

From: Reed, Elizabeth
Sent: Friday, March 11, 2011 7:03 AM
To: Sloan, Scott
Cc: Hasselberg, Rick
Subject: RE: Japan Quake

This is when I wished I still had all my files from when I worked at DHS. I did a bunch of research on seismic regulations and developed a presentation for the Secretary because of a previous Japan earthquake. That one made water in a spent fuel pool to slosh around. The Secretary had questions about if that could happen here, and also wanted to know if we had any plants on a fault line (yes).

Beth

From: Sloan, Scott
Sent: Friday, March 11, 2011 6:52 AM
To: Reed, Elizabeth
Cc: Hasselberg, Rick
Subject: Japan Quake

Beth,

I'm going to do as much research as I can on the results of the quake in Japan – I think it could help us in the NLE and determine if the seismic regulations for NPRs are realistic. Please let me know if you hear anything.

Thanks,
Scott

BT/1

From: Kammerer, Annie
Sent: Friday, March 11, 2011 7:54 AM
To: Hasselberg, Rick
Subject: FW: M8.9 NEAR THE EAST COAST OF HONSHU, JAPAN
Attachments: ISSC_Notification_Report.pdf

FYI. Also, fukushima is evacuating

From: ISSC-Notification@iaea.org [mailto:ISSC-Notification@iaea.org]
Sent: Friday, March 11, 2011 4:38 AM
To: ISSC-Notification@iaea.org
Cc: Kammerer, Annie
Subject: M8.9 NEAR THE EAST COAST OF HONSHU, JAPAN

The following New Earthquake occurred:

| | |
|-----------|--------------------------------------|
| Location | NEAR THE EAST COAST OF HONSHU, JAPAN |
| Magnitude | 8.9 |
| Time | 2011-03-11 06:46:23 |
| Lat | 38.322 |
| Lon | 142.369 |

ISSC ShakeCast Notification System
IAEA

=====

BT/2

Magnitude 8.9 - NEAR THE EAST COAST OF HONSHU, JAPAN

Version 4

Time: 2011-03-11 05:46:23 GMT

Created: 2011-03-11 09:37:54 GMT

Location: 38.32 N/ 142.37 E

For more information and latest version see

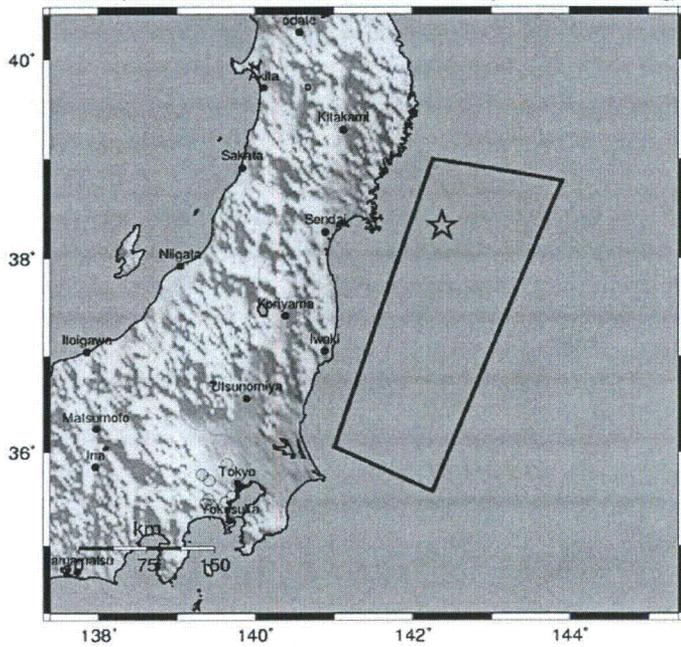
Depth: 24.4 km

<http://earthquake.usgs.gov/shakemap>

These results are from an automated system and users should consider the preliminary nature of this information when making decisions relating to public safety. ShakeCast results are often updated as additional or more accurate earthquake information is reported or derived.

USGS ShakeMap : NEAR THE EAST COAST OF HONSHU, JAPAN

Fri Mar 11, 2011 05:46:23 GMT M 8.9 N38.32 E142.37 Depth: 24.4km ID:c0001xgp



Map Version 4 Processed Fri Mar 11, 2011 01:23:57 AM MST - NOT REVIEWED BY HUMAN

| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
|------------------------|----------|---------|---------|------------|--------|-------------|----------------|---------|------------|
| POTENTIAL DAMAGE | none | none | none | Very light | Light | Moderate | Moderate/Heavy | Heavy | Very Heavy |
| PEAK ACC.(%g) | <.17 | .17-1.4 | 1.4-3.9 | 3.9-9.2 | 9.2-18 | 18-34 | 34-65 | 65-124 | >124 |
| PEAK VEL.(cm/s) | <0.1 | 0.1-1.1 | 1.1-3.4 | 3.4-8.1 | 8.1-16 | 16-31 | 31-60 | 60-116 | >116 |
| INSTRUMENTAL INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X |

IAEA ShakeCast 2

Home Earthquakes Search FAQ Profile Register Log in

Jump to: Select an earthquake from the last 7 days



ShakeCast Summary

Number of facilities evaluated: 6
 Peak Ground Acceleration (%g) : 3.6615 - 38.3224
 Peak Ground Velocity (cm/sec) : 6.1807 - 52.6241
 Instrumental Intensity : IV - VIII
 Peak Spectral Acc. at 0.3 sec (%g) : 8.8519 - 84.0143
 Peak Spectral Acc. at 1.0 sec (%g) : 6.5959 - 55.5895
 Peak Spectral Acc. at 3.0 sec (%g) : 1.528 - 10.5371
 PGA Uncertainty in Std Deviation : 0.4645 - 1
 Estimated V30 in m/s : 210 - 740

M 8.9 - NEAR THE EAST COAST OF HONSHU, JAPAN

ID: e0001xgp Version: 4
 Origin Time: 2011-03-11 06:46:23
 Location: 142.369, 38.322

| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
|------------------------|----------|---------|---------|------------|--------|-------------|----------------|---------|------------|
| POTENTIAL DAMAGE | none | none | none | Very light | Light | Moderate | Moderate/Heavy | Heavy | Very Heavy |
| PEAK ACC (%g) | <.17 | .17-1.4 | 1.4-3.9 | 3.9-9.2 | 9.2-18 | 18-34 | 34-65 | 65-124 | >124 |
| PEAK VEL (cm/s) | <0.1 | 0.1-1.1 | 1.1-3.4 | 3.4-8.1 | 8.1-16 | 16-31 | 31-60 | 60-116 | >116 |
| INSTRUMENTAL INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X |

Recent significant earthquakes in the region

- M7.7 Miyagi-Oki, Japan at 6/12/1978 8:14
- M7.4 NEAR THE EAST COAST OF HONSHU, JAPAN at 11/1/1989 18:25
- M7.2 Miyagi-Oki, Japan at 8/16/2005 2:46
- M7 NEAR THE EAST COAST OF HONSHU, JAPAN at 1/18/1981 18:11
- M7 Miyagi-Oki, Japan at 5/26/2003 9:24

| FACILITY TYPE | FACILITY ID | FACILITY NAME | LATITUDE | LONGITUDE | DAMAGE LEVEL | MMI | PGA | PGV | PSA03 | PSA10 | PSA30 |
|---------------|-------------|----------------------|----------|-----------|--------------|------|---------|---------|---------|---------|--------|
| JPP | JPN1 | Fukushima Daiichi | 37.4215 | 141.034 | RED | 7.72 | 25.8708 | 35.5119 | 57.8466 | 37.5128 | 7.4042 |
| JPP | JPN2 | Fukushima Daini | 37.3163 | 141.025 | RED | 7.76 | 26.6768 | 36.4785 | 59.5783 | 38.5339 | 7.5874 |
| JPP | JPN10 | Onagawa | 38.3998 | 141.501 | RED | 7.34 | 23.483 | 27.6412 | 52.4778 | 29.1987 | 5.7565 |
| JPP | JPN4 | Hamaoka | 34.6242 | 138.14 | GREEN | 4.96 | 6.5016 | 10.322 | 15.3754 | 10.9036 | 2.4143 |
| JPP | JPN7 | Kashiwazaki - Kariwa | 37.4317 | 138.598 | YELLOW | 5.53 | 8.5166 | 13.0735 | 19.9327 | 13.8102 | 2.9935 |
| JPP | JPN15 | Tokai | 36.4654 | 140.607 | RED | 7.72 | 25.8298 | 35.4623 | 57.7583 | 37.4606 | 7.3948 |

* - MMI level extends beyond map boundary, actual population exposure may be much larger

** - Some facilities may not appear on the map due to space restriction

From: Andrews, Tom
Sent: Monday, March 14, 2011 9:23 AM
To: Hasselberg, Rick
Subject: RE: Japan

Does she have OBE / DBE numbers for these sites? How many OBE / DBE earthquakes can these plants take?

Tom

From: Hasselberg, Rick
Sent: Monday, March 14, 2011 7:39 AM
To: Andrews, Tom
Subject: RE: Japan

I already had all that plus a PP slide show on every plant in Japan (world) . We have all the lat/lon info. Annie has been working over here for 12+ hours per day and her team is back in RES working as well. They haven't displayed much, but they are busy answering questions and clarifying statements. I'm heading into the office. I'll be working until 2300.

Japan is requesting more help be sent over ASAP.

From: Andrews, Tom
Sent: Monday, March 14, 2011 8:34 AM
To: Hasselberg, Rick
Subject: RE: Japan

Yes...saw where they were interviewing Thornburg yesterday... The only person that almost made sense on TV was a Georgia Tech professor. Rest of the folks seemed to have their own agenda... like that is unusual.

Do you need lat/lon info for Japanese sites? Did we get any useful info from Research from their version of ShakeCast?

I found the lat/lon info for world reactors in Global Earth format... You can append the following text into the user facility list in shakecast lite to run the earthquake reports for the sites. I plugged in generic values of 10% for OBE and 20% for DBE for the Japanese plants.

From: Hasselberg, Rick
Sent: Monday, March 14, 2011 7:25 AM
To: Andrews, Tom
Subject: RE: Japan

Jim Tripp and Tony Ulses are over there now getting briefed and working with the State Department. Congressman Markey is already asking if US nuclear plants have heat sinks and how we plan to protect them.

BT/3

NRC is trying to stay in the background regarding the statements being made in the media. I hope that doesn't end up being a mistake. There's a lot of bad and conflicting info out there. Does that seem familiar to you?????

From: Andrews, Tom
Sent: Monday, March 14, 2011 8:15 AM
To: Hasselberg, Rick
Subject: Japan

Sure was a lot of conflicting and misleading information coming out of Japan on the status of these sites. Sad to say, but this sounds like one of those "worst case" scenarios we have practiced for years (prolonged station blackout). Remember saying how much redundancy we have to prevent this from happening? Wonder what knee-jerk regulatory reactions will evolve from this? Wonder if this will make it too expensive for some of the plants to operate due to the cost of required modifications.

Knowing how bad the situation is in Japan and trying to make the best out of a bad situation, are we getting any data from Japan that we can use later for training? Do we know who was dispatched to Japan from the NRC?

From: Bolger, Francis T. (GE Power & Water) <Fran.Bolger@ge.com>
Sent: Tuesday, March 15, 2011 5:10 PM
To: Hasselberg, Rick; Circle, Jeff
Cc: Nichols, Paul A (GE Power & Water); Abelairas, Victor (GE Power & Water)
Subject: GEH - Fukushima Equipment Specification Listing
Attachments: Fukushima Equipment Specification Listing FINAL.docx

Rick and Jeff,

The attached contains further updates to what we provided last night.

Let us know if we can provide further assistance on specification or sourcing.

Fran Bolger

Francis T. Bolger
GE Hitachi Nuclear Energy

BT/4

Fukushima Equipment Specification Listing (3/14/2011)
Revised 3-15-2011

Pumping Equipment

Purpose- To deliver makeup water to the containment and Reactor Vessel.

1. Option 1-Fire truck or equivalent vehicle with 100 gpm or greater and 150 psig. (for each unit).
2. Option 2-Fire boat or equivalent vehicle with 100 gpm or greater and 150 psig. (for each unit).
3. Option 3 –Self-contained operated pump/motor (> 100 gpm) and 150 psig. (for each unit).
4. Option 4- Pump/motor with portable generator (>100 gpm) and 150 psig. (for each unit).15 Kw unit
5. Portable generators - >20 Kw @ 50 Hz (large truck mounted units if available- should be available in the 700Kw-1MW range. 480 volt and 4160 volts
6. High pressure Portable pumps 100 gpm at 500 psig

Cooling Equipment

Purpose- To provide cooling to the plant spent fuel pools.

7. (6) Chillers/heat exchanger 150 ton with 700KW self-contained generator (one for each Unit) Chillers 150 ton with 700KW self-contained generator (one for each Unit)
8. (1) Chiller/heat exchanger 800 ton with 3000 KW self-contained generator (for common pool)

Instrumentation

Purpose – To provide water level or RPV Temperature

1. 6 volt lantern batteries (4 put in series for 24 volts DC) use a Volt Ohm Meter at the instrument rack for obtaining measurement
2. Use a Volt Ohm Meter to get millivolt readings from RPV thermocouples and CRDM thermocouples (millivolt readings are then converted to temperature)

Spent Fuel Pool Water Injection

1. Fire Water from fire truck pumper or temporary pump through fire mains to refuel floor fire hydrants
2. Helicopter water drop uses forest fire type water containers

Equipment Air Supply

Purpose – To provide air supply to operate pneumatic valves

1. Skid mounted Air Compressor diesel driven 110 psig 700 cfm or greater
2. Portable air bottles for local valve operation >110 psig. Possibly

Powerplant/Switchgear Equipment

Purpose – To provide AC and DC supply power for temporary replacement of damaged switchgear.

Skid mounted powerplant such as the GE LM 2500, 22.5 MW 50 hz and 13800 VAC which can be stepped down to 6.9 kva 50 hz, 400 VAC 50 Hz, low voltages and DC. Self contained unit has capability to provide variety of plant voltage needs. Estimated burn rate is 2 gpm/min under full load

Diesel fuel oil storage tank- 9000 gal tanker truck or larger supply storage tank for extended operation.

From: King, Mark
Sent: Tuesday, March 15, 2011 5:12 PM
To: Hasselberg, Rick
Cc: Sigmon, Rebecca
Subject: Plant Status of Fukushima Daiichi Power Stations 2 and 3 chronological log.docx
Attachments: Plant Status of Fukushima Daiichi Power Stations 2 and 3 chronological log.docx

See attached, note: I only had time for the **TEPCO** entry review so far.

Unit 3 is entries are shown is blue.

Mark

BT/5

Plant Status of Fukushima Dai-ichi Nuclear Power Station Unit 2 and Unit 3
Chronological Log

Date /Time Event Description - Information Source TEPCO/NISA/IAEA/etc

3/11 2:26 pm A big earthquake occurred in the Miyagi Prefecture at 2:46 today. The effect of the earthquake to our facilities is as follows Fukushima Daiichi - **-Unit 1,2,3** were operated and automatically stopped. - TEPCO

3/11 3:41 PM

For the **all 3 units**, off-site power was lost due to malfunction of one out of two off-site power system, leading to automatic startup of emergency diesel generators.

Subsequently, at 3:41PM, emergency diesel generators shutdown due to malfunction resulting in the complete loss of alternating current for all three units.

Hence, at **3:42PM**, it was decided that a specific incident stipulated in Article 10, Clause 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness*1 has occurred and a "First Level Emergency" was declared and in accordance with the aforementioned Act, the Minister of Economy, Trade, and Industry, the Governor of Fukushima Prefecture, the Mayor of Okuma Town, and the Mayor of Futaba Town along with other involved organizations were notified of the incident.

TEPCO is taking steps to determine the exact cause behind the shutdown of the emergency diesel generators and is working towards their restoration. The exhaust pipe's monitor reading indicates that radiation levels have remained unchanged and presently there have been no confirmed radioactivity impact to external environment. Further details are in the process of being confirmed.

***1 Specific Incident Stipulated in Article 10, Clause 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness** The objective of the Act on Special Measures Concerning Nuclear Emergency

Preparedness is to protect the welfare, physical wellbeing and property of Japan's citizens. To this end, when accidents and equipment breakdown have reached certain levels at nuclear power plants, the Act obligates us to notify the nation, prefectures, cities and towns in order for them to take necessary actions and to grasp information in a timely manner. Notifications are issued out under circumstances such as when the nuclear reactor cannot be shut down and/or when the water supply to the reactor is cut off.

We have then notified the Minister of Economy, Trade, and Industry, the Governor of Fukushima Prefecture, the Mayor of Okuma Town, and the Mayor of Futaba Town along with other involved organizations of the incident.

Article 15, Clause 1 of the Act was cleared when the reactor water level monitoring function was restored for Unit 1. However, at 5:07PM, specific incident stipulated in Article 15, Clause 1 of the Act was applied again for Unit 1. - TEPCO

3/11 10 PM press release Evacuation has been instructed by the national government to the local residents within 3 km radius of Fukushima Daiichi Nuclear Power Station. - TEPCO

3/12 0001 AM press release Unit 2 (shut down due to earthquake) -

Reactor was shut down and although nuclear steam had been cooled by the Reactor Core Isolation Cooling system, the current operating status is unclear.

However, reactor coolant level can be monitored by a temporary power supply and the level is stable.

3/12 0001 AM (continued)

- Currently, there is a possibility of a release of radioactive materials due to decrease in reactor water level. Therefore, the national government has instructed evacuation for those local residents within 3km radius of the periphery and indoor standby for those local residents between 3km and 10km radius of the periphery.

Unit 3 (shut down due to earthquake) - Reactor was shut down and is cooled by the Reactor Core Isolation Cooling system. - Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel. - TEPCO

We measured radioactive materials inside and outside of the periphery of the nuclear power station (outdoor area) by monitoring car and confirmed that there was no difference from ordinary level.

No radiation impact to the external environment has been confirmed. We will continue to monitor in detail the possibility of radioactive material being discharged from exhaust stack or discharge canal.

Two subcontract workers were injured in the nuclear power station premise. One with a broken bone was transported to the hospital by an ambulance and the other by a company car. Further, there are 2 TEPCO employees whose presence has not been confirmed. - TEPCO

Indication from monitoring posts installed at the site boundary did not show any difference from ordinary level.

No radiation impact to the external environment has been confirmed. We will continue to monitor in detail the possibility of radioactive material being discharged from exhaust stack or discharge canal.

There is no missing person within the power station. We are presently checking on the site situation of each plant while keeping the situation of aftershock and Tsunami in mind. A seriously injured worker is still trapped in the crane operating console of the exhaust stack and his breathing and pulse cannot be confirmed. A worker was lightly injured spraining his left ankle and cutting both knees when he fell while walking at the site. The worker is conscious.

Unit 2 (shut down at 2:48PM on March 11th)

- Reactor is shut down and reactor water level is stable.
- Offsite power is available.
- Control rods are fully inserted (reactor is in subcritical status)
- Status of main steam isolation valve: closed
- We do not believe there is leakage of reactor coolant in the containment vessel.

Unit 3 (shut down at 2:48PM on March 11th)

- Reactor is shut down and reactor water level is stable.
- Offsite power is available.
- Control rods are fully inserted (reactor is in subcritical status)

- Status of main steam isolation valve: closed
- We do not believe there is leakage of reactor coolant in the containment vessel. - TEPCO

3/12 3AM We have decided to implement measures to reduce the pressure of the reactor containment vessel for those units that cannot confirm certain level of water injection by the Reactor Core Isolation Cooling System, in order to fully secure safety.

3/12 5AM Unit 2 (shut down at 2:48PM on March 11th)

- Reactor is shut down and reactor water level is stable.
- Offsite power is available.
- Control rods are fully inserted (reactor is in subcritical status)
- Status of main steam isolation valve: closed
- Injection of water into the reactor had been done by the Reactor Core Isolation Cooling System, but at 4:50AM, injection by Make-up Water Condensate System begun.
- We do not believe there is leakage of reactor coolant in the containment vessel.

Unit 3 (shut down at 2:48PM on March 11th)

- Reactor is shut down and reactor water level is stable.
- Offsite power is available.
- Control rods are fully inserted (reactor is in subcritical status)
- Status of main steam isolation valve: closed
- Reactor Core Isolation Cooling System is turned off. Currently, injection of water into the reactor is done by Make-up Water Condensate System.
- We do not believe there is leakage of reactor coolant in the containment vessel.

Indication from monitoring posts installed at the site boundary did not show any difference from ordinary level.

No radiation impact to the external environment has been confirmed. We will continue to monitor in detail the possibility of radioactive material being discharged from exhaust stack or discharge canal.

There is no missing person within the power station.

We are presently checking on the site situation of each plant while keeping the situation of aftershock and Tsunami in mind.

A seriously injured worker is still trapped in the crane operating console of the exhaust stack and his breathing and pulse cannot be confirmed.

A worker was lightly injured spraining his left ankle and cutting both knees when he fell while walking at the site. The worker is conscious. - TEPCO

3/12 7AM Evacuation has been instructed by the national government to the local residents within 10 km radius of Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station.

3/12 8AM The national government has instructed evacuation for those local residents within 10km radius of the periphery.

3/12 10AM At present, we have decided to prepare implementing measures to reduce the pressure of the reactor containment vessel (partial discharge of air containing radioactive materials) in order to fully secure safety. These measures are considered to be implemented in Units 1 to 4 and accordingly, we have reported and/or noticed the government agencies concerned. -TEPCO

3/12 11AM Unit 2(Shut down)

- Reactor has been shut down and we continue injecting water by Reactor Core Isolation Cooling System. Current reactor water level is lower than normal level, but the water level is steady. We are preparing to implement a measure to reduce the pressure of the reactor containment vessels in order to fully secure safety.

Unit 3(Shut down)

- Reactor has been shut down and we continue injecting water by Reactor Core Isolation Cooling System. We are preparing to implement a measure to reduce the pressure of the reactor containment vessels in order to fully secure safety.
- Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel. - TEPCO

3/12 3AM *_We are implementing a measure to reduce the pressure of the reactor containment vessels, but, one of our employees working in the Unit 1 was irradiated at over 100mSv level(106.3mSv). He received a medical treatment by a special physician - TEPCO

3/12 - Furthermore, today at **3:29PM**, radiation dose measured at site boundary has exceeded the limiting value. Therefore, at **4:17PM**, it was determined that a specific incident stipulated in article 15, clause 1 has occurred (**Extraordinary increase of radiation dose at site boundary**) – TEPCO

3/12 3:36 PM Today at approximately 3:36PM, a big quake occurred and there was a big sound around the Unit 1 and white smoke. Our two employees and two subcontract workers working for the safety of the plant were injured and transported to the hospital.

We are presently checking on the site situation of each plant and effect of discharged radioactive materials. We will endeavor to restore the units and continue monitoring the environment of the site periphery. - TEPCO

3/12 5PM The value of radioactive material (iodine, etc) is increasing according to the monitoring car at the site (outside of the site). One of the monitoring posts is also indicating higher than normal level. * Since the amount of radiation at the boundary of the site exceeds the limits, we decide at 4:17PM and we have reported and/or noticed the government agencies concerned to apply the clause 1 of the Article 15 of the Radiation Disaster Measure **at 5PM**.

* In addition, a vertical earthquake hit the site and big explosion has happened near the Unit 1 and smoke

breaks out around 3:36PM. Our two employees and two cooperation workers who had been working for the foundation of safety are suffered and they are all sent to the hospital. – TEPCO

3/12/ 7:11 PM * The national government has instructed evacuation for those local residents within 10km# radius of the periphery - update -- (#as of 7:11PM, it has expanded to 20km). – TEPCO

Press release 7 PM - In Unit 1, steam in reactor has been cooled by isolation condenser. In

Unit 2 and Unit 3, we continue injecting water by Reactor Core Isolation Cooling System

TEPCO employees have confirmed that there is no on-going fire inside the site of Fukushima Daiichi Nuclear Power Station. We have also confirmed that the value of radioactive materials inside the site measured by the monitoring car has remained in the ordinary level. We have been continuing the measurement. . - TEPCO

3/12 8PM Unit 2(Shut down)

- Reactor and Reactor Core Isolation Cooling System have been shut down. Current reactor water level is lower than normal level, but the water level is steady. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

Unit 3(Shut down)

- Reactor has been shut down and we continue injecting water by High Pressure Core Injection System. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

- Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel.

Two workers of a cooperative firm were injured in the nuclear power station premise. One with a broken bone was transported to the hospital by an ambulance and the other by a company car. Further, there are 2 TEPCO employees whose presence has not been confirmed. In addition, one subcontract worker standing near important earth quake-proof building was unconscious and transported to the hospital by an ambulance. - TEPCO

3/12 11PM Unit 2(Shut down)

- Reactor and Reactor Core Isolation Cooling System have been shut down. Current reactor water level is lower than normal level, but the water level is steady. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

Unit 3(Shut down)

- Reactor has been shut down and we continue injecting water by High Pressure Core Injection System. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

- Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel. – TEPCO

3/13 3 AM Unit 2(Shut down)

- Reactor and Reactor Core Isolation Cooling System have been shut down. Current reactor water level is lower than normal level, but the water level is steady. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

Unit 3(Shut down)

- Reactor has been shut down and we continue injecting water by High Pressure Core Injection System. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

- Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel.

3/13 3 AM continued -

Casualty

- 2 workers of cooperative firm were injured at the occurrence of the earthquake, and were transported to the hospital.
- 1 TEPCO employee who was not able to stand by his own with his hand holding left chest was transported to the hospital by an ambulance.
- 1 subcontract worker at important earthquake-proof building was unconscious and transported to the hospital by an ambulance.
- The radiation exposure of 1 TEPCO employee, who was working inside the reactor building, exceeded 100mSv and was transported to the hospital.
- 4 workers were injured and transported to the hospital after explosive sound and white smoke were confirmed around the Unit 1.
- Presence of 2 TEPCO employees at the site are not confirmed

Others

- We measured radioactive materials inside of the nuclear power station area (outdoor) by monitoring car and confirmed that radioactive materials level is higher than ordinary level. Also, the level at monitoring post is higher than ordinary level. We will continue to monitor in detail the possibility of radioactive material being discharged from exhaust stack or discharge canal. The national government has instructed evacuation for those local residents within 20km radius of the periphery because it's possible that radioactive materials are discharged. – TEPCO

3/13 no time given - on this release

...Afterwards, in **Unit 3**, High Pressure Core Injection System has been automatically shut down. Re-activation of Reactor Core Isolation Cooling System was attempted but failed, and as we were unable to confirm the level of water injection to the reactor by the Emergency Core Cooling System, at 5:10 on March 13th, it was determined that a specific incident (Emergency Core Cooling System water injection inability) stipulated in article 15, clause 1 has occurred.

3/13 8AM * High Pressure Coolant Injection System of **Unit 3** automatically stopped. We endeavored to restart the Reactor Core Isolation Cooling System but failed. Also, we could not confirm the water inflow of Emergency Core Cooling System. As such, we decided at 5:10AM, Mar 12, and we reported and/or noticed the government agencies concerned to apply the clause 1 of the Article 15 of the Radiation Disaster Measure at 5:58AM, Mar 13.

In order to fully secure safety, we operated the vent valve to reduce the pressure of the reactor containment vessels (partial release of air containing radioactive materials) and completed the procedure at 8:41AM, Mar 13. – TEPCO

3/13 9 AM Unit 2(Shut down)

- Reactor has been shut down and Reactor Core Isolation Cooling System has been injecting water to the reactor. Current reactor water level is lower than normal level, but the water level is steady. After fully securing safety, we are preparing to implement a measure to reduce the pressure of the reactor containment vessels under the instruction of the national government.

Unit 3(Shut down)

- Reactor has been shut down. However, High Pressure Core Injection System has been automatically shut down and injection to the reactor is currently interrupted. We are examining alternative way to inject water.

Also, following the instruction by the government and with fully securing safety, steps to lowering the pressure of reactor containment vessel has been taken. Spraying in order to lower pressure level within the reactor containment vessel has cancelled.

- Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel. – TEPCO

3/13 - no time given for release ...Furthermore, at 3:29PM, Mar 12, radiation dose measured at site boundary has exceeded the limiting value. Therefore, at 4:17PM, Mar 12, it was determined that a specific incident stipulated in a

clause 1 as occurred. as per the previous press release)

After that, the radiation dose at the monitoring post decreased once. Today, the measured value revamped and the radiation dose measured at site boundary exceeded the limiting value again. As such, **at 8:56AM, today, it was determined that a specific incident stipulated in article 15, clause 1 occurred.** – TEPCO

3/13 0 PM (noon) Unit 2 (Shut down)

- Reactor has been shut down and Reactor Core Isolation Cooling System has been injecting water to the reactor. Current reactor water level is lower than normal level, but the water level is steady. After fully securing safety, measures to lowering the pressure of reactor containment vessel has been taken, under the instruction of the national government.

Unit 3 (Shut down)

- Reactor has been shut down. However, as High Pressure Core Injection System has been automatically shut down and water injection to the reactor was interrupted, following the instruction by the government and with fully securing safety, steps to lowering the pressure of reactor containment vessel has been taken. Spraying in order to lower pressure level within the reactor containment vessel has been cancelled.
- After that, safety relief valve has been opened manually, lowering the pressure level of the reactor, which was immediately followed by injection of sea water and boric acid which absorbs neutron, into the reactor pressure vessel.
- Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel. – TEPCO

3/13 2 PM Unit 2(Shut down)

- Reactor has been shut down and Reactor Core Isolation Cooling System has been injecting water to the reactor. Current reactor water level is lower than normal level, but the water level is steady. After fully securing safety, measures to lowering the pressure of reactor containment vessel has been taken, under the instruction of the national government. – TEPCO

Unit 3(Shut down)

- Reactor has been shut down. However, as High Pressure Core Injection System has been automatically shut down and water injection to the reactor was interrupted, following the instruction by the government and with fully securing safety, steps to lowering the pressure of reactor containment vessel has been taken. Spraying in order to lower pressure level within the reactor containment vessel has been cancelled.
- After that, safety relief valve has been opened manually, lowering the pressure level of the reactor, which was immediately followed by injection of boric acid water which absorbs neutron, into the reactor pressure vessel.
- After that, following decrease of the water level and increase of the pressure level in the reactor, injection of sea water is being attempted. - Currently, we do not believe there is any reactor coolant leakage inside the reactor containment vessel.

3/12 2 PM - continued

- 2 TEPCO employees felt bad during their operation in the central control rooms of Unit 1 and Unit 2 while wearing full masks, and were transferred to Fukushima Daini Power Station for consultation with a medical advisor.

- 4 workers were injured and transported to the hospital after explosive sound and white smoke were confirmed around the Unit 1.

- Presence of 2 TEPCO employees at the site are not confirmed

Others

- **We are currently coordinating with the relevant authorities and departments as to how to cool down the water in the spent nuclear fuel pool.** – TEPCO

3/13 3 PM

* **Unit 3:** High Pressure Coolant Injection System automatically stopped. We endeavored to restart the Reactor Core Isolation Cooling System but failed.

Also, we could not confirm the water inflow of Emergency Core Cooling System.

As such, we decided at 5.10AM, Mar 12, and we reported and/or noticed the government agencies concerned to apply the clause 1 of the Article 15 of the Radiation Disaster Measure at 5:58AM, Mar 13.

In order to fully secure safety, we operated the vent valve to reduce the pressure of the reactor containment vessels (partial release of air containing radioactive materials) and completed the procedure at 8:41AM, Mar 13 (successfully completed at **09:20AM, Mar 13**. After that, we began injecting water containing boric acid that absorbs neutron into the reactor by the fire pump from **09:25AM, Mar 13**.

Taking account of the situation that the water level within the pressure vessel did not rise for a long time and the radiation dose is increasing, we cannot exclude the possibility that the same situation occurred at Unit 1 on Mar 12 will occur.

We are considering the countermeasure to prevent that. – TEPCO

3/13 no report time given - At approximately **11:01 am**, an explosive sound followed by white smoke occurred at the reactor building of the **Unit 3**. It was believed to be a hydrogen explosion.

According to the parameter, it is estimated that the reactor containment vessel remains intact. However, the status of the plant and the impact of radioactive materials to the outside environment are presently under investigation.

Some workers have sustained injuries. Ambulances are on their way to care for them.

TEPCO continues to take all measures to restore the safety and security of the site and are monitoring the site's immediate surroundings. – TEPCO

3/13 Press release no time given: At approximately **11:01am**, an explosive sound followed by white smoke occurred at the reactor building of the **Unit 3**. It was believed to be a hydrogen explosion.

According to the parameter, it is estimated that the reactor containment vessel remains intact. However, the status of the impact of radioactive materials to the outside environment are presently under investigation. (previously announced) **As of 12:00 am**, 4 TEPCO employees and 2 workers of related companies have injuries (all of them are conscious) and ambulances are on their way to care for them.

3/13 continued

As of **11:44 am**, the measured value of radiation dose near MP6 is 20 μ Sv/h and the radiation level remains stable.
- TEPCO

3/13 – no time given In response, water injection into **Unit 2's reactor** were being carried out by the Reactor Core Isolation Cooling System. However, as the Reactor Core Isolation Cooling System failed today, it was determined that a specific incident (failure of reactor cooling function) stipulated in article 15, clause 1 has occurred at **1:25 pm today**. – TEPCO

3/13 Press release: At approximately **11:01am**, an explosion followed by white smoke occurred at the reactor building of **Unit 3**. It was believed to be a hydrogen explosion.

According to the parameter, it is believed that the reactor containment vessel remains intact. However, the status of the plant and the impact of radioactive materials to the outside environment are presently under investigation. (previously announced)

As of **1:30 pm**, 4 TEPCO employees and 3 workers from other companies have sustained injuries (all of them are conscious). 3 ambulances are in operation to care for them and 2 have already dispatched the casualties to the hospital.

As of **0:30 pm**, the measured value of radiation dose near MP6 was 4 μ Sv/h. The increase of the radiation dose cannot be confirmed at this time.

As of **0:30 pm**, the measured value of radiation dose at the monitoring post in Fukushima Daini Power Station located approximately 10 km south of Fukushima Daiichi Power Station remains at the same level.

In light of the incidents that have occurred at Units 1 and **Unit 3**, we are considering applying prevention measures to the wall of the reactor building to ventilate the hydrogen gas contained in **Unit 2**. – TEPCO

From: Hasselberg, Rick
Sent: Tuesday, March 15, 2011 2:25 PM
To: Sigmon, Rebecca
Cc: RST01 Hoc
Subject: RE: Timelines for Daiichi Units 1 and 4

Thanks. I'll forward these to the Ops Center. For future reference since I'm usually not at my desk during a response, please send event related materials to RST01 Hoc.
Thanks again!

From: Sigmon, Rebecca
Sent: Tuesday, March 15, 2011 2:08 PM
To: Hasselberg, Rick
Cc: King, Mark; Thomas, Eric
Subject: Timelines for Daiichi Units 1 and 4

Rick,

Attached are timelines for Units 1 and 4. Most of the information for Unit 1 came from the press releases put out by TEPCO and NISA (noted after each comment). One observation – neither TEPCO nor NISA refers to the explosion at Unit 1 as a hydrogen explosion at any point; they initially refer to it as a loud noise and white smoke following an earthquake centered near the plant. Following the explosion at Unit 3 though, the comments about the Unit 3 explosion reference the similar explosion at Unit 1, they just never update any of the previous information about Unit 1.

There wasn't much out there about Unit 4 yet. TEPCO and NISA don't have any press releases out yet about any of this morning's events there, so what I do have is from news sites and nei.org. Hope this meets your needs, let me know if you want me to focus on any area in particular and see what else is out there.

(all times are local (Tokyo) time)

Rebecca Sigmon
Reactor Systems Engineer
NRR/DIRS/IOEB
Operating Experience Branch
(301) 415-4018
Rebecca.Sigmon@nrc.gov

BT/6

Fukushima-Daiichi Unit 4

Unit was shutdown at the time of the earthquake and tsunami for regular inspection.

All TEPCO updates through 1500 on 3/13/2011 indicate that reactor level is stable, and there is no known reactor coolant leakage into the containment vessel.

All NISA updates through 1930 on 3/14/2011 state that Unit 4 is in periodic inspection outage with no other information on Unit 4. This is the most recent NISA press release available as of 1300 on 3/15/2011.

3/13/2011

2100 General comment for Daiichi site about coordination to ensure cooling of the spent fuel pools

3/15/2011

0600 Loud explosion heard on the site. The 4th floor rooftop of the Unit 4 reactor building was found to be damaged (TEPCO)

0600 Fire burning in the Unit 4 spent fuel pool (press conference with Cabinet Secretary Edano)

0938 Fire reported in Unit 4 reactor building believed to be from a lube oil leak from the recirc pump drive system. Fire fighting efforts were successful, though the roof of the building was damaged (nei.org)

1100 Radiation level near Unit 4 ~10 Rem/hr, 821 mrem/hr at the site boundary (nei.org)

Fukushima-Daiichi Unit 1 (all times Tokyo) (source of information)

3/11/2011

1446 Automatic shutdown due to earthquake, loss of offsite power (TEPCO)

1541 Loss of emergency AC power, declaration of "1st Level Emergency" – Article 10 (TEPCO)

1636 Declaration of Article 15 due to inability to verify coolant injection. Water level verification temporarily restored, Article 15 re-declared at 1707 (TEPCO)

2200 Evacuation ordered within 3 km (TEPCO)

2400 Status Update (TEPCO):

Unit 1 shutdown and cooled by isolation condenser

Possible radiation release due to decreasing water level

3/12/2011

0300 Decision made to reduce containment pressure for units that cannot confirm water injection by RCIC (TEPCO)

0520 Radiation levels near the main gate have risen from .07 uSv/hr (7 mRem) to (NISA):

MP6 .59 uSv/hr (59 mRem)

MP8 .38 uSv/hr (38 mRem)

0600 Increasing levels of radiation measured by monitoring car, and one radiation monitoring post shows radiation levels greater than normal (TEPCO)

0700 Evacuation ordered out to 10 km (TEPCO)

0700 Status Update (NISA):

Unit 1 is in Article 15 "Nuclear Emergency Situation"

Work in progress to connect electric generating cars to power pumps for water injection

Containment vessel pressure could be as high as 840 kPa (design pressure 400 kPa)

0755 Radiation levels (NISA):

MP6 5.1 uSv/hr

MP8 2.5 uSv/hr

0940 Radiation levels (NISA)

MP6 5.1 uSv/hr

MP8 2.9 uSv/hr

1000 Containment pressure reduction ordered by government (TEPCO)

1100 Steam release in progress to relieve containment pressure (NISA)

1100 Status Update (TEPCO):

Reactor was cooled by isolation condenser, but that has since stopped.

Containment pressure increasing
Containment pressure reduction in progress
Reactor water level decreasing

1430 Successful reduction of containment pressure completed (TEPCO)

1500 One employee reported to have received 100 mSv exposure (10 Rem) (TEPCO)

1529 Large earth motion due to earthquake with close epicenter caused loud noise and white smoke from unit 1, reading of 500 uSv/hr at site boundary (NISA)***

1536 Explosion noted at Unit 1, mentioned as due to an earthquake very close to the site, 4 personnel injured (TEPCO)***

****Neither TEPCO nor NISA refers to this as a hydrogen explosion from Unit 1 in any of their communications at any point. Following the explosion from Unit 3 around 1100 on 3/14 though, both TEPCO and NISA comment that what happened at Unit 3 is similar to what happened at Unit 1*

1536 Hydrogen explosion in the space between the concrete containment and the reactor's primary system, but the explosion did not damage the containment function or the reactor system (News Conference with Japanese Cabinet Secretary Edano)

1617 Article 15 "Radiation Disaster Measure" declared due to radiation levels at site boundary exceeding limits (TEPCO)

1911 Evacuation order extended out to 20 km (TEPCO)

2005 Radiation levels (NISA):

| | |
|---------------------------------------------------|-------------|
| MP4 (monitoring car at site boundary NW of units) | 1015 uSv/hr |
| MP6 (main gate) | 3.25 uSv/hr |
| MP8 (observation platform) | 2.06 uSv/hr |

2020 Injection of seawater into core followed by boric acid (TEPCO)

2215 Suspension of seawater injection following aftershock and tsunami alert (TEPCO)

2300 Continuation of containment pressure reduction efforts (TEPCO)

3/13/2011

0200 Seawater/boric acid injection recommenced at some point before 0300 update (TEPCO)

0400 Radiation levels (NISA):

| | |
|-----|------------|
| MP4 | 40 uSv/hr |
| MP6 | 3.1 uSv/hr |
| MP8 | 4.5 uSv/hr |

0550 Radiation level (NISA):

| | |
|-----|------------|
| MP6 | 3.2 uSv/hr |
|-----|------------|

0856 Radiation levels at the site boundary, which had been decreasing, increased again above the limit, causing a renewed declaration of Article 15 "Radiation Disaster Measure" (TEPCO)

0930 Radiation level (NISA):
MP6 26 uSv/hr

1155 Seawater is being injected into containment via fire extinguishing system line (NISA)

1220 Radiation level (NISA):
MP4 47.1 uSv/hr

1500 Coordinating with authorities to determine how to cool spent fuel pool (TEPCO)

1930 Radiation levels (NISA)
MP4 44 uSv/hr
MP6 5.2 uSv/hr

03/14/2011

0110 Interruption of seawater injection to Unit 1 due to lack of seawater in pit (NISA)

0250 Radiation level (NISA):
MP6 66.3 uSv/hr

0408 Radiation level (NISA):
MP4 56.4 uSv/hr

1234 Radiation level (NISA)
MP6 4.2 uSv/hr

1930 Plant Parameters (NISA)

| | |
|---------------------------------|---------------|
| Reactor Pressure | .047/.270 MPa |
| Primary Containment Pressure | Not Available |
| Reactor Water Level | Low off scale |
| Suppression Pool Water Temp | Not Available |
| Suppression Pool Water Pressure | Not Available |

Fukushima Daiichi NPP Status Report #34 April 13, 2011 – 1230
(4/14/11 0130 JST)

Ed Note: After a flurry of coverage in the domestic media yesterday over the reclassification of the Fukushima Daiichi NPP Accident to Level 7 on the IAEA International Nuclear Event Scale there is little, if any interest today. In the words of NRC Chairman Jaczko the situation appears to be relatively "static but not stable".

From IAEA (<http://www.iaea.org/newscenter/news/tsunamiupdate01.html>) accessed 4/12/11 0730:

IAEA Briefing on Fukushima Nuclear Accident (13 April 2011, 14:30 UTC)

Presentations:

→ Summary of Reactor Status

1. Current Situation

Overall, the situation at the Fukushima Daiichi plant remains very serious but there are early signs of recovery in some functions such as electrical power and instrumentation

There have been no changes concerning the provisional INES Level 7 rating and protective measures as reported in yesterday's brief.

Earthquakes of 11th and 12th April

The IEC received information from the IAEA International Seismic Safety Center on the following recent earthquakes (equal or higher than magnitude Mw= 6.0) which occurred in the time interval from 23:08 UTC on 2011-04-11 to 05:07 UTC on 2011-04-12:

1) At 23:08 UTC, 2011-04-11, an earthquake with a magnitude of 6.2 occurred offshore of the East Coast of Honshu, Japan) at a depth of 13.1 km. Distances from epicentre of the earthquake to NPP sites were: 188 km to Tokai, 217 km to Fukushima Daini, 229 km to Fukushima Daiichi, 236 km to Hamaoka and 285 km to Kashiwazaki-Kariwa.

2) At 05:07 UTC, 2011-04-12, an earthquake with a magnitude of 6.0 occurred inland east of Honshu, Japan at a depth of 10.6 km. Distances from epicentre of the earthquake to NPP sites were; 46 km to Fukushima Daini, 53 km to Fukushima Daiichi, 72 km to Tokai, 165 km to Onagawa and 179 km to Kashiwazaki-Kariwa.

NISA press release regarding the earthquake which occurred on 12th April, states that there was no effect on the following NPP sites: Fukushima Dai-ichi, Fukushima Dai-ni, Tokai Dai-ni, Onagawa. Other nuclear related facilities (Mitsubishi Nuclear Fuel, Nuclear Fuel Industries Ltd., JAEA Tokai & its recycling plant) in Tokai area were reported to be safe by their respective operators.

BT/7

Changes to Fukushima Daiichi Plant Status

On 11th April, a fire broke out in the housing outlet structure for cooling water for **Units 1-4**. The fire was extinguished manually. No consequences were identified in terms of release of radioactive material, cooling of the plants, or values recorded by radiation monitoring posts.

In **Unit 1** fresh water is being continuously injected into the RPV through the feed-water line at an indicated flow rate of 6 m³/h using a temporary electric pump with off-site power. In **Units 2 and 3** fresh water is being continuously injected through the fire extinguisher lines at an indicated rate of 7 m³/h using temporary electric pumps with off-site power.

Nitrogen gas is being injected into the **Unit 1** containment vessel to reduce the possibility of hydrogen combustion within the containment vessel. The pressure in this containment vessel has stabilised. The pressure in the RPV is increasing as indicated on one channel of instrumentation. The other channel shows RPV pressure as stable.

In **Units 2 and 3** Reactor Pressure Vessel and Drywell pressures remain at atmospheric pressure.

RPV temperatures remain above cold shutdown conditions in all Units, (typically less than 95°C). In **Unit 1** temperature at the feed water nozzle of the RPV is 206°C and at the bottom of the RPV is 119°C. In **Unit 2** the temperature at the feed water nozzle of the RPV is 165°C. The temperature at the bottom of RPV was reported as 208°C (this measurement has been available since the 12th April). In **Unit 3** the temperature at the feed water nozzle of the RPV is 99°C and at the bottom of the RPV is 116°C.

There has been no change in status in **Units 4, 5 and 6** and the Common Spent Fuel Storage Facility.

2. Radiation monitoring

On 12th April, deposition of both iodine-131 and cesium-137 was detected in 7 and 6 prefectures respectively. The values reported for iodine-131 ranged from 1.6 to 460 Bq/m² and for cesium-137 from 31 to 700 Bq/m². The highest deposition was observed in the Ibaraki prefecture.

Gamma dose rates are measured daily in all 47 prefectures, the values tend to decrease. For Fukushima, on 12th April a dose rate of 2.1 µSv/h, for the Ibaraki prefecture a gamma dose rate of 0.14 µSv/h was reported. The gamma dose rates in all other prefectures were below 0.1 µSv/h.

Only in a few prefectures, iodine-131 or cesium-137 is detectable in drinking water at very low levels. As of 12th April, a restriction for infants related to iodine-131 (100 Bq/l) is in place as a precautionary in a small scale water supply in one village of the Fukushima prefecture.

MEXT reported on measurements of strontium-89 (half-life: 50.5 days) and strontium-90 (half-life: 28.8 years) in three samples taken in one village in the Fukushima prefecture on 16 March. The activities in soil for Sr-89 ranged from 13 and 260 Bq/kg and for Sr-90 between 3.3 and 32 Bq/kg. Sr-90 was also distributed globally during nuclear weapons' testing in the atmosphere, typical global levels of Sr-90 in surface soils are in the order of one to a few becquerel per kg.

Strontium was also measured in plant samples in four other villages, with values ranging from 12 to 61 Bq/kg for Sr-89 and 1.8 to 5.9 Bq/kg for Sr-90.

On 12th April, the IAEA Team made measurements at 7 different locations in the Fukushima area at distances of 32 to 62 km, North and Northwest from the Fukushima nuclear power plant. At these locations, the dose rates ranged from 0.6 to 1.6 $\mu\text{Sv/h}$. At the same locations, results of beta-gamma contamination measurements ranged from 0.6 to 1.7 Megabecquerel/m².

NISA reported on 12th April that the three workers who had previously been exposed to high dose rates while working in the turbine building of Unit 3 have undergone further medical checks. No negative outcomes were identified. In the case of the two workers who received doses of a few Sievert to their legs as a result of walking in contaminated water, medical tests showed no evidence of either skin burns or erythema.

Analytical results related to food contamination were reported by the Japanese Ministry of Health, Labour and Welfare on 12th April that covered a total of 55 samples taken on the 8th and 10th -- 12th April. Analytical results for 53 of the samples of various vegetables, fruit (strawberry), seafood and unprocessed raw milk in eight prefectures (Chiba, Fukushima, Gunma, Ibaraki, Kanagawa, Niigata, Saitama and Yamagata) indicated that I-131, Cs-134 and/or Cs-137 were either not detected or were below the regulation values set by the Japanese authorities. In Ibaraki prefecture for samples taken on 11th April, one sample of seafood (sand lance) was above the regulation values set by the Japanese authorities for I-131 and one sample of spinach was above the regulation values set by the Japanese authorities for Cs-134/Cs-137.

On 13th April, the Prime Minister of Japan requested the Governor of Fukushima prefecture to restrict the consumption of shiitake mushrooms (grown on logs in open fields only) produced at Iitate-village until further notice. Instructions were also issued to restrict the distribution of shiitake mushrooms (grown on logs in open fields only) produced in the cities of Date, Soma, Minamisoma, Tamura and Iwaki; the towns of Shinchi, Kawamata, Namie, Futaba, Ookuma, Tomioka, Naraha and Hirono, and; the villages of Iitate, Katsurao and Kawauchi until further notice.

3. Marine Monitoring

TEPCO Monitoring Programme

TEPCO is conducting a programme for seawater (surface sampling) at a number of near-shore and off-shore monitoring locations (see Map1. TEPCO Seawater Sampling Locations).

On same days, two samples were collected at the same sampling point, a few hours apart and analysed separately.

Until 3rd April a general decreasing trend was observed at the sampling points TEPCO1 to TEPCO4. After the discharge of contaminated water on 4th April, a temporary increase has been reported.

On 13th April new data for samples collected on 11th April at TEPCO1-10 sampling points have been reported. As for the near-shore stations TEPCO1, 3 and 4 levels of I-131 and Cs-137 below 1.5 kBq/l have been reported. At TEPCO 2, for both I-131 and Cs-137 concentrations of about 7 kBq/l were measured.

As for the six TEPCO stations 15 km offshore, at TEPCO 5-6-10 the concentration of I-131 was below 0.3 kBq/l and that of Cs-137 below 0.2 kBq/l. At TEPCO 7 and 8, I-131 and Cs-137 below 0.05 kBq/l below 0.02 kBq/l were measured. At TEPCO 9 concentrations of about 1 kBq/l of both I-131 and Cs-137 were recorded.

MEXT Off-shore Monitoring Programme

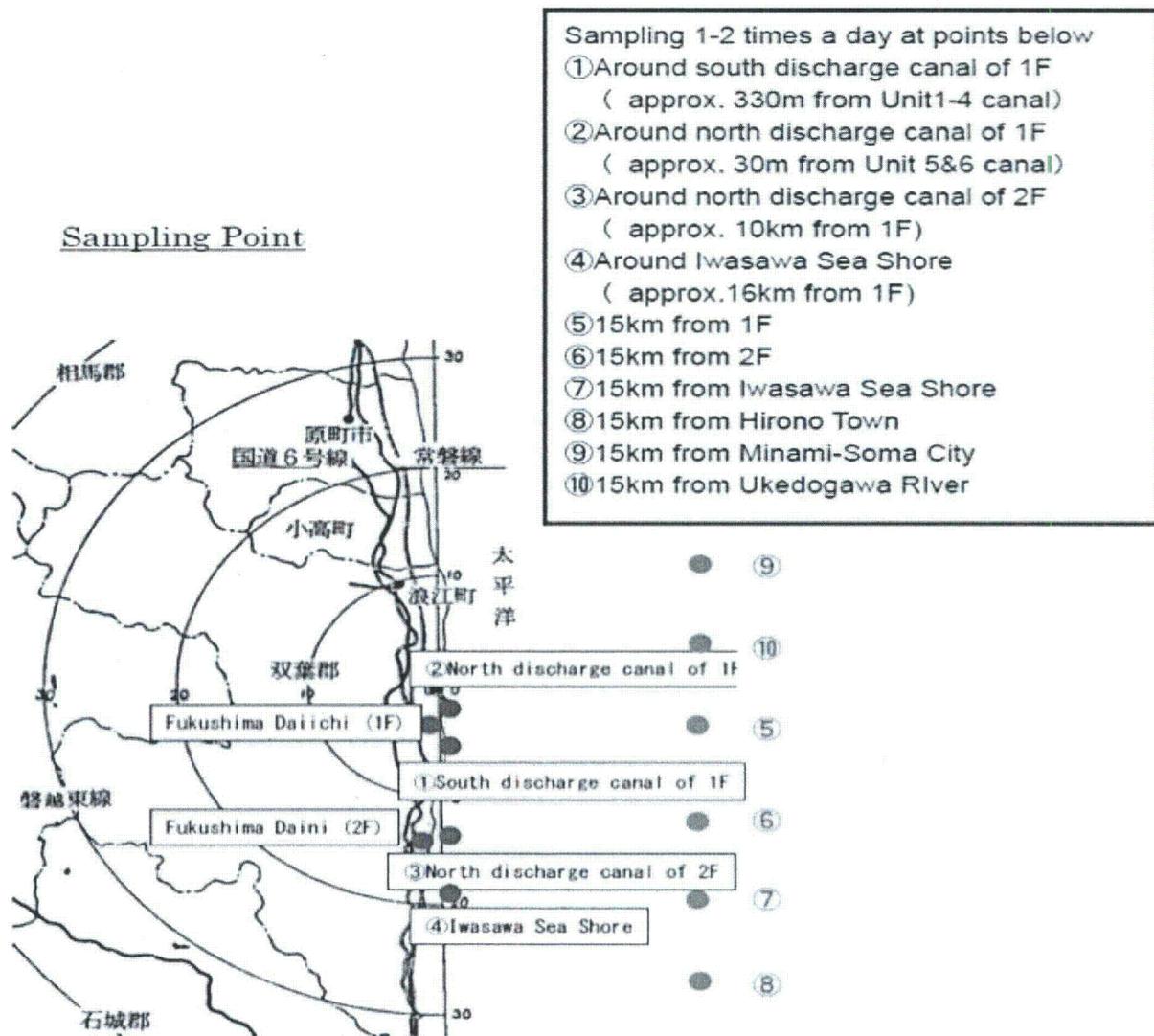
MEXT initiated the off-shore monitoring program on 23rd March and subsequently points 9 and 10 were added to the off-shore sampling scheme. On 4th April, MEXT added two sampling points to the north and west of sampling point 1. These are referred to as points A and B (see Map2: MEXT Seawater sampling Locationsc).

On 13th April new data for samples collected on 11th April at MEXT 2, 4, 6, 8, 10 and B sampling points have been reported.

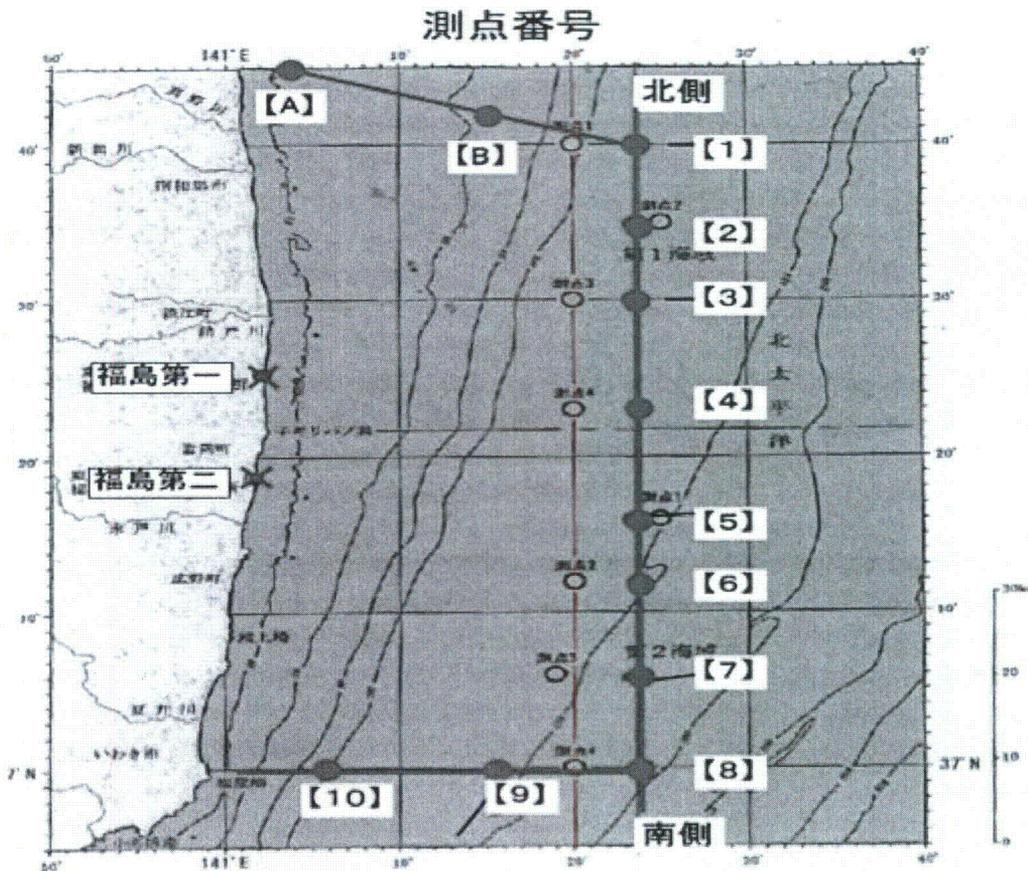
Cs-137 was only detected at MEXT 4 at a concentration level of about 70 Bq/l.

I-131 concentration of about 90 Bq/l was measured at Station MEXT4. At MEXT6, 8, 10 and B, I-131 below about 15 Bq/l was reported.

Map 1: TEPCO Seawater Sampling Locations:



Map 2: MEXT Seawater Sampling Locations:



4. IAEA activities

No new activities to report.

###

From NEI (<http://www.nei.org/newsandevents/information-on-the-japanese-earthquake-and-reactors-in-that-region/>) accessed 4/13/11 1050:

UPDATE AS OF 10 A.M. EDT, WEDNESDAY, APRIL 13:

Workers at the Fukushima Daiichi nuclear power plant are pumping radioactive water from the concrete enclosure near reactor 2 into a turbine condenser. A series of aftershocks that rattled the area Tuesday has put the work behind schedule. Tokyo Electric Power Co. (TEPCO) is inspecting another storage facility on the site to determine if it can hold contaminated water from the basement of the reactor 2 turbine building. Radioactive water in the turbine buildings is hampering efforts to restore cooling operations at the plant.

TEPCO continues to inject cooling water into reactors 1, 2 and 3 and to spray water as needed into the used fuel pools for reactors 1-4. TEPCO also continues injection of nitrogen gas into the

containment vessel of reactor 1 to prevent a possible explosion of hydrogen that may be accumulating inside.

UPDATE AS OF 6:30 P.M. EDT, TUESDAY, APRIL 12:

NEI has posted a new fact sheet, "Comparing Chernobyl and Fukushima." The key facts show that although the events at the Fukushima nuclear plant and the Chernobyl accident are both at a level 7 according to the International Nuclear and Radiological Event Scale, the situations are starkly different because of different reactor designs and much less severe public health consequences at Fukushima.

UPDATE AS OF 11:30 A.M. EDT, TUESDAY, APRIL 12:

Tokyo Electric Power Co. (TEPCO) is planning to pump highly radioactive water from reactor 2 into a condenser, as the utility works to control radiation and restore cooling systems at the Fukushima Daiichi nuclear power plant.

TEPCO continues to inject cooling water into reactors 1, 2 and 3 and to spray water into the used fuel pools for reactors 1-4. TEPCO also continues injection of nitrogen gas into the containment vessel of reactor 1 to prevent a possible explosion of hydrogen that may be accumulating inside.

A fire that broke out early Tuesday at a distribution switchboard near the south water discharge channel for reactors 1-4 was extinguished without interruption of reactor cooling operations or the release of radioactivity, TEPCO said.

The crisis rating of the Fukushima Daiichi accident was raised from 5 to 7 on the seven-level International Nuclear and Radiological Event Scale by the Japan Nuclear and Industrial Safety Agency. The new level, the highest on the scale, designates Fukushima as a "major accident." The new rating puts the Japanese incident on the same level as the 1986 Chernobyl accident—even though Japanese authorities estimate that radiation released at Fukushima is only 10 percent of the amount released from the Ukrainian plant.

Authorities said much of the high-level radiation leaked from reactor 2 on March 15 and 16, early in the accident. Abnormalities in the reactor's suppression pool caused the radiation release, the Japan Nuclear Safety Commission said. Radiation continues to leak from the suppression pool, the commission said, but the volume has dropped considerably.

###

From **NHK** (http://www3.nhk.or.jp/daily/english/13_33.html) accessed 4/13/11 835:

Work to remove contaminated wastewater continues

Workers at the damaged Fukushima Daiichi nuclear power plant are continuing efforts to remove highly radioactive water from parts of the facility.

Highly contaminated water needs to be transferred to the plant's waste processing facility from the basement of the Number 2 reactor's turbine building before workers can continue efforts to restore the cooling system.

On Wednesday, workers checked the waste processing facility to make sure it could hold the contaminated water to be transferred.

Work also continued to transfer contaminated water from an underground utility tunnel outside the Number 2 reactor to a turbine condenser.

The plant's operator, Tokyo Electric Power Company, says the water level in the tunnel was nearly one meter below the ground's surface as of Wednesday morning, dropping 8 centimeters from the previous day.

On Tuesday last week, workers stopped leakage into the sea of highly radioactive water from a concrete pit near the underground tunnel.

Another challenge is how to stop the spread of radioactive material in the sea.

Seawater sampled on Monday 30 kilometers offshore contained 2.2 times the national safety limit of radioactive iodine-131. The level 15 kilometers offshore was 23 times the safety limit. Both figures were the highest yet observed.

On Wednesday, workers put up underwater barriers in the sea near water intakes at the Number 2, Number 3 and Number 4 reactors. The barriers are to be reinforced in the coming days.

Wednesday, April 13, 2011 19:33 +0900 (JST)

###

From **NHK** (http://www3.nhk.or.jp/daily/english/13_07.html) accessed 4/13/11 0840:

High radiation levels in sea off Fukushima coast

The science ministry says radiation levels in seawater off the coast of Fukushima Prefecture are the highest since it began monitoring them about 3 weeks ago.

The ministry says the level of iodine-131 was 88.5 becquerels per liter in a sample taken on Monday in the sea about 30 kilometers east of the Fukushima Daiichi nuclear plant. The figure is 2.2 times the government's upper limit for wastewater from nuclear facilities.

The level of cesium-137 was also the highest observed so far, but was below the limit.

Tokyo Electric Power Company says the iodine-131 level was 23 times the upper limit in a sample taken 15 kilometers from the plant.

This was the highest figure since TEPCO began taking samples 15 kilometers offshore on April 2nd.

Radiation levels are higher in the sea to the north of the crippled plant.

The government's Nuclear and Industrial Safety Agency says radioactive substances seem to be flowing and diffusing northward.

The agency says predicting the course of the flow is difficult and it will step up monitoring in locations where high radiation levels have been detected.

Wednesday, April 13, 2011 09:04 +0900 (JST)

###

From **NHK** (http://www3.nhk.or.jp/daily/english/13_05.html) accessed 4/13/11 0845:

Radioactive strontium detected outside 30km zone

Japan's science ministry says small amounts of radioactive strontium have been detected in soil and plants outside the 30-kilometer zone around the Fukushima plant where the government has advised people to stay indoors. Strontium could cause cancer.

The ministry has been monitoring the level of radioactive substances in soil and weeds in Fukushima Prefecture.

It found 3.3 to 32 becquerels of strontium 90 per kilogram of soil in samples taken from 3 locations in Namie Town and Iitate Village, 30 kilometers from the plant.

An extremely small amount of strontium was also found in plants taken from Motomiya City, Ono Town and Otama and Nishigo Villages. The areas are 40 to 80 kilometers from the Fukushima plant.

Strontium 90 has a half-life of 29 years. It tends to accumulate in bones and could cause cancer.

The ministry says the amount found is extremely low and will not have a negative health impact even if a person ingested one kilogram of the contaminated soil.

The samples were taken between March 16 and 19.

A nuclear engineering expert says the fact that strontium was detected proves that the fuel in the reactor or the spent fuel in the pool was damaged at that point. He says a hydrogen explosion occurred at Reactor 3 around that time and the particles may have been carried by winds.

Wednesday, April 13, 2011 07:52 +0900 (JST)

###

From **NHK** (http://www3.nhk.or.jp/daily/english/13_03.html) accessed 4/13/11 0850:

TEPCO: 1% of radioactive iodine released outside

Tokyo Electric Power Company estimates that about one percent of the radioactive iodine at the Fukushima Daiichi nuclear power plant has been released since the March 11th earthquake and tsunami damaged the facility.

The company on Tuesday announced the estimated radioactivity levels of all substances at the plant's 6 reactors and fuel storage pools at the time of the disaster.

The estimates are classified under radioactive noble gases, iodine or other materials.

81 million tera-becquerels of iodine-131 are believed to have existed at the plant.

The utility says the amount of iodine-131 released outside the plant is about one percent of the total with a margin of error included.

The Nuclear and Industrial Safety Agency said earlier in the day that 130,000 tera-becquerels of iodine-131 have been released so far.

The company also says that, provided no leak occurred, the level of iodine-131 at the plant had fallen to less than one-hundredth of the pre-disaster level as of Monday.

The level declines naturally, as the radioactivity of iodine-131 falls by half in 8 days.

Wednesday, April 13, 2011 03:18 +0900 (JST)

###

From **NHK** (http://www3.nhk.or.jp/daily/english/13_28.html) accessed 4/13/11 0855:

Diffusion of radioactive substances predicted

Japan's science ministry says radioactive substances will continue to diffuse to the northeast in the Pacific Ocean for several days after being released from the troubled Fukushima Daiichi nuclear power plant.

The ministry conducted a computer-simulated prediction of movements of such substances, based on a seawater survey as well as data on currents in nearby waters.

On April 2nd, levels of radioactive iodine-131 near the water intake of the plant's No. 2 reactor were found to be 7.5 million times higher than the legal limit.

The ministry says the radiation levels are on the decline, but remain high.

The ministry's short-term prediction says the substances will spread from the coast to the northeast, maintaining their levels for several days.

The ministry's long-term prediction says the substances will be carried south by a current 100 kilometers offshore in lowered concentrations, then move east with a rapidly-moving current off Ibaraki Prefecture in about a month.

The ministry said the concentration of radioactive substances in the sea is likely to decrease gradually.

The ministry plans to step up monitoring of the movement of radioactive substances in waters around the plant and release another prediction.

Wednesday, April 13, 2011 19:44 +0900 (JST)

###

From **NHK** (http://www3.nhk.or.jp/daily/english/13_37.html) accessed 4/13/11 1105:

Most spent fuel not damaged at No. 4 reactor

TEPCO says most of the spent fuel in the storage pool of the No. 4 reactor is apparently undamaged.

At a news conference on Wednesday, the firm said the finding is based on interim results of an analysis of samples taken from the pool water on Tuesday.

But it said levels of radioactive substances including iodine-131 in the samples were higher than those in storage pools under normal circumstances, suggesting that some of the spent fuel may have been damaged.

TEPCO says it found 220 becquerels of iodine-131 per cubic centimeter of water, as well as 88 becquerels of cesium-134 and 93 becquerels of cesium-137. The firm says the materials are usually produced by nuclear fission.

Wednesday, April 13, 2011 21:08 +0900 (JST)

###

From **The Japan Times** (<http://search.japantimes.co.jp/cgi-bin/nn20110413x1.html>) accessed 4/13/11 00905:

Radiation surges above 4's fuel pool

By Kanako Takahara
Staff Writer

Radiation has risen to high levels above the spent-fuel pool at reactor No. 4 and its temperature is rising, the nuclear safety agency said Wednesday, indicating the fuel rods have been further damaged and emitting radioactive substances.

The radiation level 6 meters above the spent-fuel storage pool at the crippled Fukushima No. 1 nuclear plant was measured at 84 millisieverts per hour Tuesday. Normally, it's 0.1 microsievert.

The temperature of the pool was 90 degrees, compared with 84 before it caught fire on March 15 in a suspected hydrogen explosion, the agency said.

"It's quite an amount," figured Hidehiko Nishiyama, a spokesman for the Nuclear and Industrial Safety Agency.

Tokyo Electric Power Co. was unsure whether the surge in radiation was being caused by the spent fuel rods or radioactive material leaking from the reactor's pressure vessel.

Tepco used a robot to take a water sample from the pool Tuesday to analyze the radioactive materials in it, which can tell them in greater detail what is happening to the spent fuel rods.

Tepco dumped 195 tons of fresh water onto the rods early Wednesday to stop the temperature from rising.

"The temperature was rising and we don't know the water level of the pool, so we thought it would be safer to pour water," said NISA's Nishiyama said.

Tepco said it is planning to move the spent fuel rods out of the storage pools at reactors 1 through 4 so they can be moved to a safer location, although details on when and how haven't been decided yet.

Some of the options Tepco is considering include pulling the rods out with a crane or building a special structure nearby to pull them out.

But these tasks will be tough because the site is so radioactive and cluttered with debris from last month's hydrogen explosions. Meanwhile, the water level of radiation-contaminated water in the tunnel-like trench at Unit 2 dropped by 4.3 cm Wednesday morning after Tepco started pumping lethally radioactive water from its flooded turbine room into a nearby storage facility the day before.

Getting the 6,000 tons of water out is expected to take four to five days , Tepco said.

NISA also said the utility was rushing to finish installing seven steel sheets around a seawater intake for reactor 2 later in the day and silt fences near intakes for reactors 3 and 4 to hinder the spread of thousands of tons of radioactive water it dumped into the ocean.

Nishiyama also said that a seawater sample taken Monday 15 km away from the nearby city of Minamisoma, Fukushima Prefecture, showed that the concentration of radioactive iodine-131 was about 23 times the legally permissible level.

NISA said that level does not pose any health risks.

Separately, Tepco said the fuel rods in the Unit 4 pool had released cesium-134 and -137 in the process of being damaged. Cesium-137 has a half-life of 30 years. "Contaminated water leaked From the Unit 2 may have gathered as a lump and drifted offshore," Nishiyama said. "We need to continue monitoring it."

Massive amounts of water have been poured into the reactors and the spent-fuel pools as a stopgap measure to cool them down and prevent them from burning. But pools of highly contaminated water have been detected in various parts of the nuclear complex, with some of it leaking into the Pacific, as an apparent side effect of the emergency measure.

Prime Minister Naoto Kan said Tuesday that the situation of the troubled reactors is "improving step by step" and that the release of radioactive particles from the plant is declining.

###

From **The Japan Times** (<http://search.japantimes.co.jp/cgi-bin/nn20110413x3.html>) accessed 4/13/11 0910:

East Fukushima shiitake banned

By Kanako Takahara
Staff Writer

Prime Minister Naoto Kan on Wednesday banned the shipment of shiitake raised outdoors in eastern Fukushima Prefecture near the crippled nuclear power plant after radioactive substances exceeding government standard were detected.

Subject to the ban are shiitake harvested outdoors on logs in the cities of Date, Soma, Minamisoma, Tamura, Iwaki, and the towns of Shinchi, Kawamata, Namie, Futaba, Okuma, Tomioka, Naraha, Hirono as well as the villages of Iitate, Katsurao and Kawauchi.

"Shiitake mushrooms subject to the shipment ban this time are those raised outdoors and those produced indoors did not exceed the standard," Chief Cabinet Secretary Yukio Edano said. "We will lift the ban when the (level of radioactive substances) stays below the standard in a stable manner."

According to government regulations, a shipment ban will not be lifted unless contamination levels of produce near the Fukushima No. 1 nuclear plant remain below legal limits in three consecutive tests.

A test Sunday found 12,000 becquerels per kg of radioactive iodine and 13,000 becquerels per kg of cesium in shiitake harvested in Iitate. The figure is well above the legal limit of 2,000 becquerels for radioactive iodine and 500 becquerels for cesium.

Shiitake in Iwaki was found to have 3,100 becquerels of radioactive iodine and 890 becquerels of cesium.

###

From: Andrews, Tom
Sent: Thursday, April 21, 2011 3:48 PM
To: Hasselberg, Rick
Cc: Hiland, Patrick; Skeen, David; RST01 Hoc
Subject: RE: FYI - Interesting Discussions Regarding Unit 4's Explosion

By the way, a representative from JNES gave a brief presentation here at the NREP conference today that showed the Unit 4 fuel pool had 294 NEW fuel assemblies in it.

Tom

From: Hasselberg, Rick
Sent: Thursday, April 21, 2011 6:11 AM
To: Andrews, Tom
Cc: Hiland, Patrick; Skeen, David; RST01 Hoc
Subject: FYI - Interesting Discussions Regarding Unit 4's Explosion

Good insights, Tom. I'll pass this right onto the team.

Pat and Dave – I don't know if we have already considered Tom Andrews' thoughts regarding Unit 4's SFP damage. But we've passed it along for your consideration. Thanks!

Rick

From: Andrews, Tom
Sent: Thursday, April 21, 2011 6:12 AM
To: Hasselberg, Rick
Subject: RE: FYI - Interesting Discussions Regarding Unit 4's Explosion

Rick,

Here is something for your experts to ponder about the spent fuel pool scenarios. Keep in mind that my spent fuel pool criticality experience is for PWR pool, so this may or may not apply for BWRs.

I recall from my experience at Waterford that if you had 2 fuel assemblies with around 4.5% enriched fuel laying next to each other and sprayed them with fire-fighting fog or foam, you could have optimum moderation.

I am thinking that the conditions in the spent fuel pool in Unit 4 may have been exacerbated by a criticality incident. Spent fuel pools depend on several design features / constraints to reduce the possibility of criticality. These include spacing between fuel assemblies, use of water and other components as shielding between fuel assemblies, and maximum enrichment of fuel assemblies. The enrichment would be reduced through burn-up.

Normally when you consider criticality analysis for a spent fuel pool, you consider that you have water at a uniform temperature and moderation. Because BWR fuel is designed to maintain criticality in an environment with voids, is it possible that once the spent fuel pool level dropped to a certain point where you have boiling, you have optimized moderation between assemblies?

We have been told that the entire core was off-loaded to the spent fuel pool to support some kind of in-service inspection. Could there have been new fuel also stored in the pool in preparation for the next refueling? This

BT/8

would serve to raise the average enrichment of the fuel in the pool since the new fuel has no burn-up associated with it.

I know that we want to keep water in the pool and not let it boil to start with... but something like this may impact some of the timing and isotopic mix results.

Tom Andrews

From: Hasselberg, Rick
Sent: Wednesday, April 20, 2011 2:46 PM
To: Pavlechko, Frank; Andrews, Tom
Subject: FYI - Interesting Discussions Regarding Unit 4's Explosion

Thought you'd be interested in this. OOU of course.

From: Hasselberg, Rick
Sent: Friday, April 22, 2011 9:38 AM
To: Emche, Danielle
Cc: Andrews, Tom; Pavlechko, Frank; Bloom, Steven
Subject: RE: Spent Fuel Pools RE: [Updates on April 21] Information on Fukushima Nuclear Power Stations

Thank you, Danielle. (And Tom and Franks and Steve).

You folks have done all you can on this. I've got some good photos and technical reports. I really appreciate all your efforts.

Rick

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

From: Emche, Danielle
Sent: Friday, April 22, 2011 6:04 AM
To: Hasselberg, Rick
Subject: Fw: Spent Fuel Pools RE: [Updates on April 21] Information on Fukushima Nuclear Power Stations

Rick,
I believe that it may no longer possible to obtain the video footage. See the links to photos in the email below. Perhaps these offer some new shots.
Danielle
Sent from an NRC BlackBerry.

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

From: Yuko Wada <yuko@jaif.or.jp>
To: Emche, Danielle
Cc: k-kishioka@jaif.or.jp <k-kishioka@jaif.or.jp>; JAIF <aij@jaif.or.jp>
Sent: Thu Apr 21 22:09:18 2011
Subject: Re: Spent Fuel Pools RE: [Updates on April 21] Information on Fukushima Nuclear Power Stations

Dear Danielle-san,

Thank you for the meeting we had in our office a few weeks ago. We also appreciated your frank opinion and would like to discuss more at some time in the future.

Regarding your request on the footage of the Kashiwazaki-Kariwa Unit 6 spent fuel pool sloshing, as you may know, there is an information with some photos at the following TEPCO's website, but no sloshing photos.

<http://www.tepco.co.jp/en/niigata/plant/jisho04-e.html>

As you may also know, there is a sloshing photo of Unit 3 (<http://www.tepco.co.jp/en/niigata/plant/jisho02-e.html>), but I am sorry that we don't have any video and photo of Unit 6.

I am sorry that we couldn't be of more help.

Please feel free to contact us when you have something you would like to know.

BT/9

Best Regards,
Yuko

Yuko Wada
International Affairs Department
Japan Atomic Industrial Forum, Inc (JAIF)
TEL.:(+81)3-6812-7150 / FAX.:(+81)3-6812-7110

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

From: "Emche, Danielle" <Danielle.Emche@nrc.gov>
To: "JAIF" <aij@jaif.or.jp>; "Yuko Wada" <yuko@jaif.or.jp>; <k-kishioka@jaif.or.jp>
Sent: Thursday, April 21, 2011 10:25 PM
Subject: Spent Fuel Pools RE: [Updates on April 21] Information on Fukushima Nuclear Power Stations

Good morning,

We recently had the opportunity of meeting when I visited Tokyo a few weeks ago, and I greatly appreciated our honest discussions.

I have a bit of an unusual request but I thought that it might be something that you could easily have available. In light of the recent spent fuel pool issues, NRC has been looking for the footage of the Kashiwazaki Unit 6 spent fuel pool sloshing. I realize this is a few years old but I thought you might have it available as a link or something that you could easily send. If this is not possible, please don't take additional time out of your busy schedule.

Thank you,
Danielle Emche
International Relations
U.S. Nuclear Regulatory Commission

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

From: JAIF [mailto:aij@jaif.or.jp]
Sent: Wednesday, April 20, 2011 9:49 PM
To: Emche, Danielle
Subject: [Updates on April 21] Information on Fukushima Nuclear Power Stations

Dear subscribers to the "Atoms In Japan (AIJ)",

Japan Atomic Industrial Forum (JAIF) has updated the following information on Fukushima Nuclear Power Plants and environmental impacts at the JAIF website.

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

- Information on Status of Nuclear Power Plants in Fukushima (as of 10:00, April 21)
- Monitoring of Radioactive Concentrations in Nearby Sea of Fukushima Daiichi NPS (daily update)
- Trend of Radiation in the Environment around Fukushima Daiichi NPS (daily update)
- Earthquake Report 58 (daily update)

[Updates]

- Small fish (sand lances) caught in the sea near Fukushima have been found to contain radioactive cesium and iodine above the legal limit (4/5-). The government ordered to suspend shipment and warned not to eat them (4/20-).

- TEPCO released videos of the inside of the reactor buildings of Fukushima Daiichi Nuclear Power Station taken by the Packbot on April 17th and 18th.

(<http://www.tepco.co.jp/en/news/110311/>)

NHK reported that the robots have detected 18.9 millisieverts of radioactivity in reactor Unit 1 and 6.46 millisieverts in Unit 2 over 50 minutes. Levels of radioactivity were not available in the Unit 3 reactor.

*Trend data of primary parameters are available at Japan Nuclear Technology Institute's website;

http://www.gengikyo.jp/english/shokai/special_4.html

Atoms In Japan (AIJ)

Japan Atomic Industrial Forum, Inc.

2-1-3, Shimbashi, Minato-ku, Tokyo 105-8605, JAPAN

From: Hasselberg, Rick
Sent: Tuesday, April 26, 2011 8:26 AM
To: Peko, Damian
Cc: Skeen, David; Caponiti, Alice; Golub, Sal; Shields, Martha; RST01 Hoc
Subject: DOE Question Regarding USG Concurrence of TEPCO roadmap

Importance: High

Thanks, Damian.

One correction. Please use RST01.hoc@nrc.gov as your principle POC. Please cc. David.Skeen@nrc.gov, Patrick.Hiland@nrc.gov and myself.

I'm forwarding your question to RST01 right now to request the team's answer on your question.

Rick Hasselberg

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

From: Peko, Damian [mailto:Damian.Peko@Nuclear.Energy.gov]
Sent: Monday, April 25, 2011 6:34 PM
To: Hasselberg, Rick
Cc: Skeen, David; Caponiti, Alice; Golub, Sal; Shields, Martha
Subject: USG Concurrence of TEPCO roadmap

Rick

I am the new DOE person, along with Martha Shields, to work with the RST going forward. I have been advised you are keeping the list of RSTY actions. I have a question on the TEPCO roadmap, which we are collecting comments on. Specifically, did the Government of Japan (or TEPCO) ask us to concur on the TEPCO roadmap? If so, how and do we have anything in writing (email, etc.) or was it a verbal to the group in the Embassy or ...? The reason why I am asking is as we move forward we are shifting gears in what we respond to and how. I the request comes from Japan, then that puts this in another bin. Do you have this information? If not, do you know where I can get this information?

Thanks

Damian

BT/10

From: Hasselberg, Rick
Sent: Wednesday, April 27, 2011 12:35 PM
To: Zimmerman, Roy
Subject: RE: Fukushima Slides for Roy Z.ppt

You'd be good!

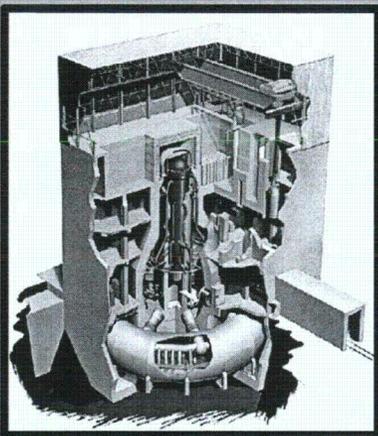
From: Zimmerman, Roy
Sent: Wednesday, April 27, 2011 11:19 AM
To: Hasselberg, Rick
Cc: Morris, Scott; McDermott, Brian; Marshall, Jane; Grant, Jeffery; Milligan, Patricia
Subject: RE: Fukushima Slides for Roy Z.ppt

Wow! Thank you so much for not only assisting but doing so quickly. You folk in NSIR must be very squared away.....I'll have to think about applying for a position there someday.....thanks again.

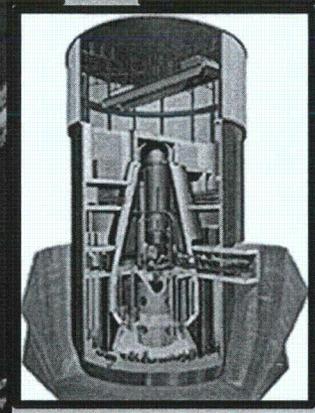
From: Hasselberg, Rick
Sent: Wednesday, April 27, 2011 11:10 AM
To: Zimmerman, Roy
Cc: Morris, Scott; McDermott, Brian; Marshall, Jane; Grant, Jeffery; Milligan, Patricia
Subject: Fukushima Slides for Roy Z.ppt

Hope this arrives via e-mail. The actual PP package is about 50 megs. Thanks.

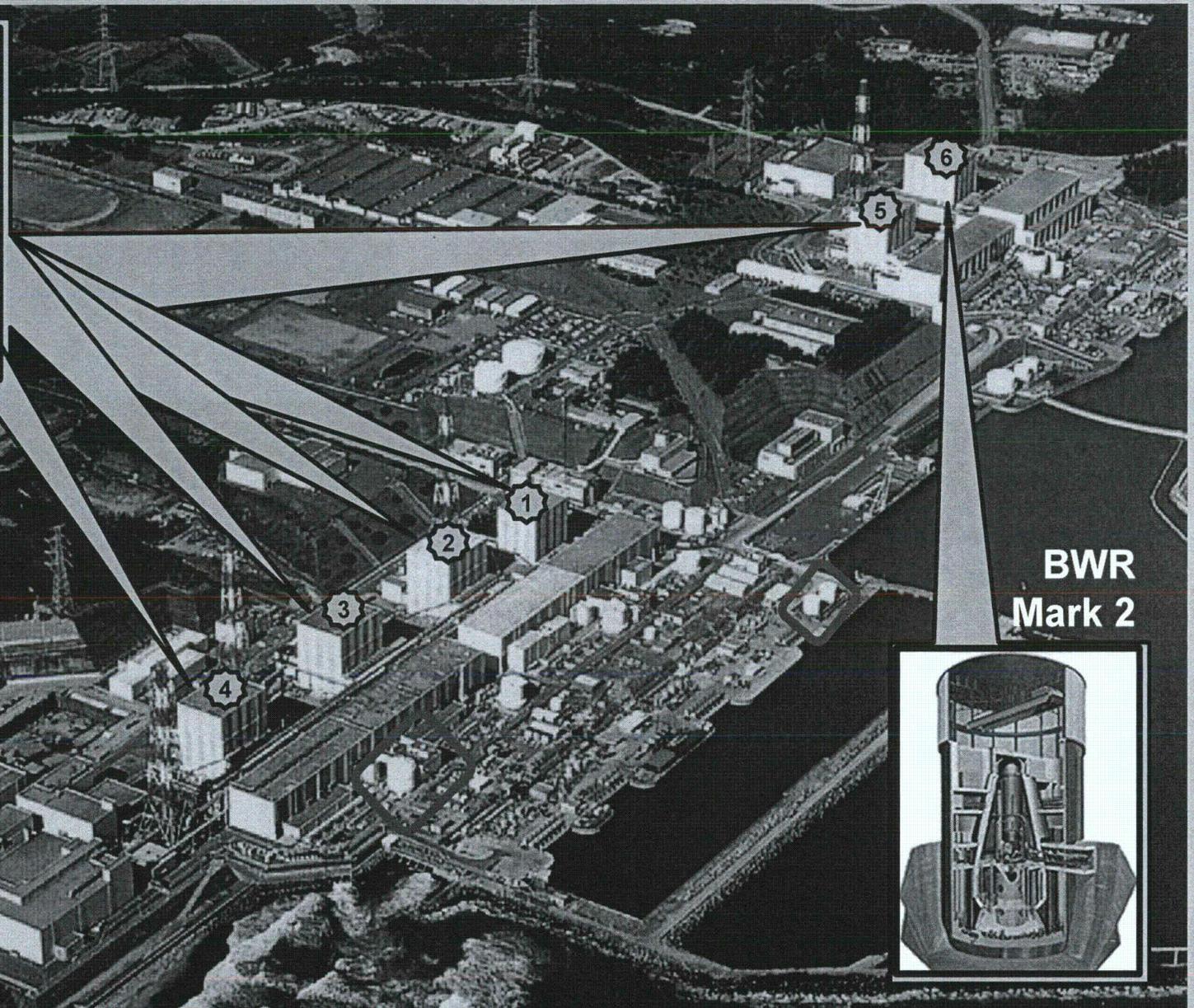
BT / 11



BWR Mark 1



BWR Mark 2

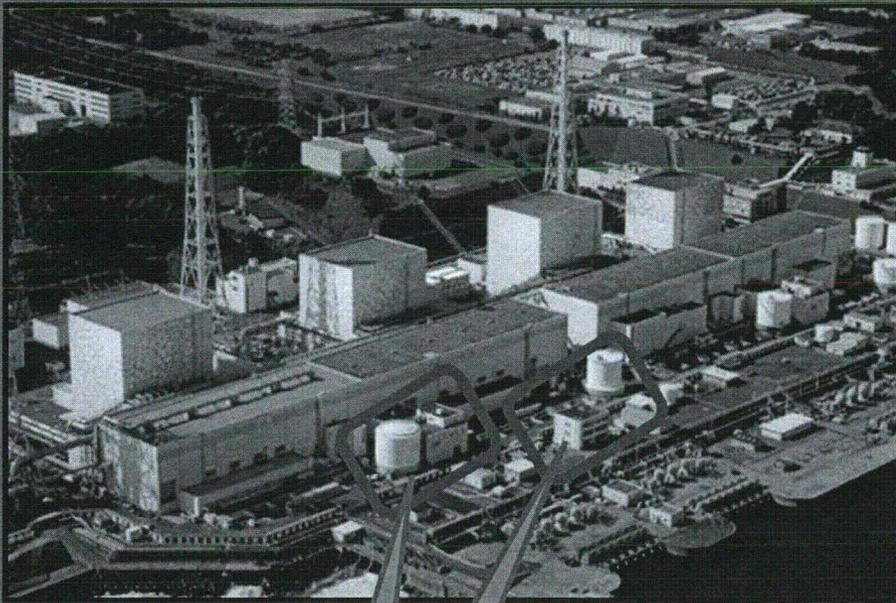


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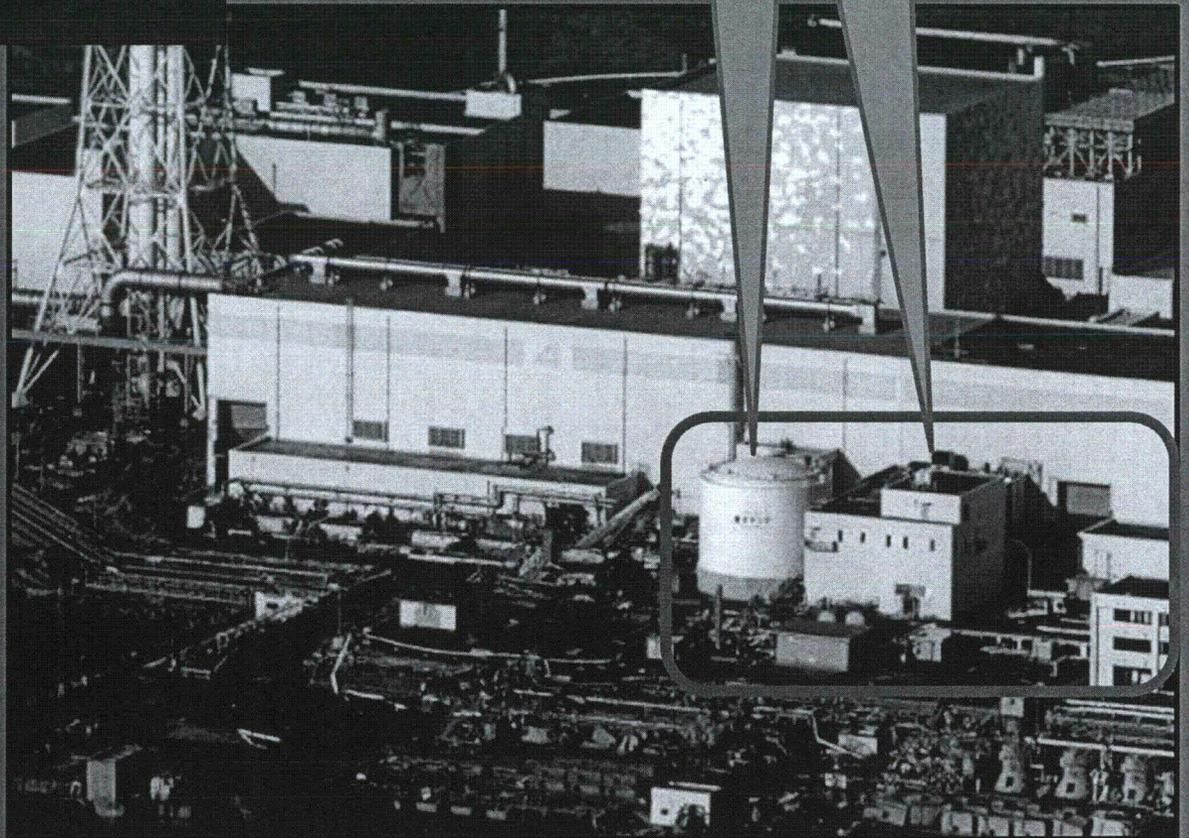
Fukushima Daiichi

Fukushima Daiichi Site Layout

Three & Four-
Story Structures



Three & Four-
Story Structures



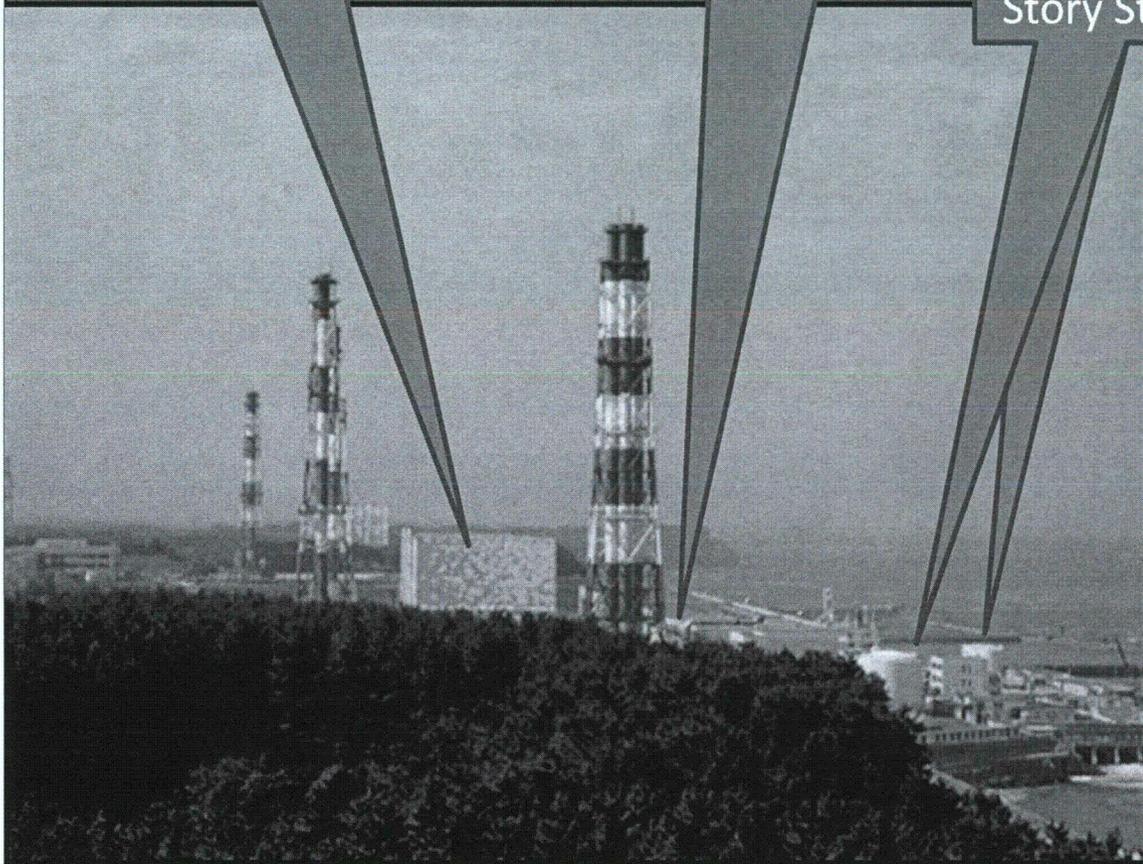
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TEPCO Web Cam Images

Unit 4 Rx Bldg.

Unit 4 Turbine Bldg.

Three & Four
Story Structures



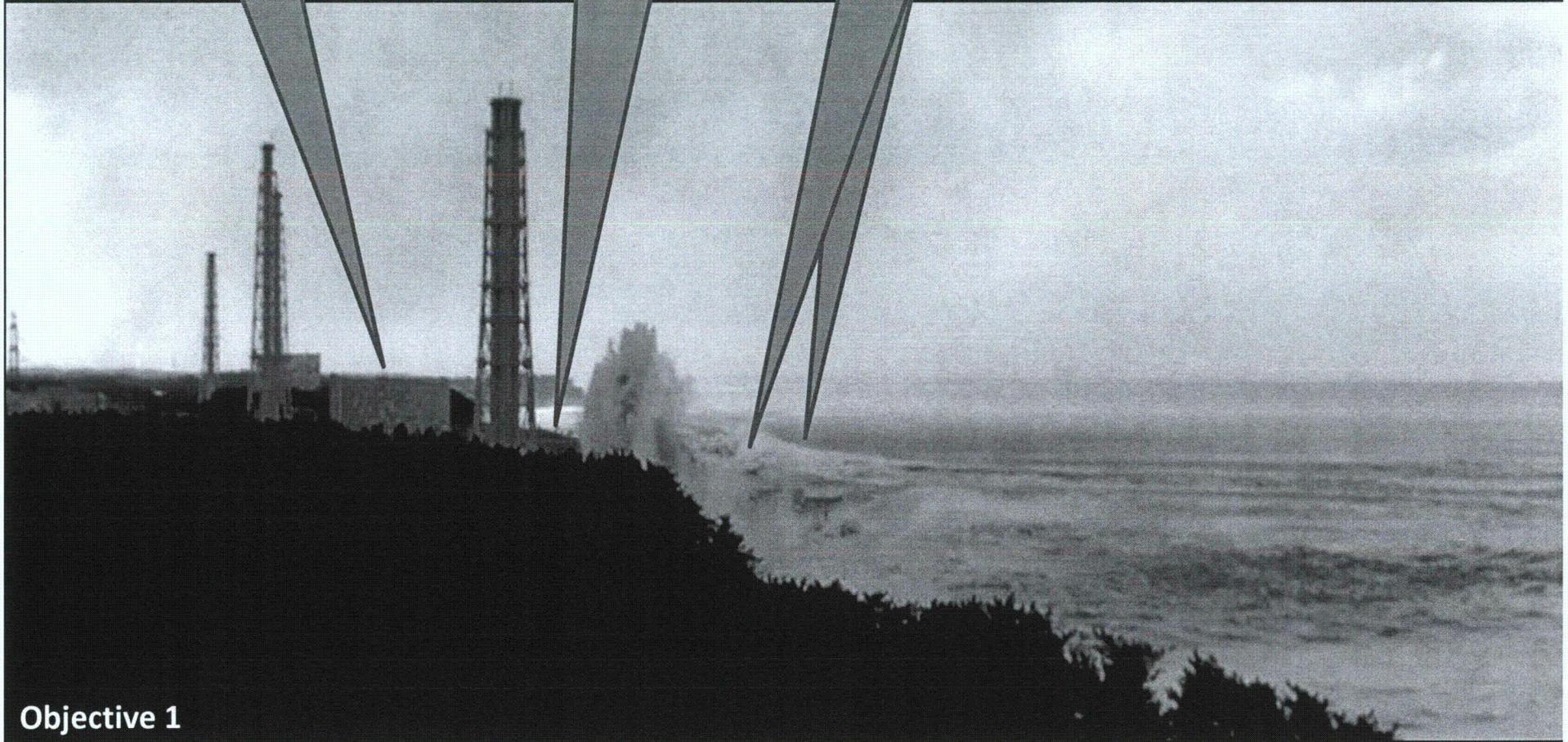
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TEPCO Web Cam Images

Unit 4 Rx Bldg.

Unit 4 Turbine Bldg.

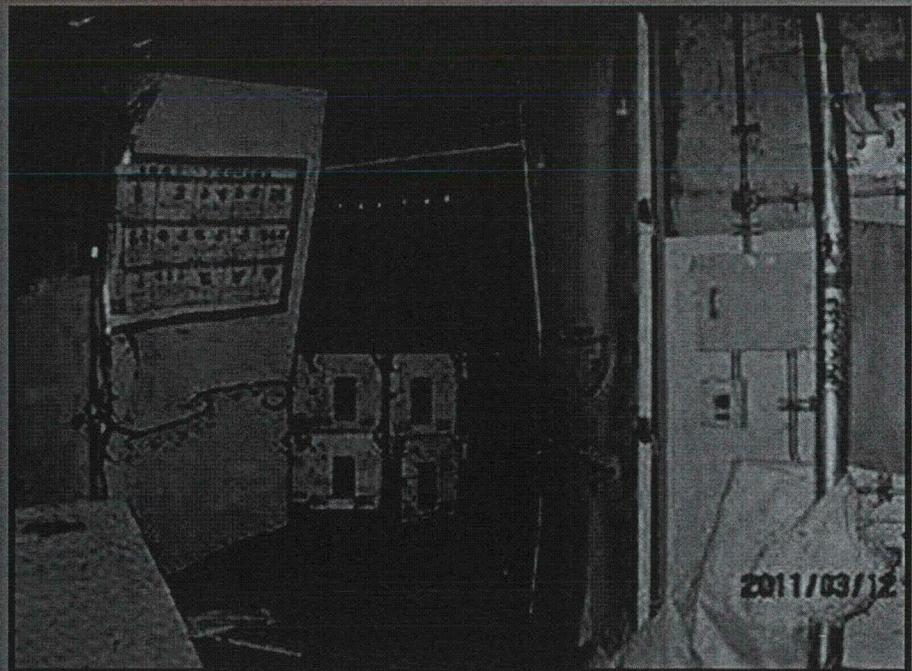
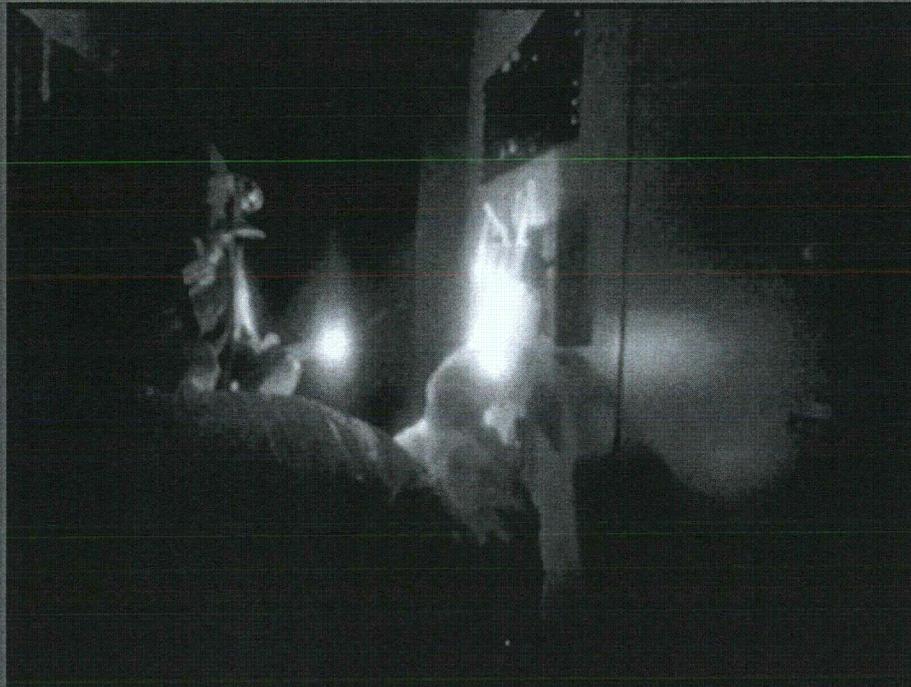
Three & Four
Story Structures



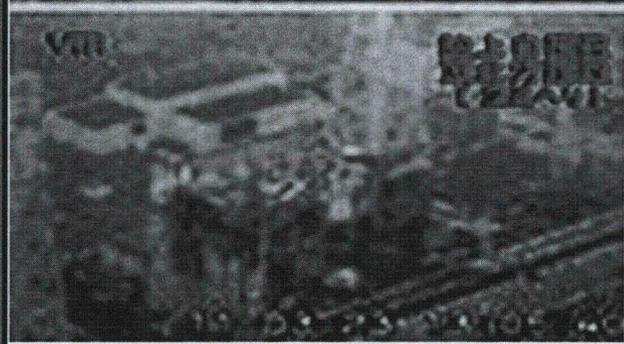
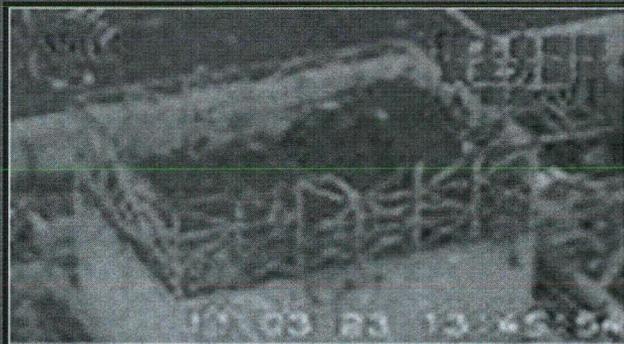
Objective 1

Sequence of Events

- Units 1, 2 & 3 operating at full power on 3/11/2011
- Units 4, 5 & 6 shutdown - refueling / maintenance
 - U4 recently shutdown. De-fueled. All fuel rods in SFP.
 - U5 shutdown some months for refueling. Fuel rods in Rx.
 - U6 shutdown some months for refueling. Fuel rods in Rx.
- Magnitude 9.0 earthquake off Japan's east coast
- 14 meter (46 ft) high tsunami impacts Daiichi site
- Loss of offsite AC power, AC distribution systems and emergency diesel generators (station blackout)
- Had some DC power from batteries for a few hours
- Rx Core & SF Pool cooling immediately challenged



Objective 1



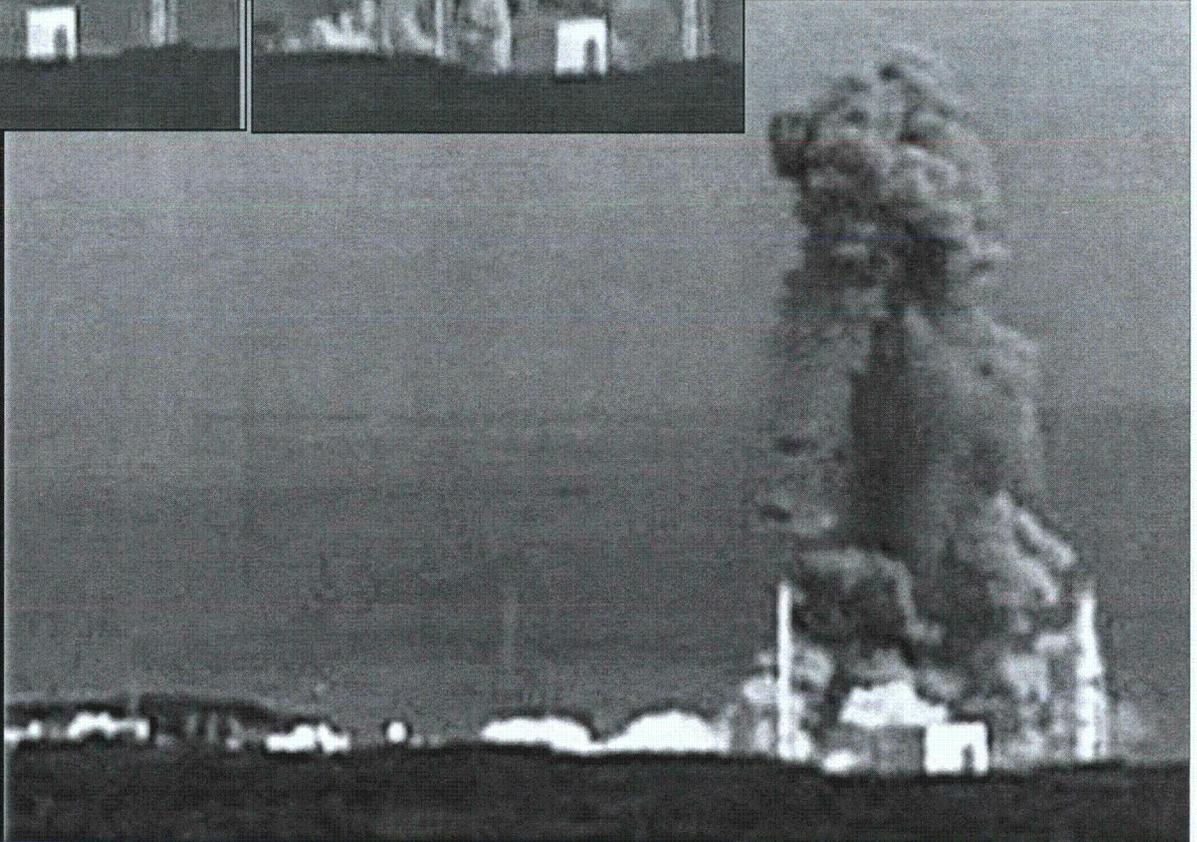
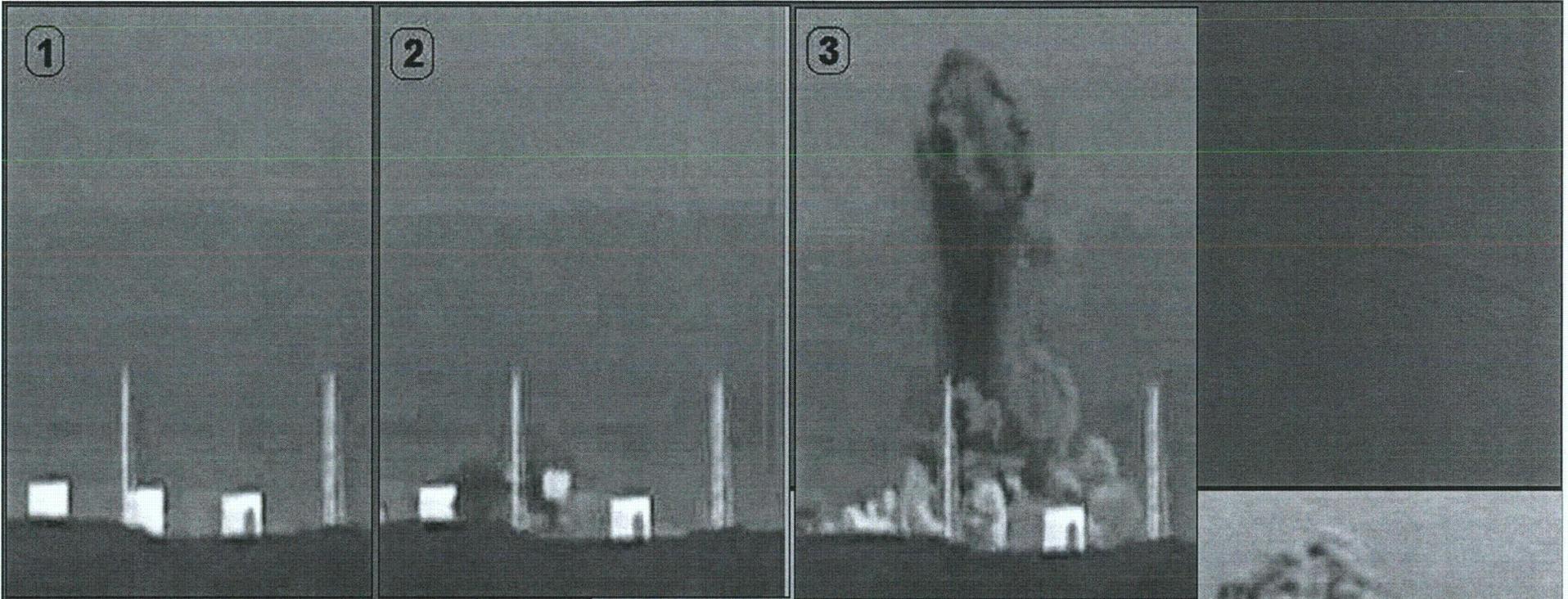


Unit 1

Hydrogen

Explosion

Objective 2

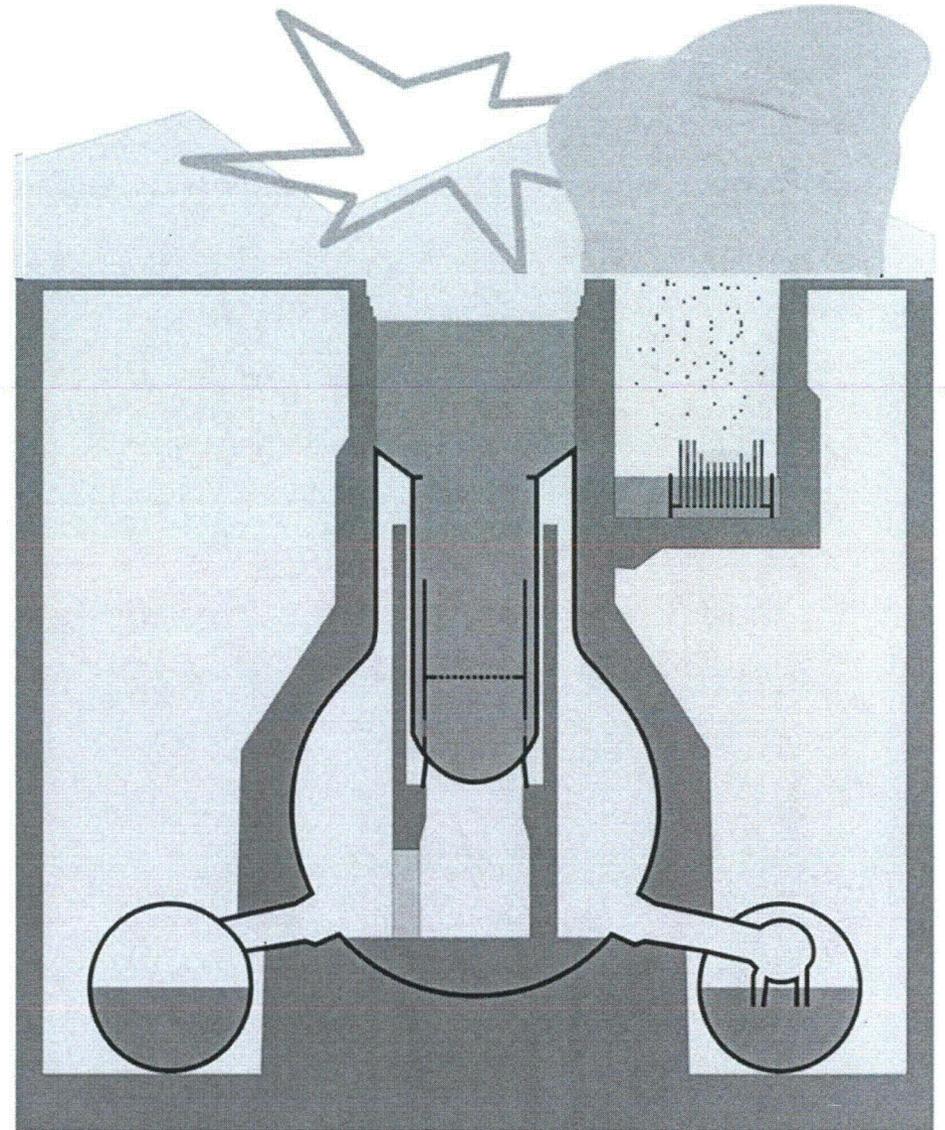
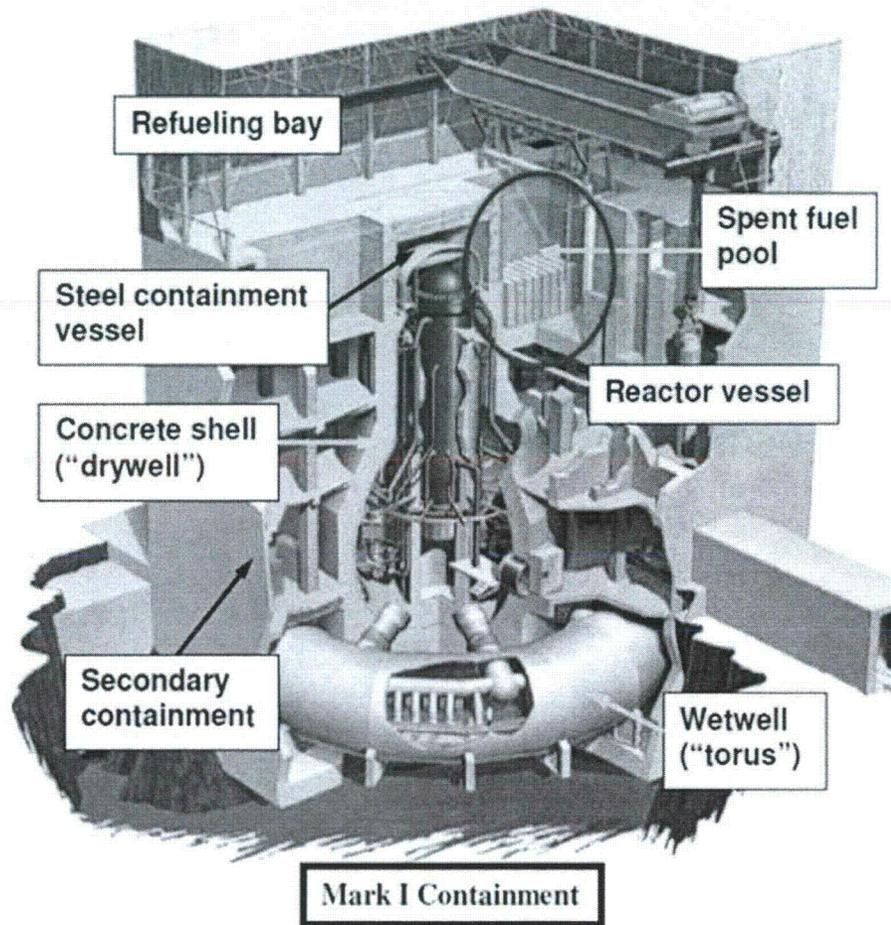


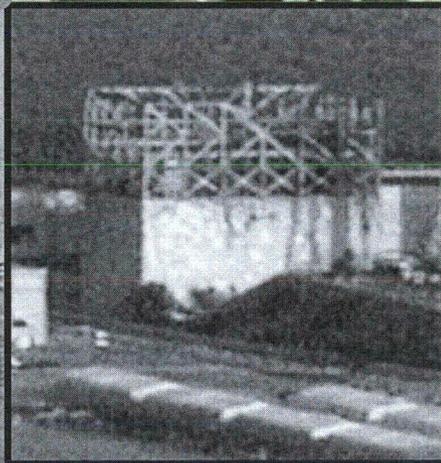
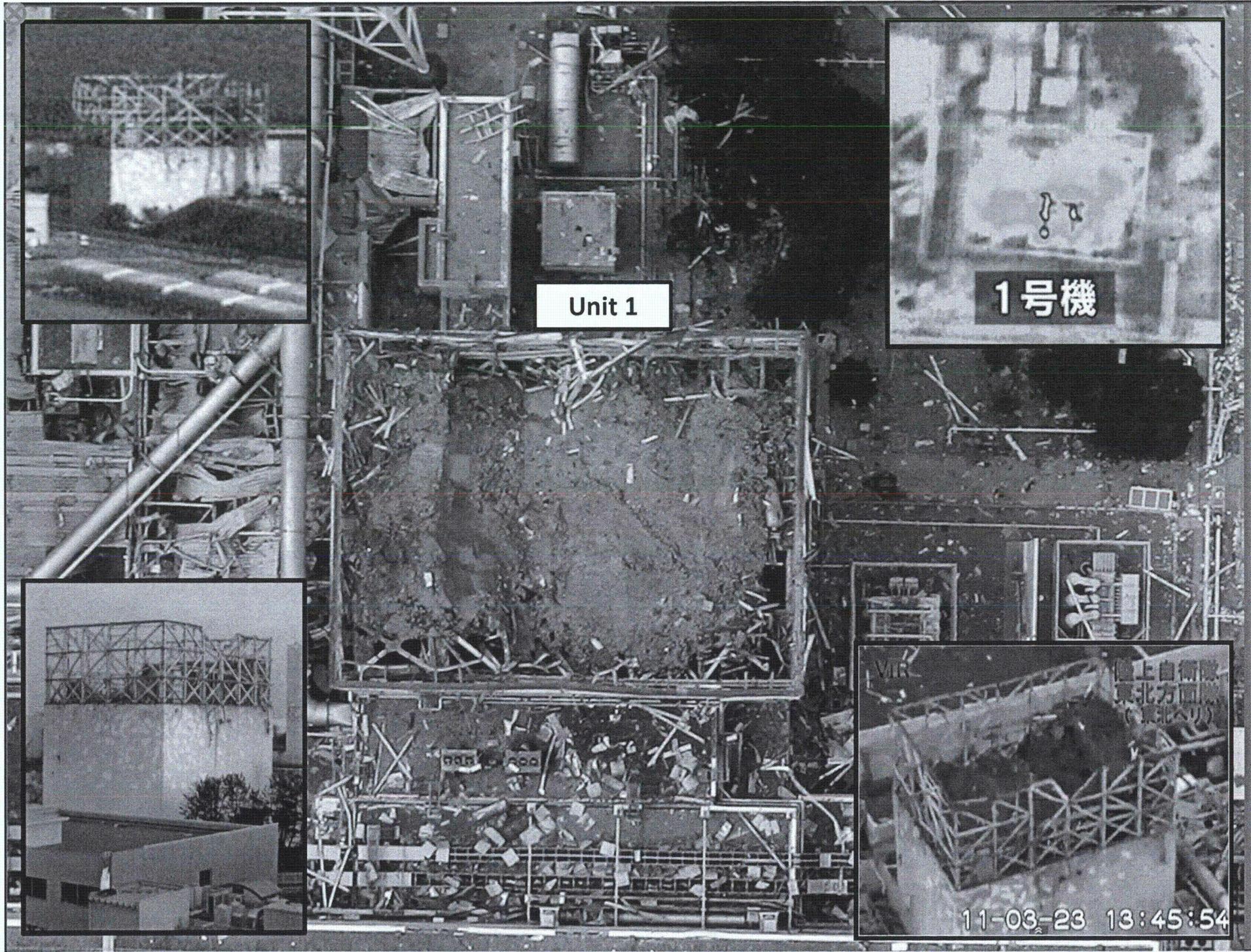
Unit 3 Hydrogen Explosion

Objective 2

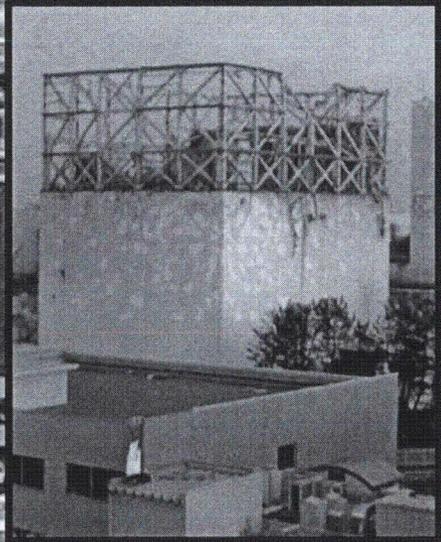
The Fukushima Daiichi Incident

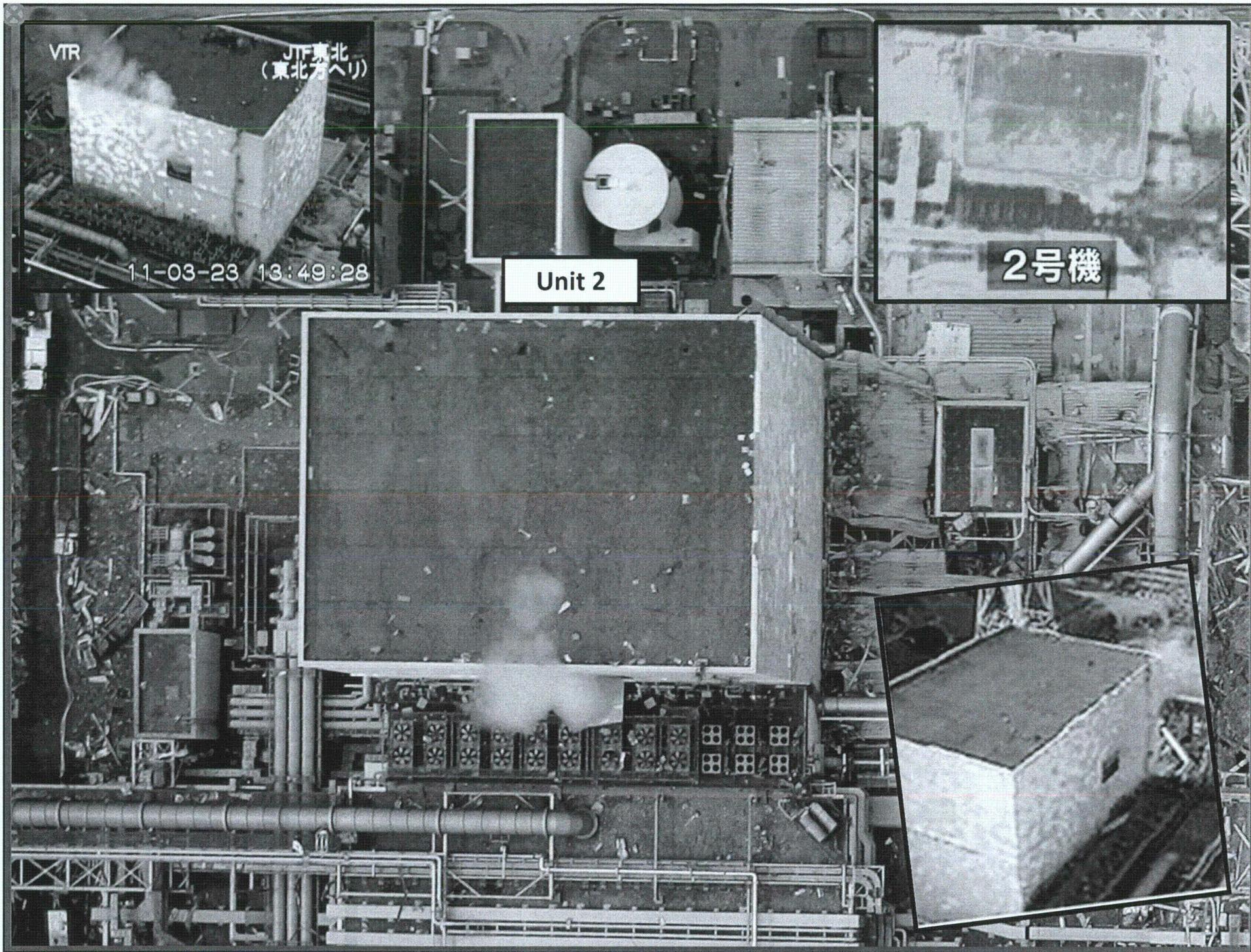
4. Spent fuel pools





Unit 1





VTR

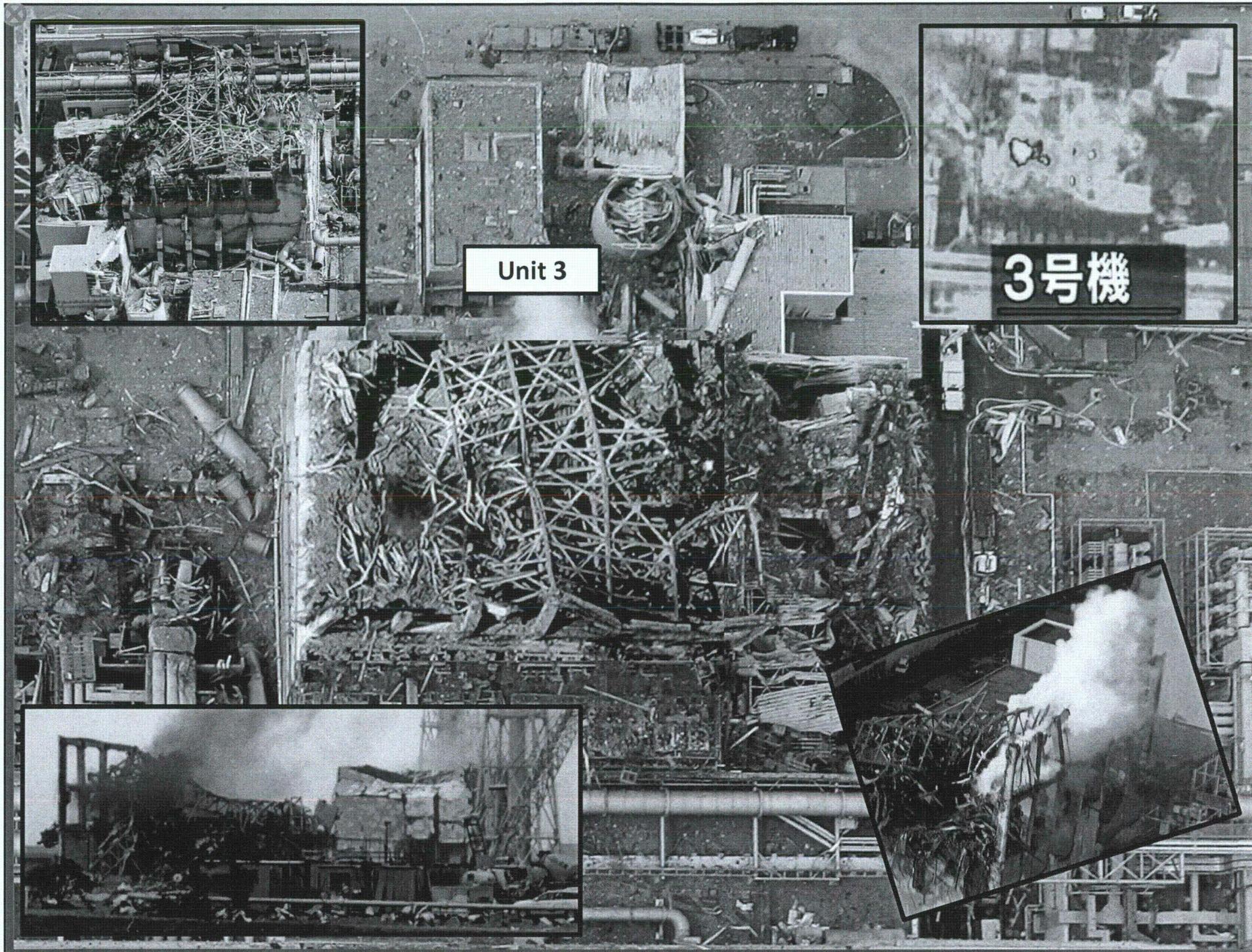
JTF東北
(東北方へ)

11-03-23 13:49:28

Unit 2

2号機



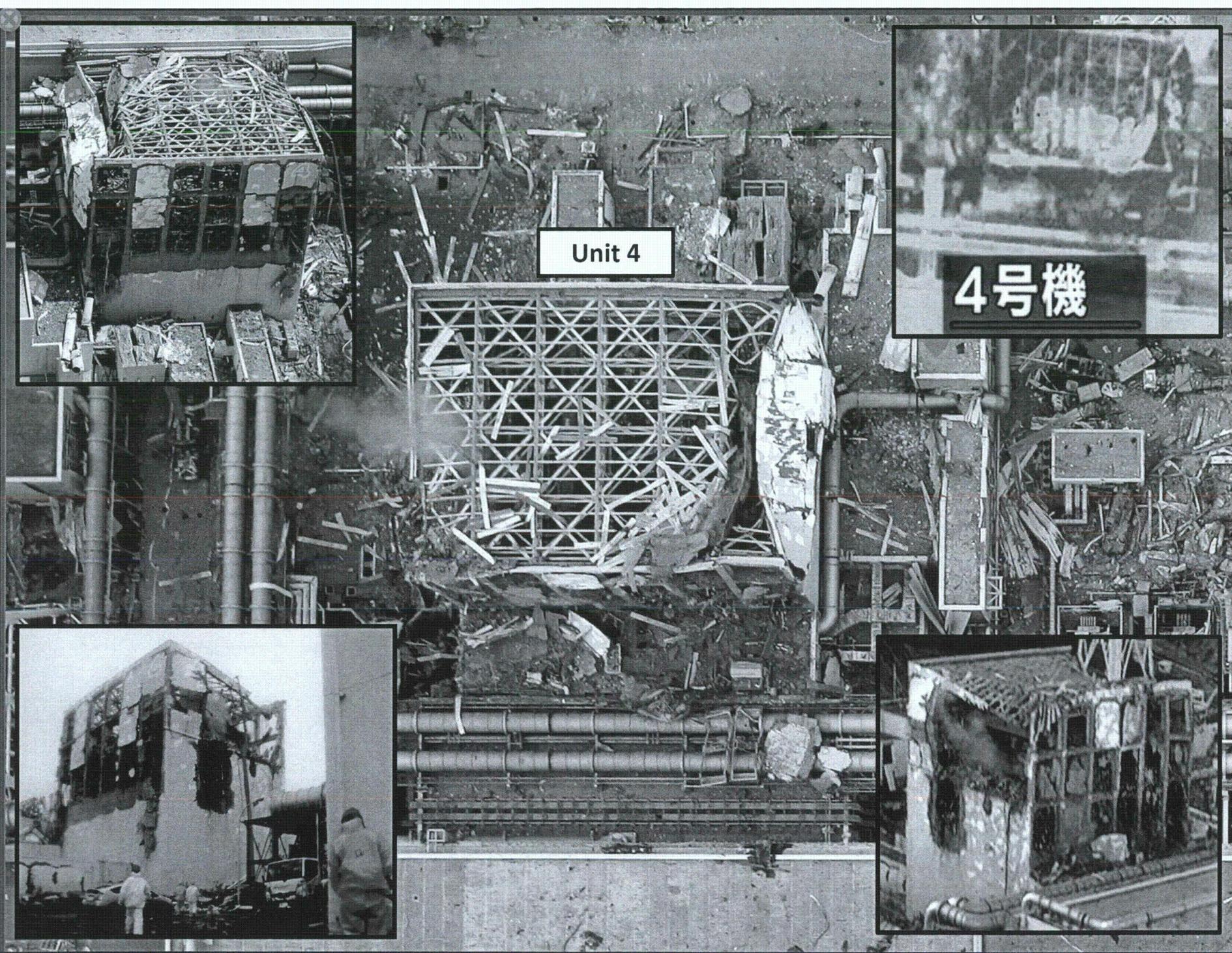
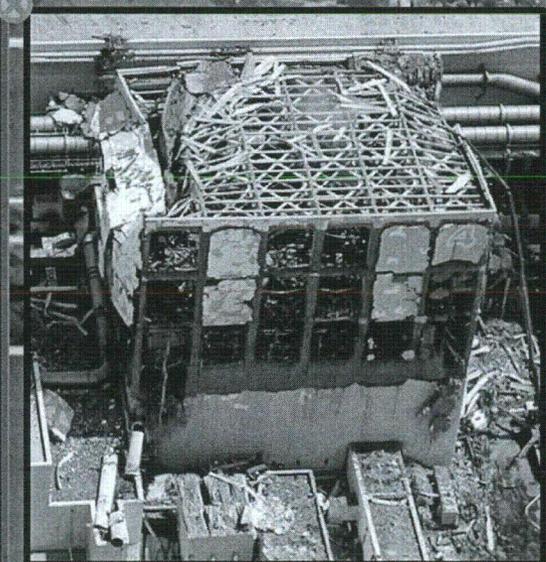
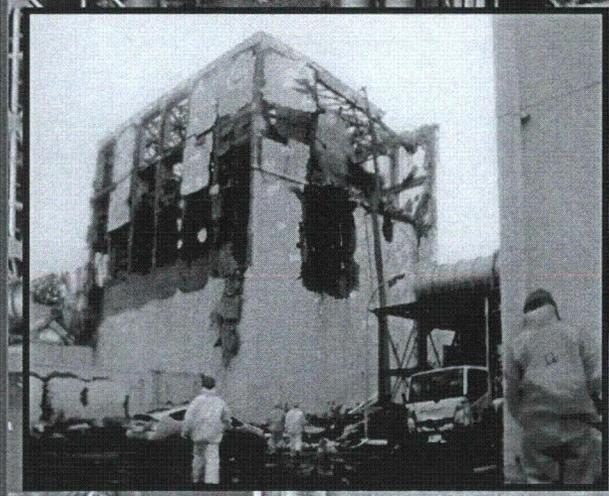


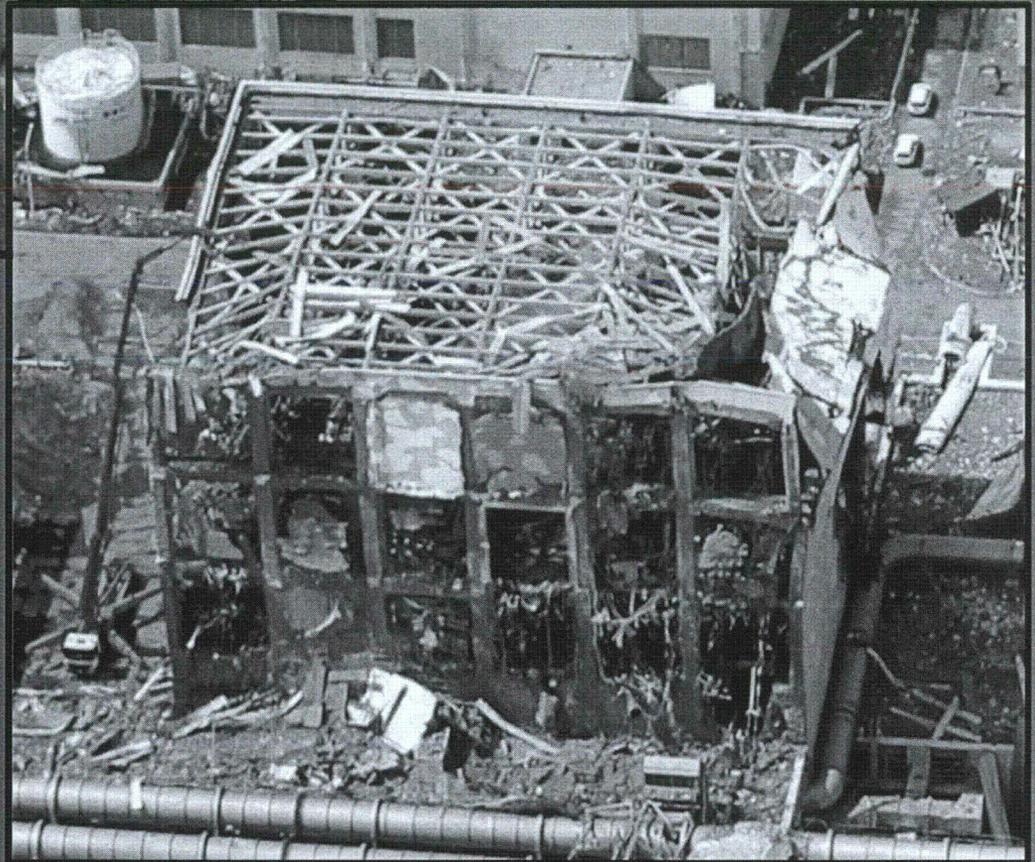
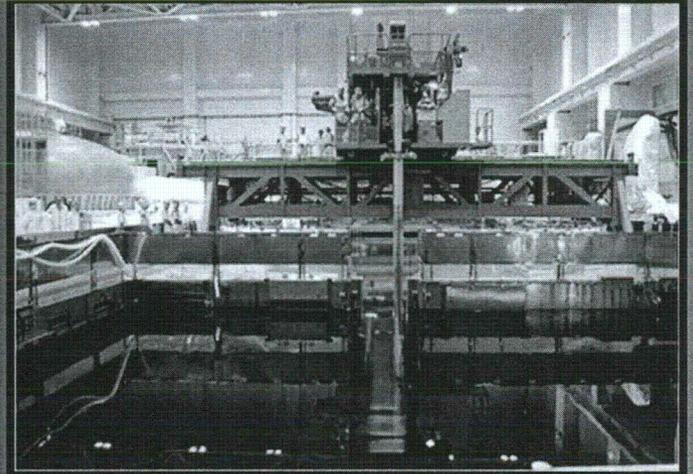
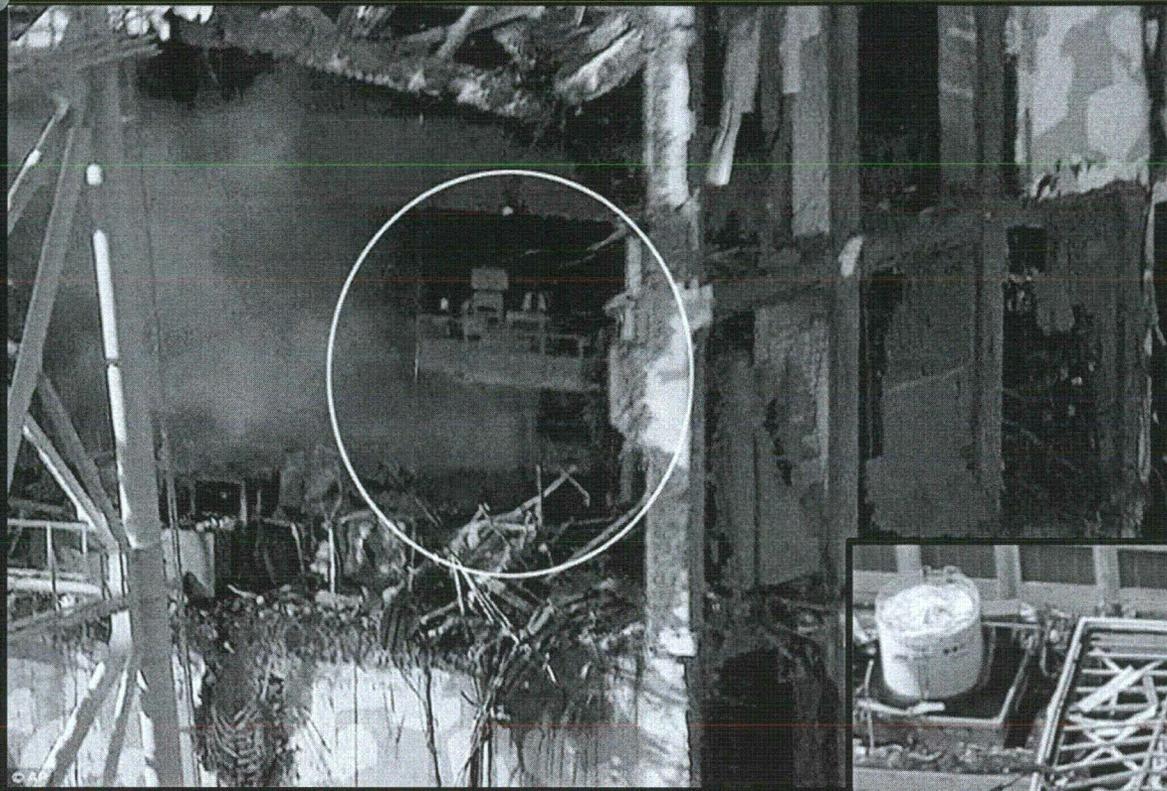
Unit 3

3号機

Unit 4

4号機





3-4. Chronology of Unit 1 after the earthquake

● **Unit 1**

- 11th ● Under operation, Automatic shutdown by the earthquake
 - Loss of A/C power
 - Loss of water injection function
- 12th ● Unusual increase of PCV pressure
 - Started to vent
 - Sound of explosion
 - Started of injection of seawater and borated water to the core
- 22nd ● Rise of reactor temperature (383°C) → Drop (26th 05:00 144.3°C)
- 23rd ● Water supply line in addition to the Fire Extinguish line. Switched to water supply line only.(Flow rate: 7m³/h)
- 24th ● Lighting in the Central Control Room was recovered.
- 25th ● Started fresh water injection
- 29th ● Switched to the water injection to the core using a temporary motor operated pump.
- 31st ● White smoke was confirmed to generate continuously
 - Freshwater is being injected into the RPV

● Unit 2

- 11th ● Under operation, Automatic shutdown by the earthquake
 - Loss of A/C power
 - Loss of water injection function
- 14th ● Loss of water cooling function
 - Unusual increase in PCV pressure
- 15th ● Sound of explosion
 - Possible damage of the suppression chamber
- 20th ● Injection of about 40 tons of seawater into SFP through fire extinguishing system.
 - Injection of seawater to the Spent Fuel Pool (SFP)
- 21st ● White smoke generated
- 22nd ● Injection of seawater to the Spent Fuel Pool (SFP)
- 25th ● Injection of seawater to SFP
- 26th ● Lighting in the Central Control Room was recovered
- 27th ● Switched to the water injection to the core using a temporary motor-driven pump.
- 29th ● The Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump
 - In order to prepare for transferring the stagnant water on the basement floor of turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water.
- 30th ● The injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. The injection of fresh water resumed at 19:05 March 30th.
- 31st ● White smoke was confirmed to generate continuously.
 - Fresh water is being injected to the spent fuel pool and the RPV

● **Unit 3**

- 11th ● Under operation, Automatic shutdown by the earthquake
 - Loss of A/C power
- 13th ● Loss of water injection function
 - Started to vent
- 14th ● Unusual increase in PCV pressure
 - Sound of explosion
- 16th ● White smoke generated
- 17th ● Water discharge by the helicopters of Self-Defense Force(4 times)
 - Water spray from the ground by High pressure water-cannon trucks
(Police: once, Self-Defense Force: 5 times)
- 18th ● Water spray from the ground by same trucks (Self-Defense Force: 6 times)
Water spray from the ground by US water-cannon trucks
(US armed force:1 time)
- 19th ● Water spray from the ground by High pressure water-cannon trucks by
Hyper Rescue Unit of Tokyo Fire Department.
- 22nd ● Lighting in the Central Control Room was recovered.
- 23rd ● Injection of seawater to the SFP
- 24th ● Injection of seawater to the SFP
- 25th ● Water spray (Emergency fire support team)
 - Started fresh water injection
- 27th ● Water spray by Concrete Pump Truck
- 28th ● Switched to the water injection to the core using a temporary
motor-driven pump
 - In order to prepare for transfer the stagnant water on the basement floor
of turbine building to the Condenser, the water in the Condensate Storage
Tank is being transferred to the Surge Tank of Suppression Pool Water
- 29th ● Started to spray freshwater by Concrete Pump Truck
- 31st ● White smoke was confirmed to generate continuously
 - Fresh water is being injected to the spent fuel pool and the RPV