank Collins	Jim Gilmer	Eva Brown	Denise McGovern
3/28/2011	Monday	0700 - 1500	Day	Pat Hiland	Peter Alter	Jeff Circle	Mike Brown	Mark Padovan
3/28/2011	Monday	1500 - 2300	Swing	Fred Brown	R Hasselberg	Len Ward	Chuck Norton	Rick Jervey
3/28/2011	Monday	2300 - 0700	Midnight	Dave Skeen	Mike Morlang	Donnie Harrison	Jim Shea	Brain Horn
3/29/2011	Tuesday	0700 - 1500	Day	Jennifer Uhle	Brett Rini	Hossein Esmaili	Mike Brown	John Thorp
3/29/2011	Tuesday	1500 - 2300	Swing	Fred Brown	G. Schoenebeck	Ed Fuller	Chuck Norton	Andy Kugler
3/29/2011	Tuesday	2300 - 0700	Midnight	Dave Skeen	Mike Morlang	Donnie Harrison	Jim Shea	Brain Horn
3/30/2011	Wednesday	0700 - 1500	Day	Jennifer Uhle	Peter Alter	Jim Gilmer	Mike Brown	Steve Bloom
3/30/2011	Wednesday	1500 - 2300	Swing	Fred Brown	G. Schoenebeck	Hossein Esmaili	Chuck Norton	Bill Roggenbrodt
3/30/2011	Wednesday	2300 - 0700	Midnight	Mike Case	Frank Collins	Steve Arndt	Jim Shea	
3/31/2011	Thursday	0700 - 1500	Day	Jennifer Uhle	Peter Alter	Don Chung	Mike Brown	Jerry Dozier
3/31/2011	Thursday	1500 - 2300	Swing	Bill Ruland	G. Schoenebeck	Hossein Esmaili	Chuck Norton	John Thorp
3/31/2011	Thursday	2300 - 0700	Midnight	Mike Case	Frank Collins	Steve Arndt	Jim Shea	
4/1/2011	Friday	0700 - 1500	Day	Jennifer Uhle	Brett Rini	Jeff Mitman	Mike Brown	Andy Kugler
4/1/2011	Friday	1500 - 2300	Swing	Bill Ruland		Don Helton	Chuck Norton	
4/1/2011	Friday	2300 - 0700	Midnight	Mike Case	Frank Collins	Ray Skarda	Eva Brown	
4/2/2011	Saturday	0700 - 1500	Day	Brian Holian	Peter Alter		Mike Brown	John Thorp
4/2/2011	Saturday	1500 - 2300	Swing	Bill Ruland	Brett Rini		Chuck Norton	
4/2/2011	Saturday	2300 - 0700	Midnight	Mike Case	Oleg Bukharin		Eva Brown	
4/3/2011	Sunday	0700 - 1500	Day	Brian Holian			Mike Brown	
4/3/2011	Sunday	1500 - 2300	Swing	Bill Ruland	Eric Thomas	Jerry Dozier	Chuck Norton	Andy Kugler
4/3/2011	Sunday	2300 - 0700	Midnight	Laura Dudes	Frank Collins			
4/4/2011	Monday	0700 - 1500	Day	Brian Holian	Peter Alter		Mike Brown	
4/4/2011	Monday	1500 - 2300	Swing			Hossein Esmaili	Chuck Norton	John Thorp
4/4/2011	Monday	2300 - 0700	Midnight	Laura Dudes	Mike Morlang			
4/5/2011	Tuesday	0700 - 1500	Day	Brian Holian		Jim Gilmer	Mike Brown	
4/5/2011	Tuesday	1500 - 2300	Swing		G. Schoenebeck	Ed Fuller	Chuck Norton	Andy Kugler
4/5/2011	Tuesday	2300 - 0700	Midnight	Laura Dudes	Mike Morlang			
4/6/2011	Wednesday	0700 - 1500	Day	Mike Case	Peter Alter		Mike Brown	Steve Bloom
4/6/2011	Wednesday	1500 - 2300	Swing	Brian Holian	G. Schoenebeck		Chuck Norton	
4/6/2011	Wednesday	2300 - 0700	Midnight	Fred Brown	Frank Collins			Rick Jervey
4/7/2011	Thursday	0700 - 1500	Day	Mike Case			Mike Brown	John Thorp
4/7/2011	Thursday	1500 - 2300	Swing		G. Schoenebeck		Chuck Norton	
4/7/2011	Thursday	2300 - 0700	Midnight					
4/8/2011	Friday	0700 - 1500	Day					
4/8/2011	Friday	1500 - 2300	Swing					
4/8/2011	Friday	2300 - 0700	Midnight					
4/9/2011	Saturday	0700 - 1500	Day					
4/9/2011	Saturday	1500 - 2300	Swing					
4/9/2011	Saturday	2300 - 0700	Midnight					

03-24 to 04-09 RST Watch Bill.xlsx

<u>Date</u>	<u>Day</u>	<u>Time</u>	<u>Shift</u>	<u>RST Director</u>	<u>RST Coordinator</u>	<u>Accident Analyst</u>	<u>BWR Expert</u>	<u>RST Communicator</u>
3/24/2011	Thursday	0700 - 1500	Day	Fred Brown	R Hasselberg	Jeff Circle	Peter Alter	John Thorp
3/24/2011	Thursday	1500 - 2300	Swing	Bill Ruland	Brett Rini	Steve Laur	Chuck Norton	Ken Hart
2/24/2011	Thursday	2300 - 0700	Midnight	Brian Holian	Tom Boyce	Don Helton	Eva Brown	Bill Roggenbrodt
3/25/2011	Friday	0700 - 1500	Day	Pat Hiland	Eric Thomas	Steve Arndt	Bob Summers	Donna Williams
3/25/2011	Friday	1500 - 2300	Swing	Bill Ruland	Brett Rini	Steve Laur	Chuck Norton	Dave Solorio
3/25/2011	Friday	2300 - 0700	Midnight	Brian Holian	Frank Collins	Don Helton	Eva Brown	R Reeves
3/26/2011	Saturday	0700 - 1500	Day	Pat Hiland	Eric Thomas	Steve Arndt	Mike Brown	John thorp
3/26/2011	Saturday	1500 - 2300	Swing	Bill Ruland	Mark Orr	Jerry Dozier	Chuck Norton	Stan Gardocki
3/26/2011	Saturday	2300 - 0700	Midnight	Dave Skeen	Bret Rini	Ray Skarda	Eva Brown	Denise McGovern
3/27/2011	Sunday	0700 - 1500	Day	Pat Hiland	Peter Alter	Andy Howe	Mike Brown	Mark Padovan
3/27/2011	Sunday	1500 - 2300	Swing	Fred Brown	R Hasselberg	Jeff Mitman	Chuck Norton	Bill Roggenbrodt
3/27/2011	Sunday	2300 - 0700	Midnight	Dave Skeen	Frank Collins	Jim Gilmer	Eva Brown	Denise McGovern
3/28/2011	Monday	0700 - 1500	Day	Pat Hiland	Peter Alter	Jeff Circle	Mike Brown	Mark Padovan
3/28/2011	Monday	1500 - 2300	Swing	Fred Brown	R Hasselberg	Len Ward	Chuck Norton	Rick Jervey
3/28/2011	Monday	2300 - 0700	Midnight	Dave Skeen	Mike Morlang	Donnie Harrison	Jim Shea	Brain Horn
3/29/2011	Tuesday	0700 - 1500	Day	Jennifer Uhle	Brett Rini	Hossein Esmaili	Mike Brown	John Thorp
3/29/2011	Tuesday	1500 - 2300	Swing	Fred Brown	G Schoenebeck	Ed Fuller	Chuck Norton	Andy Kugler
3/29/2011	Tuesday	2300 - 0700	Midnight	Dave Skeen	Mike Morlang	Donnie Harrison	Jim Shea	Brain Horn
3/30/2011	Wednesday	0700 - 1500	Day	Jennifer Uhle	Peter Alter	Jim Gilmer	Mike Brown	Steve Bloom
3/30/2011	Wednesday	1500 - 2300	Swing	Fred Brown	G Schoenebeck	Hossein Esmali	Chuck Norton	Bill Roggenbrodt
3/30/2011	Wednesday	2300 - 0700	Midnight	Mike Case	Frank Collins	Steve Arndt	Jim Shea	
3/31/2011	Thursday	0700 - 1500	Day	Jennifer Uhle	Peter Alter	Don Chung	Mike Brown	Jerry Dozier
3/31/2011	Thursday	1500 - 2300	Swing	Bill Ruland	G Schoenebeck	Hossein Esmaili	Chuck Norton	John Thorp
3/31/2011	Thursday	2300 - 0700	Midnight	Mike Case	Frank Collins	Steve Arndt	Jim Shea	
4/1/2011	Friday	0700 - 1500	Day	Jennifer Uhle	Brett Rini	Jeff Mitman	Mike Brown	Andy Kugler
4/1/2011	Friday	1500 - 2300	Swing	Bill Ruland		Don Helton	Chuck Norton	
4/1/2011	Friday	2300 - 0700	Midnight	Mike Case	Frank Collins	Ray Skarda	Eva Brown	
4/2/2011	Saturday	0700 - 1500	Day	Brian Holian	Peter Alter		Mike Brown	John Thorp
4/2/2011	Saturday	1500 - 2300	Swing	Bill Ruland	Brett Rini		Chuck Norton	
4/2/2011	Saturday	2300 - 0700	Midnight	Mike Case	Oleg Bukharin		Eva Brown	
4/3/2011	Sunday	0700 - 1500	Day	Brian Holian			Mike Brown	
4/3/2011	Sunday	1500 - 2300	Swing	Bill Ruland	Eric Thomas	Jerry Dozier	Chuck Norton	Andy Kugler
4/3/2011	Sunday	2300 - 0700	Midnight	Laura Dudes	Frank Collins			

03-24 to 04-09 RST Watch Bill.xlsx

<u>Date</u>	<u>Day</u>	<u>Time</u>	<u>Shift</u>	<u>RST Director</u>	<u>RST Coordinator</u>	<u>Accident Analyst</u>	<u>BWR Expert</u>	<u>RST Communicator</u>
4/4/2011	Monday	0700 - 1500	Day	Brian Holian	Peter Alter		Mike Brown	
4/4/2011	Monday	1500 - 2300	Swing			Hossein Esmali	Chuck Norton	John Thorp
4/4/2011	Monday	2300 - 0700	Midnight	Laura Dudes	Mike Morlang			
4/5/2011	Tuesday	0700 - 1500	Day	Brian Holian		Jim Gilmer	Mike Brown	
4/5/2011	Tuesday	1500 - 2300	Swing		G Schoenebeck	Ed Fuller	Chuck Norton	Andy Kugler
4/5/2011	Tuesday	2300 - 0700	Midnight	Laura Dudes	Mike Morlang			
4/6/2011	Wednesday	0700 - 1500	Day	Mike Case	Peter Alter		Mike Brown	Steve Bloom
4/6/2011	Wednesday	1500 - 2300	Swing	Brian Holian	G Schoenebeck		Chuck Norton	
4/6/2011	Wednesday	2300 - 0700	Midnight	Fred Brown	Frank Collins			Rick Jervey
4/7/2011	Thursday	0700 - 1500	Day	Mike Case			Mike Brown	John Thorp
4/7/2011	Thursday	1500 - 2300	Swing		G Schoenebeck		Chuck Norton	
4/7/2011	Thursday	2300 - 0700	Midnight					
4/8/2011	Friday	0700 - 1500	Day					
4/8/2011	Friday	1500 - 2300	Swing					
4/8/2011	Friday	2300 - 0700	Midnight					
4/9/2011	Saturday	0700 - 1500	Day					
4/9/2011	Saturday	1500 - 2300	Swing					
4/9/2011	Saturday	2300 - 0700	Midnight					

NSIR

Japan

From: Coyne, Kevin (RES)
To: Gibson, Kathy; Case, Michael; Richards, Stuart
Cc: Coe, Doug
Subject: FW: RST Schedule 3/26-4/2
Date: Friday, March 25, 2011 9:19:35 AM

Kathy, Mike, Stu –

Here's the current RST watch bill – will help identify gaps in coverage highlighted in yellow...

Kevin

From: Marksberry, Don (RES)
Sent: Friday, March 25, 2011 9:13 AM
To: Coyne, Kevin
Subject: FW: RST Schedule 3/26-4/2

From: RST01 Hoc (NSIR)
Sent: Wednesday, March 23, 2011 12:05 PM
To: Alter, Peter; Morlang, Gary; Hasselberg, Rick; Berry, Rollie; Collins, Frank; Thomas, Eric; Schoenebeck, Greg; McGovern, Denise; Rini, Brett; Bukharin, Oleg; Sloan, Scott; Circle, Jeff; Esmaili, Hossein; Ward, Leonard; Laur, Steven; Salay, Michael; Fuller, Edward; Schaperow, Jason; Marksberry, Don; Gilmer, James; Miranda, Samuel; Arndt, Steven; Helton, Donald; Norton, Charles; Kolb, Timothy; Brown, Eva; Shea, James; Vick, Lawrence; Brown, Michael; Williams, Donna; Roggenbrodt, William; Thorp, John; Kugler, Andrew; Williams, Joseph; Padovan, Mark; Isom, James; Hart, Ken; Bloom, Steven; Jervy, Richard
Subject: FW: RST Schedule 3/26-4/2

All,

Please look at current watchbills from the OST. Ed Fuller has signed up for swing shifts for Accident Analyst on 3/29 and 4/5. Other than that, please reply to RST01 so we can start filling in the holes on the watchbill.

Thanks for all of your support.

Eric Thomas
 RST Coordinator

From: OST02 HOC
Sent: Wednesday, March 23, 2011 8:44 AM
To: RST01 Hoc
Subject: RST Schedule 3/26-4/2

Reactor Safety Team			
RST Director			
Sat	26-Mar	7am - 3pm	Pat Hiland
Sat	26-Mar	3pm-11pm	Bill Ruland
Sat-Sun	3/26-3/27	11pm - 7am	Mike Case
Sun	27-Mar	7am - 3pm	Pat Hiland
Sun	27-Mar	3pm-11pm	Fred Brown
Sun-Mon	3/27-3/28	11pm - 7am	Mike Case
Mon	28-Mar	7am - 3pm	Pat Hiland

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Mon	28-Mar	3pm-11pm	Fred Brown
Mon-Tue	3/28-3/29	11pm - 7am	Mike Case
Tue	29-Mar	7am - 3pm	Jennifer Uhle
Tue	29-Mar	3pm-11pm	Fred Brown
Tue-Wed	3/29-3/30	11pm - 7am	Mike Case
Wed	30-Mar	7am - 3pm	Jennifer Uhle
Wed	30-Mar	3pm-11pm	Fred Brown
Wed-Thur	3/30-3/31	11pm - 7am	Dave Skeen
Thur	31-Mar	7am - 3pm	Jennifer Uhle
Thur	31-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/31-4/1	11pm - 7am	Dave Skeen
Fri	1-Apr	7am - 3pm	Jennifer Uhle
Fri	1-Apr	3pm-11pm	Bill Ruland
Fri-Sat	4/1-4/2	11pm-7am	Dave Skeen
RST Coordinator			
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Sat	26-Mar	7am - 3pm	Eric Thomas
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Peter Alter
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	Frank Collins
Mon	28-Mar	7am - 3pm	Rick Hasselberg
Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	Mike Morlang
Tue	29-Mar	7am - 3pm	Peter Alter
Tue	29-Mar	3pm-11pm	Greg Schoenebeck
Tue-Wed	3/29-3/30	11pm - 7am	Mike Morlang
Wed	30-Mar	7am - 3pm	Rick Hasselberg
Wed	30-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/30-3/31	11pm - 7am	Frank Collins
Thur	31-Mar	7am - 3pm	Peter Alter
Thur	31-Mar	3pm-11pm	Greg Schoenebeck
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Rick Hasselberg
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Frank Collins
Severe Accident/PRA			
Sat	26-Mar	7am - 3pm	Steven Arndt
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Jeff Circle

Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Hossein Esmaili
Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Jim Gilmer?
Wed	30-Mar	3pm-11pm	Hossein Esmaili
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	Hossein Esmaili
Thur-Fri	3/31-4/1	11pm - 7am	Ray Skarda
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	Ray Skarda
BWR Expertise			
Sat	26-Mar	7am - 3pm	Mike Brown
Sat	26-Mar	3pm-11pm	Chuck Norton
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mike Brown
Sun	27-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Mike Brown
Mon	28-Mar	3pm-11pm	Chuck Norton
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	Mike Brown
Tue	29-Mar	3pm-11pm	Chuck Norton
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	Mike Brown
Wed	30-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Mike Brown
Thur	31-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mike Brown
Fri	1-Apr	3pm-11pm	Chuck Norton
Fri-Sat	4/1-4/2	11pm-7am	
RST Comm/ERDS Operator			
Sat	26-Mar	7am - 3pm	Donna Williams
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	Mark Padovan
Sun	27-Mar	3pm-11pm	Bill Roggenbrodt
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	Mark Padovan
Mon	28-Mar	3pm-11pm	Bill Roggenbrodt

Mon-Tue	3/28-3/29	11pm - 7am	Andy Kugler
Tue	29-Mar	7am - 3pm	Mark Padovan
Tue	29-Mar	3pm-11pm	Bill Roggenbrodt
Tue-Wed	3/29-3/30	11pm - 7am	Andy Kugler
Wed	30-Mar	7am - 3pm	Mark Padovan
Wed	30-Mar	3pm-11pm	Bill Roggenbrodt
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	Andy Kugler
Thur	31-Mar	3pm-11pm	Bill Roggenbrodt
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	Mark Padovan
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
RST Support (Seismology Q&A)			
Sat	26-Mar	7am - 3pm	
Sat	26-Mar	3pm-11pm	
Sat-Sun	3/26-3/27	11pm - 7am	
Sun	27-Mar	7am - 3pm	
Sun	27-Mar	3pm-11pm	
Sun-Mon	3/27-3/28	11pm - 7am	
Mon	28-Mar	7am - 3pm	
Mon	28-Mar	3pm-11pm	
Mon-Tue	3/28-3/29	11pm - 7am	
Tue	29-Mar	7am - 3pm	
Tue	29-Mar	3pm-11pm	
Tue-Wed	3/29-3/30	11pm - 7am	
Wed	30-Mar	7am - 3pm	
Wed	30-Mar	3pm-11pm	
Wed-Thur	3/30-3/31	11pm - 7am	
Thur	31-Mar	7am - 3pm	
Thur	31-Mar	3pm-11pm	
Thur-Fri	3/31-4/1	11pm - 7am	
Fri	1-Apr	7am - 3pm	
Fri	1-Apr	3pm-11pm	
Fri-Sat	4/1-4/2	11pm-7am	
RST Support (Structural)			
Sat	26-Mar	7am - 3pm	Off (On Call)
Sat	26-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	Off (On Call)
Sun	27-Mar	7am - 3pm	Off (On Call)
Sun	27-Mar	3pm-11pm	Off (On Call)
Sun-Mon	3/27-3/28	11pm - 7am	Off (On Call)
Mon	28-Mar	7am - 3pm	Off (On Call)
Mon	28-Mar	3pm-11pm	Off (On Call)
Mon-Tues	3/28-3/29	11pm - 7am	Off (On Call)

Tues	29-Mar	7am - 3pm	Off (On Call)
Tues	29-Mar	3pm-11pm	Off (On Call)
Tues-Wed	3/29-3/30	11pm - 7am	Off (On Call)
Wed	30-Mar	7am - 3pm	Off (On Call)
Wed	30-Mar	3pm-11pm	Off (On Call)
Wed-Thur	3/30-3/31	11pm - 7am	Off (On Call)
Thur	31-Mar	7am - 3pm	Off (On Call)
Thur	31-Mar	3pm-11pm	Off (On Call)
Thur-Fri	3/31-4/1	11pm - 7am	Off (On Call)
Fri	1-Apr	7am - 3pm	Off (On Call)
Fri	1-Apr	3pm-11pm	Off (On Call)
Fri-Sat	4/1-4/2	11pm-7am	Off (On Call)

(NSHR)
Japan
Related

From: [Coyne, Kevin](#)
To: [Gibson, Kathy](#); [Case, Michael](#); [Richards, Stuart](#)
Cc: [Coe, Doug](#); [Sheron, Brian](#); [Uhle, Jennifer](#); [Rini, Brett](#); [Dion, Jeanne](#)
Subject: FW: Operations Center Reactor Safety Team Watchbill
Date: Friday, March 25, 2011 9:05:50 AM
Attachments: [RES input IRCvolunteers.xlsx.msg](#)
Importance: High

Kathy, Mike, Stu –

Just got calls from both Jerry Dozier and Mike Cheok from the Ops Center. They are starting to burn out their reactor safety team support and are looking for volunteers with expertise in severe accidents and PRA. They are currently looking at staffing through April 3, but have a few critical needs this weekend. DRA can coordinate getting a list back to Jerry, but could you provide any other volunteers from DE and DSA? I have the list that went up on March 17 (see attached) and can obviously provide this back to Jerry, but I wasn't sure if you had any changes or updates.

Obviously a quick turnaround – if we could get any additional feedback from you by noon, that would give the IRC time to coordinate coverage.

Thanks!

Kevin

From: Cheok, Michael
Sent: Friday, March 25, 2011 8:45 AM
To: Wong, See-Meng; Mitman, Jeffrey; Zoulis, Antonios; Harrison, Donnie; Dozier, Jerry; Howe, Andrew
Cc: Laur, Steven; Circle, Jeff; Rodriguez, Veronica; Lee, Samson; Coyne, Kevin; Demoss, Gary; Lombard, Mark; Coe, Doug
Subject: Operations Center Reactor Safety Team Watchbill

To those on the "To" list: I have added your names as PRA/systems analysts to be used in the Reactor Safety Team (RST) watchbill. Jerry Dozier will be contacting you to coordinate times and dates when you will be available. The RST has several slots to fill this weekend. To those I already had a chance to talk to, thanks for volunteering. To the others who I have not talked to yet, you can still decline if you would like. The RST will be staffed (at the least) for the next several weeks.

Steve Laur and Jeff Circle – please inform Jerry if you are able/willing to continue.

Gary Demoss and Kevin Coyne – thanks for helping to look for RES volunteers. Please let me and Jerry Dozier know when you come up with a list.

Mark Lombard – would NRO have available PRA/systems type analysts who would be able to help staff the RST? The more staff we have on the list, the more we would spread out the work load.

Thanks

✓/181

Mike

Attachment RES_input_IRCvolunteers.xlsx.msg (2560 Bytes) cannot be converted to PDF format.

(NSIR)
Japan
Related

From: Breskovic, Clarence (OIP)
To: Breskovic, Clarence
Subject: Recent CRS Reports on Earthquakes, Japan, Fukushima....
Date: Friday, March 25, 2011 12:13:10 PM
Attachments: [CRS Earthquakes.pdf](#)
[CRS Japan 2011 Experts.pdf](#)
[CRS Fukushima Crisis 1.pdf](#)
[CRS Tsunami Programs.pdf](#)
[CRS Earthquake DOD Response.pdf](#)

Please see attached PDF files.

Earthquakes: Risk, Detection, Warning, and Research
U.S. Tsunami Programs: A Brief Overview
Japan 2011 Earthquake: U.S. Department of Defense (DOD) Response
Fukushima Nuclear Crisis
Japan 2011 Disaster: CRS Experts

Clarence Breskovic
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Alternate Email: cal.breskovic@gmail.com

V/182



Earthquakes: Risk, Detection, Warning, and Research

Peter Folger

Specialist in Energy and Natural Resources Policy

March 18, 2011

Congressional Research Service

7-5700

www.crs.gov

RL33861

CRS Report for Congress

Prepared for Members and Committees of Congress

Summary

The United States faces the possibility of large economic losses from earthquake-damaged buildings and infrastructure. The Federal Emergency Management Agency has estimated that earthquakes cost the United States, on average, over \$5 billion per year. California, Oregon, and Washington account for nearly \$4.1 billion (77%) of the U.S. total estimated average annualized loss. California alone accounts for most of the estimated annualized earthquake losses for the nation.

A single large earthquake, however, can cause far more damage than the average annual estimate. The 1994 Northridge (CA) earthquake caused as much as \$26 billion (in 2005 dollars) in damage and was one of the costliest natural disasters to strike the United States. One study of the damage caused by a hypothetical magnitude 7.8 earthquake along the San Andreas Fault in southern California projected as many as 1,800 fatalities and more than \$200 billion in economic losses. An issue for the 112th Congress is whether existing federally supported programs aimed at reducing U.S. vulnerability to earthquakes are an adequate response to the earthquake hazard.

Under the National Earthquake Hazards Reduction Program (NEHRP), four federal agencies have responsibility for long-term earthquake risk reduction: the U.S. Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute of Standards and Technology (NIST). They variously assess U.S. earthquake hazards, deliver notifications of seismic events, develop measures to reduce earthquake hazards, and conduct research to help reduce overall U.S. vulnerability to earthquakes. Congressional oversight of the NEHRP program might revisit how well the four agencies coordinate their activities to address the earthquake hazard. Better coordination was a concern that led to changes to the program in legislation enacted in 2004 (P.L. 108-360).

P.L. 108-360 authorized appropriations for NEHRP through FY2009. Total funding enacted from reauthorization through FY2009 was \$613.2 million, approximately 68% of the total amount of \$902.4 million authorized by P.L. 108-360. Congress appropriated \$131.2 million for NEHRP in FY2010, similar to FY2009 funding levels. Also, the American Recovery and Reinvestment Act (ARRA; P.L. 111-5) provided some additional funding for earthquake activities under NEHRP. What effect funding at the levels enacted through FY2010 under NEHRP has had on the U.S. capability to detect earthquakes and minimize losses after an earthquake occurs is difficult to assess. The effectiveness of the NEHRP program is a perennial issue for Congress: it is inherently difficult to capture precisely, in terms of dollars saved or fatalities prevented, the effectiveness of mitigation measures taken before an earthquake occurs. A major earthquake in a populated urban area within the United States would cause damage, and a question becomes how much damage would be prevented by mitigation strategies underpinned by the NEHRP program.

Legislation was introduced during the 111th Congress (H.R. 3820) that would have made changes to the program and would have authorized appropriations totaling \$906 million over five years for NEHRP. Ninety percent of the funding would have been designated for the USGS and NSF, and the remainder for FEMA and NIST. The bill passed the House but not the Senate. Similar legislation will likely be introduced in the 112th Congress.

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Introduction

Close to 75 million people in 39 states face some risk from earthquakes. Earthquake hazards are greatest in the western United States, particularly in California, but also in Alaska, Washington, Oregon, and Hawaii. Earthquake hazards are also prominent in the Rocky Mountain region and the New Madrid Seismic Zone (a portion of the central United States), as well as in portions of the eastern seaboard, particularly South Carolina. Given the potentially huge costs associated with a large, damaging earthquake in the United States, an ongoing issue for Congress is whether the federally supported earthquake programs are appropriate for the earthquake risk.

Under the National Earthquake Hazards Reduction Program (NEHRP), the federal government supports efforts to assess and monitor earthquake hazards and risk in the United States. Four federal agencies responsible for long-term earthquake risk reduction coordinate their activities under NEHRP: the U.S. Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute of Standards and Technology (NIST). Congress last made changes to NEHRP in 2004 (P.L. 108-360), and authorized appropriations through FY2009 for a total of \$902.4 million over five years. A bill introduced in the 111th Congress, H.R. 3820 (Title I), would have made further changes to the program and authorized appropriations through FY2014, but it was not enacted.

This report discusses:

- NEHRP—the multi-agency federal program to reduce the nation’s risk from earthquakes;
- earthquake hazards and risk in the United States;
- federal programs that support earthquake monitoring;
- the U.S. capability to detect earthquakes and issue notifications and warnings; and
- federally supported research to improve the fundamental scientific understanding of earthquakes with a goal of reducing U.S. vulnerability.

National Earthquake Hazards Reduction Program (NEHRP)

In 1977 Congress passed the Earthquake Hazards Reduction Act (P.L. 95-124) establishing NEHRP as a long-term earthquake risk reduction program for the United States. The program initially focused on research, led by USGS and NSF, toward understanding and ultimately predicting earthquakes. Earthquake prediction has proved intractable thus far, and the NEHRP program shifted its focus to minimizing losses from earthquakes after they occur. FEMA was created in 1979 and President Carter designated it as the lead agency for NEHRP. In 1980, Congress passed the Earthquake Hazards Reduction Act (P.L. 96-472), defining FEMA as the lead agency and authorizing additional funding for earthquake hazard preparedness and mitigation for FEMA and the National Bureau of Standards (now NIST).

A Shift in Program Emphasis to Hazard Reduction

NEHRP's original focus on research to predict earthquakes was changed in 1990, when Congress enacted P.L. 101-614. Congress decreased the emphasis on earthquake prediction, clarified the role of FEMA, clarified and expanded the program objectives, and required federal agencies to adopt seismic safety standards for new and existing federal buildings. In 2004, Congress enacted P.L. 108-360 and adjusted the program again by shifting primary responsibility for planning and coordinating NEHRP from FEMA to NIST. P.L. 108-360 also established a new interagency coordinating committee and a new advisory committee, both focused on earthquake hazards reduction.

The current program activities are focused on four broad areas:

- developing effective measures to reduce earthquake hazards;
- promoting the adoption of earthquake hazard reduction activities by federal, state, and local governments, national building standards and model building code organizations, engineers, architects, building owners, and others who play a role in planning and constructing buildings, bridges, structures, and critical infrastructure or "lifelines";¹
- improving the basic understanding of earthquakes and their effects on people and infrastructure, through interdisciplinary research involving engineering, natural sciences, and social, economic, and decision sciences; and
- developing and maintaining the Advanced National Seismic System (ANSS), the George E. Brown Jr. Network for Earthquake Engineering Simulation (NEES), and the Global Seismic Network (GSN).²

The House Science Committee report in the 108th Congress on H.R. 2608 (P.L. 108-360) noted that NEHRP has produced a wealth of useful information since 1977, but it also stated that the program's potential has been limited by the inability of the NEHRP agencies to coordinate their efforts.³ The committee asserted that restructuring the program with NIST as the lead agency, directing funding towards appropriate priorities, and implementing it as a true interagency program would lead to improvement.

The 2004 law directed the Director of NIST to chair the Interagency Coordinating Committee. Other members of the committee include the directors of FEMA, USGS, NSF, the Office of Science and Technology Policy, and the Office of Management and Budget. The Interagency Coordinating Committee is charged with overseeing the planning, management, and coordination of the program. Primary responsibilities for the NEHRP agencies break down as follows (see also **Figure 1**):

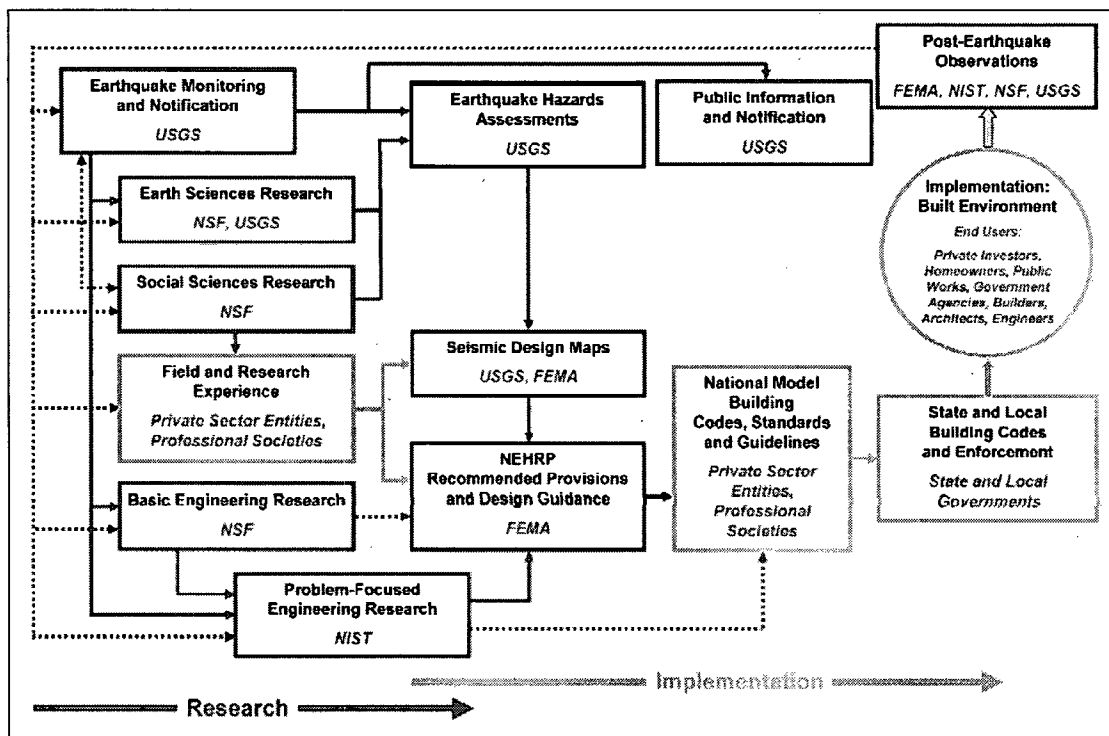
¹ Lifelines are essential utility and transportation systems.

² ANSS is a nationwide network of seismographic stations operated by the USGS. GSN is a global network of stations coordinated by the Incorporated Research Institutions for Seismology (IRIS, a nonprofit organization). NEES is an NSF-funded project that consists of 15 experimental facilities and an IT infrastructure with a goal of mitigating earthquake damage by the use of improved materials, designs, construction techniques, and monitoring tools.

³ U.S. House, Committee on Science, *National Earthquake Hazards Reduction Program Reauthorization Act of 2003*, H.Rept. 108-246 (Aug. 14, 2003), p. 13.

- NIST is the lead NEHRP agency and has primary responsibility for NEHRP planning and coordination. NIST supports the development of performance-based seismic engineering tools and works with FEMA and other groups to promote the commercial application of the tools through building codes, standards, and construction practices.
- FEMA assists other agencies and private-sector groups to prepare and disseminate building codes and practices for structures and “lifelines”, and aids development of performance-based codes for buildings and other structures.
- USGS conducts research and other activities to characterize and assess earthquake risks, and (1) operates a forum, using the National Earthquake Information Center (NEIC), for the international exchange of earthquake information; (2) works with other NEHRP agencies to coordinate activities with earthquake reduction efforts in other countries; and (3) maintains seismic hazard maps in support of building codes for structures and lifelines, and other maps needed for performance-based design approaches.
- NSF supports research to improve safety and performance of buildings, structures, and lifelines using the large-scale experimental and computational facilities of NEES and other institutions engaged in research and implementation of NEHRP.

Figure 1. NEHRP Agency Responsibilities and End Users of NEHRP Outcomes



Source: NEHRP program office at http://www.nehrp.gov/pdf/ppt_sdr.pdf (modified by CRS).

Table 1 shows the authorized and enacted appropriations for NEHRP from FY2005 through FY2010. The total enacted amount for FY2005-FY2009 was \$613.2 million, or 68% of the \$902.4 million total amount authorized in P.L. 108-360 over the five-year span. President Obama requested a total of \$129.7 million for NEHRP in FY2011, even though authorization of appropriations for the program under P.L. 108-360 expired at the end of FY2009.

Table 1. Authorized and Enacted Funding for NEHRP

(\$ millions)

		USGS	NSF	FEMA	NIST	Total
FY2005	Authorized	77.0	58.0	21.0	10.0	166.0
	Enacted	58.4	53.1	14.7	0.9	127.1
FY2006	Authorized	84.4	59.5	21.6	11.0	176.5
	Enacted	54.5	53.8	9.5	0.9	118.7
FY2007	Authorized	85.9	61.2	22.3	12.1	181.5
	Enacted	55.4	54.2	7.2	1.7	118.5
FY2008	Authorized	87.4	62.9	23.0	13.3	186.6
	Enacted	58.1	53.6	6.1	1.7	119.5
FY2009	Authorized	88.9	64.7	23.6	14.6	191.8
	Enacted	61.2	55.0	9.1	4.1	129.4
FY2010	Enacted	62.8	55.3	9.0	4.1	131.2
FY2011	Requested	62.3	54.3	9.0	4.1	129.7

Source: NEHRP program office, at <http://www.nehrp.gov/pdf/2010NEHRPAnnualReport.pdf>.

Notes: According to the NEHRP program office, ARRA funds are not included. The FY2011 requested budget is the estimated portion of the President's budget request that would be allocated for NEHRP activities. The FY2010 enacted amounts are estimates.

NEHRP Legislation in the 111th Congress

Title I of H.R. 3820, the Natural Hazards Risk Reduction Act of 2009, introduced in the 111th Congress, would have made changes to NEHRP and authorized appropriations for the program through FY2014. The bill was reported by the House Science and Technology Committee on February 26, 2010, and was passed by the House on March 2, 2010. The Senate did not act on the bill. The legislation would have retained NIST as the lead NEHRP agency, and authorized total appropriations of about \$906 million over five years. Title II of H.R. 3820 would have made changes to the National Windstorm Impact Reduction Act (first enacted in 2004 as Title II of P.L. 108-360 and modeled after NEHRP), and Title III would have created an interagency coordinating committee, chaired by the Director of NIST, to oversee the planning and coordination of both the earthquake and wind hazards programs. The single interagency coordinating committee would have replaced the two separate interagency committees overseeing the current earthquake and wind hazards programs.

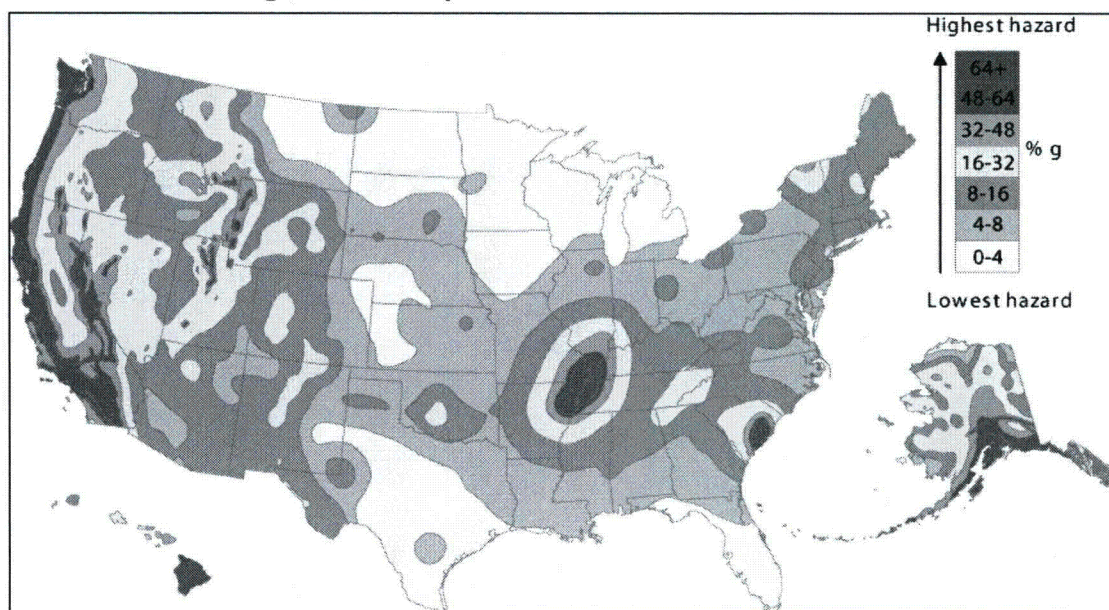
Earthquake Hazards and Risk

Portions of all 50 states and the District of Columbia are vulnerable to earthquake hazards, although risks vary greatly across the country and within individual states. Seismic hazards are greatest in the western United States, particularly in California, Washington, Oregon, and Alaska and Hawaii. Alaska is the most earthquake-prone state, experiencing a magnitude 7 earthquake almost every year and a magnitude 8 earthquake every 14 years on average. (See box below for a description of earthquake magnitude.) Because of its low population and infrastructure density, Alaska has a relatively low risk for large economic losses from an earthquake. In contrast, California has more citizens and infrastructure at risk than any other state because of the state's frequent seismic activity combined with its large population.

United States National Seismic Hazard Map

Figure 2 shows where earthquakes are likely to occur in the United States and how severe the earthquake magnitude and resulting ground shaking are likely to be. The map in **Figure 2** depicts the potential shaking hazard from future earthquakes. It is based on the frequency at which earthquakes occur in different areas and how far the strong shaking extends from the source of the earthquake. In **Figure 2**, the hazard levels indicate the potential ground motion—expressed as a percentage of the acceleration due to gravity (g). In a sense, the map shows the likelihood of where earthquakes could occur, and where the strongest shaking could take place.

Figure 2. Earthquake Hazard in the United States



Source: USGS Fact Sheet 2008-3018 (April 2008), at http://pubs.usgs.gov/fs/2008/3018/pdf/FS08-3018_508.pdf. Modified by CRS.

Note: The bar in the upper right shows the potential ground motion—expressed as a percentage of the acceleration due to gravity (g)—with up to a 1 in 50 chance of being exceeded over a 50-year period.

Figure 2 also shows relatively high earthquake hazard in the Rocky Mountain region, portions of the eastern seaboard—particularly South Carolina—and a part of the central United States known as the New Madrid Seismic Zone (see “The New Madrid Seismic Zone” below). Other portions of the eastern and northeastern United States are also vulnerable to moderate seismic hazard. According to the USGS, 75 million people in 39 states are subject to “significant risk.”⁴

Earthquake Magnitude and Intensity

Earthquake magnitude is a number that characterizes the relative size of an earthquake. It was historically reported using the *Richter scale* (magnitudes in this report are generally consistent with the Richter scale). Richter magnitude is calculated from the strongest seismic wave recorded from the earthquake, and is based on a logarithmic (base 10) scale: for each whole number increase in the Richter scale, the ground motion increases by 10 times. The amount of energy released per whole number increase, however, goes up by a factor of 32. The *moment magnitude* scale is another expression of earthquake size, or energy released during an earthquake, that roughly corresponds to the Richter magnitude and is used by most seismologists because it more accurately describes the size of very large earthquakes. Sometimes earthquakes will be reported using qualitative terms, such as Great or Moderate. Generally, these terms refer to magnitudes as follows: Great ($M > 8$); Major ($M > 7$); Strong ($M > 6$); Moderate ($M > 5$); Light ($M > 4$); Minor ($M > 3$); and Micro ($M < 3$).

Intensity is a measure of how much shaking occurred at a site based on observations and amount of damage. Intensity is usually reported on the Modified Mercalli Intensity Scale as a Roman numeral ranging from I (not felt) to XII (total destruction). The intensity of an earthquake depends on where the earthquake occurs, how it is felt by people, and the damage it causes. The lower numbers of the Modified Mercalli Intensity Scale generally refer to how the earthquake is felt by people, and the higher numbers are based on observed structural damage.

Modified Mercalli intensities that are typically observed at locations near the epicenters of earthquakes of different magnitudes are as follows:

Magnitude 1.0-3.0	Modified Mercalli Intensity I
Magnitude 3.0-3.9	Modified Mercalli Intensity II-III
Magnitude 4.0-4.9	Modified Mercalli Intensity IV-V
Magnitude 5.0-5.9	Modified Mercalli Intensity VI-VII
Magnitude 6.0-6.9	Modified Mercalli Intensity VII-IX
Magnitude 7.0+	Modified Mercalli Intensity VIII or higher

Source: USGS FAQs, at <http://earthquake.usgs.gov/learn/faq/>; and Magnitude/Intensity Comparison, at http://earthquake.usgs.gov/learn/topics/mag_vs_int.php.

2008 Update to the National Seismic Hazard Map

On April 21, 2008, the USGS released National Seismic Hazards Maps that updated the version published in 2002.⁵ Compared to the 2002 version, the new maps indicate lower ground motions (by 10% to 25%) for the central and eastern United States, based on modifications to the ground-motion models used for earthquakes. The new maps indicate that estimates of ground motion for the western United States are as much as 30% lower for certain types of ground motion, called long-period seismic waves, which affect taller, multi-story buildings. Ground motion that affects

⁴ U.S. Geological Survey, Dept. of the Interior, *Earthquake Hazards—A National Threat*, Fact Sheet 2006-3016, March 2006, <http://pubs.usgs.gov/fs/2006/3016/2006-3016.pdf>. During the period 1975-1995, only four states did not experience detectable earthquakes: Florida, Iowa, North Dakota, and Wisconsin. See USGS Earthquake Hazards Program, *Earthquake Facts*, at <http://earthquake.usgs.gov/learn/facts.php>.

⁵ USGS Fact Sheet 2008-3018, “2008 United States National Seismic Hazard Maps” (April 2008), at http://pubs.usgs.gov/fs/2008/3018/pdf/FS08-3018_508.pdf.

shorter buildings of a few stories, called short-period seismic waves, is roughly similar to the 2002 maps. The new maps show higher estimates for ground motion for western Oregon and Washington compared to the 2002 maps, due to new ground motion models for the offshore Cascadia subduction zone. In formulating the 2008 maps, the USGS gave more weight to the probability of a catastrophic magnitude 9 earthquake occurring along the Cascadia subduction zone. The Cascadia subduction zone fault ruptures, on average, every 500 years, and has the potential to generate destructive earthquakes and tsunamis along the coasts of Washington, Oregon, and northern California.

Earthquake Forecast for California

According to a report released on April 14, 2008, California has a 99% chance of experiencing a magnitude 6.7 or larger earthquake in the next 30 years.⁶ The likelihood of an even larger earthquake, magnitude 7.5 or greater, is 46%, and such an earthquake would likely occur in the southern part of the state. The fault with the highest probability of generating at least one earthquake of magnitude 6.7 or greater over the next 30 years is the San Andreas in southern California (59% probability); for northern California it is the Hayward-Rodgers Creek fault (31%). The earthquake forecasts are not predictions (i.e., they do not give a specific date or time), but represent probabilities over a given time period. In addition, the probabilities have variability associated with them. The earthquake forecasts are known as the “Uniform California Earthquake Rupture Forecast (UCERF)” and are produced by a working group composed of the USGS, the California Geological Survey, and the Southern California Earthquake Center.

How Many Earthquakes Occur Each Year?

The USGS estimates that several million earthquakes occur worldwide each year, but the majority are of small magnitude or occur in remote areas, and are not detectable. More earthquakes are detected each year as more seismometers⁷ are installed in the world, but the number of large earthquakes (magnitude greater than 6.0)⁸ has remained relatively constant. Between 2000 and 2008 there were between 2,261 and 3,876 earthquakes per year in the United States, according to the National Earthquake Information Center (NEIC). (See **Figure 3**.)

As **Figure 3** shows, about 98% of earthquakes detected each year by the NEIC are smaller than magnitude 5.0 (light earthquakes); only 63 earthquakes exceeded magnitude 6.0 (strong earthquakes) for the 10-year period (about 0.2% of the total earthquakes detected), for an average of about six earthquakes per year of at least 6.0 magnitude. Larger earthquakes, although infrequent, cause the most damage and are responsible for most earthquake-related deaths. The great San Francisco earthquake of 1906 claimed an estimated 3,000 lives, as a result of both the earthquake and subsequent fires. Over the past 100 years, relatively few Americans have died as a result of earthquakes, compared to citizens in some other countries.⁹ Since 1970, three strong

⁶ USGS Fact Sheet 2008-3027, “Forecasting California’s Earthquakes—What Can We Expect in the Next 30 Years?” (2008), at <http://pubs.usgs.gov/fs/2008/3027/fs2008-3027.pdf>.

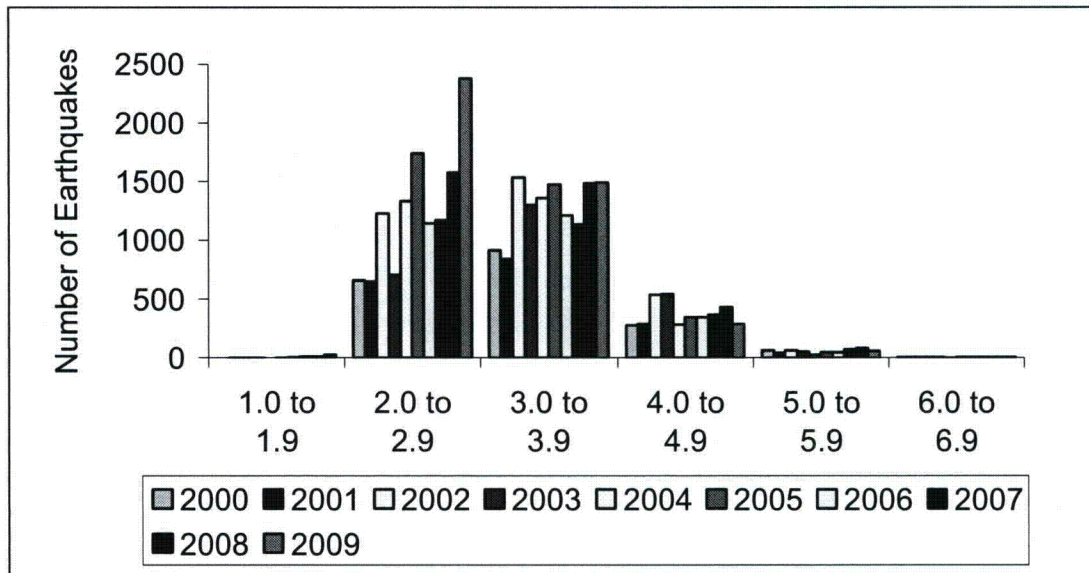
⁷ *Seismometers* are instruments that measure and record the size and force of seismic waves, essentially sound waves radiated from the earthquake as it ruptures. Seismometers generally consist of a mass attached to a fixed base. During an earthquake, the base moves and the mass does not, and the relative motion is commonly transformed into an electrical voltage that is recorded. A *seismograph* usually refers to the *seismometer* and the recording device, but the two terms are often used interchangeably.

⁸ See USGS “Earthquakes Facts and Statistics” at http://neic.usgs.gov/neis/eqlists/eqstats.html#table_2.

⁹ Estimates of earthquake-related fatalities vary, and an exact tally of deaths and injuries is rare. For more information (continued...)

earthquakes (greater than magnitude 6) in the United States were responsible for 188 of the 212 total earthquake-related fatalities. (See Table 2.)

Figure 3. Histogram of the Number of U.S. Earthquakes from 2000 to 2009 by Magnitude (1.0 to 6.9)



Source: USGS, "Earthquake Facts and Statistics," at <http://neic.usgs.gov/neis/eqlists/eqstats.html>; data as of January 6, 2011.

Note: Earthquakes greater than magnitude 7.0 and less than 1.0 are not shown. According to the USGS, 6 earthquakes of magnitude 7.0 or greater occurred in the United States between 2000 and 2009.

Table 2. Earthquakes Responsible for Most U.S. Fatalities Since 1970

Date	Location	Magnitude	Deaths
February 9, 1971	San Fernando Valley, CA	6.6	65
October 18, 1989	Loma Prieta, CA	6.9	63
January 17, 1994	Northridge, CA	6.7	60

Source: USGS, http://earthquake.usgs.gov/earthquakes/states/us_deaths.php.

Note: Other sources report different numbers of fatalities associated with the Northridge earthquake.

Earthquake Fatalities

Since 2000, only two deaths directly caused by earthquakes have occurred in the United States, both associated with falling debris in Paso Robles (CA) during the December 22, 2003, San Simeon earthquake of magnitude 6.5. In contrast, earthquakes have been directly or indirectly responsible for more than 685,000 fatalities in other countries since 2000.¹⁰ Approximately 65%

(...continued)

on the difficulties of counting earthquake-related deaths and injuries, see http://earthquake.usgs.gov/regional/world/casualty_totals.php.

¹⁰ U.S. Geological Survey, *Earthquakes with 1,000 or More Deaths Since 1900*, at http://earthquake.usgs.gov/earthquakes/world/world_deaths.php. This estimate does not include fatalities from the February 27, 2010, magnitude 8.8 Chilean earthquake, which has resulted in widespread destruction but few fatalities compared to the Indonesian, (continued...)

of those estimated deaths resulted from the December 2004 Indonesian earthquake (and resulting tsunami) of magnitude 9.1, and the January 2010 magnitude 7.0 earthquake in Haiti.

Estimating Potential Losses from Earthquakes

Estimating the seismic hazard for a region—as in **Figure 2**—is a first step in assessing risk. As a second step, shaking hazards maps are often combined with other data, such as the strength of existing buildings, to estimate possible damage in an area due to an earthquake. A third step in estimating potential losses would be in assigning value to the infrastructure at risk from earthquake damage. The combination of seismic risk, population, and vulnerable infrastructure can help improve the understanding of which urban areas across the United States face risks from earthquake hazards that may not be immediately obvious from the probability maps of shaking hazards alone, and what potential economic costs may be at stake.

The 1994 Northridge earthquake was the nation's most damaging earthquake in the past 100 years, preceded five years earlier by the second-most costly earthquake—Loma Prieta. Comparing losses between different earthquakes, and between earthquakes and other disasters such as hurricanes, can be difficult because of the different ways losses are calculated. Calculations may include a combination of insured losses, uninsured losses, and estimates of lost economic activity.

The United States faces potentially large total losses due to earthquake-caused damage to buildings and infrastructure and lost economic activity. As urban development continues in earthquake-prone regions in the United States, concerns are increasing about the exposure of the built environment, including utilities and transportation systems, to potential earthquake damage.¹¹ One estimate of economic loss from a severe earthquake in the Los Angeles area is over \$500 billion.¹² Another estimate of economic loss from a hypothetical 6.5 magnitude earthquake along the heavily populated central New Jersey-Philadelphia corridor would be even higher—approximately \$900 billion. The seismic hazard in the New Jersey-Philadelphia regions, however, is much lower than in the Los Angeles area, as shown in **Figure 2**.

Another approach to estimating potential losses is to “normalize” the damage estimates from past earthquakes by adjusting for inflation, increases in wealth, and changes in population. For example, adjusting the 1906 San Francisco earthquake and subsequent fire using 2005 dollars results in between \$39 billion and \$328 billion in losses, depending on assumptions and earthquake mitigation measures if that earthquake happened today.¹³

(...continued)

Pakistan, and Haiti earthquakes.

¹¹ FEMA Publication 366, *HAZUS MH Estimated Annualized Earthquake Losses for the United States* (April 2008), at <http://www.fema.gov/library/viewRecord.do?id=3265>. Hereafter referred to as FEMA 366.

¹² A. M. Best Company Inc., *2006 Annual Earthquake Study: \$100 Billion of Insured Loss in 40 Seconds* (Oldwick, NJ: A.M. Best Company, 2006), p. 12. The A. M. Best report includes estimates from catastrophe-modeling companies of predicted damage from hypothetical earthquakes in Los Angeles, the Midwest, the Northeast, and Japan. The report cites an estimate by one such company, Risk Management Solutions (RMS), that a hypothetical 7.4 magnitude event along the Newport-Inglewood Fault near Los Angeles would cause \$549 billion in total property damage. A hypothetical 6.5 magnitude earthquake along a fault between Philadelphia and New York City would produce \$901 billion in total loss, according to an RMS estimate.

¹³ Kevin Vranes and Roger Pielke, Jr., “Normalized Earthquake Damage and Fatalities in the United States: 1900- (continued...) ”

Some studies and techniques combine seismic risk with the value of the building inventory¹⁴ and income losses (e.g., business interruption, wage, and rental income losses) in cities, counties, or regions across the country to provide estimations of economic losses from earthquakes. An April 2008 report from FEMA calculated that the average *annualized* loss from earthquakes nationwide is \$5.3 billion, with California, Oregon, and Washington accounting for nearly \$4.1 billion (77%) of the U.S. total estimated average annualized loss.¹⁵ **Table 3** shows metropolitan areas with estimated average annualized U.S. earthquake losses over \$10 million.

Table 3. U.S. Metropolitan Areas with Estimated Annualized Earthquake Losses of More Than \$10 Million

(in \$ millions)

Rank	Metro area	AEL	Rank	Metro area	AEL
1	Los Angeles-Long Beach-Santa Ana, CA	\$1,312	23	Reno-Sparks, NV	\$29
2	San Francisco-Oakland-Fremont, CA	\$781	24	Charleston-North Charleston, SC	\$22
3	Riverside-San Bernadino-Ontario, CA	\$397	25	Columbia, SC	\$22
4	San Jose-Sunnyvale-Santa Clara, CA	\$277	26	Stockton, CA	\$21
5	Seattle-Tacoma, WA	\$244	27	Atlanta-Sandy Springs-Marietta, GA	\$19
6	San Diego-Carlsbad-San Marcos, CA	\$155	28	Bremerton-Silverdale, WA	\$18
7	Portland-Vancouver-Carlsbad, OR	\$137	29	Ogden-Clearfield, UT	\$18
8	Oxnard-Thousand Oaks-Ventura, CA	\$111	30	Salem, OR	\$17
9	Santa Rosa-Petaluma, CA	\$69	31	Eugene-Springfield, OR	\$17
10	St. Louis, MO-IL	\$59	32	Napa, CA	\$16
11	Salt Lake City, UT	\$52	33	San Luis Obispo-Paso Robles, CA	\$16
12	Sacramento-Arden-Arcade-Roseville, CA	\$52	34	Nashville-Davidson-Murfreesboro, TN	\$15
13	Vallejo-Fairfield, CA	\$40	35	Albuquerque, NM	\$15
14	Memphis, TN	\$38	36	Olympia, WA	\$14
15	Santa Cruz-Watsonville, CA	\$36	37	Modesto, CA	\$13
16	Anchorage, AK	\$35	38	Fresno, CA	\$13
17	Santa Barbara-Santa Maria-Goleta, CA	\$34	39	Evansville, IN-KY	\$12
18	Las Vegas-Paradise, NV	\$33	40	Birmingham-Hoover, AL	\$11
19	Honolulu, HI	\$32	41	El Centro, CA	\$11
20	Bakersfield, CA	\$30	42	Little Rock-North Little Rock, AR	\$11
21	New York-Northern New Jersey-Long Island, NY	\$30	43	Provo-Orem, UT	\$10
22	Salinas, CA	\$29			

Source FEMA Publication 366, *HAZUS MH Estimated Annualized Earthquake Losses for the United States* (April 2008). Annualized earthquake losses (AEL) calculated in 2005 dollars.

(...continued)

2005," *Natural Hazards Review*, vol. 10, no. 3 (August 2009), pp. 84-101.

¹⁴ Building inventory refers to four main inventory groups: (1) general building stock, (2) essential and high potential loss facilities, (3) transportation systems, and (4) utility systems (FEMA 366).

¹⁵ FEMA 366, p. 37.

Annualized earthquake loss (AEL) addresses two components of seismic risk: the probability of ground motion and the consequences of ground motion. It enables comparison between different regions with different seismic hazards and different building construction types and quality. For example, earthquake hazard is higher in the Los Angeles area than in Memphis, but the general building stock in Los Angeles is more resistant to the effects of earthquakes. The AEL annualizes the expected losses by averaging them by year.

A single large earthquake can cause far more damage than the average annual estimate. Annualized estimates, however, help provide comparisons of infrequent, high-impact events like damaging earthquakes with more frequently occurring hazards like floods, hurricanes, or other types of severe weather. The annualized earthquake loss values shown in **Table 3** represent future estimates, and are calculated by multiplying losses from potential future ground motions by their respective frequencies of occurrence, and then summing these values.¹⁶

Table 3 also shows that annualized earthquake losses in the New York-Northern New Jersey-Long Island metropolitan area are \$30 million (ranked 21 out of 43 metropolitan areas with losses greater than \$1 million per year), even though no destructive earthquakes have struck that area for generations.¹⁷ This area has a relatively low seismic hazard, but also has an extensive infrastructure and is densely populated. That combination of seismic risk, extensive infrastructure, and dense population produces a significant risk to people and structures, according to some estimates.¹⁸

A Decrease in Estimated Loss?

In its most recent publication estimating potential earthquake losses, FEMA noted that the \$5.3 billion in annualized earthquake loss nationwide was 21% higher than the \$4.4 billion calculated in FEMA's previous report, published in February 2001.¹⁹ However, the 2001 report calculated losses using 1994 dollars, and when adjusted to reflect 2005 dollars the earlier estimate increased to \$5.6 billion, indicating a small decrease in nationwide annualized earthquake loss potential since the 2001 report was published. According to FEMA, this loss occurred even though the national building inventory increased by 50% over this same period.

What factors led to a decreased estimate in potential loss despite growth in building inventory? According to FEMA, two primary factors were responsible: (1) a slight decrease in estimated earthquake hazard in the western United States (namely California) except for some parts of Washington and Utah, and (2) a change in the distribution of building inventory in California, with an increase in wood frame buildings of 17% and a reduction in the amount of masonry (-6%), steel (-5.8%), and concrete (-3%) buildings in the state.²⁰ Wood frame buildings are less vulnerable to earthquake damage, generally, compared to other construction types. Because California accounts for 66% of the overall nationwide annualized earthquake loss, a 17% increase

¹⁶ FEMA 366, p. 10.

¹⁷ The largest earthquakes in New York, New Jersey, and Massachusetts were, respectively: 1944, Massena, NY, magnitude 5.8, felt from Canada south to Maryland; 1783, New Jersey, magnitude 5.3, felt from New Hampshire to Pennsylvania; and 1755, Cape Ann and Boston, MA, intensity of VIII on the Modified Mercalli Scale, felt from Nova Scotia to Chesapeake Bay (USGS Earthquake Hazards Program).

¹⁸ USGS Circular 1188, Table 3.

¹⁹ FEMA 366, p. 32.

²⁰ *Ibid.*, p. 32 and p. 36.

in wood frame buildings had a proportionally large effect. In fact, FEMA attributed 78% of the loss reduction between 2001 and 2008 to the change in building inventory distribution, and 22% to the decrease in earthquake hazard for California.²¹

The New Madrid Seismic Zone

The New Madrid Seismic Zone in the central United States is vulnerable to large but infrequent earthquakes. A series of large (magnitude greater than 7.0) earthquakes struck the Mississippi Valley over the winter of 1811-1812, centered close to the town of New Madrid, MO. Some of the tremors were felt as far away as Charleston, SC, and Washington, DC. The mechanism for the earthquakes in the New Madrid zone is poorly understood,²² and no earthquakes of comparable magnitude have occurred in the area since these events.

Estimating earthquake damage is not an exact science and depends on many factors. As described above, these are primarily the probability of ground motion occurring in a particular area (see **Figure 2**), and the consequences of that ground motion, which are largely a function of building construction type and quality, and of the level of ground motion and shaking during the actual event. Such factors contribute to the difficulty of making a reasonable damage estimate for a low-frequency, high-impact event in the New Madrid region based on the probability of an earthquake of similar magnitude occurring. This uncertainty has implications for policy decisions to ameliorate risk, such as setting building codes, and for designing and building structures to withstand a level of shaking commensurate with the risk. Presumably, the same seismic hazard should lead to similar building codes in urban areas (e.g., in **Figure 2**, compare the seismic hazard for the New Madrid area with portions of California).

Some researchers have questioned whether erring on the side of caution in the New Madrid Seismic Zone is justified.²³ These researchers challenge whether the benefits of building structures to conform with the earthquake probability estimates merit the costs, in light of the uncertainty in making those probability estimates.²⁴ These analyses may call into question whether the probability of ground motion estimates for the New Madrid Seismic Zone (the bulls-eye-shaped area shown in **Figure 2** that includes parts of Arkansas, Illinois, Tennessee, and Missouri), and other regions of the country that experience infrequent earthquakes, are too high.²⁵ A contributing factor to the uncertainty in estimating the earthquake hazard in the New Madrid Seismic Zone is the small amount of ground motion measured across the major faults, compared to much faster motions measured across major faults in California.²⁶ Typically, seismologists

²¹ Ibid., p. 36.

²² In contrast to California, where earthquakes occur on the active margin of the North American tectonic plate, the New Madrid seismic zone is not on a plate boundary but may be related to old faults in the interior of the plate, marking a zone of tectonic weakness.

²³ Andrew Newman et al., "Slow Deformation and Lower Seismic Hazard in the New Madrid Seismic Zone," *Science*, v. 284 (April 23, 1999), pp. 619-621.

²⁴ Seth Stein, Joseph Tomasello, and Andrew Newman, "Should Memphis Build for California's Earthquakes?" *Eos*, v. 84, no. 19, (May 13, 2003), pp. 177, 184-185.

²⁵ Seth Stein, "Code Red: Earthquake Imminent?" *Earth*, vol. 54, no. 1 (January 2009), pp. 52-59.

²⁶ Some researchers measure, for example, less than 2 millimeters of ground motion per year in the New Madrid Seismic Zone using modern GPS technology. In contrast, motion across the San Andreas Fault in California is about 36 millimeters per year. See Seth Stein, *Disaster Deferred: How New Science is Changing Our View of Earthquake Hazards in the Midwest* (New York: Columbia University Press, 2010), pp. 4-5.

estimate the stress that builds up on a fault by measuring ground motion across the fault: the faster the motion, the more quickly the stress builds up. The buildup of stress may be ultimately released in an earthquake during which the rocks on one side of the fault move relative to the other side. Generally, for fast-moving faults such as the San Andreas Fault, the period of earthquake recurrence is short compared to faults where the ground motion is relatively slow.

Yet despite the uncertainty raised by some researchers because of the apparent lack of much ground motion, the USGS attributes a seismic hazard to areas of the New Madrid Seismic Zone comparable to the most seismically active portions of California (see **Figure 2**), where earthquakes are much more frequent, and the mechanisms for generating earthquakes are better understood. The lack of much ground motion is a confusing factor for scientists trying to understand the New Madrid Seismic Zone, which experienced three major earthquakes 200 years ago but does not seem to exhibit much ground motion today. In part because of the 200th anniversary of the three major earthquakes, FEMA is planning a National Level Exercise (NLE 2011) that will focus on a scenario of a catastrophic earthquake in the New Madrid Seismic Zone and will encompass eight states: Alabama, Arkansas, Kentucky, Illinois, Indiana, Mississippi, Missouri, and Tennessee. The NLE 2011 will be conducted in May 2011.²⁷

Earthquakes in Haiti, Chile, and Japan—Some Comparisons

The magnitude 8.8 earthquake that struck Chile on February 27, 2010, was over 60 times larger than the magnitude 7.0 earthquake that destroyed Port-au-Prince, Haiti, less than two months earlier. Yet the number of deaths and the amount of damage in Haiti far exceeded damage and fatalities in Chile. The Chile earthquake occurred offshore, and was deeper and farther away from major cities than the Haiti earthquake; in addition, the infrastructure in Chile—buildings, highways, bridges—appears to have been built to withstand earthquake shaking far better than similar infrastructure in Haiti. Japan's magnitude 9.0 earthquake on March 11, 2011, was even larger and more destructive than the Chile earthquake, but a large portion of the damage was caused by a powerful tsunami. The three countries faced significant seismic hazards, although the hazards facing Chile and Japan were arguably better known, because Chile experienced a great (magnitude 9.5) earthquake in 1960²⁸ and Japan experienced a very damaging earthquake in Kobe in 1995 and has a long history of seismic activity. By contrast, Haiti had last experienced a large earthquake in 1860 (earthquakes in 1751 and 1770 destroyed Port-au-Prince; the 1860 earthquake struck farther west). In addition to the seismic *hazard*, which is a consequence of geology and plate tectonics, Haiti's vulnerability to earthquake shaking appears to have exceeded Chile's. Japan's dense population and infrastructure, in particular the nuclear power reactors located on the northeast coastline close to the epicenter, increased its vulnerability to the March 11 earthquake and tsunami. However, Haiti was at greater *risk* of fatalities—from the earthquake and resulting damage to buildings—than Chile or Japan, even though Japan's March 11, 2011, earthquake was approximately 100 times larger than the Haiti earthquake.

²⁷ See FEMA, National Level Exercise NLE 2011 Private Sector Participation, at http://www.fema.gov/privatesector/take_action.shtm#2.

²⁸ According to the USGS, the May 22, 1960, magnitude 9.5 earthquake was the largest earthquake in the world. See http://earthquake.usgs.gov/earthquakes/world/events/1960_05_22.php.

January 12, 2010, Magnitude 7.0 Earthquake in Haiti

On Tuesday, January 12, 2010, a magnitude 7.0 earthquake struck Haiti at 4:53 p.m. The epicenter was located approximately 15 miles west-southwest of Port-au-Prince, and the earthquake occurred at a depth of about 8 miles, according to the USGS.²⁹ The relatively shallow earthquake, and its close proximity to the capital city, exposed millions of Haitians to severe to violent ground shaking. The earthquake occurred along the Enriquillo-Plantain Garden fault system, a major east-west trending strike-slip fault system that lies between the Caribbean tectonic plate and the North American tectonic plate; the Caribbean plate actively moves against the North American plate and shear stresses are created at the boundary. At a strike-slip fault, the rocks move past each other horizontally along the fault line (in contrast to a thrust fault, where rocks on one side of the fault move on top of the rocks on the other side). Other examples of strike-slip faults are the San Andreas fault in California and the Red River fault in China.

The January 12, 2010, earthquake caused widespread damage in the Port-au-Prince area, causing approximately 223,000 deaths and 300,000 injuries.³⁰ Also, a series of aftershocks followed the main earthquake. There were 14 aftershocks greater than magnitude 5, and 36 greater than magnitude 4, within the first day following the magnitude 7.0 event. Aftershocks have the potential to cause further damage, especially to structures weakened by the initial large earthquake. The USGS noted that buildings in the Port-au-Prince area will continue to be at risk from strong earthquake shaking, and that the fault responsible for the January 12, 2010, earthquake still stores sufficient strain to be released as a large, damaging earthquake during the lifetime of structures built during the reconstruction effort.³¹

The USGS based its probability estimates on techniques developed to assess earthquake hazards in the United States. Using these techniques, the USGS estimated that the probability of a magnitude 7 or greater earthquake occurring within the next 50 years along the Enriquillo fault near Port-au-Prince is between 5% and 15%. The range of probabilities reflects the current understanding of the seismicity and tectonics of the Haiti region. By comparison, the USGS has estimated that the probability of a magnitude 7 or greater earthquake occurring within the next 50 years along the Hayward-Rodgers Creek fault east of San Francisco is about 15%.³²

February 27, 2010, Magnitude 8.8 Earthquake in Chile

A magnitude 8.8 earthquake struck Chile on February 27, 2010, along a subduction zone plate boundary fault 65 miles north-northeast of the city of Concepcion and offshore of the Chilean coast.³³ The earthquake occurred at a depth of approximately 22 miles below the seafloor, much deeper than the earthquake that struck Haiti on January 12, 2010. The city of Concepcion experienced intensity IX shaking on the Modified Mercalli Intensity Index, corresponding to considerable damage to specially designed structures, and corresponding to great damage to “substantial” buildings. The capital city of Santiago, located 200 miles northeast of the epicenter,

²⁹ USGS Earthquake Hazards Program, at <http://earthquake.usgs.gov/earthquakes/eqinthenews/2010/us2010rja6/>.

³⁰ See <http://earthquake.usgs.gov/earthquakes/eqinthenews/2010/us2010rja6/#summary>.

³¹ USGS statement, “USGS Updates Assessment of Earthquake Hazard and Safety in Haiti and the Caribbean,” February 23, 2010, at http://www.usgs.gov/newsroom/article.asp?ID=2413&from=rss_home.

³² *Ibid.* However, the USGS also notes that the probability of a magnitude 6.7 or greater earthquake occurring on the Hayward-Rodgers fault over the next 30 years is 31%.

³³ See <http://earthquake.usgs.gov/earthquakes/eqinthenews/2010/us2010tfan/#details>.

experienced intensity VIII shaking corresponding to considerable damage in ordinary substantial buildings.³⁴ The earthquake caused an estimated \$30 billion in total economic damage.³⁵ Over 500 deaths were reported, many from the tsunami generated by the subsea earthquake, and approximately 1.8 million people were affected.

Because the earthquake occurred offshore, it generated a tsunami, which struck parts of the Chilean coastline and offshore islands, causing damage and fatalities. Tsunami warnings were issued by the National Weather Service Pacific Tsunami Warning Center for Hawaii, Japan, and other regions bordering the Pacific Ocean that may have been vulnerable to a damaging tsunami wave, although most regions far from the epicenter did not experience any serious damage. A tsunami caused significant damage to the city of Hilo, Hawaii, following the May 1960 magnitude 9.5 earthquake that also occurred along the subduction zone fault about 143 miles south of the February 27, 2010, earthquake.³⁶ Why the 1960 earthquake generated a tsunami that caused damage and fatalities in Hawaii, Japan, and the Philippines, while the 2010 earthquake did not, is not yet well understood and is being actively studied.

The magnitude 8.8 earthquake occurred along the boundary between the Nazca tectonic plate and the South American tectonic plate, which converge at a rate of about 3 inches per year. The Nazca plate is subducting under the South American plate, which rides over the top of the Nazca plate. In geologic terms, this is known as a thrust fault or megathrust, in contrast to a strike-slip fault, where the rocks on either side of the fault slide past each other. The San Andreas fault and the Enriquillo fault that caused the January 2010 Haiti earthquake are strike-slip faults. The Sumatran-Andaman megathrust fault, which triggered the December 2004 Indonesian earthquake and tsunami, is a subduction zone fault or megathrust geologically similar to the Nazca-South American tectonic plate subduction zone.

March 11, 2011, Magnitude 9.0 Earthquake in Japan

A 9.0 magnitude massive earthquake struck off Japan's northeast coast near Honshu on Friday, March 11, 2011 (12:46 a.m. eastern time in the United States). The earthquake triggered a tsunami that caused widespread devastation to parts of the coastal regions in Japan closest to the earthquake epicenter. The epicenter was located about 80 miles east of Sendai, and about 230 miles northeast of Tokyo, and it occurred at a depth of approximately 20 miles beneath the seafloor.³⁷

The earthquake resulted from thrust faulting along the subduction zone plate boundary between the Pacific and North America plates, and this is similar tectonically to the motion described for the 2010 Chile earthquake. Where the earthquake occurred, the Pacific plate is moving westward and sliding underneath the North America plate at just over 3 inches per year. (See **Figure 4**.) This is similar to the convergence rate of the Nazca plate and the South American plate on the west side of Chile, where the February 27, 2010, earthquake occurred. The convergence zone between the Pacific plate and North America plate creates an undersea feature known as the Japan Trench. According to the USGS, tectonic plate motion in the Japan Trench subduction zone has

³⁴ See <http://earthquake.usgs.gov/earthquakes/eqinthenews/2010/us2010tfan/#summary>.

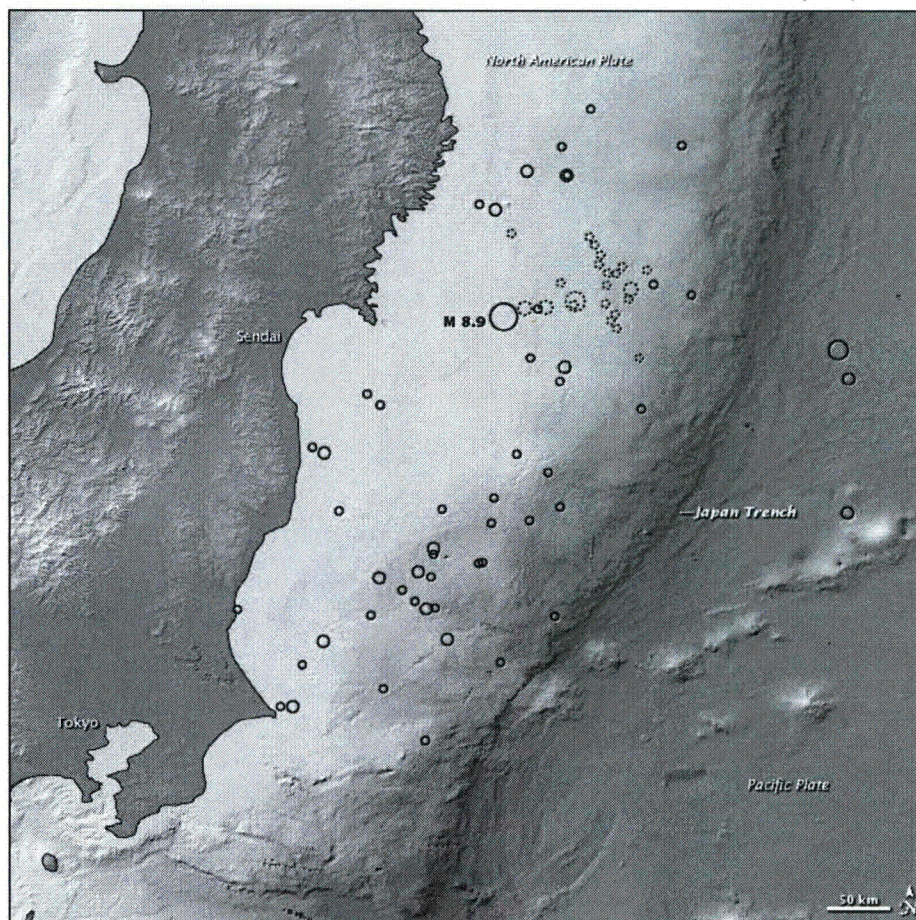
³⁵ *Ibid.*

³⁶ *The Orphan Tsunami of 1700—Japanese Clues to a Parent Earthquake in North America*, USGS, Professional Paper 1707, 2005, <http://pubs.usgs.gov/pp/pp1707/>.

³⁷ USGS, Earthquake Hazards Program, <http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/>.

triggered nine magnitude 7 or greater earthquakes since 1973.³⁸ Also, records indicate that large offshore earthquakes occurred in the same subduction zone in 1611, 1896, and 1933, each producing tsunamis that caused great destruction and fatalities.³⁹ According to records, the 1896 earthquake created tsunami waves of over 100 feet high and a reported death toll of 27,000.⁴⁰

Figure 4. Image of the Japan Trench and Location of the March 11, 2011, Earthquake
(the Pacific plate is moving west and underneath the North America plate)



Source: NASA, Earth Observatory, March 11, 2011, <http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=49621>.

Notes: Large circle depicts epicenter of the earthquake (upgraded to magnitude 9.0); solid circles indicate aftershocks, dotted circles indicate foreshocks (smaller earthquakes that occurred prior to the major earthquake).

³⁸ USGS Earthquake Hazards Program, <http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/#summary>.

³⁹ Ibid.

⁴⁰ For more information on the March 11, 2011, Japan tsunami, and the U.S. tsunami monitoring network, see CRS Report R41686, *U.S. Tsunami Programs: A Brief Overview*, by Peter Folger.

Is There a Similar Risk to the United States?

Subduction zone megathrust faults generate the largest earthquakes in the world. The Cascadia Subduction Zone megathrust that stretches from mid-Vancouver Island in southern British Columbia southward to Cape Mendocino in northern California has the potential to generate a very large earthquake, similar in magnitude to the February 2010 Chilean earthquake and the March 11, 2011, Japan earthquake. The fault's proximity to the northwestern U.S. coastline—approximately 50-100 miles offshore—also poses a significant tsunami hazard; destructive waves from a large earthquake along the fault could reach the coast of Oregon and Washington in less than an hour, possibly in tens of minutes. The Cascadia Subduction Zone fault forms the boundary between the subducting Juan de Fuca tectonic plate and the overriding North America plate, very similar to the relationship between the Nazca plate and the South American plate off the Chilean coast, and the Pacific plate and North America plate east of Japan. If the Cascadia Subduction Zone megathrust were to “unzip” or rupture along a large section of its entire length, models indicate that it would likely generate a megathrust earthquake near magnitude 9 or more, similar to the 1964 Alaskan earthquake, the 1960 and 2010 Chilean earthquakes, the 2004 Indonesian earthquake, and the 2011 Japan earthquake. Scientists have documented that the last time this occurred along the Cascadia Subduction Zone fault was in 1700. The 1700 earthquake spawned a tsunami that traveled across the Pacific Ocean and struck Japan. Because of the similarities in the subduction zone megathrust faults, scientists hope to learn a great deal about the seismic hazard in the Pacific Northwest by studying the unique strong ground motion recordings from the 2010 Chilean magnitude 8.8 earthquake and the 2011 Japan earthquake.

Monitoring

Congress authorized the USGS to monitor seismic activity in the United States in the 1990 law modifying NEHRP (P.L. 101-614). The USGS operates a nationwide network of seismographic stations called the Advanced National Seismic System (ANSS), which includes the National Strong-Motion Project (NSMP). Globally, the USGS and the Incorporated Research Institutions for Seismology (IRIS) operate 140 seismic stations of the Global Seismic Network (GSN) in more than 80 countries.⁴¹ The GSN provides worldwide coverage of earthquakes, including reporting and research.⁴²

Advanced National Seismic System (ANSS)

According to the USGS, “the mission of ANSS is to provide accurate and timely data and information products for seismic events, including their effects on buildings and structures, employing modern monitoring methods and technologies.”⁴³ If fully implemented, ANSS would encompass more than 7,000 earthquake sensor systems covering portions of the nation that are vulnerable to earthquake hazards. As envisioned, the system would consist of dense urban networks, regional networks, and backbone stations.

⁴¹ IRIS is a university research consortium, primarily funded by NSF, that collects and distributes seismographic data.

⁴² The GSN also monitors nuclear explosions.

⁴³ USGS Earthquake Hazards Program, <http://earthquake.usgs.gov/research/monitoring/anss/>.

ANSS Funding

Congress first authorized the ANSS program in P.L. 106-503 at a level of \$38 million for FY2002 and \$44 million for FY2003. The 2004 reauthorization of NEHRP (P.L. 108-360) authorized \$30 million for ANSS in FY2005 and then \$36 million per year through FY2009. From FY2000 through FY2010, the USGS has spent a total of \$68.2 million on ANSS-directed funding,⁴⁴ although expenditures have never reached authorized levels since Congress first authorized appropriations for ANSS. Of the \$8.8 million for ANSS-directed funding in FY2009, about \$1.5 million was devoted to the development, modernization, and expansion of the system; the remainder of FY2009 funding was used to operate the existing system.⁴⁵ By the end of 2009, the USGS and its partners had installed a cumulative total of 886 ANSS earthquake monitoring stations.⁴⁶

The American Recovery and Reinvestment Act (ARRA, P.L. 111-5) provided an additional \$19 million for ANSS.⁴⁷ The ARRA funding for ANSS was provided for modernization of the current system, and is approximately 70% expended. The remainder of the ARRA funding for ANSS is expected to be expended by the end of FY2011.⁴⁸

Dense Urban Networks

In the original conception for ANSS, approximately 6,000 of the planned stations would have been installed in 26 high-risk urban areas to monitor strong ground shaking and how buildings and other structures respond. Currently, five high-risk urban areas have instruments deployed in sufficient density to generate the data to produce near real-time maps,⁴⁹ called ShakeMaps, which can be used in emergency response during and after an earthquake.⁵⁰ (See “ShakeMap,” below.)

Backbone Stations

Approximately 100 instruments comprise the existing “backbone” of ANSS, with a roughly uniform distribution across the United States, including Alaska and Hawaii. These instruments provide a broad and uniform minimum threshold of coverage across the country. The backbone network consists of USGS-deployed instruments and other instruments that serve both ANSS and the EarthScope project (described below, under “National Science Foundation”).

⁴⁴ USGS FY2011 Budget Justification, p. J-9, at http://www.usgs.gov/budget/2011/greenbook/FY2011_USGS_Greenbook.pdf.

⁴⁵ Email from William Leith, Advanced National Seismic System Coordinator, USGS, December 22, 2009.

⁴⁶ USGS FY2011 Budget Justification, p. J-10.

⁴⁷ USGS FY2011 Budget Justification, p. J-10.

⁴⁸ E-mail from William Leith, USGS, January 11, 2011.

⁴⁹ The five urban areas are Los Angeles, San Francisco, Seattle, Salt Lake City, and Anchorage. E-mail from William Leith, USGS, February 7, 2011.

⁵⁰ The number of stations necessary to generate a data-based ShakeMap depends on the urban area and geology, but roughly correspond to about half the number of planned stations per urban area, at a spacing of about 20 kilometers between stations. Personal communication, William Leith, USGS, January 11, 2010.

National Strong-Motion Project (NSMP)

Under ANSS, the USGS operates the NSMP to record seismic data from damaging earthquakes in the United States on the ground and in buildings and other structures in densely urbanized areas. The program currently has approximately 1,280 strong-motion⁵¹ instruments across the United States and in the Caribbean. The NSMP has three components: data acquisition, data management, and research. The near real-time measurements collected by the NSMP are used by other government agencies for emergency response and real-time warnings. If fully implemented, the ANSS program would deploy about 3,000 strong-motion instruments. Many of the current NSMP instruments are older designs and are being upgraded with modern seismometers.

Regional Networks

If ANSS were fully implemented under its original conception, approximately 1,000 new instruments would replace aging and obsolete stations in the networks that now monitor the nation's most seismically active regions. The current regional networks contain a mix of modern, digital, broadband, and high-resolution instruments that can provide real-time data; they are supplemented by older instruments that may require manual downloading of data. Universities in the region typically operate the regional networks and will likely continue to do so as ANSS is implemented.

Global Seismic Network (GSN)

The GSN is a system of broadband digital seismographs arrayed around the globe and designed to collect high-quality data that are readily accessible to users worldwide, typically via computer. Currently, 140 stations have been installed in 80 countries and the system is nearly complete, although in some regions the spacing and location of stations has not fully met the original goal of uniform spacing of approximately 2,000 kilometers. The system is currently providing data to the United States and other countries and institutions for earthquake reporting and research, as well as for monitoring nuclear explosions to assess compliance with the Comprehensive Test Ban Treaty.

The Incorporated Research Institutions for Seismology (IRIS) coordinates the GSN and manages and makes available the large amounts of data that are generated from the network. The actual network of seismographs is organized into two main components, each managed separately. The USGS operates two-thirds of the stations from its Albuquerque Seismological Laboratory, and the University of California-San Diego manages the other third via its Project IDA (International Deployment of Accelerometers). Other universities and affiliated agencies and institutions operate a small number of additional stations. IRIS, with funding from the NSF, supports all of the stations not funded through the USGS appropriations. Funding for the GSN is provided via annual appropriations from the USGS and the National Science Foundation. In addition, the USGS committed \$4.7 million from ARRA funding to the GSN, and NSF committed a similar portion of its ARRA funding to replace obsolete equipment on GSN stations worldwide.⁵²

⁵¹ Strong motion seismometers, or accelerometers, are special sensors that measure the acceleration of the ground during large (>6.0 magnitude) earthquakes.

⁵² USGS FY2011 Budget Justification, p. J-32. Annual appropriations for GSN totaled approximately \$9 million for FY2009 and reflect the combined appropriations for USGS and NSF. The USGS portion of annual appropriations in (continued...)

Detection, Notification, and Warning

Unlike other natural hazards, such as hurricanes, where predicting the location and timing of landfall is becoming increasingly accurate, the scientific understanding of earthquakes does not yet allow for precise earthquake prediction. Instead, notification and warning typically involves communicating the location and magnitude of an earthquake as soon as possible after the event to emergency response providers and others who need the information.

Some probabilistic earthquake forecasts are now available that give, for example, a 24-hour probability of earthquake aftershocks for a particular region, such as California. These forecasts are not predictions, and are currently intended to increase public awareness of the seismic hazard, improve emergency response, and increase scientific understanding of the short-term hazard.⁵³ In the California example, a time-dependent map is created and updated every hour by a system that considers all earthquakes, large and small, detected by the California Integrated Seismic Network,⁵⁴ and calculates a probability that each earthquake will be followed by an aftershock⁵⁵ that can cause strong shaking. The probabilities are calculated from known behavior of aftershocks and the possible shaking pattern based on historical data.

When a destructive earthquake occurs in the United States or in other countries, the first reports of its location, or epicenter,⁵⁶ and magnitude originate either from the National Earthquake Information Center (NEIC), or from one of the regional seismic networks that are part of ANSS. Other organizations, such as universities, consortia, and individual seismologists may also contribute information about the earthquake after the event. Products such as ShakeMap (described below) are assembled as rapidly as possible to assist in emergency response and damage estimation following a destructive earthquake.

National Earthquake Information Center (NEIC)

The NEIC, part of the USGS, is located in Golden, CO. Originally established as part of the National Ocean Survey (U.S. Department of Commerce) in 1966, the NEIC was made part of the USGS in 1973. With data gathered from the networks described above and from other sources, the NEIC determines the location and size of all destructive earthquakes that occur worldwide and disseminates the information to the appropriate national or international agencies, government public information channels, news media, scientists and scientific groups, and the general public.

(...continued)

FY2010 was \$5.8 million.

⁵³ USGS Open-File Report 2004-1390, and California 24-hour Aftershock Forecast Map, at <http://pasadena.wr.usgs.gov/step/>.

⁵⁴ The California Integrated Seismic Network is the California region of ANSS; see <http://www.cisn.org/>.

⁵⁵ Earthquakes typically occur in clusters, in which the earthquake with the largest magnitude is called the main shock, events before the main shock are called foreshocks, and those after are called aftershocks. See also <http://pasadena.wr.usgs.gov/step/aftershocks.html>.

⁵⁶ The *epicenter* of an earthquake is the point on the earth's surface directly above the hypocenter. The *hypocenter* is the location beneath the earth's surface where the fault rupture begins.

With the advent of the USGS Earthquake Notification Service (ENS), notifications of earthquakes detected by the ANSS/NEIC are provided free to interested parties. Users of the service can specify the regions of interest, establish notification thresholds of earthquake magnitude, designate whether they wish to receive notification of aftershocks, and even set different magnitude thresholds for daytime or nighttime to trigger a notification.

The NEIC has long-standing agreements with key emergency response groups, federal, state, and local authorities, and other key organizations in earthquake-prone regions who receive automated alerts—typically location and magnitude of an earthquake—within a few minutes of an event in the United States. The NEIC sends these preliminary alerts by email and pager immediately after an earthquake's magnitude and epicenter are automatically determined by computer.⁵⁷ This initial determination is then checked by around-the-clock staff who confirm and update the magnitude and location data.⁵⁸ After the confirmation, a second set of notifications and confirmations are triggered to key recipients by email, pager, fax, and telephone.

For earthquakes outside the United States, the NEIC notifies the State Department Operations Center, and often sends alerts directly to staff at American embassies and consulates in the affected countries, to the International Red Cross, the U.N. Department of Humanitarian Affairs, and other recipients who have made arrangements to receive alerts.

ShakeMap

Traditionally, the information commonly available following a destructive earthquake has been epicenter and magnitude, as in the data provided by the NEIC described above. Those two parameters by themselves, however, do not always indicate the intensity of shaking and extent of damage following a major earthquake. Recently, the USGS developed a product called ShakeMap that provides a nearly real-time map of ground motion and shaking intensity following an earthquake in areas of the United States where the ShakeMap system is in place. **Figure 5** shows an example of a ShakeMap.

The maps produced portray the extent of damaging shaking and can be used by emergency response and for estimating loss following a major earthquake. Currently, ShakeMaps are available for northern California, southern California, the Pacific Northwest, Nevada, Utah, Hawaii, and Alaska.⁵⁹

With improvements to the regional seismographic networks in the areas where ShakeMap is available, new real-time telemetry from the region, and advances in digital communication and computation, ShakeMaps are now triggered automatically and made available within minutes of the event via the web. In addition, better maps are now available because of recent improvements in understanding the relationship between the ground motions recorded during the earthquake and the intensity of resulting damage. If databases containing inventories of buildings and lifelines are available, they can be combined with shaking intensity data to produce maps of estimated damage. The ShakeMaps have limitations, especially during the first few minutes following an

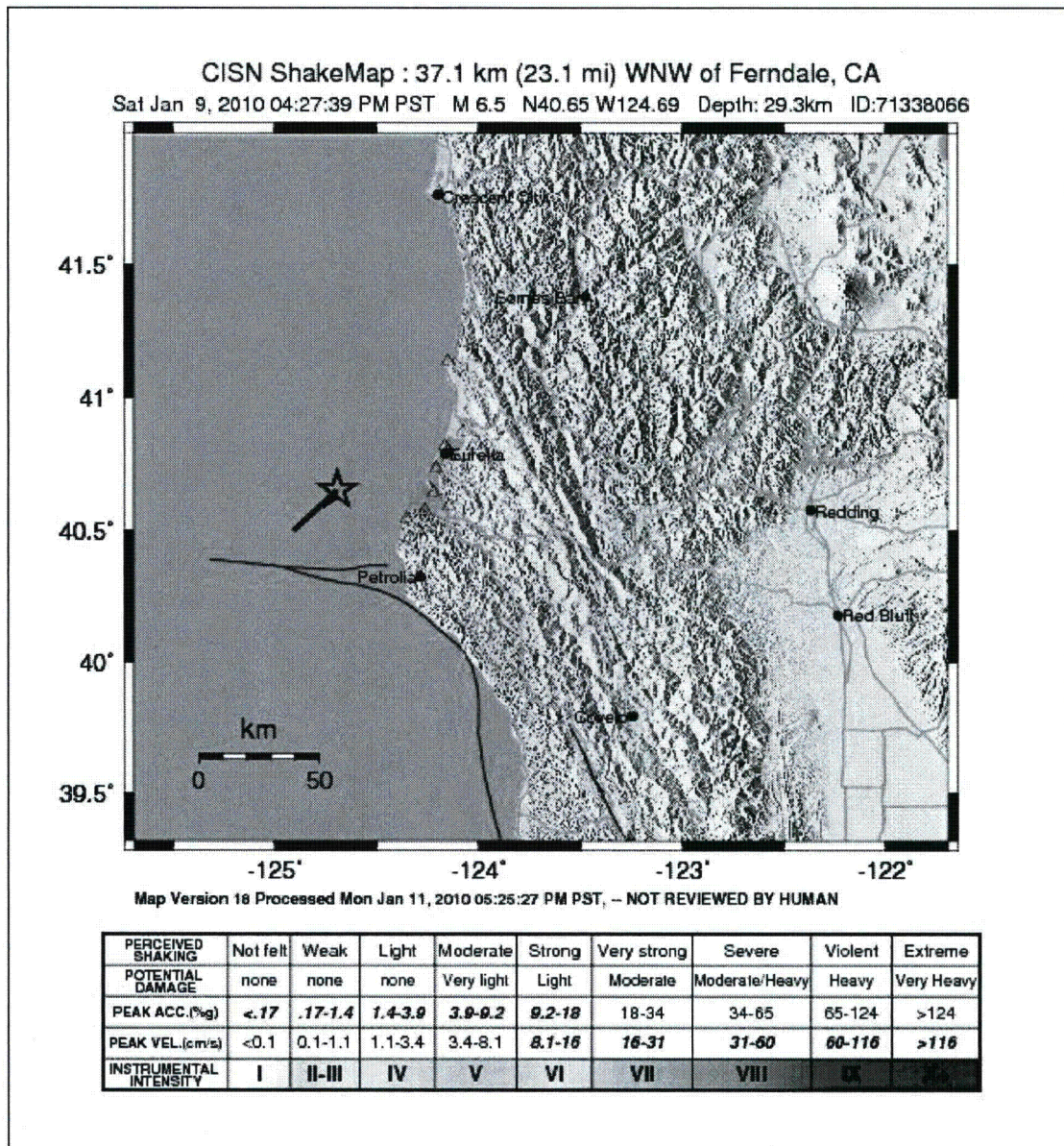
⁵⁷ Stuart Simkin, NEIC, Golden, CO, telephone conversation, Nov. 4, 2006.

⁵⁸ In early 2006, the NEIC implemented an around-the-clock operation center and seismic event processing center in response to the Indonesian earthquake and resulting tsunami of December 2004. Funding to implement 24/7 operations was provided by P.L. 109-13.

⁵⁹ ShakeMaps for some areas outside the United States are also available. See <http://earthquake.usgs.gov/eqcenter/shakemap/>.

earthquake before additional data arrive from distributed sources. Because they are generated automatically, the initial maps are preliminary, and may not have been reviewed by experts when first made available. They are considered a work in progress, but are deemed to be very promising, especially as more modern seismic instruments are added to the regional networks under ANSS and computational and telecommunication abilities improve.

Figure 5. Example of a ShakeMap



Source: USGS, <http://earthquake.usgs.gov/eqcenter/shakemap/nc/shake/71338066/>.

Note: Earthquake occurred 23.1 miles west-northwest of Ferndale, CA, at 4:27 p.m. on January 9, 2010, with a magnitude of 6.5. The star indicates the epicenter of the earthquake. Viewed on January 12, 2010.

Prompt Assessment of Global Earthquakes for Response (PAGER)

Another USGS product that is designed to provide nearly real-time earthquake information to emergency responders, government agencies, and the media is the Prompt Assessment of Global Earthquakes for Response, or PAGER, system.⁶⁰ This automated system rapidly assesses the number of people, cities, and regions exposed to severe shaking by an earthquake, and generally makes results available within 30 minutes. Following the determination of earthquake location and magnitude, the PAGER system calculates the degree of ground shaking using the methodology developed for ShakeMap, estimates the number of people exposed to various levels of shaking, and produces a description of the vulnerability of the exposed population and infrastructure. The vulnerability includes potential for earthquake-triggered landslides, which could be devastating, as was the case for the huge May 12, 2008, earthquake in Sichuan, China. The automated and rapid reports produced by the PAGER system provide an advantage compared to the traditional accounts from eye-witnesses on the ground or media reports, because communications networks may have been disabled from the earthquake. Emergency responders, relief organizations, and government agencies could make plans based on PAGER system reports even before getting “ground-truth” information from eye-witnesses and the media.⁶¹ **Figure 6** shows an example of PAGER output for the January 12, 2010, magnitude 7.0 earthquake in Haiti.

Pre-disaster Planning: HAZUS-MH

FEMA developed a methodology and software program called the Hazards U.S. Multi-Hazard (HAZUS-MH).⁶² The program allows a user to estimate losses from damaging earthquakes, hurricane winds, and floods before a disaster occurs. The pre-disaster estimates could provide a basis for developing mitigation plans and policies, preparing for emergencies, and planning response and recovery. HAZUS-MH combines existing scientific knowledge about earthquakes (for example, ShakeMaps, described above), engineering information that includes data on how structures respond to shaking, and geographic information system (GIS) software to produce maps and display hazards data including economic loss estimates. The loss estimates produced by HAZUS-MH include

- physical damage to residential and commercial buildings, schools, critical facilities, and infrastructure;
- economic loss, including lost jobs, business interruptions, repair and reconstruction costs; and
- social impacts, including estimates of shelter requirements, displaced households, and number of people exposed to the disaster.

In addition to furnishing information as part of earthquake mitigation efforts, HAZUS-MH can also be used to support real-time emergency response activities by state and federal agencies after a disaster. Twenty-seven HAZUS-MH user groups—cooperative ventures among private, public, and academic organizations that use the HAZUS-MH software—have formed across the United States to help foster better-informed risk management for earthquakes and other natural hazards.⁶³

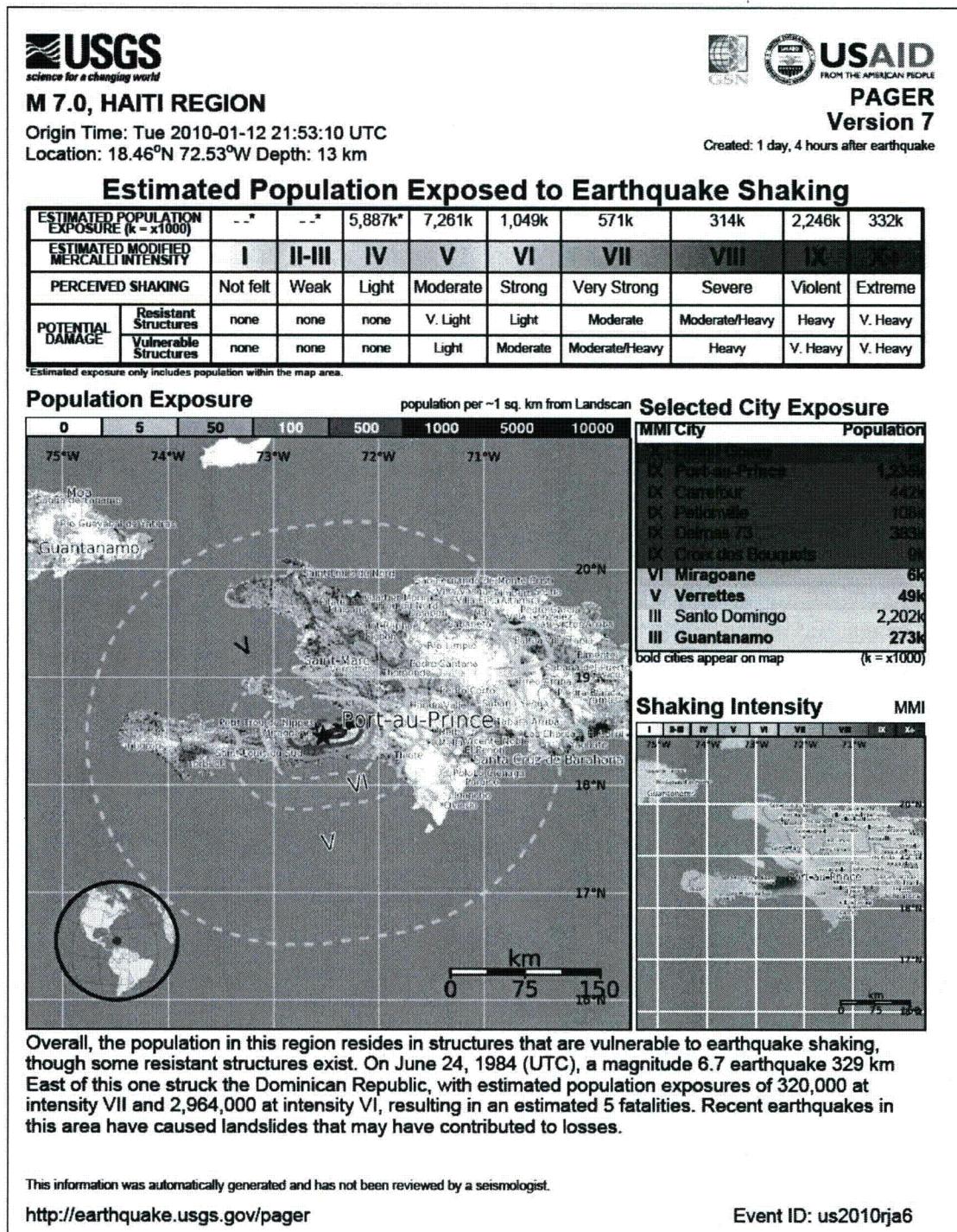
⁶⁰ See the USGS Earthquakes Hazards Program for more information, at <http://earthquake.usgs.gov/earthquakes/pager/>.

⁶¹ See also USGS Fact Sheet 2007-3101 at <http://pubs.usgs.gov/fs/2007/3101/>.

⁶² See http://www.fema.gov/plan/prevent/hazus/hz_overview.shtm.

⁶³ See <http://www.hazus.org/>.

Figure 6. Example of PAGER Output for the January 12, 2010, Magnitude 7.0 Haiti Earthquake



Source: USGS, <http://earthquake.usgs.gov/earthquakes/pager/events/us/2010rja6/onepager.pdf>.

Note: This is version 7 of the PAGER output, accessed on January 14, 2010.

Research—Understanding Earthquakes

U.S. Geological Survey

Under NEHRP, the USGS has responsibility for conducting targeted research into improving the basic scientific understanding of earthquake processes. The current earthquake research program at the USGS covers six broad categories:⁶⁴

- *Borehole geophysics and rock mechanics*: studies to understand heat flow, stress, fluid pressure, and the mechanical behavior of fault-zone materials at seismogenic⁶⁵ depths to yield improved models of the earthquake cycle;
- *Crustal deformation*: studies of the distortion or deformation of the earth's surface near active faults as a result of the motion of tectonic plates;
- *Earthquake geology and paleoseismology*: studies of the history, effects, and mechanics of earthquakes;
- *Earthquake hazards*: studies of where, why, when, and how earthquakes occur;
- *Regional and whole-earth structure*: studies using seismic waves from earthquakes and man-made sources to determine the structure of the planet ranging from the local scale, to the whole crust, mantle, and even the earth's core; and
- *Strong-motion seismology, site response, and ground motion*: studies of large-amplitude ground motions and the response of engineered structures to those motions using accelerometers.

National Science Foundation

NSF supports fundamental research into understanding the earth's dynamic crust. Through its Earth Sciences Division (part of the Geosciences Directorate), NSF distributes research grants and coordinates programs investigating the crustal processes that lead to earthquakes around the globe.⁶⁶

EarthScope

In 2003, NSF initiated a Major Research Equipment and Facilities Construction (MREFC) project called EarthScope that deploys instruments across the United States to study the structure and evolution of the North American Continent, and to investigate the physical processes that cause earthquakes and volcanic eruptions.⁶⁷ EarthScope is a multi-year project begun in 2003 that is funded by NSF and conducted in partnership with the USGS and NASA.

⁶⁴ See <http://earthquake.usgs.gov/research/>.

⁶⁵ Seismogenic means capable of generating earthquakes.

⁶⁶ See <http://www.nsf.gov/div/index.jsp?div=EAR>.

⁶⁷ See <http://www.earthscope.org/>.

EarthScope instruments are intended to form a framework for broad, integrated studies of the four-dimensional (three spatial dimensions, plus time) structure of North America. The project is divided into three main programs:

- *The San Andreas Fault Observatory at Depth (SAFOD)*, a deep borehole observatory drilled through the San Andreas fault zone close to the hypocenter of the 1966 Parkfield, CA, magnitude 6 earthquake;
- *The Plate Boundary Observatory (PBO)*, a system of GPS arrays and strainmeters⁶⁸ that measure the active boundary zone between the Pacific and North American tectonic plates in the western United States; and
- *USArray*, 400 transportable seismometers that will be deployed systematically across the United States on a uniform grid to provide a complete image of North America from continuous seismic measurements.

SAFOD and PBO are in place and providing data to the seismological community. USArray is progressing across North America and is also furnishing real-time data to seismologists. The portable array currently covers the midsection of the United States and is moving east. The installation plan calls for completing the portable array by 2013.⁶⁹

Network for Earthquake Engineering Simulation

Through its Engineering Directorate, NSF funds the George E. Brown Jr. Network for Earthquake Engineering Simulation (NEES), a project intended to operate until 2014, aimed at understanding the effects of earthquakes on structures and materials.⁷⁰ To achieve the program's goal, the NEES facilities conduct experiments and computer simulations of how buildings, bridges, utilities, coastal regions, and materials behave during an earthquake. In the first six years of operations since 2004, 160 multiyear projects have been completed or are in progress under NEES.⁷¹

Conclusion

At present earthquakes can be neither accurately predicted nor prevented, and in its 1990 reauthorization NEHRP shifted its program emphasis from prediction to hazard reduction. The program's focus has been on understanding the earthquake hazard and its risk to populations and infrastructure in the United States, developing effective measures to reduce earthquake hazards, and promoting the adoption of earthquake hazards reduction measures in vulnerable areas.

⁶⁸ A strainmeter is a tool used by seismologists to measure the motion of one point relative to another.

⁶⁹ See <http://www.usarray.org/maps>.

⁷⁰ Management for NEES has been headquartered at Purdue University's Discovery Park since October 1, 2009. Institutions participating in NEES include Cornell University; Lehigh University; Oregon State University; Rensselaer Polytechnic Institute; University of Buffalo-State University of New York; University of California-Berkeley; University of California-Davis; University of California-Los Angeles; University of California-San Diego; University of California-Santa Barbara; University of Colorado-Boulder; University of Illinois at Urbana-Champaign; University of Minnesota; University of Nevada-Reno; and University of Texas at Austin. See <http://www.nees.org/>.

⁷¹ See <http://nees.org/about>.

Legislation to modify NEHRP in the 108th Congress (P.L. 108-360) reflected congressional concerns about how well the four NEHRP agencies coordinated their efforts to maximize the program's potential. If legislation is introduced in the 112th Congress to modify the program and reauthorize appropriations, Congress may consider evaluating how effectively the agencies have responded to Congress's direction in P.L. 108-360 to improve coordination since 2004.

In the 111th Congress, legislation introduced to make changes to NEHRP, H.R. 3820, reemphasized that approach but cast it in terms of hazard *mitigation* by stating that a major goal for the program should be "to reduce the loss of life and damage to communities and infrastructure through increasing the adoption of hazard mitigation measures." The bill further emphasized the social aspects of mitigating earthquake hazards, calling for research to better understand institutional, social, behavioral, and economic factors that influence how risk mitigation is implemented, in addition to the traditional research into understanding how, why, and where earthquakes occur.

The emphasis on mitigation proposed by H.R. 3820 in the 111th Congress reflects at least two fundamental challenges to increasing the nation's resiliency to earthquakes, and to most other major natural hazards such as hurricanes and major floods. The first is to assess whether social, behavioral, and economic factors can be understood in sufficient degree to devise strategies that influence behavior to mitigate risk posed by the hazard. Put simply, what motivates people and communities to adopt risk mitigation measures that address the potential hazard? A second challenge, which is more squarely an issue for Congress, is how to measure the effectiveness of NEHRP more quantitatively. It is inherently difficult to capture precisely, in terms of dollars saved or fatalities prevented, the effectiveness of mitigation measures taken before an earthquake occurs. A major earthquake in a populated urban area within the United States would cause damage, and a question becomes how much damage would be prevented by mitigation strategies underpinned by the NEHRP program.

A precise relationship between earthquake mitigation measures, NEHRP and other federal earthquake-related activities, and reduced losses from an actual earthquake may never be possible. However, as more accurate seismic hazard maps evolve, as understanding of the relationship between ground motion and building safety improves, and as new tools for issuing warnings and alerts such as ShakeMap and PAGER are devised, trends denoting the effectiveness of mitigation strategies and NEHRP activities may emerge more clearly. Without an ability to precisely predict earthquakes, Congress is likely to face an ongoing challenge in determining the most effective federal approach to increasing the nation's resilience to low-probability but high-impact natural hazards, such as major earthquakes.

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Japan 2011 Disaster: CRS Experts

Ben Dolven

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March 15, 2011

Congressional Research Service

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CRS Report for Congress
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The following table provides access to names and contact information for CRS experts on policy concerns relating to the nuclear and humanitarian disaster unfolding in Japan. Policy areas identified include

- Nuclear power, nuclear safety, and radioactive health concerns;
- Geology, earthquakes, and tsunamis;
- U.S. relations with Japan;
- U.S. government response to the disaster; and
- Economic impacts of the crisis.

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Fukushima Nuclear Crisis

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Summary of the Crisis

The earthquake on March 11, 2011, off the east coast of Honshu, Japan's largest island, reportedly caused an automatic shutdown (called a "scram") of eleven of Japan's fifty-five operating nuclear power plants.¹ Most of the shutdowns proceeded without incident. The plants closest to the epicenter, Fukushima and Onagawa (see **Figure 1**), were damaged by the earthquake and resulting tsunami.

¹ *BBC News*, "Timeline: Japan Power Plant Crisis," March 13, 2011, <http://www.bbc.co.uk/news/science-environment-12722719>.

Figure 1. Japan and Earthquake Epicenter



Source: Nuclear Energy Institute, edited by CRS.

Notes: http://i1107.photobucket.com/albums/h384/reactor1/japan_map1.jpg.

Tokyo Electric Power Company (TEPCO) operates the Fukushima nuclear power complex in the Futaba district of Fukushima prefecture in Northern Japan, consisting of six nuclear units at the Daiichi station and four nuclear units at the Daini station. All the units at the Fukushima complex

are boiling water reactors² with reactors 1, 2, and 3 being the General Electric Mark I design (see **Figure 2**). The Fukushima Daiichi reactors entered commercial operations in the years from 1971 (reactor 1) to 1979 (reactor 6). At the time of the earthquake, reactors 1, 2, and 3 at Daiichi were operational and shut down after the quake, while reactors 4, 5, and 6 were already shut down for routine inspections. All four of the Daiichi reactors were operational at the time of the earthquake and taken down after the quake.

Nuclear fuel rods in a reactor continue to produce heat when the reactor is shut down. To stop the nuclear reaction, control rods³ are inserted into the reactor. During the cool-down phase, a source of electricity is needed to operate pumps and circulate water in the reactor. Under normal conditions, it would take a few days for a reactor core to cool down to a “cold shutdown” state.⁴

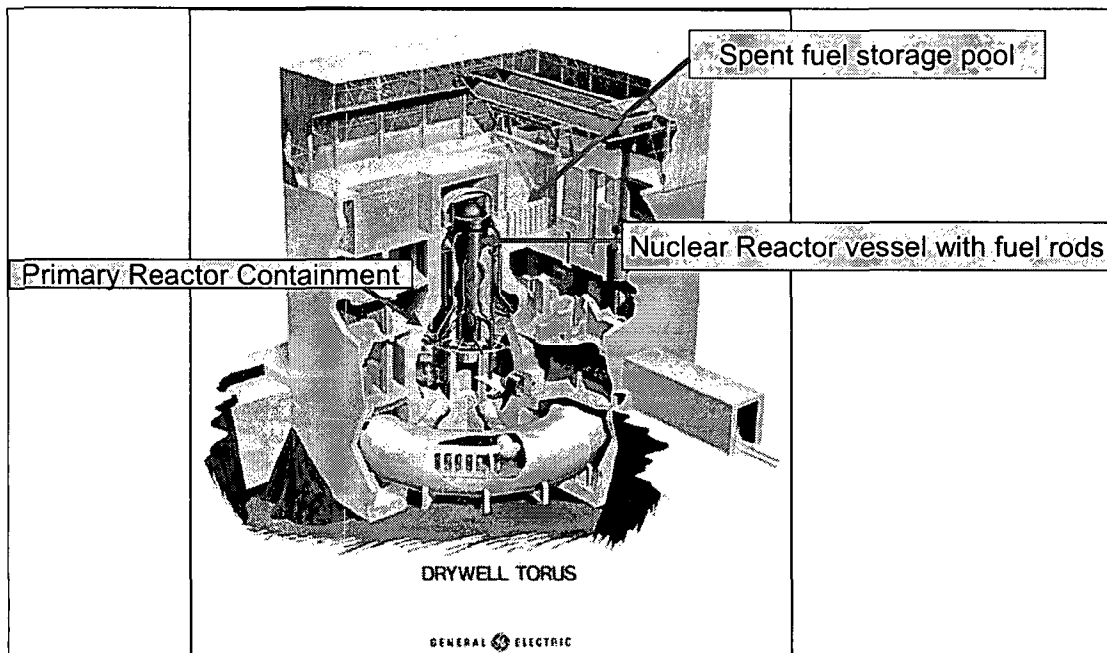
The magnitude 9.0 earthquake triggered a ten meter (33 foot) high tsunami which struck the coast, devastating much of the area and overtopping a six meter high sea wall at Fukushima Daiichi station. The station was cut off from Japan’s national electricity grid. Diesel generators at the Daiichi station initially took over the power load but later failed. The tsunami flooded the backup diesel powered electric generators at the station, sweeping away the diesel fuel tanks, and knocking out the backup cooling capability for the station’s nuclear reactors.⁵

² A common nuclear power reactor design in which water flows upward through the core, where it is heated by fission and allowed to boil in the reactor vessel. The resulting steam then drives turbines, which activate generators to produce electrical power. BWRs operate similarly to electrical plants using fossil fuel, except that the BWRs are powered by 370–800 nuclear fuel assemblies in the reactor core rather than burning coal or natural gas to create steam. U.S. Nuclear Regulatory Commission, “Boiling-Water Reactor (BWR),” <http://www.nrc.gov/reading-rm/basic-ref/glossary/boiling-water-reactor-bwr.html>.

³ A rod, plate, or tube containing a material such as hafnium, boron, etc., used to control the power of a nuclear reactor. By absorbing neutrons, a control rod prevents the neutrons from causing further fissions. U.S. Nuclear Regulatory Commission, “Control Rod,” <http://www.nrc.gov/reading-rm/basic-ref/glossary/control-rod.html>.

⁴ U.S. Nuclear Regulatory Commission, “Cold Shutdown,” <http://www.nrc.gov/reading-rm/basic-ref/glossary/cold-shutdown.html>.

⁵ *BBC News*, “Timeline: Japan Power Plant Crisis,” March 13, 2011, <http://www.bbc.co.uk/news/science-environment-12722719>.

Figure 2. General Electric Mark I Boiling Water Reactor and Containment Building

Source: <http://www.nrc.gov/>.

TEPCO immediately began to experience problems with the Daiichi units, as temperatures began to rise in the reactors. With the primary and secondary cooling systems for the Daiichi reactors offline, TEPCO began trying to cool the reactor cores with seawater. Boron⁶ has been added to the seawater to help slow down the nuclear reactions and cool down the reactor cores. Pressure began building in Daiichi reactor 1, resulting in an explosion on March 13, 2011, and radiation leak possibly from a build-up of hydrogen gas. Falling water levels in the reactor core are thought to have exposed fuel rods, leading to oxidation of the zirconium cladding resulting in the formation of hydrogen gas.

An explosion was reported at reactor 3 on March 14, 2011, with an associated release of radiation. At this time, while the containment structures at reactors 1 and 3 were breached, the reactor vessels themselves were thought to be undamaged. Falling water levels in reactor 2 and increasing pressure eventually led to another explosion on March 15, 2011, resulting in damage to the roof of the building above the reactor vessel and a release of radiation. It was unclear at that time whether the reactor vessel itself was damaged in the explosion. Fires were also reported at reactor 4, with the loss of water levels in the spent fuel pool. Elevated radiation levels measured around reactor 4 caused the temporary suspension of reactor control room operations on March 16, 2011. The spent fuel pool of reactor 3 was also reported to be boiling, with the reported release of radioactive steam. Water is also being introduced to the non-operational reactors 5 and 6 at the Daiichi station. The Japanese military may be enlisted to pump water into reactor 3 and the spent fuel pool in reactor 4.⁷

⁶ Boron is the main material that goes into control rods used to halt or slow fission reactions in nuclear reactors. *Japan Times Online*, "Seoul to Send Boron in Bid to Cool Reactors," March 16, 2011, <http://search.japantimes.co.jp/cgi-bin/nn20110317a9.html>.

⁷ *Reuters*, "Timeline for Japan's Unfolding Nuclear Crisis," March 16, 2011, <http://www.vision.org/visionmedia/> (continued...)

Efforts continue in Japan to try to cool the nuclear reactors at the Daiichi station and keep water in the spent fuel pools. Loss of cooling water has reportedly led to “prolonged” exposure of fuel rods in the reactor cores, resulting in hydrogen gas formation. The explosions at reactors 1, 2, and 3 are thought to have been caused by the buildup of hydrogen gas. TEPCO is trying to build a new power line to supply electricity to the Daiichi station. It is unclear how long it will take to complete the line. However, it is not clear to what extent that any of the reactor core cooling systems are functioning at reactors 1, 2 and 3. Experts suggest that as long as the fuel cores can be kept covered with liquid water, the reactors cores should continue to cool, and a cold shutdown state may yet be achieved in all the Daiichi reactors.

If the fuel rods in the reactor cores cannot be cooled down, temperatures will continue to increase and the nuclear fuel assemblies would likely melt. In such a situation, a full meltdown or explosion could result in a major breach of the reactor vessel and extreme measures may be needed to contain a major radioactive release. This could mean filling the surviving reactor containment structures with concrete. Eventually, a reinforced concrete structure would be needed over the reactor containment buildings and the site monitored for radioactive releases.

The Fukushima Daini station is approximately 12 kilometers south of the Daiichi station, and further removed from the epicenter of the earthquake. The earthquake and tsunami apparently caused damage to the emergency core cooling systems at reactors 1, 2, and 4, while reactor 3 was apparently able to shut down without problems. The station reportedly retained offsite power to maintain its ability to circulate cooling water in the reactor. The makeup water and condensate systems were used as an emergency measure to maintain cooling water levels in reactors 1, 2, and 4. TEPCO has since made repairs to the cooling systems, and stable, cold shutdown conditions are reported at all Daini reactors as of March 14, 2011.⁸

The United States and other countries, as well as the International Atomic Energy Agency, are providing assistance to Japan to deal with the nuclear crisis. According to the U.S. State Department, Japan has requested foreign assistance including consequence management support, transport of pumps, boron, fresh water, remote cameras, global hawk surveillance, evacuation support, medical support, decontamination, and radiation monitoring equipment. A U.S. Nuclear Regulatory Commission advisory team is in Japan at the Japanese government’s request. The Department of Energy has sent radiation monitoring equipment, and the U.S. Department of Defense has provided high-pressure water pumps and fire trucks.

(...continued)

article.aspx?id=42042.

⁸ *World Nuclear News*, “All Fukushima Daini Units in Cold Shutdown,” March 14, 2011, http://www.world-nuclear-news.org/IT-All_Fukushima_Daini_units_in_cold_shutdown-1503114.html.

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U.S. Tsunami Programs: A Brief Overview

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Summary

A 9.0 magnitude earthquake struck off Japan's northeast coast near Honshu in the afternoon on Friday, March 11, 2011 (12:46 a.m. eastern time in the United States). The earthquake triggered a tsunami that has caused widespread devastation to parts of the coastal regions in Japan closest to the earthquake. The tsunami traveled across the Pacific Ocean, and the National Oceanic and Atmospheric Administration (NOAA) tsunami warning centers in Hawaii and Alaska issued tsunami warnings for coastal areas of Hawaii, Guam, the Commonwealth of the Northern Marianas, American Samoa, Alaska, and California. Although the tsunami caused widespread damage along the northeast coast of Japan, tsunami warnings issued from the tsunami warning centers gave the above U.S. Pacific territories, Hawaii, and the U.S. West Coast adequate warning to prepare for incoming waves.

NOAA's National Weather Service (NWS) manages the two tsunami warning centers that monitor, detect, and issue warnings for tsunamis generated in the Pacific Ocean. The NWS operates the Pacific Tsunami Warning Center (PTWC) at Ewa Beach, HI, and the West Coast/Alaska Tsunami Warning Center (WC/AKTWC) at Palmer, AK. The National Tsunami Hazards Mitigation Program (NTHMP) assists states in emergency planning and in developing maps of potential coastal inundation for a tsunami of a given intensity. The goal of NTHMP is to ensure adequate advance warning of tsunamis along all the U.S. coastal areas and appropriate community response to a tsunami event.

The tsunami warning centers monitor and evaluate data from seismic networks and determine if a tsunami is likely based on the location, magnitude, and depth of an earthquake. If the center determines that a tsunami is likely, it transmits a warning message to NOAA's weather forecasting offices and state emergency management centers, as well as to other recipients. The centers monitor coastal water-level data, typically with tide-level gages, and data from NOAA's network of Deep-ocean Assessment and Reporting of Tsunamis (DART) detection buoys to confirm that a tsunami has been generated, and if not, to cancel any warnings. Shortly after the 2004 tsunami in the Indian Ocean, Congress passed the Tsunami Warning and Education Act (P.L. 109-424), to enhance and modernize the existing Pacific Tsunami Warning System to increase coverage, reduce false alarms, and increase the accuracy of forecasts and warnings, among other purposes. As a result, the array was expanded to a total of 39 DART buoys in March 2008.

Funding for the NOAA tsunami program supports three main categories of activities: (1) *warning*, such as the activities of the tsunami warning centers and DART network; (2) *mitigation*, such as the activities of NTHMP; and (3) *research*, including activities conducted by the Pacific Marine Environmental Laboratory and the National Buoy Data Center. The Government Accountability Office (GAO) noted that total funding for all these activities ranged from \$5 million to \$10 million annually between FY1997 and FY2004, but increased after the 2004 Indian Ocean tsunami from approximately \$27 million in FY2005 to \$42 million in FY2009. Funding in FY2010 was \$41 million.

Currently, 7 of the 39 DART buoys are not operational. Of the 7 buoys that are not working, 5 are deployed in the Pacific Ocean. If more DART buoys fail, and regional forecasting capabilities are impaired, then the NOAA Administrator must notify Congress within 30 days. According to NOAA, the current continuing resolution (P.L. 112-4) does not allow the NWS to allocate FY2011 funding to purchase ship time required to repair the 7 DART buoys that are not working.

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Japan Earthquake and Tsunami

A 9.0 magnitude massive earthquake struck off Japan's northeast coast near Honshu in the afternoon on Friday, March 11, 2011 (12:46 a.m. eastern time in the United States). The earthquake triggered a tsunami¹ that has caused widespread devastation to parts of the coastal regions in Japan closest to the earthquake. The tsunami traveled across the Pacific Ocean, and the National Oceanic and Atmospheric Administration (NOAA) tsunami warning centers in Hawaii and Alaska issued tsunami warnings for coastal areas of Hawaii, Guam, the Commonwealth of the Northern Marianas, American Samoa, Alaska, and California. The first tsunami waves reached Hawaii in the early morning of March 11,² and reached the west coast of the United States later in the morning (Pacific time). Although the tsunami caused widespread damage along the northeast coast of Japan, tsunami warnings issued from the tsunami warning centers gave the above U.S. Pacific territories, Hawaii, and the U.S. West Coast adequate warning to prepare for incoming waves.³ In addition, the long distance traveled across the Pacific from the earthquake epicenter attenuated the energy associated with the tsunami thousands of miles from its source. In contrast, the city of Sendai, Japan, is just 80 miles west of the epicenter.⁴

Tsunami Warning Centers

NOAA's National Weather Service (NWS) manages the two tsunami warning centers that monitor, detect, and issue warnings for tsunamis generated in the Pacific Ocean. The NWS operates the Pacific Tsunami Warning Center (PTWC) at Ewa Beach, HI, and the West Coast/Alaska Tsunami Warning Center (WC/AKTWC) at Palmer, AK. The PTWC monitors for tsunamis and issues warnings for the Hawaiian Islands, the U.S. Pacific territories, and other U.S. and international interests in the Pacific Basin. The center was established in 1949, after a strong earthquake and massive landslides off the coast of southwest Alaska caused a disastrous tsunami for the Hawaiian Islands only hours later. The WC/AKTWC was established in 1967, following a magnitude 9.2 earthquake that struck Anchorage, AK, in 1964 and caused major earthquake and localized tsunami damages.⁵ The WC/AKTWC is responsible for issuing tsunami warnings to emergency management officials in Alaska, British Columbia (Canada), Washington State, Oregon, and California. The WC/AKTWC also serves as the center for warning U.S. populations located in the western Atlantic.

¹ A tsunami is a large ocean wave typically caused by a subsea earthquake or volcanic eruption that can cause extreme destruction when it strikes land.

² CNN U.S., *Tsunami Waves Reach Hawaii, Eye West Coast*, CNN Wire Staff, March 11, 2011, <http://www.cnn.com/2011/US/03/11/tsunami/index.html?hpt=T1>.

³ Despite the tsunami warnings, some communities along the West Coast and in Hawaii suffered damages. For example, some boats and harbor facilities were damaged by the tsunami in Crescent City, CA, although most of the fishing fleet headed out to sea to avoid the waves before they reached the harbor, according to the *Los Angeles Times*. Crescent City has suffered tsunami damage in the past, particularly from the 1964 Good Friday earthquake that struck Alaska. See Maria L. La Ganga, "Crescent City Comes to Grips with Tsunami's Devastation," *Los Angeles Times*, March 13, 2011, <http://www.latimes.com/news/local/la-me-japan-quake-crescent-city-20110313,0,5296998.story>.

⁴ U.S. Geological Survey, Earthquake Hazards Program, <http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/#details>.

⁵ See NOAA, NWS, "How *TsunamiReady* Helps Communities and Counties at Risk," <http://www.tsunamiready.noaa.gov/>.

The National Tsunami Hazards Mitigation Program

The National Tsunami Hazards Mitigation Program (NTHMP) assists states in emergency planning and in developing maps of potential coastal inundation for a tsunami of a given intensity. The NTHMP also operates tsunami disaster outreach and education programs through NOAA's *TsunamiReady* program. In 1992, NOAA launched the NTHMP to address the credibility of Pacific tsunami warnings and to reduce the number of "false alarms." The goal of NTHMP is to ensure adequate advance warning of tsunamis along all the U.S. coastal areas and appropriate community response to a tsunami.⁶

Detecting Tsunamis and Issuing Warnings

The tsunami warning centers monitor and evaluate data from seismic networks and determine if a tsunami is likely based on the location, magnitude, and depth of an earthquake.⁷ If the center determines that a tsunami is likely, they transmit a warning message to NOAA's weather forecasting offices and state emergency management centers, as well as to other recipients. The centers monitor coastal water-level data, typically with tide-level gages, and data from NOAA's network of Deep-ocean Assessment and Reporting of Tsunamis (DART) detection buoys to confirm that a tsunami has been generated, and if not, to cancel any warnings.⁸ A generalized decision tree network for the earthquake-detection-through-warning process is shown in **Figure 1**.

Warnings Triggered by the March 11, 2011, Tsunami

Initial warnings of an impending tsunami were first issued by the PTWC based on seismic information before the network of DART buoys and tide gages actually detected a wave generated by the earthquake.⁹ According to NOAA, initial tsunami warnings are normally based only on seismic information to provide the earliest possible alert.¹⁰ Because tsunamis travel more slowly than seismic waves, confirmation of a tsunami may take much longer than confirmation of an earthquake. That was the case for the March 11, 2011, tsunami. The DART network first detected the earthquake-triggered wave 27 minutes after the earthquake struck at 2:46 p.m. local time in Japan,¹¹ confirming that a tsunami had been generated and could lead to significant widespread inundation around the Pacific Ocean. **Figure 2** shows results from a model depicting the tsunami wave propagation across the Pacific Ocean.

⁶ NOAA FY2012 Blue Book, Chapter 5, National Weather Service, p. 691, http://www.corporateservices.noaa.gov/nbo/fy12_presidents_budget/National_Weather_Service_FY12.pdf.

⁷ Nearly all tsunamis are triggered by subsea earthquakes, although some may also be caused by underwater volcanic eruptions or landslides.

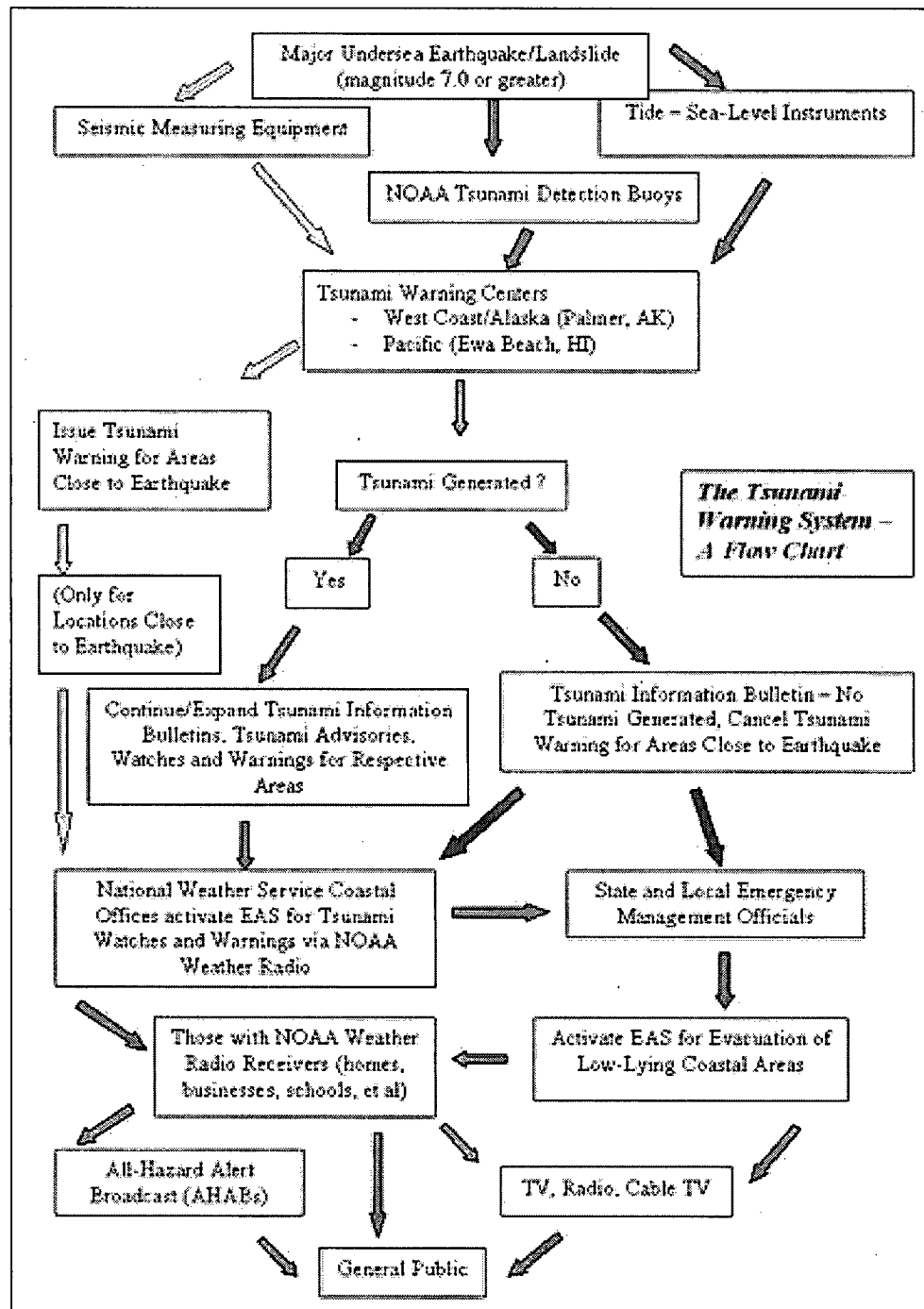
⁸ U.S. Government Accountability Office, *U.S. Tsunami Preparedness: NOAA Has Expanded Its Tsunami Programs, but Improved Planning Could Enhance Effectiveness*, GAO-10-490, April 2010, p. 5.

⁹ DART buoy 21418; telephone conversation with Laura Furgione, Deputy Director, National Weather Service, March 15, 2011.

¹⁰ NWS, Pacific Tsunami Warning Center, *About PTWC Messages*, http://ptwc.weather.gov/ptwc/about_messages.php.

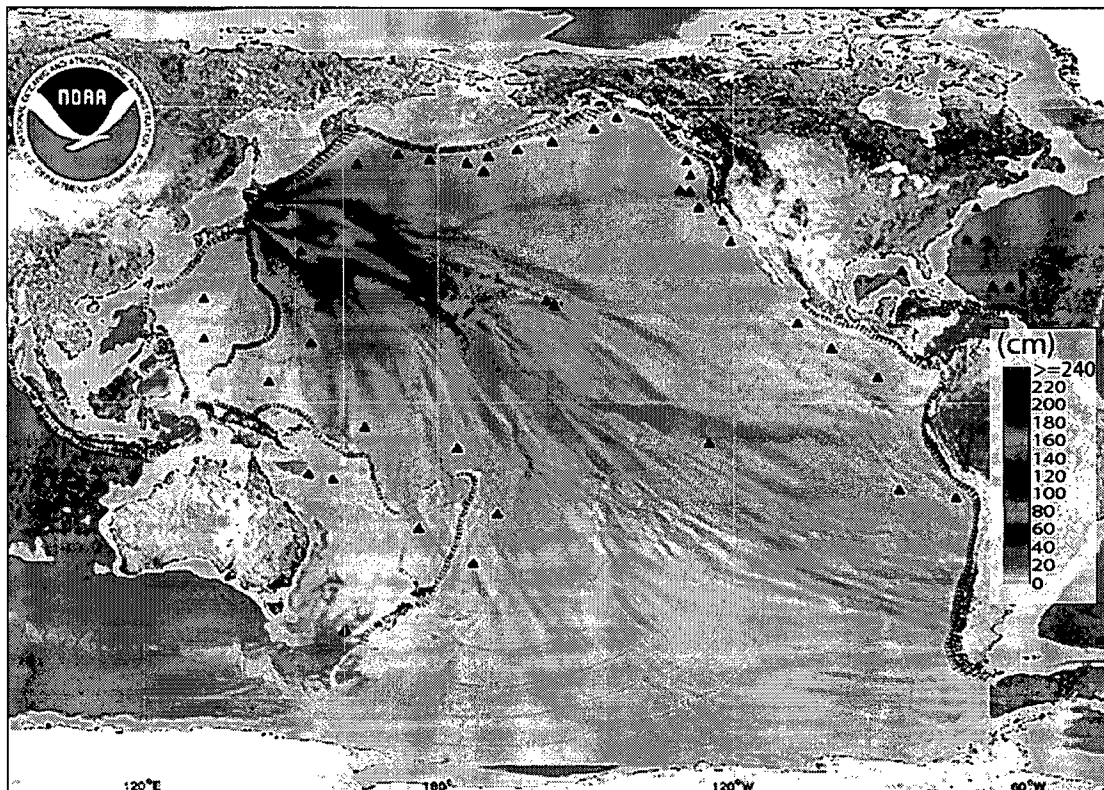
¹¹ Telephone conversation with Laura Furgione, March 15, 2011.

Figure 1. Flow Chart of the Tsunami Warning System



Source: NOAA, *How Does the Tsunami Warning System Work?* <http://www.tsunami.noaa.gov/images/warning-system-smaller.jpg>.

Figure 2. Results from NOAA Model Depicting the March 11, 2011 Tsunami Propagating Across the Pacific Ocean



Source: NOAA Center for Tsunami Research, Pacific Marine Environmental Laboratory, <http://nctr.pmel.noaa.gov/honshu20110311/>.

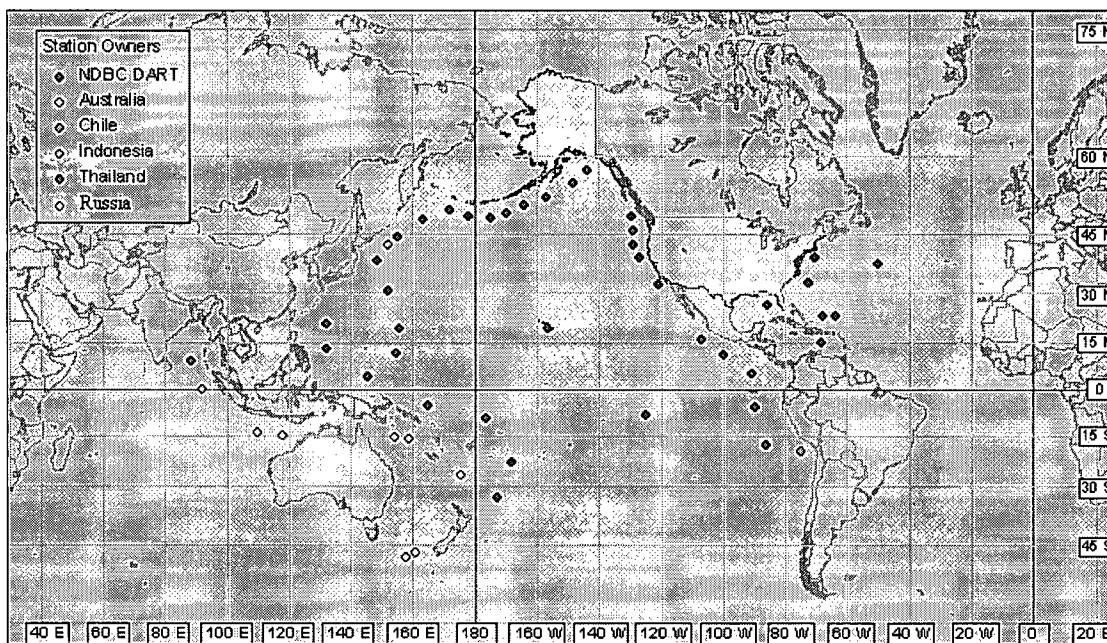
Notes: Colors indicate the wave amplitude in centimeters (see scale bar on right side of figure); contour labels indicate the computed tsunami arrival times. Black triangles indicate location of Deep-ocean Assessment and Reporting of Tsunamis (DART) detection buoys.

The DART Buoy Network

NOAA first completed a six-buoy DART array in 2001 in the Pacific Ocean. Shortly after the 2004 Indian Ocean earthquake and tsunami that killed over 200,000 people, Congress passed H.R. 1674, the Tsunami Warning and Education Act (P.L. 109-424), to enhance and modernize the existing Pacific Tsunami Warning System to increase coverage, reduce false alarms, and increase the accuracy of forecasts and warnings, among other purposes. In part, the 2004 tsunami provided the impetus to expand and upgrade the DART system and to improve the U.S. capability to detect and issue warnings for tsunamis generally. As a result, the array was expanded to a total of 39 DART buoys in March 2008.¹² (See **Figure 3**.)

¹² According to NOAA, 33 of the DART buoys are deployed in the Pacific Ocean, and the rest are deployed in the Atlantic Ocean and Caribbean. NOAA National Data Buoy Center, Deep-ocean Assessment and Reporting of Tsunamis (DART) Description, <http://www.ndbc.noaa.gov/dart/dart.shtml>.

Figure 3. Locations of DART Buoys



Source: NOAA National Data Buoy Center, <http://www.ndbc.noaa.gov/dart.shtml>

Notes: The United States owns and operates 39 of the DART Buoys.

Currently, 7 of the 39 buoys are not operational and in need of repair. Of the 7 buoys that are not working, 5 are deployed in the Pacific Ocean. Other countries also operate DART buoys in the Pacific (e.g., Australia and Russia), but if another U.S. DART buoy ceases to function less than 80% of the U.S. DART network would be operational. The Tsunami Warning and Education Act (P.L. 109-424) requires that NWS ensure that maintaining operations of tsunami detection equipment is the highest priority within the tsunami forecasting and warning program at NOAA. Further, P.L. 109-424 requires that the NOAA Administrator notify Congress¹³ within 30 days of (1) impaired regional forecasting capabilities due to equipment or system failures; and (2) significant contractor failures or delays in completing work associated with the tsunami forecasting and warning system.¹⁴

Tsunami Warnings from the Japan Meteorological Agency

According to the International Tsunami Information Center, which operates under the International Oceanographic Commission (IOC)—part of the U.N.'s Educational, Scientific, and Cultural Organization (UNESCO)—the Japan Meteorological Agency (JMA) issued a major

¹³ Specifically, P.L. 109-424 requires the NOAA Administrator to notify the Committee on Commerce, Science, and Transportation in the Senate and the Committee on Science (now Science, Space, and Technology) in the House.

¹⁴ The statute does not define what is considered impairment of the forecasting abilities, or what is a threshold for significant contractor failures or delays. However, the committee report accompanying the bill states that NWS is required to notify Congress when the tsunami forecasting capabilities are impaired for more than three months; U.S. Congress, House Science, *United States Tsunami Warning and Education Act*, report to accompany H.R. 1674, 109th Cong., 2nd sess., 2006, H.Rept. 109-698, p. 10. NWS uses an 80% operational threshold as its internal guideline; Telephone conversation with Laura Furgione, March 15, 2011.

tsunami warning 3 minutes after the earthquake struck at 3:46 pm local time.¹⁵ The first regional tsunami bulletins were issued by the North West Pacific Tsunami Advisory Centre (NWPTAC), operated by the JMA, about 9 minutes after the earthquake occurred.¹⁶ The first tsunami wave reached the Japan coastline nearest to the epicenter about 15 minutes after the earthquake.¹⁷

The network of tsunami warning centers is coordinated under the umbrella of the IOC, through its Tsunami Programme, which falls under the auspices of UNESCO. According to the IOC, its role is coordinating the regional tsunami warning systems.¹⁸ The IOC coordinates the Indian Ocean Tsunami Warning and Mitigation System (IOTWS), in addition to its role in the Pacific, per U.N. mandate after the 2004 Indian Ocean tsunami. The IOC also coordinates similar systems in the Caribbean (CARIBE-EWS) and the North-Eastern Atlantic and Mediterranean (NEAMTWS).

The IOC noted that for the March 11 earthquake the warning centers operated well and according to expectations: the seismic systems identified the location and magnitude of the earthquake within minutes and allowed for early warnings; the DART buoys confirmed the initial tsunami warnings and alerts; and the communication systems allowed for near-real time monitoring.¹⁹ As a result, countries with Pacific Ocean coastlines received adequate warning in time to prepare for the oncoming tsunami waves. Northeast Japan, however, suffered the worst damage because it is so close to the epicenter, and the waves struck before people could evacuate to safety. In such instances, the ground shaking caused by the earthquake may be the only early indicator for people to act upon who live closest to the epicenter of an impending tsunami.²⁰

Funding for the Tsunami Program

Funding for the NOAA tsunami program supports three main categories of activities: (1) *warning*, such as the activities of the tsunami warning centers and DART network; (2) *mitigation*, such as the activities of NTHMP; and (3) *research*, including activities conducted by the Pacific Marine Environmental Laboratory and the National Buoy Data Center.²¹ In the NOAA budget, these activities are cross-cutting among different activities under the NWS line item.²² GAO, which analyzed funding data for the three general categories, noted that total funding for all these activities ranged from \$5 million to \$10 million annually between FY1997 and FY2004, but increased after the 2004 Indian Ocean tsunami from approximately \$27 million in FY2005 to \$42 million in FY2009. According to GAO, the proportion of funding allocated to warning activities increased from about 40% of the total in FY2004 to approximately 70% of the funding in FY2009.²³ The proportion allocated to mitigation decreased from approximately 50% of the total

¹⁵ UNESCO, International Tsunami Information Center, <http://itic.ioc-unesco.org/>.

¹⁶ World Meteorological Organization, March 11, 2011, http://www.wmo.int/pages/mediacentre/news/index_en.html.

¹⁷ UNESCO, Intergovernmental Oceanographic Commission, <http://ioc-unesco.org/>.

¹⁸ UNESCO, International Tsunami Information Center, <http://itic.ioc-unesco.org/>.

¹⁹ Ibid.

²⁰ Personal communication, Dr. Gregory van der Vink, seismologist, March 14, 2011.

²¹ U.S. Government Accountability Office, *U.S. Tsunami Preparedness: NOAA Has Expanded Its Tsunami Programs, but Improved Planning Could Enhance Effectiveness*, GAO-10-490, p. 7.

²² For example, the FY2010 enacted budget contains a line item: Strengthen U.S. Tsunami Warning Network—\$23.264 million. However, research activities for tsunamis are included in the overall budget for the Pacific Marine Environmental Laboratory and for the National Buoy Data Center.

²³ U.S. Government Accountability Office, *U.S. Tsunami Preparedness: NOAA Has Expanded Its Tsunami Programs*, (continued...)

in FY2004 to about 30% in FY2009, while the proportion for research remained steady between about 6% to 10%.

Funding for the NWS tsunami program for FY2010 was approximately \$41 million, allocated as follows:

- \$23 million—Strengthen U.S. Tsunami Warning Program;
- \$13 million—Spectrum Auction funding;²⁴
- \$4 million—NWS/Local Warnings and Forecasts; and
- \$1 million—Office of Oceanic and Atmospheric Research/Pacific Marine Environmental Laboratory.²⁵

In 2010, the Government Accountability Office (GAO) found that NOAA had made progress since 2005 in expanding and strengthening its tsunami warning and mitigation capabilities, including the deployment of the 39 DART buoys. GAO also found that operating and maintaining the buoys has proved difficult and costly, consuming about 28% of the total NOAA Tsunami Warning Program budget in FY2009.²⁶ GAO noted that NOAA is exploring ways to reduce maintenance costs by improving buoy reliability.

According to NOAA, the current continuing resolution (P.L. 112-4) does not allow the NWS to allocate FY2011 funding to purchase ship time required to repair the seven DART buoys that are not working.²⁷ As noted above, the delay or failure in completing work associated with the tsunami forecasting and warning system by contractors should also trigger notification of Congress by the NOAA Administrator under P.L. 109-424.

Additional Reading

CRS Report RL33861, *Earthquakes: Risk, Detection, Warning, and Research*, by Peter Folger.

CRS Report RL33436, *Japan-U.S. Relations: Issues for Congress*, coordinated by Emma Chanlett-Avery.

CRS Report R41023, *Haiti Earthquake: Crisis and Response*, by Rhoda Margesson and Maureen Taft-Morales.

(...continued)

but Improved Planning Could Enhance Effectiveness, GAO-10-490, p. 8.

²⁴ Starting in FY2009, the tsunami program received funding from the proceeds of the Federal Communication Commission's auctioning of broadcast frequency spectrum. In FY2012, the program will be augmented by \$12.7 million from auction proceeds, according to NOAA. Total funding received from auction proceeds will be approximately \$50 million for the tsunami program at the end of FY2012, according to GAO.

²⁵ E-mail from Lara Hinderstein, NOAA Budget Outreach and Communications, March 11, 2011.

²⁶ U.S. Government Accountability Office, *U.S. Tsunami Preparedness: NOAA Has Expanded Its Tsunami Programs, but Improved Planning Could Enhance Effectiveness*, GAO-10-490, p. 21.

²⁷ Approximately \$4 million would required, according to NOAA. Telephone conversation with Laura Furgione, March 15, 2011.

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Japan 2011 Earthquake: U.S. Department of Defense (DOD) Response

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CRS Report for Congress

Prepared for Members and Committees of Congress

Overview

With almost 40,000 U.S. troops stationed in Japan, the March 11, 2011, earthquake and tsunami is unique in that U.S. forces and associated resources were located in close proximity to deal with the crisis. All services—Army, Navy, Marine Corps, and Air Force—are present in Japan in various capacities. In addition, U.S. forces train regularly with their Japanese Self Defense Force (SDF) counterparts, including many humanitarian assistance and disaster relief exercises.

With 100,000 SDF troops called up to respond to the disaster, U.S. forces were able to coordinate their efforts almost immediately to provide support for the Japanese responders. Within five days of the earthquake, the SDF had deployed 76,000 personnel (45,000 ground, 31,000 air and maritime); 194 rotary aircrafts and 322 fixed-wings; and 58 ships. As of March 16, the SDF had rescued 19,300 people, in addition to supporting activities at the troubled nuclear reactors.¹

Operational Update²

DOD officials report that as of the morning of March 17, 14 U.S. naval ships and their aircraft and 17,000 sailors and Marines are now involved in humanitarian assistance and disaster relief efforts in and around Japan. These efforts have included 132 helicopter sorties and 641 fixed-wing sorties moving both people and supplies, assisting in search and rescue efforts, and delivering 129,000 gallons of water and 4,200 pounds of food. These totals are increasing by the hour, although some helicopter activities have been limited by poor weather and visibility. All search and rescue assets from Okinawa, the southernmost part of Japan, have been moved to Yokota Air base outside of Tokyo to be deployed to the north. Further details are in the sections on each branch's operations below.

DOD Funding³

On March 12, Secretary of Defense Gates authorized U.S. Pacific Command (USPACOM) to continue disaster relief operations and approved \$35 million in Overseas Humanitarian, Disaster, and Civic Aid (OHDACA) funding for these purposes. As the scope and duration of DOD's support becomes better defined, it is possible that additional funding will be required.

Status of DOD Facilities and Personnel

Initial DOD efforts after the earthquake were focused on what can be described as “force protection,” such as relocating naval vessels and aircraft so that potential damage from the impending tsunami would be mitigated, as well as protecting and accounting for U.S. military personnel, 43,000 dependents, and 5,000 DOD civilian employees stationed in Japan. These force

¹ Japanese Ministry of Defense, <http://www.mod.go.jp/j/press/news/2011/03/16d.html>

² Cheryl Pellerin, “Ships, Aircraft Support Japan Relief Effort,” *American Forces Press Service*, March 16, 2011.

³ Operational Update provide to CRS by the Office of Secretary of Defense Office for Legislative Affairs, March 16, 2011.

protection efforts appear to have been successful, as there were no reported DOD-related fatalities and no reports of major damage to DOD facilities or equipment.⁴

Voluntary Departure of DOD Dependents⁵

After the State Department authorized voluntary departure for family members and dependents of U.S. government personnel who wish to leave northeast Japan on March 17, DOD stated that it would implement the State Department's plan for eligible DOD dependents. It was reported that Navy bases in the Tokyo area will begin voluntary evacuations for family members as early as the evening of March 17. The Navy reportedly has the capability to evacuate up to 10,000 people per day.

Operation Tomodachi⁶

DOD's relief effort has been designated "Operation Tomodachi"—Japanese for "friend"—and consists at this point primarily of search-and-rescue missions and the delivery of humanitarian aid. U.S. airlift capability is particularly valuable in reaching survivors in the devastated areas. The U.S. airbase Misawa, located in Aomori prefecture in northeastern Japan, was shaken violently by the earthquake but escaped with only minor damage. The facility is being used as a forward operating base for both U.S. and SDF forces. In addition, the government of Japan granted permission for U.S. forces to use Yamagata airport, the first time such an allowance has been approved. SDF troops are also using the facility.⁷

Response to Damaged Nuclear Reactors

It is not yet clear to what extent DOD will be involved in responding to the problems at the affected nuclear reactor. On a force protection level, U.S. forces both ashore in Japan as well as at sea and in the air are well-equipped to monitor radiation levels as well as to decontaminate personnel and equipment that might become contaminated by radiological materials. On March 15, sensitive instrumentation on the USS *George Washington* in Yokosuka detected low levels of radioactivity from the Fukushima plant.

As the crisis surrounding the stricken reactors at the Fukushima Dai-ichi facility intensified, it appeared that the United States was stepping up efforts to assist the government of Japan (GoJ). On March 16, news outlets reported that the Global Hawk drone would fly over the reactor site in order to collect data and imagery for the GoJ.⁸ On March 17, the U.S. Navy Seventh Fleet reported that five high-pressure water pumps from Sasebo and 100 Nuclear, Biological, Chemical

⁴ Cheryl Pellerin, "Military Gears Up to Help Japan," *American Forces Press Service*, March 11, 2011.

⁵ Operational Update provide to CRS by the Office of Secretary of Defense Office for Legislative Affairs, March 17, 2011 and Erik Slavin, "Navy to Begin Voluntray Evacuation of Families in Japan," *Stripes.com*, March 17, 2011.

⁶ Information in this section is taken from Fred W. Baker III, "U.S. Forces Provide Relief Aid to Japan," *American Forces Press Service*, March 13, 2011; Chris Carroll et al, "Relief Efforts Limited Days After the Earthquake," *American Forces Press Service*, March 13, 2011; and Phil Stewart, "More U.S. Ships Head to Japan, Radiation Risk Eyed," *Reuters.com*, March 14, 2011.

⁷ "Japan, U.S. Engage in Record-scale Cooperation for Quake Relief," *Sankei News*, March 17, 2011.

⁸ "Northrop Drone Set to Overfly Japan Reactor, Seek Data on Damage," *Bloomberg News*, March 16, 2011.

(NBC) suits and masks were delivered to the government of Japan to be employed at the troubled Fukushima plant. The Naval Disometer Center is sending 2,000 personal disometers (devices to monitor radiation exposure on individuals) to Japan. The U.S. military also contributed two fire trucks to Japanese authorities for use at the site.

Naval Activities⁹

The USS *Ronald Reagan* Carrier Strike Group, which includes the cruiser USS *Chancellorsville*, the destroyer USS *Preble*, and the combat support ship USS *Bridge*, was diverted from military exercises around Korea and is now conducting operations off the coast of east Honshu. The USS *Ronald Reagan*, with its 3,200 sailors and 2,480 aviators and air wing personnel and 85 aircraft, in addition to conducting flight operations, is expected to serve as a refueling platform for helicopters from the Japanese SDF, Japanese Coast Guard, and civilian authorities involved in rescue and recovery efforts. Seventeen members of the *Reagan*'s crew were exposed to low-level radiation and were successfully decontaminated.¹⁰

Guided missile destroyers USS *Fitzgerald*, USS *John S. McCain*, USS *McCampbell*, and the USS *Curtis Wilbur* are also operating in close proximity to the USS *Ronald Reagan* Group, and the destroyer USS *Mustin* is at sea south of the disaster site. As of March 16, the group has already flown scores of sorties to deliver around 40 tons of humanitarian supplies to the affected areas.

The USS *Tortuga*, an amphibious dock landing ship that had been docked at the U.S. naval base in Sasebo, picked up over 90 SDF vehicles and nearly 300 SDF forces from Hokkaido, Japan's northernmost island, and delivered them to northern Honshu. The *Tortuga* also transported 5,000 bottles of water and 5,000 Meals Ready to Eat (MREs).

The USS *Essex*, an amphibious assault ship with the 31st Marine Expeditionary Unit aboard, and the USS *Harpers Ferry* and USS *Germantown* amphibious dock landing ships have arrived in the Sea of Japan and will conduct operations from Japan's west coast due to concerns about radiation levels closer to the Fukushima reactor site on the east coast. This position will allow access to undamaged roads to deliver relief supplies. One primary mission will be the re-opening of the severely damaged Sendai airport in order for it to serve as an operating base for disaster response in the surrounding area.

The USS *Blue Ridge*, the Seventh Fleet's command ship, arrived in the Okinawa vicinity and loaded personnel and additional supplies. It is expected in the disaster region within the next day.

Marine Corps Ground Activities

The III Marine Expeditionary Force is opening a command element and two forward refueling points at the Yamagata airport, located about 35 miles from Sendai.

Two U.S. Marine Corp Humanitarian Assistance Support (HAS) teams from the III Marine Expeditionary Force have arrived in the affected area, with two more HAS teams expected in the

⁹ Information reported on U.S. Navy Seventh Fleet Facebook page, March 16-17, 2011.

¹⁰ Cheryl Pellerin, "Ships, Aircraft Support Japan Relief Effort," *American Forces Press Service*, March 16, 2011.

region in the coming days. Landing in a heavily damaged Air SDF airfield, the Marines worked with ASDF personnel to unload relief supplies headed for a survivors' refuge center near Kesenuma, a coastal city north of Sendai particularly hard hit by the tsunami. The HAS teams will deliver water and other supplies, survey damaged infrastructure in need of repair, and monitor the spread of potential disease among the displaced population.

Air Activities¹¹

In the early hours immediately following the earthquake, Yokota Air Base was used to recover airline traffic and as an alternate airfield for planes that could not land at Tokyo's Narita Airport. Initial air operations from Naval Air Facility Atsugi and the USS *Ronald Reagan* were focused on identifying survivors in need of assistance as well as delivering water, blankets, and food. Additional helicopters conducted surveys of the at-sea debris fields, looking for survivors, and also conducted search and rescue missions along the coastline. Two U.S. Navy P-3 Orion aircraft also participated in survey operations.

U.S. Air Force and Marine helicopters and transport aircraft have been moved from Okinawa to U.S. military bases on Honshu to assist with operations. In addition, Carrier Airwing Five began relocating scores of tactical fixed-wing aircraft from Atsugi to Okinawa and Guam to provide for incoming aircraft to be used in relief operations. Delivery of generators and helicopters to Misawa is ongoing.

An RQ-4 Global Hawk, an unmanned, long-endurance aircraft that performs surveys of large geographic areas, was deployed from Anderson Air Force Base in Guam to assist with disaster relief. Using radar and optical surveillance, the aircraft will be able to assess damage to infrastructure throughout the affected area.¹²

Ground Activities¹³

The U.S. Army in Japan reportedly provided a 10-person team of translators, communications experts, and combat medics upon request of the Japanese Self-Defense Forces to help with disaster assessment efforts in the Sendai area. It was also reported that throughout Japan, similar efforts were undertaken at the request of local Japanese authorities by DOD personnel to aid and assist Japanese communities affected by the earthquake and tsunami. In addition, the U.S. Army Corps of Engineers Japan District provided an administrative system to help the U.S. Army Japan disaster assessment team with debris-removal efforts, and the Corps is also working on a plan to clear debris from airfields that are critical to logistic and humanitarian efforts.¹⁴

¹¹ Information in this section is taken from Fred W. Baker III, "U.S. Forces Provide Relief Aid to Japan," *American Forces Press Service*, March 13, 2011; Chris Carroll et al, "Relief Efforts Limited Days After the Earthquake," *American Forces Press Service*, March 13, 2011; and Phil Stewart, "More U.S. Ships Head to Japan, Radiation Risk Eyed," *Reuters.com*, March 14, 2011.

¹² "Air Force Officials Use Global Hawk to Support Japan Relief Efforts," *Air Force News Today*, March 16, 2011.

¹³ Chris Carroll et al, "Relief Efforts Limited Days After the Earthquake," *American Forces Press Service*, March 13, 2011 and Devon James, "Misawa Sailors Assist Clean Up at Local Fishing Port," United States Pacific Command, March 14, 2011.

¹⁴ Cheryl Pellerin, "Ships, Aircraft Support Japan Relief Effort," *American Forces Press Service*, March 16, 2011.

Background: U.S. Military Presence in Japan¹⁵

Current U.S. military presence in Japan consists of approximately 38,000 military personnel, 43,000 dependents, 5,000 DOD civilian employees, and 25,000 Japanese workers. U.S. forces are stationed in Japan pursuant to the U.S.-Japan Treaty of Mutual Cooperation and Security of 1960.

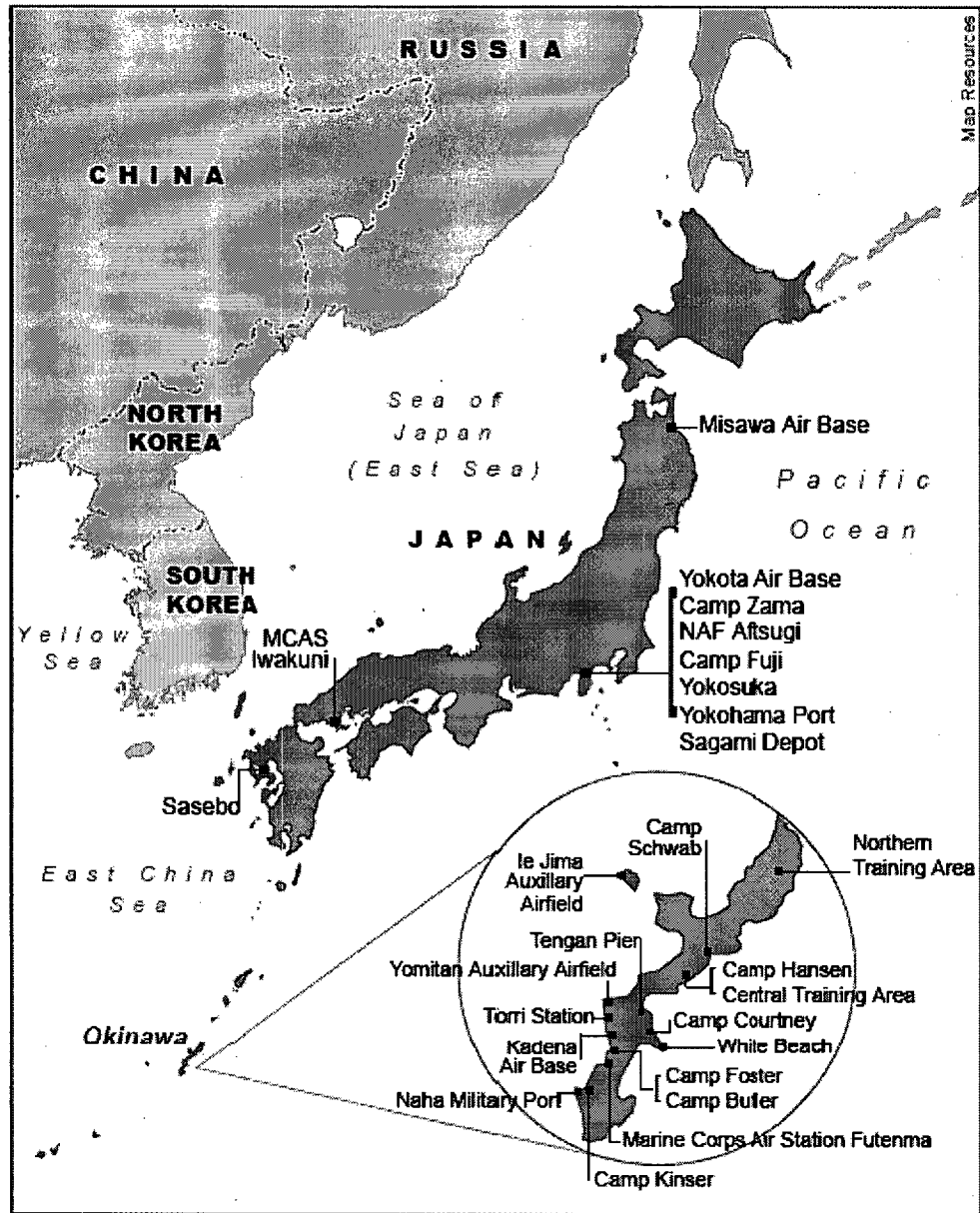
U.S. military strength in Japan is about 38,000 ashore and 11,000 afloat, and U.S. forces are dispersed among 85 facilities located on Honshu, Kyushu, and Okinawa.¹⁶ Total acreage of U.S. bases is approximately 77,000 acres. United States Forces Japan (USFJ) bases and facilities range in size from a several-thousand-acre training area to a single antenna site.

On mainland Japan, there are seven different bases/posts: Yokota and Misawa, representing the Air Force; Camp Zama, representing the Army; Iwakuni; the Marine Corps; and Yokosuka, Atsugi, and Sasebo, the Navy.

¹⁵ Information in this section is taken directly from the U.S. Forces Japan website, <http://www.usfj.mil/>, accessed on March 16, 2011.

¹⁶ See **Figure 1**.

Figure 1. U.S. Bases in Japan



Source: Adapted by CRS. (6/1/06)

U.S. Army, Japan (USARJ)¹⁷

U.S. Army, Japan (USARJ) consists of about 2,000 soldiers and is charged, during peacetime, with operating port facilities and a series of logistics installations throughout Honshu and Okinawa. USARJ participates actively with the Japan Ground Self Defense Force in bilateral training exercises and the development of bilateral plans. It commands and supports U.S. Army assigned units, attached units, and augmentation forces and employs these forces in support of the Commander. USARJ maintains defense facilities, war reserves, and operational project stocks. USARJ/9th Theater Support Command (TSC) is headquartered at Camp Zama.

U.S. Marine Corps

The III Marine Expeditionary Force (MEF), which is under the operational command of Marine Forces Pacific, consists of approximately 16,000 Marines, who are garrisoned primarily on Okinawa and southern Honshu. III MEF is headquartered at Camp Courtney, Okinawa.

U.S. Marine Corps Bases, Japan¹⁸

U.S. Marine Corps Bases, Japan, consists of approximately 9,000 military and civilian personnel and includes two air stations and nine camps/housing areas throughout Okinawa and mainland Japan. Its primary mission is to provide installation support and services, including force protection and quality of life, to forward-deployed Marine and Naval forces, other service members, civilians, retirees, family members, and others associated with U.S. Marine Corps Bases, Japan. HQs, U.S. Marine Corps Bases, Japan, is located at Camp Foster, Okinawa.

U.S. Navy¹⁹

Commander, Naval Forces, Japan, consisting of about 6,000 personnel, is responsible for maintaining and operating the port facilities and providing base and logistic support for those surface, subsurface, aviation, and amphibious elements of the U.S. Seventh Fleet that operate from Japan as part of the Forward Deployed Naval Forces (FDNF). U.S. Commander Navy Forces, Japan, participates with the Japan Maritime Self Defense Force in exercises and planning. CNFJ is headquartered at Yokosuka.

U.S. Seventh Fleet

U.S. Seventh Fleet, which is under the operation control of Commander, Pacific Fleet, has about 13,000 sailors, 18 ships, and 100 airplanes operating from Japan as part of the Forward Deployed Naval Forces.

¹⁷ Information in this section is taken directly from the U.S. Forces Japan website, <http://www.usfj.mil/>, accessed on March 16, 2011.

¹⁸ Ibid.

¹⁹ Ibid.

U.S. Air Force Japan (USAFJ)²⁰

The U.S. Air Forces, Japan/Fifth Air Force mission is to maintain the deterrent force posture of the United States and to conduct offensive and defensive air operations, should deterrence fail. Supporting that mission are approximately 13,000 military and civilian personnel located at units throughout Japan. In addition to the tactical air roles, USAFJ provides theater airlift and operational support with cargo airlift. USAFJ participates with the Japan Air Self Defense Force in bilateral training exercises and the development of bilateral plans. Fifth Air Force is headquartered at Yokota Air Base and is commanded by Commander, U.S. Forces Japan in a dual-hatted capacity.

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²⁰ Ibid.

Kauffman, John

From: OST02 HOC
Sent: Friday, March 25, 2011 12:31 PM
To: Abrams, Charlotte; Abu-Eid, Bobby; Adams, John; Afshar-Tous, Mugeh; Ahn, Hosung; Alemu, Bezakulu; Algama, Don; Alter, Peter; Anderson, Brian; Anderson, James; Arndt, Steven; Arribas-Colon, Maria; Ashkeboussi, Nima; Athey, George; Baker, Stephen; Ballam, Nick; Barnhurst, Daniel; Barr, Cynthia; Barss, Dan; Bazian, Samuel; Benshi, Michelle; Bergman, Thomas; Berry, Rollie; Bhachu, Ujagar; Bloom, Steven; Blount, Tom; Boger, Bruce; Bonnette, Cassandra; Borchardt, Bill; Bowers, Anthony; Bowman, Gregory; Boyce, Tom (RES); Brandon, Lou; Brandt, Philip; Brenner, Eliot; Brock, Kathryn; Brown, Cris; Brown, David; Brown, Eva; Brown, Frederick; Brown, Michael; Bukharin, Oleg; Burnell, Scott; Bush-Goddard, Stephanie; Campbell, Stephen; Camper, Larry; Carpenter, Cynthia; Carter, Mary; Case, Michael; Casto, Greg; Cecere, Bethany; Cervera, Margaret; Chazell, Russell; Chen, Yen-Ju; Cheok, Michael; Chokshi, Nilesh; Chowdhury, Prosanta; Chung, Donald; Circle, Jeff; Clement, Richard; Clinton, Rebecca; Coggins, Angela; Collins, Frank; Cool, Donald; Correia, Richard; Corson, James; Costa, Arlon; Couret, Ivonne; Craffey, Ryan; Crutchley, Mary Glenn; Cruz, Zahira; Cuadrado, Leira; Dacus, Eugene; DeCicco, Joseph; Decker, David; Dembek, Stephen; Devlin, Stephanie; Dimmick, Lisa; Doane, Margaret; Dorman, Dan; Dorsey, Cynthia; Dozier, Jerry; Drake, Margaret; Droggitis, Spiros; Dube, Donald; Dudes, Laura; Eads, Johnny; Emche, Danielle; English, Lance; Erlanger, Craig; Esmaili, Hossein; Figueroa, Roberto; Fiske, Jonathan; Flanders, Scott; Flannery, Cindy; Floyd, Daphene; Foggie, Kirk; Foster, Jack; Fragoyannis, Nancy; Franovich, Rani; Frazier, Alan; Freshman, Steve; Fuller, Edward; Galletta, Thomas; Gambone, Kimberly; Gardocki, Stanley; Gartman, Michael; Gibson, Kathy; Giitter, Joseph; Gilmer, James; Glenn, Nichole; Gordon, Dennis; Gott, William; Grant, Jeffery; Greenwood, Carol; Greenwood, Carol; Grimes, Kelly; Grobe, Jack; Gross, Allen; Gulla, Gerald; Hale, Jerry; Hardesty, Duane; Hardin, Kimberly; Hardin, Leroy; Harrington, Holly; Harris, Tim; Harrison, Donnie; Hart, Ken; Hart, Michelle; Harvey, Brad; Hasselberg, Rick; Hayden, Elizabeth; Helton, Donald; Henderson, Karen; Hiland, Patrick; Holahan, Patricia; Holahan, Vincent; Holian, Brian; HOO Hoc; Horn, Brian; Howard, Tabitha; Huffert, Anthony; Hurd, Sapna; Huyck, Doug; Imboden, Andy; Isom, James; Jackson, Karen; Jacobson, Jeffrey; Jervy, Richard; Jessie, Janelle; Johnson, Michael; Jolicoeur, John; Jones, Andrea; Jones, Cynthia; Jones, Henry; Kahler, Carolyn; Kammerer, Annie; Karas, Rebecca; Kauffman, John; Khan, Omar; Kolb, Timothy; Kotzalas, Margie; Kowalczyk, Jeffrey; Kratchman, Jessica; Kugler, Andrew; Lamb, Christopher; Lane, John; Larson, Emily; Laur, Steven; LaVie, Steve; Lewis, Robert; Li, Yong; Lichtz, Taylor; Lising, Jason; Lombard, Mark; Lubinski, John; Lui, Christiana; Lukes, Kim; Lynch, Jeffery; Ma, John; Mamish, Nader; Manahan, Michelle; Marksberry, Don; Marshall, Jane; Masao, Nagai; Maupin, Cardelia; Mayros, Lauren; Mazaika, Michael; McConnell, Keith; McCoppin, Michael; McDermott, Brian; McGinty, Tim; McGovern, Denise; McIntyre, David; McMurray, Anthony; Merritt, Christina; Meyer, Karen; Miller, Charles; Miller, Chris; Milligan, Patricia; Miranda, Samuel; Mohseni, Aby; Moore, Scott; Morlang, Gary; Morris, Scott; Mroz (Sahm), Sara; Munson, Clifford; Murray, Charles; Nerret, Amanda; Nguyen, Caroline; Norris, Michael; Norton, Charles; Opara, Stella; Ordaz, Vonna; Owens, Janice; Padovan, Mark; Parillo, John; Patel, Jay; Patel, Pravin; Patrick, Mark; Perin, Vanice; Pope, Tia; Powell, Amy; Purdy, Gary; Quinlan, Kevin; Raddatz, Michael; Ragland, Robert; Ralph, Melissa; Ramsey, Jack; Reed, Elizabeth; Reed, Sara; Reed, Wendy; Reeves, Rosemary; Reis, Terrence; Resner, Mark; Riley (OCA), Timothy; Riner, Kelly; Rini, Brett; Robinson, Edward; Rodriguez-Luccioni, Hector; Roggenbrodt, William; Ropon, Kimberly; Rosales-Cooper, Cindy; Rosenberg, Stacey; Ross-Lee, MaryJane; Roundtree, Amy; Ruland, William; Russell, Tonya; Ryan, Michelle; Salay, Michael; Salter, Susan; Salus, Amy; Sanfilippo, Nathan; Santos, Daniel; Scarbrough, Thomas; Schaperow, Jason; Schmidt, Duane; Schmidt, Rebecca; Schoenebeck, Greg; Schrader, Eric; Schwartzman, Jennifer; Seber, Dogan; See, Kenneth; Shane, Raeann; Shea, James; Shepherd, Jill; Sheron, Brian; Skarda, Raymond; Skeen, David; Sloan, Scott; Smioldo, Elizabeth; Smith, Brooke; Smith, Stacy; Smith, Theodore; Stahl, Eric; Stang, Annette; Stark, Johnathan; Steger (Tucci), Christine; Stieve, Alice; Stone, Rebecca; Stransky, Robert; Sturz, Fritz; Sullivan, Randy; Summers, Robert; Sun, Casper; Tappert, John; Tegeler, Bret; Temple, Jeffrey; Thaggard, Mark; Thomas, Eric; Thorp, John; Tiruneh, Nebiyu; Tobin, Jennifer; Trefethen, Jean; Tschiltz, Michael; Turtill, Richard; Uhle, Jennifer; Valencia, Sandra; Vaughn, James; Vick, Lawrence; Virgilio, Martin; Virgilio, Rosetta; Ward, Leonard; Ward, William; Wastler, Sandra; Watson, Bruce; Webber, Robert; Weber, Michael; White, Bernard; Wiggins, Jim; Williams, Donna; Williams, Joseph; Williamson, Linda; Willis, Dori; Wimbush, Andrea; Wittick, Brian; Wray,

To: John; Wright, Lisa (Gibney); Wright, Ned; Wunder, George; Young, Francis; Zimmerman, Jacob; Zimmerman, Roy
Subject: Japanese Earthquake ERO Staffing March 20-26, 2011 (Pay Period 7, Week 2)
Attachments: Japan Earthquake - ERO Staffing Schedule - March 20-26.pdf

Good Afternoon,

Attached is the OPS Center revised watchbill for March 20-26. The watchbill for the week of March 27-April 2 will be sent by Saturday, March 27.

If you need to change the schedule, please send an email to OST02 HOC and your Teams Coordinator.

EST Admin Support
NRC Operations Center
eMail: OST02.HOC@nrc.gov
301-816-5100 x5600

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Position	Date	Time	Staff
Executive Team			
ET Director			
Sat-Sun	3/19-3/20	11pm - 7am	Mike Johnson
Sun	20-Mar	7am - 3pm	Jim Wiggins
Sun	20-Mar	3pm-11pm	Brian Sheron
Sun-Mon	3/20-3/21	11pm - 7am	Mike Johnson
Mon	21-Mar	7am - 3pm	Mike Weber
Mon	21-Mar	3pm-11pm	Jim Wiggins
Mon-Tues	3/21-3/22	11pm - 7am	Mike Johnson
Tues	22-Mar	7am - 3pm	Mike Weber
Tues	22-Mar	3pm-11pm	Jim Wiggins
Tues-Wed	3/22-3/23	11pm - 7am	Bruce Boger
Wed	23-Mar	7am - 3pm	Mike Weber
Wed	23-Mar	3pm-11pm	Roy Zimmerman
Wed-Thur	3/23-3/24	11pm - 7am	Bruce Boger
Thur	24-Mar	7am - 3pm	Mike Weber
Thur	24-Mar	3pm-11pm	Roy Zimmerman
Thur-Fri	3/24-3/25	11pm - 7am	Jennifer Uhle
Fri	25-Mar	7am - 3pm	Jim Dyer
Fri	25-Mar	3pm-11pm	Roy Zimmerman
Fri-Sat	3/25-3/26	11pm-7am	Jennifer Uhle
Sat	26-Mar	7am - 3pm	Jim Dyer
Sat	26-Mar	3pm-11pm	Brian Sheron
Sat-Sun	3/26-3/27	11pm - 7am	Jennifer Uhle
ET Response Advisor			
Sat-Sun	3/19-3/20	11pm - 7am	Scott Morris
Sun	20-Mar	7am - 3pm	Chris Miller
Sun	20-Mar	3pm-11pm	Mary Jane (MJ) Ross-Lee
Sun-Mon	3/20-3/21	11pm - 7am	Scott Morris
Mon	21-Mar	7am - 3pm	Brian McDermott
Mon	21-Mar	3pm-11pm	Chris Miller
Mon-Tues	3/21-3/22	11pm - 7am	Scott Morris
Tues	22-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Tues	22-Mar	3pm-11pm	Chris Miller
Tues-Wed	3/22-3/23	11pm - 7am	Tim McGinty
Wed	23-Mar	7am - 3pm	Brian McDermott
Wed	23-Mar	3pm-11pm	Joe Giitter
Wed-Thur	3/23-3/24	11pm - 7am	Tim McGinty
Thur	24-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Thur	24-Mar	3pm-11pm	Joe Giitter
Thur-Fri	3/24-3/25	11pm - 7am	Tim McGinty
Fri	25-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Fri	25-Mar	3pm-11pm	Joe Giitter
Fri-Sat	3/25-3/26	11pm-7am	Tim McGinty
Sat	26-Mar	7am - 3pm	Mary Jane (MJ) Ross-Lee
Sat	26-Mar	3pm-11pm	Joe Giitter
Sat-Sun	3/26-3/27	11pm - 7am	Chris Miller
ET Rx Prot Measures & State Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Rob Lewis

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Sun	20-Mar	7am - 3pm	Vonna Ordaz
Sun	20-Mar	3pm-11pm	Larry Camper
Sun-Mon	3/20-3/21	11pm - 7am	Cynthia Carpenter
Mon	21-Mar	7am - 3pm	Charlie Miller
Mon	21-Mar	3pm-11pm	Larry Camper
Mon-Tues	3/21-3/22	11pm - 7am	Rob Lewis
Tues	22-Mar	7am - 3pm	Charlie Miller
Tues	22-Mar	3pm-11pm	Patricia Holahan
Tues-Wed	3/22-3/23	11pm - 7am	Cynthia Carpenter
Wed	23-Mar	7am - 3pm	Charlie Miller
Wed	23-Mar	3pm-11pm	Patricia Holahan
Wed-Thur	3/23-3/24	11pm - 7am	N/A
Thur	24-Mar	7am - 3pm	Larry Camper
Thur	24-Mar	3pm-11pm	Cynthia Carpenter
Thur-Fri	3/24-3/25	11pm - 7am	N/A
Fri	25-Mar	7am - 3pm	Cynthia Carpenter
Fri	25-Mar	3pm-11pm	Patricia Holahan
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	N/A
Sat	26-Mar	3pm-11pm	N/A
Sat-Sun	3/26-3/27	11pm - 7am	N/A
Executive Briefing Team			
EBT Admin. Assistant			
Sat-Sun	3/19-3/20	11pm - 9am	Sapna Hurd
Sun	20-Mar	9am - 7pm	Annette Stang
Sun-Mon	3/20-3/21	7pm-7am	Carolyn Kahler
Mon	21-Mar	7am - 3pm	A. Stang (7-11) / Sapna Hurd (11-3)
Mon	21-Mar	3pm-11pm	Tia Pope
Mon-Tues	3/21-3/22	11pm - 7am	Christina Merritt
Tues	22-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Tues	22-Mar	3pm-11pm	Jon Fiske
Tues-Wed	3/22-3/23	11pm - 7am	Tia Pope
Wed	23-Mar	7am - 3pm	Jon Fiske
Wed	23-Mar	3pm-11pm	Annette Stang
Wed-Thur	3/23-3/24	11pm - 7am	Christina Merritt
Thur	24-Mar	7am - 3pm	Carolyn Kahler/Sapna Hurd
Thur	24-Mar	3pm-11pm	Jonathan Fiske
Thur-Fri	3/24-3/25	11pm - 7am	Tia Pope
Fri	25-Mar	7am - 3pm	Jon Fiske
Fri	25-Mar	3pm-11pm	Sapna Hurd
Fri-Sat	3/25-3/26	11pm-7am	Carolyn Kahler
Sat	26-Mar	7am - 3pm	Kelly Riner
Sat	26-Mar	3pm-11pm	Louise Lovell
Sat-Sun	3/26-3/27	11pm - 7am	Jonathan Fiske
EBT Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Jim Andersen
Sun	20-Mar	7am - 3pm	Yen-Ju Chen
Sun	20-Mar	3pm-11pm	Caroline Nguyen
Sun-Mon	3/20-3/21	11pm - 7am	Jim Andersen
Mon	21-Mar	7am - 3pm	Yen-Ju Chen

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Mon	21-Mar	3pm-11pm	Sara Mroz
Mon-Tues	3/21-3/22	11pm - 7am	Jim Andersen
Tues	22-Mar	7am - 3pm	Caroline Nguyen
Tues	22-Mar	3pm-11pm	Sara Mroz
Tues-Wed	3/22-3/23	11pm - 7am	Jim Andersen
Wed	23-Mar	7am - 3pm	Yen-Ju Chen
Wed	23-Mar	3pm-11pm	Sara Mroz
Wed-Thur	3/23-3/24	11pm - 7am	Jim Andersen
Thur	24-Mar	7am - 3pm	Yen-Ju Chen
Thur	24-Mar	3pm-11pm	Sara Mroz
Thur-Fri	3/24-3/25	11pm - 7am	Jim Andersen
Fri	25-Mar	7am - 3pm	Caroline Nguyen
Fri	25-Mar	3pm-11pm	Sara Mroz
Fri-Sat	3/25-3/26	11pm-7am	Jim Andersen
Sat	26-Mar	7am - 3pm	Yen-Ju Chen/Tonya Russell
Sat	26-Mar	3pm-11pm	Sara Mroz
Sat-Sun	3/26-3/27	11pm - 7am	Jim Anderson
Executive Support Team			
EST Status Officer			
Sat-Sun	3/19-3/20	11pm - 7am	Doug Huyck
Sun	20-Mar	7am - 3pm	Craig Erlanger
Sun	20-Mar	3pm-11pm	John Jolicoeur
Sun-Mon	3/20-3/21	11pm - 7am	Doug Huyck
Mon	21-Mar	7am - 3pm	Jane Marshall
Mon	21-Mar	3pm-11pm	Bill Gott
Mon-Tues	3/21-3/22	11pm - 7am	Jeff Grant
Tues	22-Mar	7am - 3pm	John Jolicoeur
Tues	22-Mar	3pm-11pm	Bill Gott
Tues-Wed	3/22-3/23	11pm - 7am	Jeff Grant
Wed	23-Mar	7am - 3pm	Sally Billings/Jane Marshall
Wed	23-Mar	3pm-11pm	Bill Gott
Wed-Thur	3/23-3/24	11pm - 7am	Jeff Grant
Thur	24-Mar	7am - 3pm	Jane Marshall
Thur	24-Mar	3pm-11pm	Bill Gott
Thur-Fri	3/24-3/25	11pm - 7am	Jeff Grant
Fri	25-Mar	7am - 3pm	Jane Marshall
Fri	25-Mar	3pm-11pm	Bill Gott
Fri-Sat	3/25-3/26	11pm-7am	Jeff Grant
Sat	26-Mar	7am - 3pm	Jane Marshall ?
Sat	26-Mar	3pm-11pm	Bill Gott
Sat-Sun	3/26-3/27	11pm - 7am	Jeff Grant
EST Actions Officer			
Sat-Sun	3/19-3/20	11pm - 7am	Jonathan Fiske
Sun	20-Mar	7am - 3pm	Melissa Ralph
Sun	20-Mar	3pm-11pm	Jonathan Fiske
Sun-Mon	3/20-3/21	11pm - 7am	Dori Votolato-Willis
Mon	21-Mar	7am - 3pm	Melissa Ralph
Mon	21-Mar	3pm-11pm	Amanda Nerret
Mon-Tues	3/21-3/22	11pm - 7am	Kelly Grimes
Tues	22-Mar	7am - 3pm	Melissa Ralph

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

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Tues	22-Mar	3pm-11pm	Dori Votolato-Willis
Tues-Wed	3/22-3/23	11pm - 7am	Kelly Grimes
Wed	23-Mar	7am - 3pm	Melissa Ralph
Wed	23-Mar	3pm-11pm	Dori Votolato-Willis
Wed-Thur	3/23-3/24	11pm - 7am	Kelly Grimes
Thur	24-Mar	7am - 3pm	Wendy Reed
Thur	24-Mar	3pm-11pm	Dori Votolato-Willis
Thur-Fri	3/24-3/25	11pm - 7am	N/A
Fri	25-Mar	7am - 3pm	Amanda Nerret
Fri	25-Mar	3pm-11pm	Melissa Ralph
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	James Corson
Sat	26-Mar	3pm-11pm	Don Algama
Sat-Sun	3/26-3/27	11pm - 7am	N/A

EST Coordinator

Sat-Sun	3/19-3/20	11pm - 7am	Rebecca Stone
Sun	20-Mar	7am - 3pm	Clyde Ragland
Sun	20-Mar	3pm-11pm	Tony Bowers
Sun-Mon	3/20-3/21	11pm - 7am	Rebecca Stone
Mon	21-Mar	7am - 3pm	Tony McMurtray
Mon	21-Mar	3pm-11pm	Tony Bowers
Mon-Tues	3/21-3/22	11pm - 7am	Rebecca Stone
Tues	22-Mar	7am - 3pm	Tony McMurtray
Tues	22-Mar	3pm-11pm	Clyde Ragland
Tues-Wed	3/22-3/23	11pm - 7am	Rebecca Stone
Wed	23-Mar	7am - 3pm	Tony McMurtray
Wed	23-Mar	3pm-11pm	Clyde Ragland
Wed-Thur	3/23-3/24	11pm - 7am	Rebecca Stone
Thur	24-Mar	7am - 3pm	Tony McMurtray
Thur	24-Mar	3pm-11pm	Clyde Ragland
Thur-Fri	3/24-3/25	11pm - 7am	Steve Campbell
Fri	25-Mar	7am - 3pm	Taylor Lichatz
Fri	25-Mar	3pm-11pm	Tony McMurtray
Fri-Sat	3/25-3/26	11pm-7am	Steve Campbell
Sat	26-Mar	7am - 3pm	Tonya Russell
Sat	26-Mar	3pm-11pm	Tony McMurtray
Sat-Sun	3/26-3/27	11pm - 7am	Steve Campbell

EST Chronology Officer

Sat-Sun	3/19-3/20	11pm - 7am	Cynthia Dorsey
Sun	20-Mar	7am - 3pm	James Vaughn
Sun	20-Mar	3pm-11pm	Rebecca Karas
Sun-Mon	3/20-3/21	11pm - 7am	Mark Resner
Mon	21-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Mon	21-Mar	3pm-11pm	Rebecca Karas
Mon-Tues	3/21-3/22	11pm - 7am	Thomas Scarbrough
Tues	22-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Tues	22-Mar	3pm-11pm	Rebecca Karas
Tues-Wed	3/22-3/23	11pm - 7am	Thomas Scarbrough
Wed	23-Mar	7am - 3pm	James Vaughn
Wed	23-Mar	3pm-11pm	Rebecca Karas

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

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Wed-Thur	3/23-3/24	11pm - 7am	Nick Ballam
Thur	24-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Thur	24-Mar	3pm-11pm	Rebecca Karas
Thur-Fri	3/24-3/25	11pm - 7am	Thomas Scarbrough
Fri	25-Mar	7am - 3pm	Hector Rodriguez-Luccioni
Fri	25-Mar	3pm-11pm	Rebecca Karas
Fri-Sat	3/25-3/26	11pm-7am	Thomas Scarbrough
Sat	26-Mar	7am - 3pm	Nick Ballam
Sat	26-Mar	3pm-11pm	Rebecca Karas
Sat-Sun	3/26-3/27	11pm - 7am	Thomas Scarbrough

EST Response Ops Mgr

Sat-Sun	3/19-3/20	11pm - 7am	Jean Trefethan
Sun	20-Mar	7am - 3pm	Karen Jackson
Sun	20-Mar	3pm-11pm	Roberto Figueroa
Sun-Mon	3/20-3/21	11pm - 7am	Jean Trefethan
Mon	21-Mar	7am - 3pm	Bob Stransky
Mon	21-Mar	3pm-11pm	Omar Khan
Mon-Tues	3/21-3/22	11pm - 7am	Cris Brown
Tues	22-Mar	7am - 3pm	Bob Stransky
Tues	22-Mar	3pm-11pm	Karen Jackson
Tues-Wed	3/22-3/23	11pm - 7am	Roberto Figueroa
Wed	23-Mar	7am - 3pm	Bob Stransky
Wed	23-Mar	3pm-11pm	Jean Trefethan
Wed-Thur	3/23-3/24	11pm - 7am	Cris Brown
Thur	24-Mar	7am - 3pm	Karen Jackson
Thur	24-Mar	3pm-11pm	Omar Khan
Thur-Fri	3/24-3/25	11pm - 7am	Roberto Figueroa
Fri	25-Mar	7am - 3pm	Jean Trefethan
Fri	25-Mar	3pm-11pm	Cris Brown
Fri-Sat	3/25-3/26	11pm-7am	Roberto Figueroa
Sat	26-Mar	7am - 3pm	Omar Khan
Sat	26-Mar	3pm-11pm	Cris Brown
Sat-Sun	3/26-3/27	11pm - 7am	Roberto Figueroa

EST Admin. Assistant

Sat-Sun	3/19-3/20	11pm - 7am	Chris Lamb
Sun	20-Mar	7am - 3pm	Karen Meyer
Sun	20-Mar	3pm-11pm	Linda Williamson
Sun-Mon	3/20-3/21	11pm - 7am	Chris Lamb
Mon	21-Mar	7am - 3pm	Karen Meyer
Mon	21-Mar	3pm-11pm	Mary Glenn Crutchley
Mon-Tues	3/21-3/22	11pm - 7am	Andrea Wimbush
Tues	22-Mar	7am - 3pm	Cynthia Dorsey
Tues	22-Mar	3pm-11pm	Mary Glenn Crutchley
Tues-Wed	3/22-3/23	11pm - 7am	Michelle Manahan
Wed	23-Mar	7am - 3pm	Karen Meyer
Wed	23-Mar	3pm-11pm	Mary Glenn Crutchley
Wed-Thur	3/23-3/24	11pm - 7am	Andrea Wimbush
Thur	24-Mar	7am - 3pm	Cynthia Dorsey
Thur	24-Mar	3pm-11pm	Mary Glenn Crutchley
Thur-Fri	3/24-3/25	11pm - 7am	N/A

Japan Earthquake ERO Staffing Roster

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Fri	25-Mar	7am - 3pm	Karen Meyer
Fri	25-Mar	3pm-11pm	Cynthia Dorsey
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	Karen Meyer
Sat	26-Mar	3pm-11pm	Cynthia Dorsey
Sat-Sun	3/26-3/27	11pm - 7am	N/A
Liaison Team			
LT Director			
Sat-Sun	3/19-3/20	11pm - 7am	John Adams
Sun	20-Mar	7am - 3pm	Tom Bergman
Sun	20-Mar	3pm-11pm	Bob Webber
Sun-Mon	3/20-3/21	11pm - 7am	John Adams
Mon	21-Mar	7am - 3pm	Tom Bergman
Mon	21-Mar	3pm-11pm	Bob Webber
Mon-Tues	3/21-3/22	11pm - 7am	John Adams
Tues	22-Mar	7am - 3pm	Tom Bergman
Tues	22-Mar	3pm-11pm	Bob Webber
Tues-Wed	3/22-3/23	11pm - 7am	John Adams
Wed	23-Mar	7am - 3pm	Michael Tschiltz
Wed	23-Mar	3pm-11pm	Rich Correia
Wed-Thur	3/23-3/24	11pm - 7am	Jake Zimmerman
Thur	24-Mar	7am - 3pm	Michael Tschiltz
Thur	24-Mar	3pm-11pm	Rich Correia
Thur-Fri	3/24-3/25	11pm - 7am	Jake Zimmerman
Fri	25-Mar	7am - 3pm	Michael Tschiltz
Fri	25-Mar	3pm-11pm	Rich Correia
Fri-Sat	3/25-3/26	11pm-7am	Jake Zimmerman
Sat	26-Mar	7am - 3pm	Michael Tschiltz
Sat	26-Mar	3pm-11pm	Rich Correia
Sat-Sun	3/26-3/27	11pm - 7am	Marissa Bailey
LT Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Janelle Jessie
Sun	20-Mar	7am - 3pm	Jeff Temple
Sun	20-Mar	3pm-11pm	Nathan Sanfilippo
Sun-Mon	3/20-3/21	11pm - 7am	Milt Murray
Mon	21-Mar	7am - 3pm	Jeff Temple
Mon	21-Mar	3pm-11pm	Nathan Sanfilippo
Mon-Tues	3/21-3/22	11pm - 7am	Milt Murray
Tues	22-Mar	7am - 3pm	Rani Franovich
Tues	22-Mar	3pm-11pm	Nathan Sanfilippo
Tues-Wed	3/22-3/23	11pm - 7am	Milt Murray
Wed	23-Mar	7am - 3pm	Rani Franovich
Wed	23-Mar	3pm-11pm	Jeff Temple
Wed-Thur	3/23-3/24	11pm - 7am	Milt Murray
Thur	24-Mar	7am - 3pm	Rani Franovich
Thur	24-Mar	3pm-11pm	Jeff Temple
Thur-Fri	3/24-3/25	11pm - 7am	Milt Murray
Fri	25-Mar	7am - 3pm	Janelle Jessie
Fri	25-Mar	3pm-11pm	Rani Franovich
Fri-Sat	3/25-3/26	11pm-7am	Milt Murray

Japan Earthquake ERO Staffing Roster

March 20-26, 2011

Pay Period 7 - Week 2

Sat	26-Mar	7am - 3pm	Janelle Jessie
Sat	26-Mar	3pm-11pm	Rani Franovich
Sat-Sun	3/26-3/27	11pm - 7am	Milt Murray
LT State Liaison			
Sat-Sun	3/19-3/20	9pm-7am	Michelle Ryan/Rich Turttil (ON CALL ONLY)
Sun	20-Mar	7am-2pm	Michelle Ryan/Rich Turttil (ON CALL ONLY)
Sun	20-Mar	2pm-9pm	Michelle Ryan/Rich Turttil (ON CALL ONLY)
Sun-Mon	3/20-3/21	9pm-7am	Michelle Ryan/Rich Turttil (ON CALL ONLY)
Mon	21-Mar	7am-2pm	Flannery (Riveria-On Call)
Mon	21-Mar	2pm-9pm	Easson (Turttil-On Call)
Mon-Tue	3/21-3/22	9pm-7am	Michelle Ryan/Rich Turttil (ON CALL ONLY)
Tue	22-Mar	7am-2pm	Maupin
Tue	22-Mar	2pm-9pm	Easson/Michelle Ryan
Tue-Wed	3/22-3/23	9pm-7am	Alison Rivera/Amanda Noonan (ON CALL ONLY)
Wed	23-Mar	7am-2pm	Maupin
Wed	23-Mar	2pm-9pm	Alison Rivera
Wed-Thur	3/23-3/24	9pm-7am	Michelle Ryan/Turttil (ON CALL ONLY)
Thur	24-Mar	7am-2pm	Flannery
Thur	24-Mar	2pm-9pm	Amanda Noonan
Thur-Fri	3/24-3/25	9pm-7am	Rivera/Turttil (ON CALL ONLY)
Fri	25-Mar	7am-2pm	Kim Lukes
Fri	25-Mar	2pm-9pm	Michelle Ryan
Fri-Sat	3/25-3/26	9pm-7am	Alison Rivera/Amanda Noonan (ON CALL ONLY)
Sat	26-Mar	7am-2pm	Michelle Ryan/Amanda Noonan (ON CALL ONLY)
Sat	26-Mar	2pm-9pm	Michelle Ryan/Amanda Noonan (ON CALL ONLY)
Sat-Sun	3/26-3/27	9pm-7am	Michelle Rivera/Amanda Noonan (ON CALL ONLY)
LT Federal Liaison (2)			
Sun	20-Mar	7am - 3pm	Ned Wright
Sun	20-Mar	3pm-11pm	Jeff Temple
Sun-Mon	3/20-3/21	11pm - 7am	Scott Sloan
Sun-Mon	3/20-3/21	11pm - 7am	Lisa Wright
Mon	21-Mar	7am - 3pm	Beth Reed/Ted Smith
Mon	21-Mar	3pm-11pm	Ned Wright
Mon-Tues	3/21-3/22	11pm - 7am	Lisa Wright
Tues	22-Mar	7am - 3pm	Beth Reed/Ted Smith
Tues	22-Mar	3pm-11pm	Ned Wright
Tues-Wed	3/22-3/23	11pm - 7am	Lisa Wright
Wed	23-Mar	7am - 3pm	Jerry Hale/Ted Smith
Wed	23-Mar	3pm-11pm	Ned Wright
Wed-Thur	3/23-3/24	11pm - 7am	Lisa Wright
Thur	24-Mar	7am - 3pm	Ted Smith/Bethany Cecere
Thur	24-Mar	3pm-11pm	Jerry Hale
Thur-Fri	3/24-3/25	11pm - 7am	Scott Sloan
Fri	25-Mar	7am - 3pm	Ted Smith/Bethany Cecere
Fri	25-Mar	3pm-11pm	Jason Lising
Fri-Sat	3/25-3/26	11pm-7am	Scott Sloan
Sat	26-Mar	7am - 3pm	Jason Lising/Lisa Gibney
Sat	26-Mar	3pm-11pm	Jeff Temple
Sat-Sun	3/26-3/27	11pm - 7am	Scott Sloan

Japan Earthquake ERO Staffing Roster

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LT Congressional Liaison (2)

Sun	20-Mar	7am - 2pm	Rebecca Schmidt
	20-Mar	2pm-9pm	Reanne Shane
Mon	21-Mar	7am - 2pm	Spiros Droggitis
	21-Mar	2pm-9pm	Tim Riley
Tues	22-Mar	7am - 2pm	Tim Riley
	22-Mar	2pm-9pm	Spiros Droggitis
Wed	23-Mar	7am - 2pm	Gene Dacus
	23-Mar	2pm-9pm	Raeann Shane
Thur	24-Mar	7am - 2pm	Spiros Droggitis
	24-Mar	2pm-9pm	Raeann Shane
Fri	25-Mar	7am - 2pm	Gene Dacus
	25-Mar	2pm-9pm	Amy Powell
Sat	26-Mar	7am - 3pm	Amy Powell (ON CALL ONLY)
Sat	26-Mar	3pm-11pm	Amy Powell (ON CALL ONLY)
Sun	3/26-3/27	11pm - 7am	Amy Powell (ON CALL ONLY)

LT International Liaison (2)

Sat-Sun	3/19-3/20	11pm - 7am	Elizabeth Smirolodo/Danielle Emche
Sun	20-Mar	7am - 3pm	Karen Henderson/Steve Baker
Sun	20-Mar	3pm-11pm	Eric Stahl/Nancy Fragoyanis
Sun-Mon	3/20-3/21	11pm - 7am	Elizabeth Smirolodo/Jenny Tobin
Mon	21-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3
Mon	21-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Mon-Tues	3/21-3/22	11pm - 7am	Eric Stahl/Mugeh Afshar-Tous
Tues	22-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3
Tues	22-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Tues-Wed	3/22-3/23	11pm - 7am	Eric Stahl/Mugeh
Wed	23-Mar	7am - 3pm	Jen Schwartzman/Charlotte Abrams/Nancy (12-3
Wed	23-Mar	3pm-11pm	Danielle Emche/Lauren Mayros
Wed-Thur	3/23-3/24	11pm - 7am	Eric Stahl/Mugeh
Thur	24-Mar	7am - 3pm	Steve Bloom/Lance English
Thur	24-Mar	3pm-11pm	Janice/Jenny Tobin
Thur-Fri	3/24-3/25	11pm - 7am	Andrea/Elizabeth Smirolodo
Fri	25-Mar	7am - 3pm	Steve Bloom/Lance English
Fri	25-Mar	3pm-11pm	Janice/Jenny Tobin
Fri-Sat	3/25-3/26	11pm-7am	Andrea/Elizabeth Smirolodo
Sat	26-Mar	7am - 3pm	Steve Bloom / Lance English
Sat	26-Mar	3pm-11pm	Janice Owens / Jenny Tobin
Sat-Sun	3/26-3/27	11pm - 7am	Cindy Rosales/ Elizabeth Smirolodo

Protective Measures Team

PMTR Director			
Sat-Sun	3/19-3/20	11pm - 7am	Kathy Gibson
Sun	20-Mar	7am - 3pm	John Lubinski
Sun	20-Mar	3pm-11pm	Don Cool
Sun-Mon	3/20-3/21	11pm - 7am	Kathy Gibson
Mon	21-Mar	7am - 3pm	John Lubinski
Mon	21-Mar	3pm-11pm	Don Cool
Mon-Tues	3/21-3/22	11pm - 7am	John Tappert
Tues	22-Mar	7am - 3pm	John Lubinski
Tues	22-Mar	3pm-11pm	Don Cool

Japan Earthquake ERO Staffing Roster

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Tues-Wed	3/22-3/23	11pm - 7am	John Tappert
Wed	23-Mar	7am - 3pm	Terry Reis
Wed	23-Mar	3pm-11pm	Cindy Jones
Wed-Thur	3/23-3/24	11pm - 7am	Randy Sullivan
Thur	24-Mar	7am - 3pm	Terry Reis
Thur	24-Mar	5pm-11pm	Cindy Jones
Thur-Fri	3/24-3/25	11pm - 7am	Randy Sullivan
Fri	25-Mar	7am - 3pm	Terry Reis
Fri	25-Mar	5pm-11pm	Cindy Jones
Fri-Sat	3/25-3/26	11pm-7am	Randy Sullivan
Sat	26-Mar	7am - 3pm	Terry Reis
Sat	26-Mar	3pm-11pm	Cindy Jones
Sat-Sun	3/26-3/27	11pm - 7am	Randy Sullivan

PMTR Coordinator

Sat-Sun	3/19-3/20	11pm - 7am	Lou Brandon
Sun	20-Mar	7am - 3pm	Nima Ashkeboussi
Sun	20-Mar	3pm-11pm	Jay Patel
Sun-Mon	3/20-3/21	11pm - 7am	Lou Brandon
Mon	21-Mar	7am - 3pm	Prosanta Chowdhury (8 am)
Mon	21-Mar	3pm-11pm	Jay Patel
Mon-Tues	3/21-3/22	11pm - 7am	Lou Brandon
Tues	22-Mar	7am - 3pm	Prosanta Chowdhury (8 am)
Tues	22-Mar	3pm-11pm	Nima Ashkeboussi
Tues-Wed	3/22-3/23	11pm - 7am	Mike Norris
Wed	23-Mar	7am - 3pm	John Wray
Wed	23-Mar	3pm-11pm	Nima Ashkeboussi
Wed-Thur	3/23-3/24	11pm - 7am	Mike Norris
Thur	24-Mar	7am - 3pm	John Wray
Thur	24-Mar	3pm-11pm	Jay Patel/Joe DeCicco
Thur-Fri	3/24-3/25	11pm - 7am	Mike Norris
Fri	25-Mar	7am - 3pm	Duane Hardesty/Joe DeCicco
Fri	25-Mar	3pm-11pm	Ryan Craffey
Fri-Sat	3/25-3/26	11pm-7am	Lou Brandon
Sat	26-Mar	7am - 3pm	Arlon Costa
Sat	26-Mar	3pm-11pm	Kimberly Hardin
Sat-Sun	3/26-3/27	11pm - 7am	Lou Brandon

PMTR Prot Actions Asst Dir

Sat-Sun	3/19-3/20	11pm - 7am	Greg Casto
Sun	20-Mar	7am - 3pm	Kathryn Brock
Sun	20-Mar	3pm-11pm	Tim Harris
Sun-Mon	3/20-3/21	11pm - 7am	Greg Casto (Jessica Kratchman - to shadow)
Mon	21-Mar	7am - 3pm	Kathryn Brock
Mon	21-Mar	3pm-11pm	Dan Barss
Mon-Tues	3/21-3/22	11pm - 7am	Jessica Kratchman
Tues	22-Mar	7am - 3pm	Kathryn Brock
Tues	22-Mar	3pm-11pm	Tim Harris
Tues-Wed	3/22-3/23	11pm - 7am	Jessica Kratchman
Wed	23-Mar	7am - 3pm	Sandra Wastler
Wed	23-Mar	3pm-11pm	Vince Holahan
Wed-Thur	3/23-3/24	11pm - 7am	Jessica Kratchman

Japan Earthquake ERO Staffing Roster

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Thur	24-Mar	7am - 3pm	Sandra Wastler
Thur	24-Mar	3pm-11pm	Stacey Rosenberg
Thur-Fri	3/24-3/25	11pm - 7am	Jessica Kratchman
Fri	25-Mar	7am - 3pm	Kathryn Brock
Fri	25-Mar	3pm-11pm	Vince Holahan
Fri-Sat	3/25-3/26	11pm-7am	Greg Casto
Sat	26-Mar	7am - 3pm	Dan Barss
Sat	26-Mar	3pm-11pm	Sandra Wastler
Sat-Sun	3/26-3/27	11pm - 7am	Greg Casto/Jessica Kratchman
PMTR RAAD			
Sat-Sun	3/19-3/20	11pm - 7am	Patricia Milligan
Sun	20-Mar	7am - 3pm	Eric Schrader
Sun	20-Mar	3pm-11pm	Steve LaVie
Sun-Mon	3/20-3/21	11pm - 7am	Mike Norris
Mon	21-Mar	7am - 3pm	Michelle Hart
Mon	21-Mar	3pm-11pm	Steve Lavie
Mon-Tues	3/21-3/22	11pm - 7am	Boby Abu-Eid
Tues	22-Mar	7am - 3pm	Bruce Watson
Tues	22-Mar	3pm-11pm	Steve LaVie
Tues-Wed	3/22-3/23	11pm - 7am	Boby Abu-Eid
Wed	23-Mar	7am - 3pm	Bruce Watson
Wed	23-Mar	3pm-11pm	Michelle Hart
Wed-Thur	3/23-3/24	11pm - 7am	Duane Schmidt
Thur	24-Mar	7am - 3pm	Bruce Watson
Thur	24-Mar	3pm-11pm	Steve LaVie
Thur-Fri	3/24-3/25	11pm - 7am	Cynthia Barr
Fri	25-Mar	7am - 3pm	Bruce Watson
Fri	25-Mar	3pm-11pm	Michelle Hart
Fri-Sat	3/25-3/26	11pm-7am	Cynthia Barr
Sat	26-Mar	7am - 3pm	Bruce Watson
Sat	26-Mar	3pm-11pm	Steve LaVie
Sat-Sun	3/26-3/27	11pm - 7am	Mike Norris
PMTR Dose Assessment (RASCAL) - Need 2			
Sat-Sun	3/19-3/20	11pm - 7am	Kimberly Gambone/John Parillo
Sun	20-Mar	7am - 3pm	Casper Sun / Duane Schmidt
Sun	20-Mar	3pm-11pm	Margaret Cervera / Tony Huffert
Sun-Mon	3/20-3/21	11pm - 7am	Kimberly Gambone/John Parillo
Mon	21-Mar	7am - 3pm	Eric Schrader/Rich Clement
Mon	21-Mar	3pm-11pm	Margaret Cervera/Tony Huffert
Mon-Tues	3/21-3/22	11pm - 7am	John Parillo / Bernie White
Tues	22-Mar	7am - 3pm	Eric Schrader/Rich Clement
Tues	22-Mar	3pm-11pm	Gary Purdy/Casper Sun
Tues-Wed	3/22-3/23	11pm - 7am	Margaret Cervera/Tony Huffert
Wed	23-Mar	7am - 3pm	Eric Schrader/Rich Clement
Wed	23-Mar	3pm-11pm	Kimberly Gambone/Casper Sun
Wed-Thur	3/23-3/24	11pm - 7am	Tony Huffert/John Parillo
Thur	24-Mar	7am - 3pm	Eric Schrader/Rich Clement
Thur	24-Mar	3pm-11pm	Kimberly Gambone/Casper Sun
Thur-Fri	3/24-3/25	11pm - 7am	Tony Huffert/John Parillo
Fri	25-Mar	7am - 3pm	Eric Schrader/Rich Clement

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Fri	25-Mar	3pm-11pm	Gary Purdy/Casper Sun
Fri-Sat	3/25-3/26	11pm-7am	John Parillo / Bernie White
Sat	26-Mar	7am - 3pm	Tony Huffert/Charlie Hinson
Sat	26-Mar	3pm-11pm	Leroy Hardin/Gary Purdy?
Sat-Sun	3/26-3/27	11pm - 7am	John Parillo/Ron LaVera
PMTR GIS Analyst			
Sun-Mon	3/20-3/21	11pm - 7am	Alice Stieve
Mon	21-Mar	7am - 3pm	Nebiyu Tiruneh
Mon	21-Mar	3pm-11pm	Stephanie Devlin
Mon-Tues	3/21-3/22	11pm - 7am	Alice Stieve
Tues	22-Mar	7am - 3pm	Yong Li
Tues	22-Mar	3pm-11pm	Stephanie Devlin
Tues-Wed	3/22-3/23	11pm - 7am	Alice Stieve
Wed	23-Mar	7am - 3pm	Allen Gross
Wed	23-Mar	3pm-11pm	Stephanie Devlin
Wed-Thur	3/23-3/24	11pm - 7am	Phil Brandt
Thur	24-Mar	7am - 3pm	Yong Li
Thur	24-Mar	3pm-11pm	Stephanie Devlin
Thur-Fri	3/24-3/25	11pm - 7am	Dogan Seber
Fri	25-Mar	7am - 3pm	Allen Gross
Fri	25-Mar	3pm-11pm	N/A
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	N/A
Sat	26-Mar	3pm-11pm	N/A
Sat-Sun	3/26-3/27	11pm - 7am	N/A
PMTR Meteorologist			
Sat-Sun	19-Mar	3pm-11pm	Mike Mazaika
Sun	3/19-3/20	11pm - 7am	David Brown
Sun	20-Mar	7am - 3pm	Kevin Quinlan
Sun	20-Mar	3pm-11pm	Mike Mazaika
Sun-Mon	3/20-3/21	11pm - 7am	David Brown
Mon	21-Mar	7am - 3pm	Mike Mazaika
Mon	21-Mar	3pm-11pm	Brad Harvey
Mon-Tues	3/21-3/22	11pm - 7am	Kevin Quinlan
Tues	22-Mar	7am - 3pm	David Brown
Tues	22-Mar	3pm-11pm	Brad Harvey
Tues-Wed	3/22-3/23	11pm - 7am	Andy Imboden/Kevin Quinlan
Wed	23-Mar	7am - 3pm	Mike Mazaika
Wed	23-Mar	3pm-11pm	Brad Harvey
Wed-Thur	3/23-3/24	11pm - 7am	Kevin Quinlan
Thur	24-Mar	7am - 3pm	David Brown
Thur	24-Mar	3pm-11pm	Brad Harvey
Thur-Fri	3/24-3/25	11pm - 7am	Kevin Quinlan
Fri	25-Mar	7am - 3pm	Mike Mazaika
Fri	25-Mar	3pm-11pm	N/A
Fri-Sat	3/25-3/26	11pm-7am	N/A
Sat	26-Mar	7am - 3pm	N/A
Sat	26-Mar	3pm-11pm	N/A
Sat-Sun	3/26-3/27	11pm - 7am	N/A

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Reactor Safety Team			
RST Director			
Sat-Sun	3/19-3/20	11pm - 7am	Jennifer Uhle
Sun	20-Mar	7am - 3pm	Laura Dudes
Sun	20-Mar	3pm-11pm	Dave Skeen
Sun-Mon	3/20-3/21	11pm - 7am	Jennifer Uhle
Mon	21-Mar	7am - 3pm	Fred Brown
Mon	21-Mar	3pm-11pm	Dave Skeen
Mon-Tues	3/21-3/22	11pm - 7am	Jennifer Uhle
Tues	22-Mar	7am - 3pm	Fred Brown
Tues	22-Mar	3pm-11pm	Dave Skeen
Tues-Wed	3/22-3/23	11pm - 7am	Brian Holian
Wed	23-Mar	7am - 3pm	Fred Brown
Wed	23-Mar	3pm-11pm	Bill Ruland
Wed-Thur	3/23-3/24	11pm - 7am	Brian Holian
Thur	24-Mar	7am - 3pm	Fred Brown
Thur	24-Mar	3pm-11pm	Bill Ruland
Thur-Fri	3/24-3/25	11pm - 7am	Brian Holian
Fri	25-Mar	7am - 3pm	Pat Hiland
Fri	25-Mar	3pm-11pm	Bill Ruland
Fri-Sat	3/25-3/26	11pm-7am	Brian Holian
Sat	26-Mar	7am - 3pm	Pat Hiland
Sat	26-Mar	3pm-11pm	Bill Ruland
Sat	3/26-27/2011	11pm - 7am	Dave Skeen
RST Coordinator			
Sat-Sun	3/19-3/20	11pm - 7am	Frank Collins
Sun	20-Mar	7am - 3pm	Peter Alter
Sun	20-Mar	3pm-11pm	Eric Thomas
Sun-Mon	3/20-3/21	11pm - 7am	Mike Morlang
Mon	21-Mar	7am - 3pm	Peter Alter
Mon	21-Mar	3pm-11pm	Greg Schoenebeck
Mon-Tues	3/21-3/22	11pm - 7am	Frank Collins
Tues	22-Mar	7am - 3pm	Rick Hasselberg
Tues	22-Mar	3pm-11pm	Mike Morlang
Tues-Wed	3/22-3/23	11pm - 7am	Oleg Bukharin
Wed	23-Mar	7am - 3pm	Eric Thomas
Wed	23-Mar	3pm-11pm	Greg Schoenebeck
Wed-Thur	3/23-3/24	11pm - 7am	Frank Collins
Thur	24-Mar	7am - 3pm	Rick Hasselberg
Thur	24-Mar	3pm-11pm	Brett Rini
Thur-Fri	3/24-3/25	11pm - 7am	Tom Boyce (RES)
Fri	25-Mar	7am - 3pm	Eric Thomas
Fri	25-Mar	3pm-11pm	Brett Rini
Fri-Sat	3/25-3/26	11pm-7am	Frank Collins
Sat	26-Mar	7am - 3pm	Eric Thomas
Sat	26-Mar	3pm-11pm	Mark Orr
Sat-Sun	3/26-3/27	11pm - 7am	Brett Rini
Severe Accident/PRA			
Sat-Sun	3/19-3/20	11pm - 7am	Mike Salay
Sun	20-Mar	7am - 3pm	John Lane

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Sun	20-Mar	3pm-11pm	Jim Gilmer
Sun-Mon	3/20-3/21	11pm - 7am	Don Dube
Mon	21-Mar	7am - 3pm	Jeff Circle
Mon	21-Mar	3pm-11pm	Hossein Esmaili
Mon-Tues	3/21-3/22	11pm - 7am	Jim Gilmer
Tues	22-Mar	7am - 3pm	Ed Fuller
Tues	22-Mar	3pm-11pm	Len Ward
Tues-Wed	3/22-3/23	11pm - 7am	Sam Miranda
Wed	23-Mar	7am - 3pm	Jeff Circle
Wed	23-Mar	3pm-11pm	Steven Arndt
Wed-Thur	3/23-3/24	11pm - 7am	Mike Salay
Thur	24-Mar	7am - 3pm	Jeff Circle
Thur	24-Mar	3pm-11pm	Steve Laur
Thur-Fri	3/24-3/25	11pm - 7am	Don Helton
Fri	25-Mar	7am - 3pm	Steven Arndt
Fri	25-Mar	3pm-11pm	Steve Laur
Fri-Sat	3/25-3/26	11pm-7am	Don Helton
Sat	26-Mar	7am - 3pm	Steven Arndt
Sat	26-Mar	3pm-11pm	Jerry Dozier
Sat-Sun	3/26-3/27	11pm - 7am	Ray Skarda
BWR Expertise			
Sat-Sun	3/19-3/20	11pm - 7am	John Kauffman
Sun	20-Mar	7am - 3pm	Larry Vick
Sun	20-Mar	3pm-11pm	Chuck Norton
Sun-Mon	3/20-3/21	11pm - 7am	Mike Brown
Mon	21-Mar	7am - 3pm	Bob Summers
Mon	21-Mar	3pm-11pm	Chuck Norton
Mon-Tues	3/21-3/22	11pm - 7am	Mike Brown
Tues	22-Mar	7am - 3pm	Tom Boyce (RES)
Tues	22-Mar	3pm-11pm	Chuck Norton
Tues-Wed	3/22-3/23	11pm - 7am	Mike Brown
Wed	23-Mar	7am - 3pm	Larry Vick
Wed	23-Mar	3pm-11pm	Chuck Norton
Wed-Thur	3/23-3/24	11pm - 7am	Eva Brown
Thur	24-Mar	7am - 3pm	Peter Alter
Thur	24-Mar	3pm-11pm	Chuck Norton
Thur-Fri	3/24-3/25	11pm - 7am	Eva Brown
Fri	25-Mar	7am - 3pm	Bob Summers
Fri	25-Mar	3pm-11pm	Chuck Norton
Fri-Sat	3/25-3/26	11pm-7am	Eva Brown
Sat	26-Mar	7am - 3pm	Mike Brown
Sat	26-Mar	3pm-11pm	Chuck Norton
Sat-Sun	3/26-3/27	11pm - 7am	Eva Brown
RST Comm/ERDS Operator			
Sat-Sun	3/19-3/20	11pm - 7am	Ujagar Bhachu
Sun	20-Mar	7am - 3pm	Denise McGovern
Sun	20-Mar	3pm-11pm	Donna Williams
Sun-Mon	3/20-3/21	11pm - 7am	Ujagar Bhachu
Mon	21-Mar	7am - 3pm	Joseph Williams
Mon	21-Mar	3pm-11pm	John Thorp

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Mon-Tues	3/21-3/22	11pm - 7am	Bill Roggenbrodt
Tues	22-Mar	7am - 3pm	Steve Bloom
Tues	22-Mar	3pm-11pm	Jim Isom
Tues-Wed	3/22-3/23	11pm - 7am	Bill Roggenbrodt
Wed	23-Mar	7am - 3pm	Joseph Williams
Wed	23-Mar	3pm-11pm	Ken Hart
Wed-Thur	3/23-3/24	11pm - 7am	Bill Roggenbrodt
Thur	24-Mar	7am - 3pm	John Thorp
Thur	24-Mar	3pm-11pm	Ken Hart
Thur-Fri	3/24-3/25	11pm - 7am	Bill Roggenbrodt
Fri	25-Mar	7am - 3pm	Donna Williams
Fri	25-Mar	3pm-11pm	David Solorio
Fri-Sat	3/25-3/26	11pm-7am	Rick Hasselberg
Sat	26-Mar	7am - 3pm	John Thorp
Sat	26-Mar	3pm-11pm	Stan Gardocki
Sat-Sun	3/26-3/27	11pm - 7am	Denise McGovern
RST Support (Seismology Q&A)			
Fri-Sat	3/18-3/19	11pm-7am	Off (On Call)
Sat	19-Mar	7am - 3pm	Off (On Call)
Sat	19-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/19-3/20	11pm - 7am	Alice Stieve (On Call) Working as PMT GIS
Sun	20-Mar	7am - 3pm	Cliff Munson (On Call)
Sun	20-Mar	3pm-11pm	Annie Kammerer (On Call)
Sun-Mon	3/20-3/21	11pm - 7am	Stephanie Devlin (On Call)
Mon	21-Mar	7am - 3pm	Cliff Munson (On Call)
Mon	21-Mar	3pm-11pm	A. Kammerer 3-11; M. Bensi 3-6 (On Call)
Mon-Tues	3/21-3/22	11pm - 7am	Dogan Seber (On Call)
Tues	22-Mar	7am - 3pm	Nilesh Chokchi On Call)
Tues	22-Mar	3pm-11pm	S. Devlin 3-11; M. Bensi 3-6 (On Call)
Tues-Wed	3/22-3/23	11pm - 7am	Cliff Munson (On Call)
Wed	23-Mar	7am - 3pm	Nilesh Chokchi On Call)
Wed	23-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Wed-Thur	3/23-3/24	11pm - 7am	Annie Kammerer (On Call)
Thur	24-Mar	7am - 3pm	Cliff Munson (On Call)
Thur	24-Mar	3pm-11pm	A. Kammerer 3-11, M. Bensi 3-6 (On Call)
Thur-Fri	3/24-3/25	11pm - 7am	Dogan Seber (On Call)
Fri	25-Mar	7am - 3pm	Dogan Seber (On Call)
Fri	25-Mar	3pm-11pm	A.Kammerer 3-11, M. Bensi 3-6 (On Call)
Fri-Sat	3/25-3/26	11pm-7am	Dogan Seber (On Call)
Sat	26-Mar	7am - 3pm	A. Kammerer (On Call)
Sat	26-Mar	3pm-11pm	A. Kammerer (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	A. Kammerer (On Call)
RST Support (Structural)			
Fri-Sat	3/18-3/19	11pm-7am	Off (On Call)
Sat	19-Mar	7am - 3pm	Off (On Call)
Sat	19-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/19-3/20	11pm - 7am	Off (On Call)
Sun	20-Mar	7am - 3pm	Off (On Call)
Sun	20-Mar	3pm-11pm	Off (On Call)
Sun-Mon	3/20-3/21	11pm - 7am	Off (On Call)

Japan Earthquake ERO Staffing Roster

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Mon	21-Mar	7am - 3pm	Off (On Call)
Mon	21-Mar	3pm-11pm	Bret Tegeler (On Call)
Mon-Tues	3/21-3/22	11pm - 7am	Bret Tegeler (On Call)
Tues	22-Mar	7am - 3pm	Pravin Patel (On Call)
Tues	22-Mar	3pm-11pm	Bret Tegeler (On Call)
Tues-Wed	3/22-3/23	11pm - 7am	Bret Tegeler (On Call)
Wed	23-Mar	7am - 3pm	Pravin Patel (On Call)
Wed	23-Mar	3pm-11pm	Samir Chakrabart (On Call)
Wed-Thur	3/23-3/24	11pm - 7am	Samir Chakrabart (On Call)
Thur	24-Mar	7am - 3pm	Pravin Patel (On Call)
Thur	24-Mar	3pm-11pm	Jerry Chung (On Call)
Thur-Fri	3/24-3/25	11pm - 7am	Jerry Chung(On Call)
Fri	25-Mar	7am - 3pm	Pravin Patel (On Call)
Fri	25-Mar	3pm-11pm	Manas Chakravorty (On Call)
Fri-Sat	3/25-3/26	11pm-7am	Manas Chakravorty (On Call)
Sat	26-Mar	7am - 3pm	Off (On Call)
Sat	26-Mar	3pm-11pm	Off (On Call)
Sat-Sun	3/26-3/27	11pm - 7am	Off (On Call)