9:00 on April 18, 2011

Concerning the Fukushima Daiichi NPP Accident Caused by the Great East Japan Earthquake Disaster

The Federation of Electric Power Companies

We offer our sincerest condolences to all the people who were caught up in the Eastern Japan Earthquake Disaster on March 11.

We are extremely aware of the serious concerns and difficulties caused by the accident at TEPCO's Fukushima Daiichi Nuclear Power Plant and the consequent release of radioactive material, both for those living nearby and the wider public. We most deeply apologize for this situation.

Working with the support of the Japanese Government and related agencies, TEPCO is making the utmost effort to prevent the situation from deteriorating, and the electricity industry as a whole is committing all its resources, including vehicles, equipment and manpower, toward resolving the situation.

Outline of the Tohoku-Pacific Ocean Earthquake

- Date of occurrence: 14:46 on Friday, March 11, 2011
- Epicenter: Offshore Sanriku (38ºN, 142.9ºE), Depth of hypocenter: 24 km (tentative value),
  Magnitude: 9.0
  (The largest in recorded history (130 years) in Japan. The U.S. Geological Survey Office placed the quake as the 4th largest in the world since 1900.)
- Seismic intensity

  7: Kurihara city, Miyagi prefecture

  Upper 6: Hitachi city, Ibaraki prefecture, Naraha- cho, Tomioka-cho, Okuma-machi, Futaba-cho, Fukushima prefecture, Natori city, Miyagi prefecture, etc.

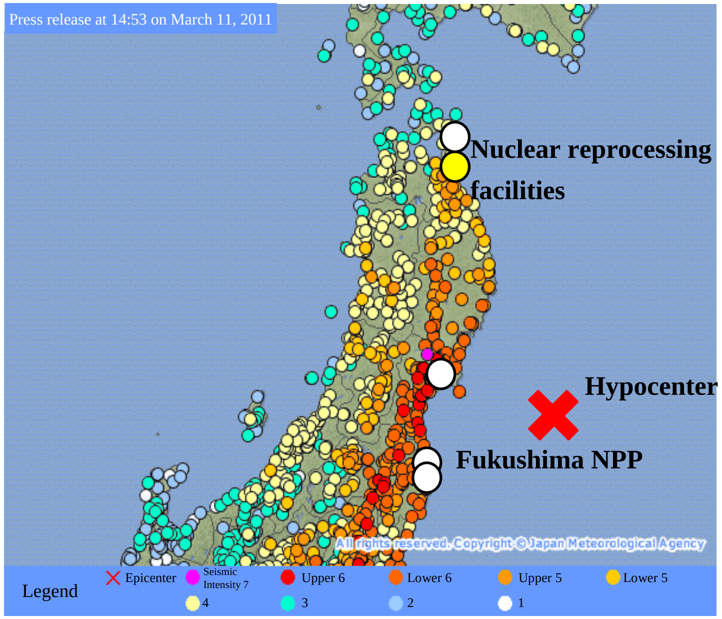
  Lower 6: Ofunato city, Ishinomaki city, Onagawa-cho, Miyagi prefecture, Tokai village, Ibaraki prefecture, etc.

  Upper 5: Miyako city, Iwate prefecture, Fukushima city, Fukushima prefecture, Taihaku ward, Sendai city, Miyagi prefecture

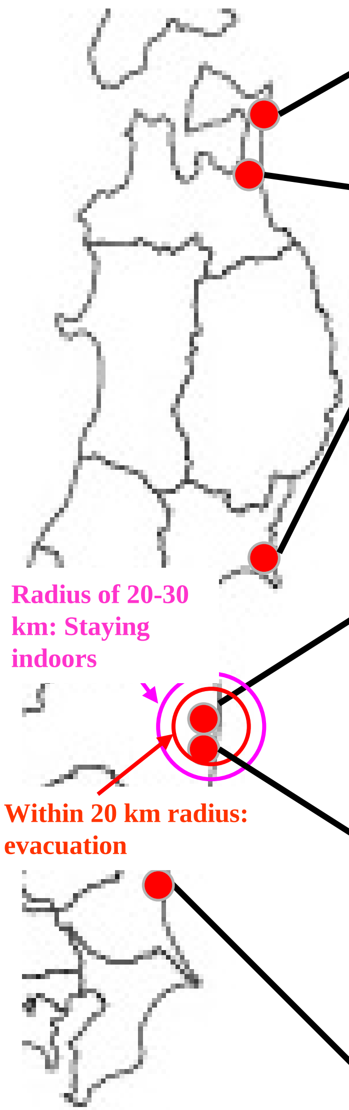
  Lower 5: Kuji city, Iwate prefecture, Kariiwa village, Niigata prefecture

  4: Rokkasho village and Higashidori village, Aomori prefecture, Kashiwazaki city, Niigata prefecture, Tadami-cho, Fukushima prefecture

Hypocenter and seismic intensity



Current Status of NPPs Affected by the Earthquake



Tohoku Electric Higashidori NPP
Unit 1
□

JNFL reprocessing plant: no significant event

◎ Cold shutdown (with cooling water below 100ºC)
▲ Hot shutdown
□ Reactor shutdown for outage
Numbers in parentheses show the time of cold shutdown.

Tohoku Electric Onagawa NPP		
Unit 1	Unit 2	Unit 3
◎(0:58 on Mar. 12)	**◎(*)**	**◎ (1:17 on Mar. 12)**

*Cooling water temperature was 100ºC because the units had just been started up.

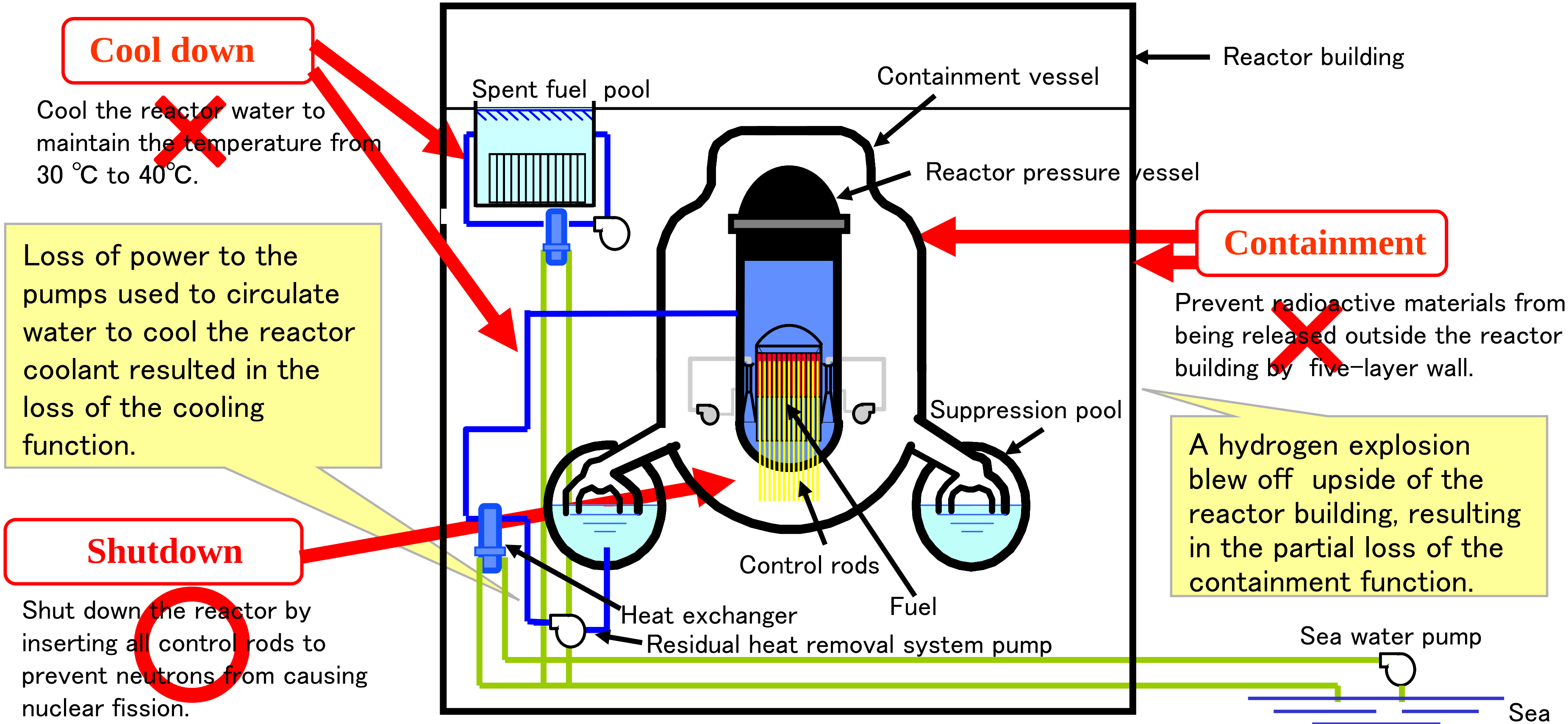
Tokyo Electric Fukushima Daiichi NPP					
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
▲	▲	▲	□	**◎ (14:35 on Mar. 20)**	**◎ (19:27 on Mar. 20)**

Tokyo Electric Fukushima Daini NPP			
Unit 1	Unit 2	Unit 3	Unit 4
◎ (17:00 on Mar. 14)	**◎ (18:00 on Mar. 14)**	**◎ (12:15 on Mar. 12)**	**◎ (7:15 on Mar. 15)**

JAPC Tokai II NPP
◎ (0:40 on Mar. 15)

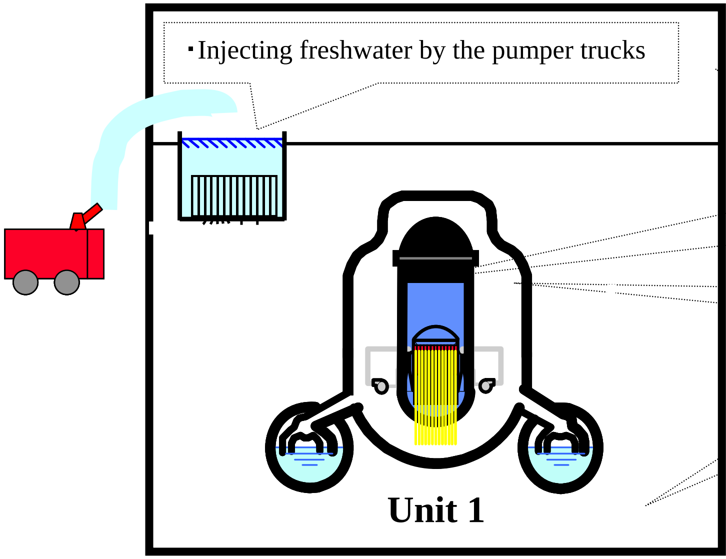
Current Status of Fukushima Daiichi NPP

- Control rods were inserted to shut the reactor down following signals received from seismometers. The operating plant automatically shutdown, which means the shutdown function worked.
- The loss of cooling function at units 1, 2 and 3 caused the temperature and pressure inside the reactor pressure vessel to rise, leading to a release of radioactive materials from the reactor.



Current Status of Fukushima Daiichi NPP（Unit 1 & 2）

Last Update; 9:00 April 18



・A hydrogen explosion blew off upside of the reactor building

・The Reactor condition is stable
・Continuing freshwater injection by a temporary electric-driven pump

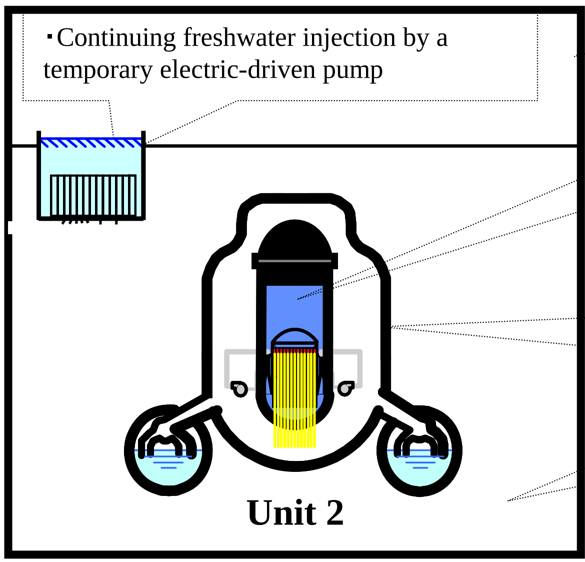
・The Containment Vessel is not damaged. *

・External power was restored. (Checking integrity of machinery)

Mar.11 14:46 Scram
15:42 All power sources failed
16:36 ECCS stopped (batteries exhausted)
Mar. 12 1:20 CV pressure rose abnormally.
10:17 Venting commenced
15:36 A hydrogen explosion occurred
20:20 Injection of seawater and boric acid into the reactor commenced
→ Injection of freshwater instead of seawater commenced on Mar. 25
→ A temporary electric pump was installed on Mar. 29.
Mar. 24 Lighting in the control room was restored
Apr. 6 Nitrogen injection into CV commenced

Leaked water is being transferred from the turbine building and the trench.

＊Highly contaminated water was detected in the turbine.



・The reactor building remains sound

・The Reactor condition is stable
・Continuing freshwater injection by a temporary electric-driven pump

・An explosion sound was observed (Suppression chamber damage is suspected).

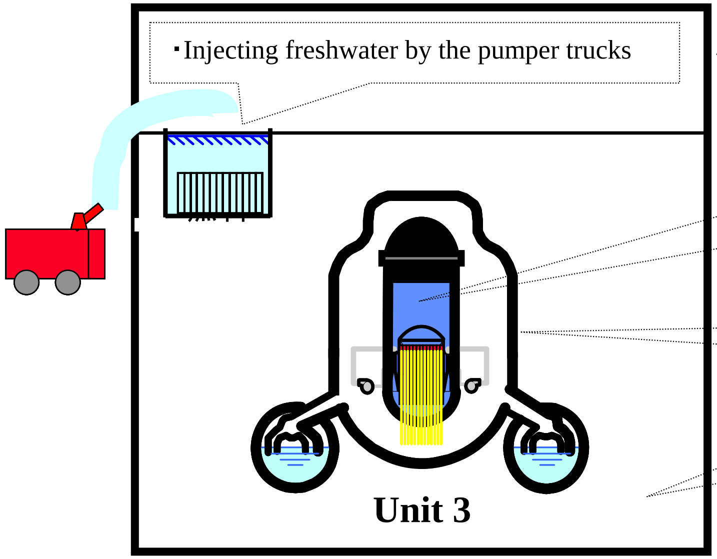
・External power was restored. (Checking integrity of machinery)

Mar.11 14:46 Scram
15:42 All power sources failed
16:36 ECCS stopped (batteries exhausted)
Mar. 13 11:00 Venting commenced
Mar. 14 16:34 Injection of seawater commenced
→ Injection of freshwater instead of seawater commenced on Mar. 26
→ A temporary electric pump was installed on Mar.27.
22:50 CV pressure rose abnormally.
Mar. 15 0:02 Venting commenced
6:10 An explosion sound was observed (Suppression chamber damage is suspected).
Mar. 22 Injection of seawater into spent fuel pool commenced
→Injection of freshwater by a temporary electric pump commenced on Mar. 29.
Mar. 26 Lighting in the control room restored
Apr. 2 Water leak was found at a pit near by the seawater intake → Sealed up on Apr. 6

Leaked water is being transferred from the turbine building and the trench.

Current Status of Fukushima Daiichi NPP（Unit 3 & 4）

Last Update; 9:00 April 18



・A hydrogen explosion damaged the reactor building

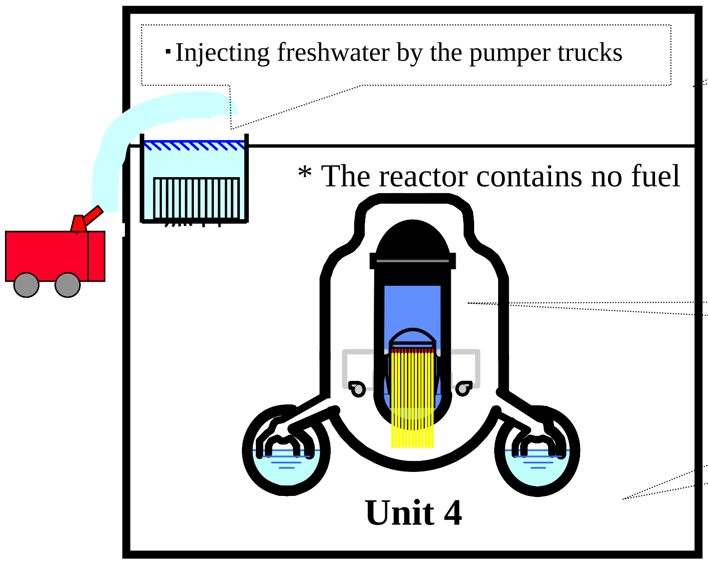
・The Reactor condition is stable
・Continuing freshwater injection by a temporary electric-driven pump

・The Containment Vessel is not damaged (estimation)

・External power was restored. (Checking integrity of machinery)

Mar.11 14:46 Scram
15:42 All power sources failed
Mar. 12 20:41 Venting commenced
Mar. 13 5:10 ECCS stopped (batteries exhausted)
8:41 Venting commenced
13:12 Injection of seawater and boric acid into the reactor commenced
→ Injection of freshwater instead of seawater commenced on Mar. 25
→ A temporary electric pump was installed on Mar. 28.
→ The pump got an external power source.
Mar. 14 5:20 Venting commenced
7:44 CV pressure rose abnormally
11:01 A hydrogen explosion occurred
Mar. 22 Lighting in the control room was restored
Mar. 23 Injection of freshwater into spent fuel pool commenced
Black smoke was observed.

Leaked water is being transferred from the turbine building and the trench.
＊Highly contaminated water was detected in the turbine.



・The reactor building damaged

・The CV is not damaged

・External power was restored. (Checking integrity of machinery)

Mar. 15 The reactor building wall was partially damaged

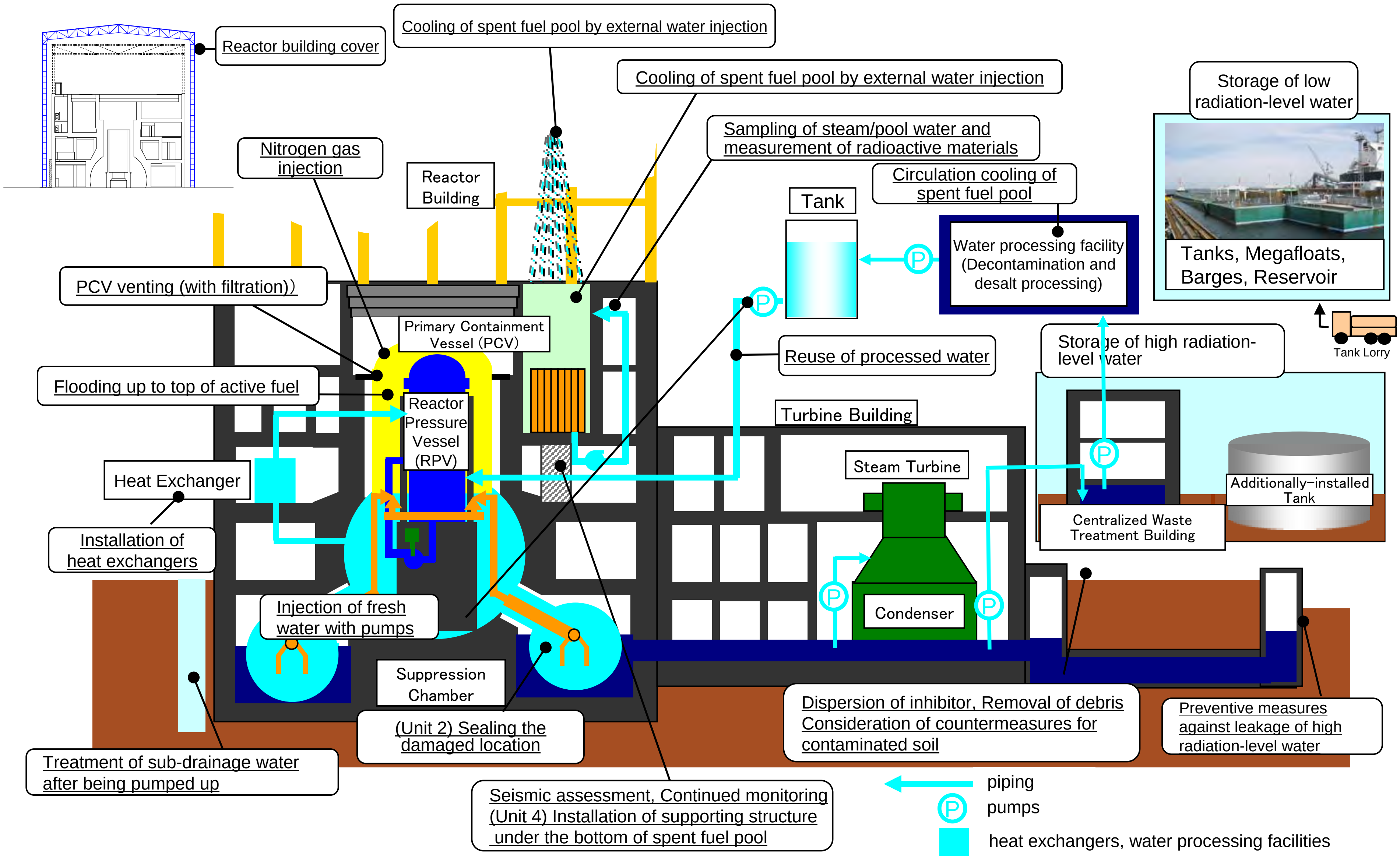
A fire occurred on the 3rd floor of the reactor building

Mar.16 A fire was observed again

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

		Current Status	STEP1	STEP2	Mid-term Issues
I. Cooling	(1)Reactor	Injecting fresh water	Nitrogen gas injection （Unit 1・3) Flooding up to top of active fuel Examination and implementation of heat exchange function (Unit2) Sealing the damaged location **Stable cooling**	Flooding up to top of active fuel **Cold shutdown condition**	Prevention of breakage of structural materials, etc.
	(2)Spent Fuel Pool	Injecting fresh water	Enhance reliability of water injection Restore coolant circulation system (Unit4)Install supporting structure **Stable cooling**	Remote control of water injection Examination and implementation of heat exchange function **More stable cooling**	Removal of fuels
II. Mitigation	(3)Accumulated Water	Transferring water with high radiation level Storing water with low radiation level	Installation of storage / processing facilities Installation of storage facilities / decontamination processing **Secure storage place**	Expansion of storage / processing facilities Decontamination / Desalt processing (reuse), etc. **Decrease contaminated water**	Installation of fuel-fledged water treatment facilities
	(4)Atmosphere/ Soil		Dispersion of inhibitor Removal of debris Installing reactor building cover	Dispersion of inhibitor Removal of debris Installing reactor building cover	Installation of reactor building cover (container with concrete) Solidification of contaminated soil, etc.
III. Monitoring/ Decontamination	(5)Measurement, Reduction and Announcement	Monitoring of radiation dose in and out of the power station	Expand / enhance monitoring and inform of results fast and accurately	Sufficiently reduce radiation dose in evacuation order / planned evacuation /emergency evacuation preparation areas	Continue monitoring and informing environmental safety

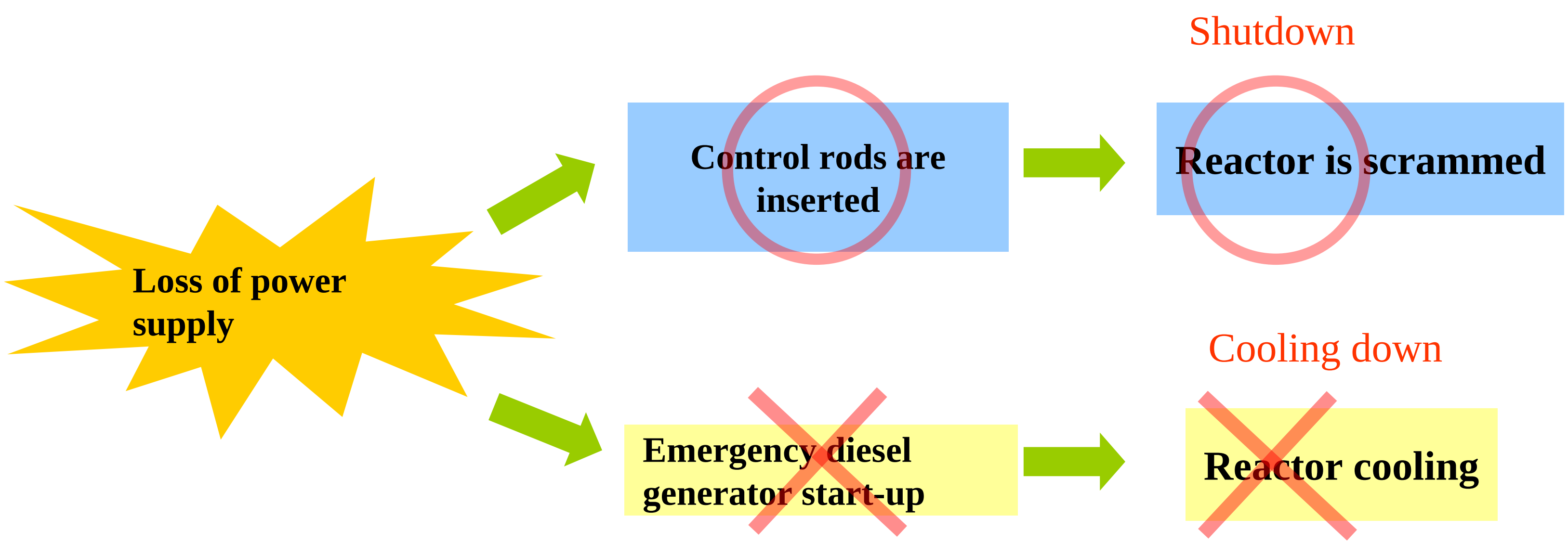
Overview of Major Countermeasures in the Power Station



What Happened Following the Loss of the Off-site Power Supply

- The plant was designed so that:
  - In case of loss of external power supply, the control rods that suppress nuclear fission reaction are automatically inserted into the reactor by water pressure to scram the reactor immediately (shutdown).
  - At the same time, emergency diesel generators are automatically turned on to supply the necessary electricity.

Following this earthquake, the reactor shutdown function worked properly, but the emergency diesel generators failed after starting up, causing loss of the function to cool the reactor.



Differences Between Exposure and Contamination

- According to the press release, the measured radioactive contamination of an evacuee was 40,000 cpm, which means a radiation exposure of approximately 0.18 mSv per hour in terms of the effect on the human body.

*Calculated values may differ if different types of instruments are used.

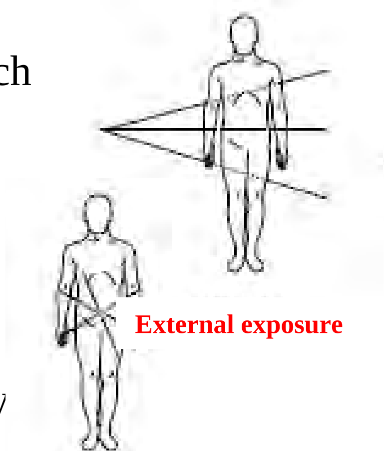
Radiation exposure: A person is exposed to radiation.

External exposure

External exposure occurs when the radiation source (radioactive material, etc.), such as roentgen, is outside the human body.

Measured values are represented as radiation dose per hour (in sieverts/hour, millisieverts per hour, or microsieverts per hour).

1 sievert = 1,000 millisieverts (mSv) = 1,000,000 microsieverts (μ Sv)


External exposure

Internal exposure

Internal exposure

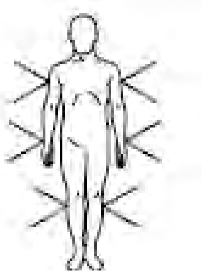
Internal exposure occurs when radioactive material is taken into the human body by swallowing radioactive materials or breathing contaminated air.

It is measured in radiation counts per minute (cpm).

Contamination: Radioactive contamination occurs when radioactive material is deposited on the surface of skin or clothes.

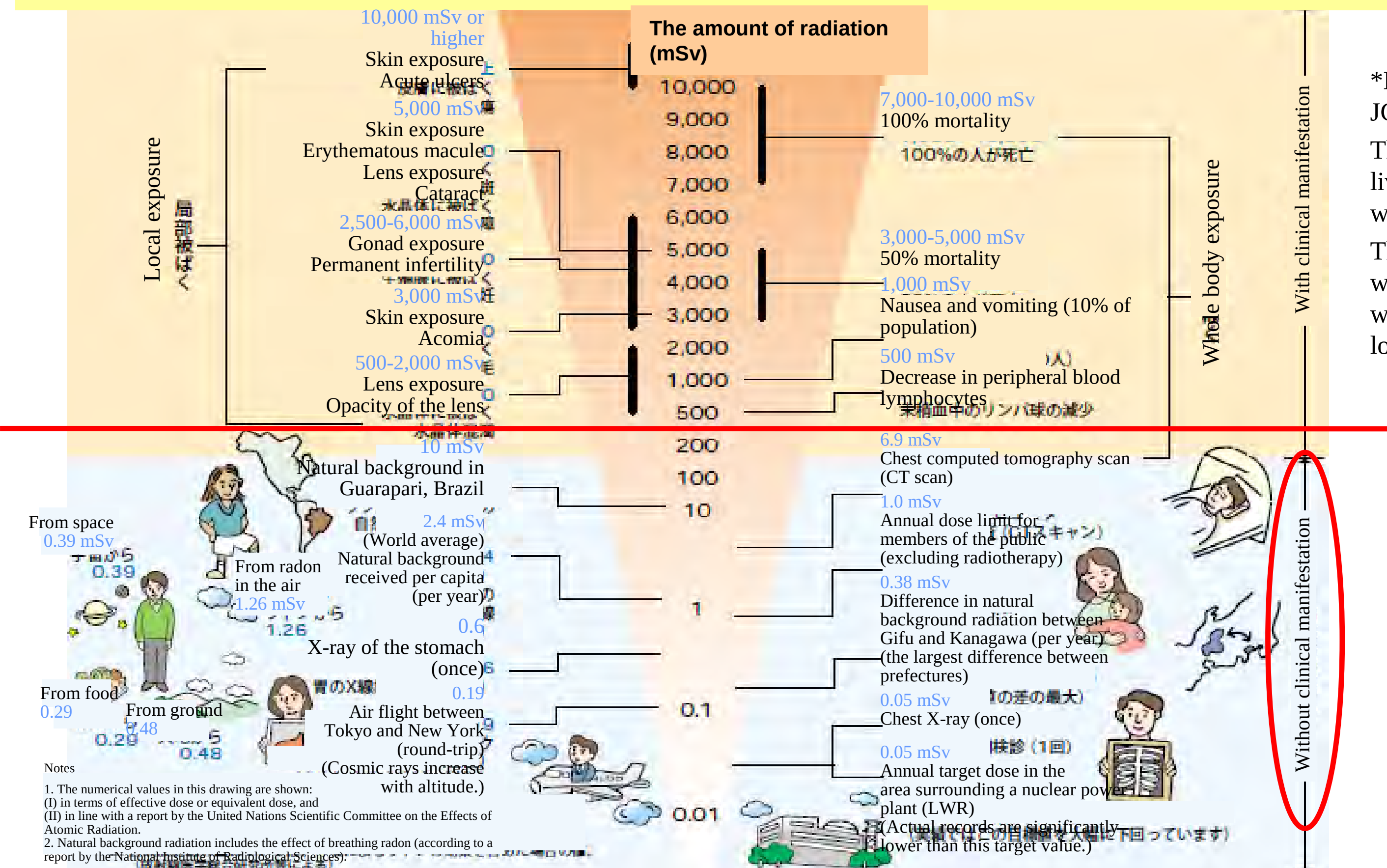
A contaminated person will be continuously exposed to radiation until the radiation source (radioactive material) is removed.

It is measured in radiation counts per minute (cpm).


Contamination

Possible Health Effects of Radiation on Local Residents

- The integrated doses of external exposure in the surrounding area of the Fukushima Daiichi NPP is estimated to amount to 10-20 mSv (miliseiverts) at the maximum (at Iitate vil. and Namie town, Fukushima pref.). The external exposure at this level would not affect the health of the local residents.
- The average person receives roughly 2.4 mSv of radiation exposure, both internal and external, a year due to exposure to natural sources in daily life (as global average).
- No health effects have been observed from radiation exposure below 100 mSv.



*Health effects of radiation released by the JCO criticality accident

The exposure dose received by local residents living on the west boundary of the JCO site was 16 millisieverts at the highest.

The level of detected radioactive material within a 10-kilometer radius from the facility was low enough not to affect the health of local residents or the environment.

Will Contamination Level at the Surrounding Area Affect on the Health of the Local Residents?

- As of April 16, the Fukushima prefecture had carried out the radioactive contamination screening* on 156,478 residents at the refuges and the health centers. The results of 102 residents primarily exceeded 100,000cpm but were reduced to less than 100,000cpm after they were decontaminated. No effects on human health has been observed.

  ＊The measurement of radioactive materials adherent to the surface of cloths and human body

The Reference Value for the Screening Level for Decontamination of Radioactivity

On March 20, Directive from Local Nuclear Emergency Response Headquarters was issued regarding the reference value for the screening level for decontamination of for decontamination of radioactivity.

The Reference value:　1μ Sv/hour（dose rate at 10cm distance）or 100,000cpm equivalent

Possible Health Effects of Radiation on Workers?

- Twenty eight site workers including twenty five TEPCO employees have received a dose of more than 100 millisieverts, but less than the revised limit, of radiation so far.
- It was inferred that three workers from cooperating companies were exposed to radiation of 2000-3000 mSv on their feet and received internal exposure of 200 mSv or less. They received medical treatment at the National Institute of Radiological Sciences in Chiba City. (No health abnormality was found on the medical examination on April 11.)

	Radiation Exposure Limits
General public	A whole body dose of no more than 1 mSv per year (beginning on April 1)
Occupational exposure	A whole body dose of no more than 100 mSv in five years (beginning on April 1) and no more than 50 mSv in any one year (beginning on April 1)
	No more than 100 mSv during emergency work

The radiation exposure limit was raised to 250 mSv during emergency work.

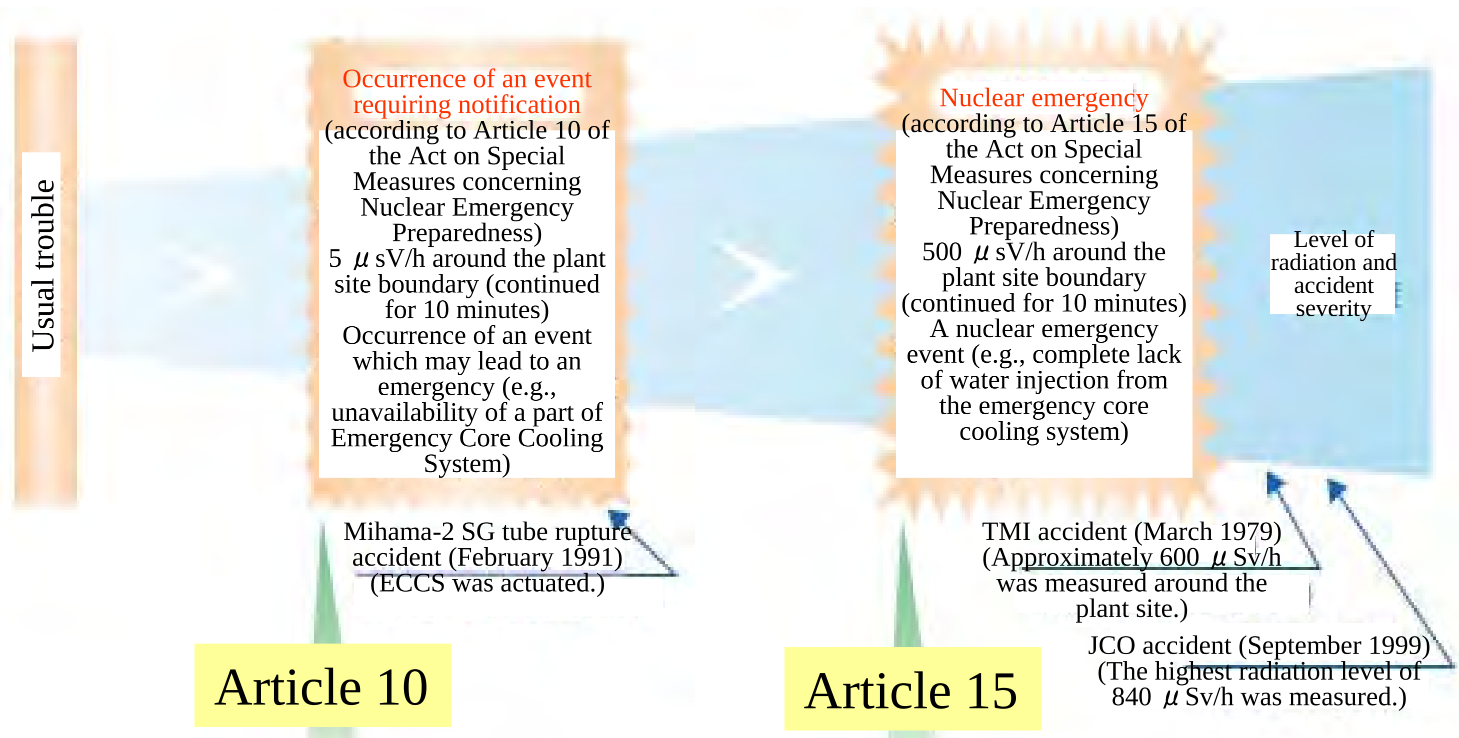
Due to the current circumstances, the Ministry of Health, Labour and Welfare (MHLW) raised the annual radiation exposure limit only for workers involved in emergency work at nuclear power plants to 250 millisieverts from the existing standard of 100 millisieverts.
One reason for raising the limit is that the International Commission on Radiological Protection (ICRP) recommends that "the annual radiation exposure limit should not exceed 500 millisieverts (during a severe accident)".
Consequently, according to an officer from the MHLW, the radiation exposure limit was revised, but is still lower than the level recommended by the ICRP.

Personal dosimeter with alarm function

A personal dosimeter is always worn by workers during work to measure radiation exposure. The digital display shows the exposed dose directly. An alarm will sound if the exposed dose exceeds the preset value.

Notification According to the Act on Special Measures Concerning Nuclear Emergency Preparedness Articles 10 &15

- Following the release of radioactive material from Fukushima Daiichi NPP, local residents living in a 20-km radius were ordered to evacuate and those living in a 20- to 30-km radius to stay indoors according to the Act on Special Measures concerning Nuclear Emergency Preparedness, Articles 10 and 15 respectively.
- Currently, the prohibition of entrance to the evacuation area (20-km radius) has been notified. On the other hand, assistance for living of the residents within 20-30 km radius area has been carried out.
- This Act was enacted in June 2000 to improve disaster prevention measures, including the initial response in case of an accident, as well as cooperation between the national government and prefectures/municipalities based on the lessons learned from the JCO criticality accident in September 1999.



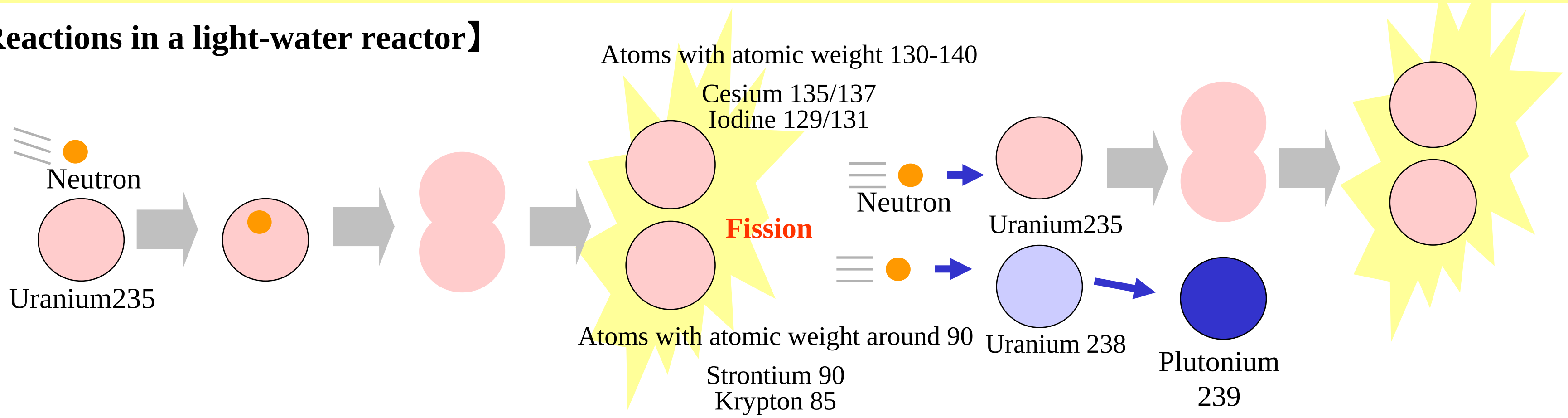
What Does the Detection of Cesium, Iodine and Plutonium Mean?

- Radioactive cesium and radioactive iodine are extremely rarely detected in nature, but exist as radioactive isotopes produced from the fission of uranium, plutonium, etc.
- Plutonium, which is a radioactive material produced from uranium in reactors, does not exists in nature.

 * Cesium, iodine and plutonium produced by previous nuclear tests and the Chernobyl accident exist in Japan.

- It is suspected that fission products, which should be contained in fuel pellets and fuel cladding, have been released with gases and steam due to continued abnormal conditions.

【Reactions in a light-water reactor】

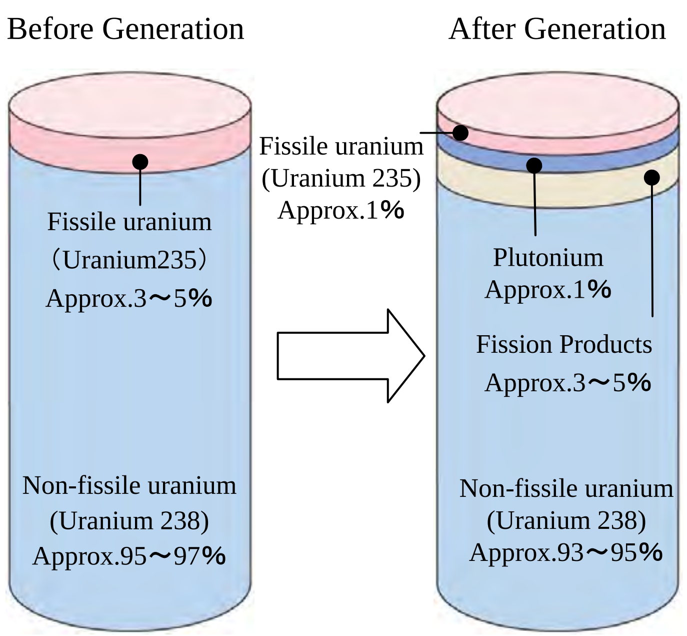


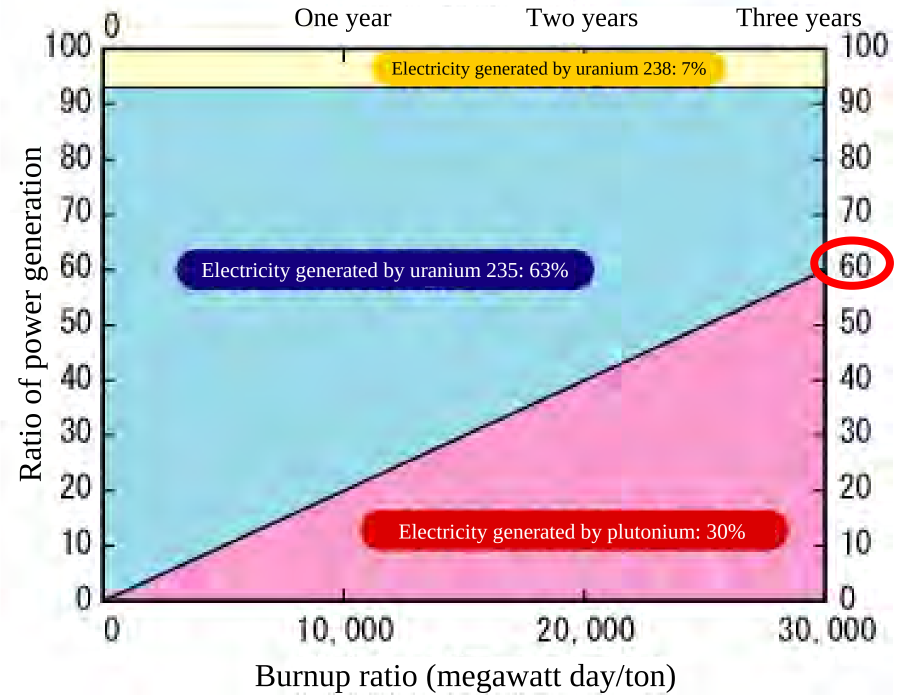
Effects of radiation to human bodies depend on nuclides and routes of exposure (internal or external)

Iodine 131 (Half-life 8 days): Accumulate in the thyroid gland. Volatile (apt to be released with gasses).
Cesium 137 (Half-life 30 years) : Accumulate in the muscular tissue. Buoyant (apt to be released with gasses).
Plutonium 239 (Half-life 24,000 years): Plutonium radiates alpha rays and possesses high toxicity. However, a sheet of paper or air a few centimeter-thick can shield the rays. Thus, external exposure is unlikely. Plutonium has a large mass density and is difficult to diffuse widely.

Has Dangerous Plutonium been Released from the MOX Fuel in Fukushima Daiichi Unit 3?

- Plutonium detected in the soil of the Fukushima Daiichi site has not been determined to have come from unit 3 reactor.
- There is no difference in the variety of radioactive materials between a uranium fuel reactor and MOX fuel reactor because plutonium is produced during power generation in a uranium fuel reactor.





- Uranium fuel (after generation) contains approx.1% of plutonium produced from uranium 238.
- Plutonium contained in each reactor of Fukushima Daiichi does not vary much because there are only 32 MOX fuel clusters among 548 fuel clusters in total in Fukushima Daiichi Unit 3 reactor.
- Uranium fuel remains in the reactor for 3 to 4 years to continuously generate power. After 3 to 4 years of use, about 60% of the electricity comes from plutonium.

Is Tap Water Safe When Excess Radioactive Materials Are Detected?

➢ "Indices relating to limits on food and drink ingestion" are set to protect human health even in the very unlikely scenario that drinking-water was contaminated and consumed for an entire year at this level. Therefore, a few-days dose would not immediately affect human health. And daily use of tap water at this level would not cause any problem to human health.

Iodine-131 was detected in clean water

Sampled at the waterworks facility in Iitate vil. (Fukushima) on Mar. 20

Detected value: 965 Bq/kg

Sampled at the Kanamachi waterworks facility (Tokyo) on Mar. 22

Detected value: 210 Bq/kg

"Indices relating to limits on food and drink ingestion "

For Adult: 300 Bq/kg

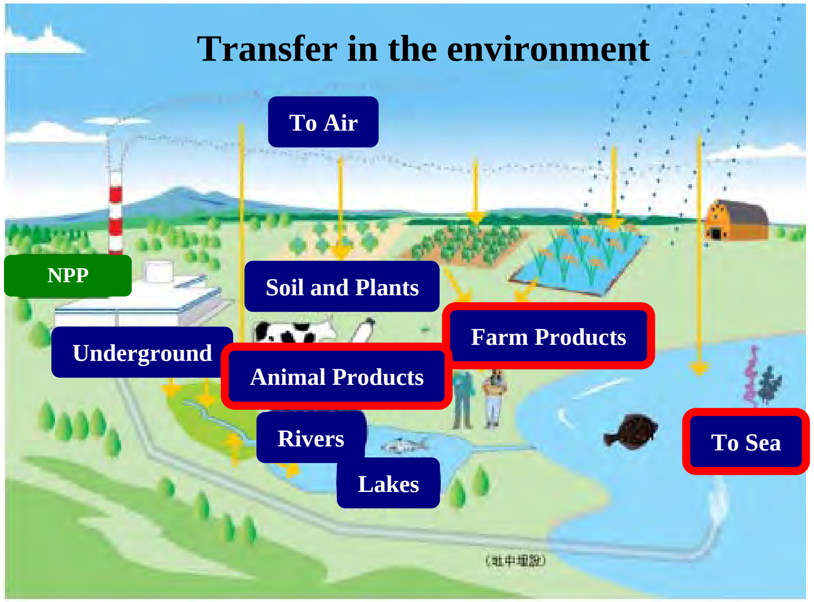
For Infant: 100 Bq/kg

By drinking tap water in above cases for an entire year, the radiation exposure would amount to:

In the Iitate Case approx. 8.4 mSv (for an adult) *

In the Tokyo Case approx. 1.8 mSv (for an adult) *

* Estimated conformable to "Emergency Preparedness for Nuclear Facilities (Nuclear Safety Commission) ".



The gaseous and liquid radioactive materials released from a nuclear facility will spread through the environment and go into soil, river water, lake water and sea water.

Are Milk and Spinach Safe When Excess Radioactive Materials Are Detected?

➢The provisional limits set in line with the Food Sanitation Act are strict (with a wide safety margin) taking into consideration long term ingestion, and so ingesting milk and spinach at this level would not immediately affect human health.

Iodine-131 was detected in raw milk sampled in Date-gun, Fukushima on March 17

Detected value: 1,510 Bq/kg

(Provisional regulatory limit: 300 Bq/kg)

The cumulative radiation dose in one year if a person were to keep drinking 200ml of milk with the detected level every day would be approx. 2 millisieverts.*

Iodine-131 and cesium-137 were detected in spinach sampled in Takahagi-city, Ibaraki on March 18.

Iodine-131

Detected value: 15,020 Bq/kg

(Provisional regulatory limit: 2,000 Bq/kg)

Cesium-137

Detected value: 524 Bq/kg

(Provisional regulatory limit: 500 Bq/kg)

The cumulative radiation dose in one year if a person were to keep eating 100 grams of spinach every day with the detected level would be approx. 9 millisieverts.*

Iodine-131 and cesium-137 were detected in kounago (sand lance) sampled in Kitaibaraki-city, Ibaraki on April 5.

Iodine-131

Detected value: 4,080 Bq/kg

(Provisional limit: 2,000 Bq/kg)

Cesium-137

Detected value: 526 Bq/kg

(Provisional limit: 500 Bq/kg)

The cumulative radiation dose in one year if a person were to keep eating 200 grams of kounago every day with the detected level would be approx. 5 mSv.*

* Estimated conformable to the " Guidelines for environmental radiation monitoring (Nuclear Safety Commission) ".

What is the "Indices relating to limits on food and drink ingestion"?

- In cases where radioactive materials are detected in foods, drinks or water at the level exceeding **the indices**, the prime minister shall instruct the relevant governors to take measures regarding restriction of ingestion or shipping of such foods, drinks or water.
- **The Indices** are set at a strict level based on the recommendation of the International Commission on Radiological Protection (ICRP) regarding standard for radiological protection. Thus, daily ingestion of foods, drinks and water which contain radioactive materials at levels below the indices would not affect human health. (That is, ingesting foods and drinks distributed to the markets would not affect human health.)

Indices relating to limits on food and drink ingestion (Radioactive Iodine)

Indices（Unit: Bq / kg）		Estimated exposure dose on the thyroid gland if an adult daily ingests such foods or drinks for an entire year. *3 (Unit: mSv)
Drinking water	300	2.6
Milk, dairy products ＊1	300	0.3
Vegetables（Except root vegetables and tubers）＊2	2,000	4.3

＊1: Provide guidance so that materials exceeding 100 Bq/kg are not used in milk supplied for use in powdered baby formula or for direct drinking to baby.
＊2: The provisional regulation values for radioactive iodine set for vegetables was applied to fishery products. (by MHLW on April 5, 2011)
＊3: The exposure doses were estimated taking decrement (half-life) of radioactivity into consideration. Ingestion amounts were referred from the National Nutrition Survey executed by MHLW.

Indices relating to limits on food and drink ingestion (Radioactive cesium)

Indices（Unit: Bq / kg）		Estimated exposure dose if an adult daily ingests such foods or drinks for an entire year.*3 (Unit: mSv)
Drinking water	200	1.0
Milk, dairy products	200	0.1
Vegetables	500	0.9
Grains	500	0.5
Meat, eggs, fish, etc.	500	0.8

＊Source: "Emergency Preparedness for Nuclear Facilities (Nuclear Safety Commission) "

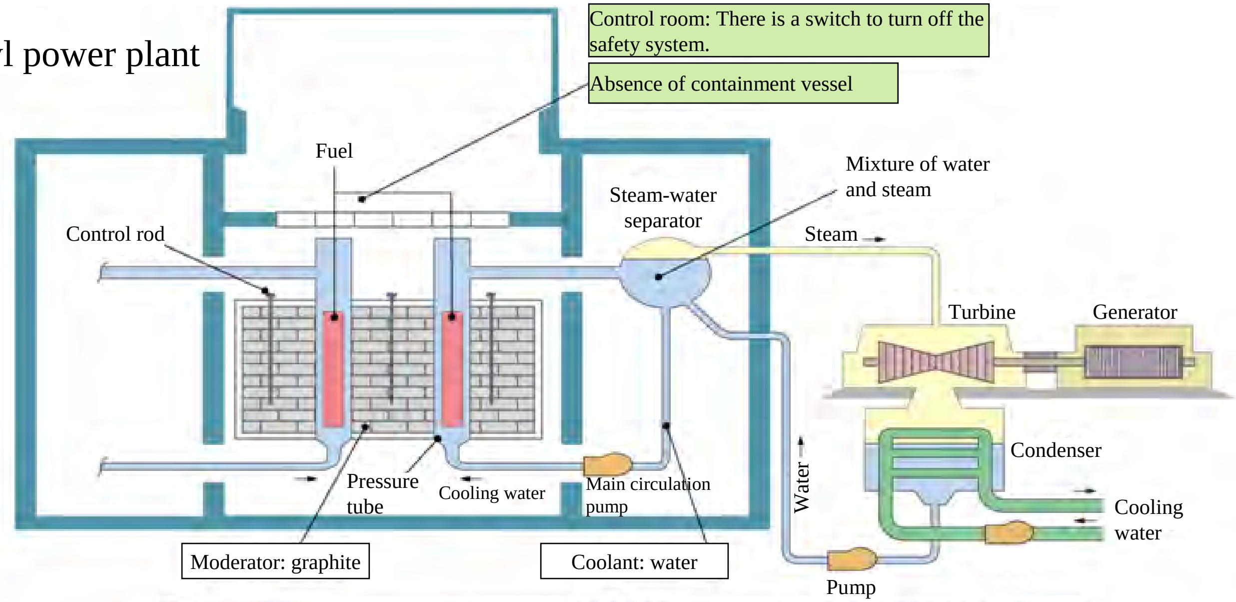
In compliance with the indices (as the provisional regulation limits), the restriction of the ingestion of tap water for infants continues in Iitate Village, Fukushima Prefecture. And the following shipping restrictions have been promulgated.
Shipping restriction : Spinach, cabbage, broccoli, cauliflower, komatsuna, turnip, raw milk and shiitake produced in Fukushima and spinach etc. produced in Ibaraki, Tochigi and Chiba Pref.

Outline of the Chernobyl Accident

Outline of the accident at Chernobyl (former Soviet Union, 1986):

- A rapid increase in power output occurred during low-power operation for an extended period of time, which was prohibited, damaging the core. As the type of the reactor was unique to the former Soviet Union and the reactor wasn't made of steel, moreover, there was no containment vessel, it was impossible to seal radioactive material. Both the reactor and building cracked, causing the release of a large amount of radioactive material.
- About 135,000 people living within a 30-km radius were evacuated. A person received at average dose of 120 millisieverts. About 50 people were exposed to radiation during fighting a fire.

Structure of Chernobyl power plant



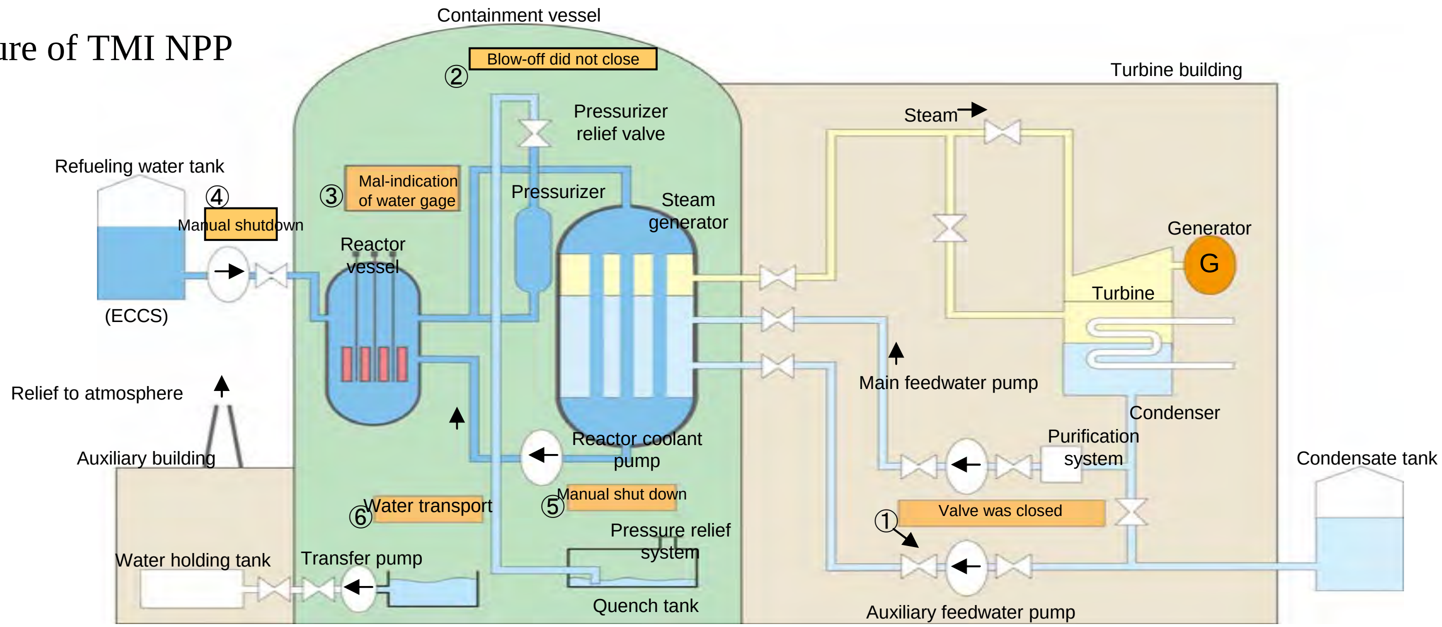
		Japanese reactor	Chernobyl reactor
Self-control ability		Yes	Possibility of loss
	Coolant	Water	Water
	Neutron moderator	Water	Graphite
Safety system		Preventing risky operation by interlock function	Easy to be removed
Rigid containment vessel enclosing the reactor		Yes	No

Outline of the Three Mile Island Accident

Outline of the TMI accident (U.S.A., 1979)

When the main feedwater pumps and valves malfunctioned, operators made multiple mistakes, including accidentally shutting down the emergency core cooling system, which caused a loss of inventory of reactor coolant and fuel damage. However, the containment of radioactive material remained intact, and thus only a small amount of radioactive material was released, causing no health effect.

Structure of TMI NPP



"China Syndrome" is a term coined in the U.S. for an exaggerated core meltdown accident, in which the core at a nuclear power plant in the U.S. melts down, penetrates the earth's crust, and reaches the opposite side of the earth (China). The phrase was used as the title of an American film about a nuclear power plant accident.

Level of Fukushima Daiichi NPP Accident

- The level of Fukushima Daiichi NPP accident was determined as Level 7 based on the International Nuclear and Radiological Event Scale (INES) (provisional). The released radioactive iodine (iodine-131 equivalent) was estimated to amount to 630,000 T-Bq by the Nuclear Industrial Safety Agency and 370,000 T-Bq by Nuclear Safety Committee in Several.

【International Nuclear and Radiological Event Scale (INES)】

	INES Level	General description of INES levels: People and Environment	General description of INES levels: Radiological Barriers and Control	General description of INES levels: Defence-in-Depth	Examples of Events
Accident	Major Accident Level 7	■ Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures.			Chernobyl, 1986
	Serious Accident Level 6	■ Significant release of radioactive material likely to require implementation of planned countermeasures.			
	Accident with Wider Consequences Level 5	■ Limited release of radioactive material likely to require implementation of some planned countermeasures. ■ Several deaths from radiation.	■ Severe damage to reactor core. ■ Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire.		Three Mile Island, USA, 1979
	Accident with Local Consequences Level 4	■ Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. ■ At least one death from radiation	■ Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory. ■ Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure.		Tokaimura (JCO), Japan, 1999
Incident	Serious Incident Level 3	■ Exposure in excess of ten times the statutory annual limit for workers. ■ Non-lethal deterministic health effect (e.g., burns) from radiation.	■ Exposure rates of more than 1 Sv/h in an operating area. ■ Severe contamination in an area not expected by design, with a low probability of significant public exposure.	■ Near accident at a nuclear power plant with no safety provisions remaining. ■ Lost or stolen highly radioactive sealed source. ■ Misdelivered highly radioactive sealed source without adequate procedures in place to handle it.	
	Incident Level 2	■ Exposure of a member of the public in excess of 10 mSv. ■ Exposure of a worker in excess of the statutory annual limits.	■ Radiation levels in an operating area of more than 50 mSv/h. ■ Significant contamination within the facility into an area not expected by design.	■ Significant failures in safety provisions but with no actual consequences. ■ Found highly radioactive sealed orphan source, device or transport package with safety provisions intact. ■ Inadequate packaging of a highly radioactive sealed source.	
	Anomaly Level 1			■ Overexposure of a member of the public in excess of statutory annual limits. ■ Minor problems with safety components with significant defence-in-depth remaining. ■ Low activity lost or stolen radioactive source, device or transport package.	Mihama, Japan, 2004
Below Scale	Deviation (Below Scale/ Level 0)			0+ 0-	
Out of Scale		Events of no safety relevance			

Seismic Safety of Nuclear Power Plants

- In Preparation for the seismic designing, investigations on geological structures and active faults both in land and marine area around the site should be conducted. Based on the investigation, the maximum levels of earthquakes should be formulated in order to evaluate consequent ground motions which may hit the power plant.
- Nuclear power plants should be built on stable rock ground and designed to withstand possible earthquake ground motions (the Design Bases Ground Motions (DBGM)).
- The validity of the seismic safety of a nuclear power plant is judged according to the "Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities" (revised in 2006) established by the Nuclear Safety Committee.

Countermeasures against earthquakes

- Thorough survey
- Install plants on strong supporting bedrock
- Plant design with sufficient safety margin
- Demonstration test
- Automatic shutdown function
- Countermeasures against tsunami

【Observed ground motions at Fukushima Daiichi NPP】

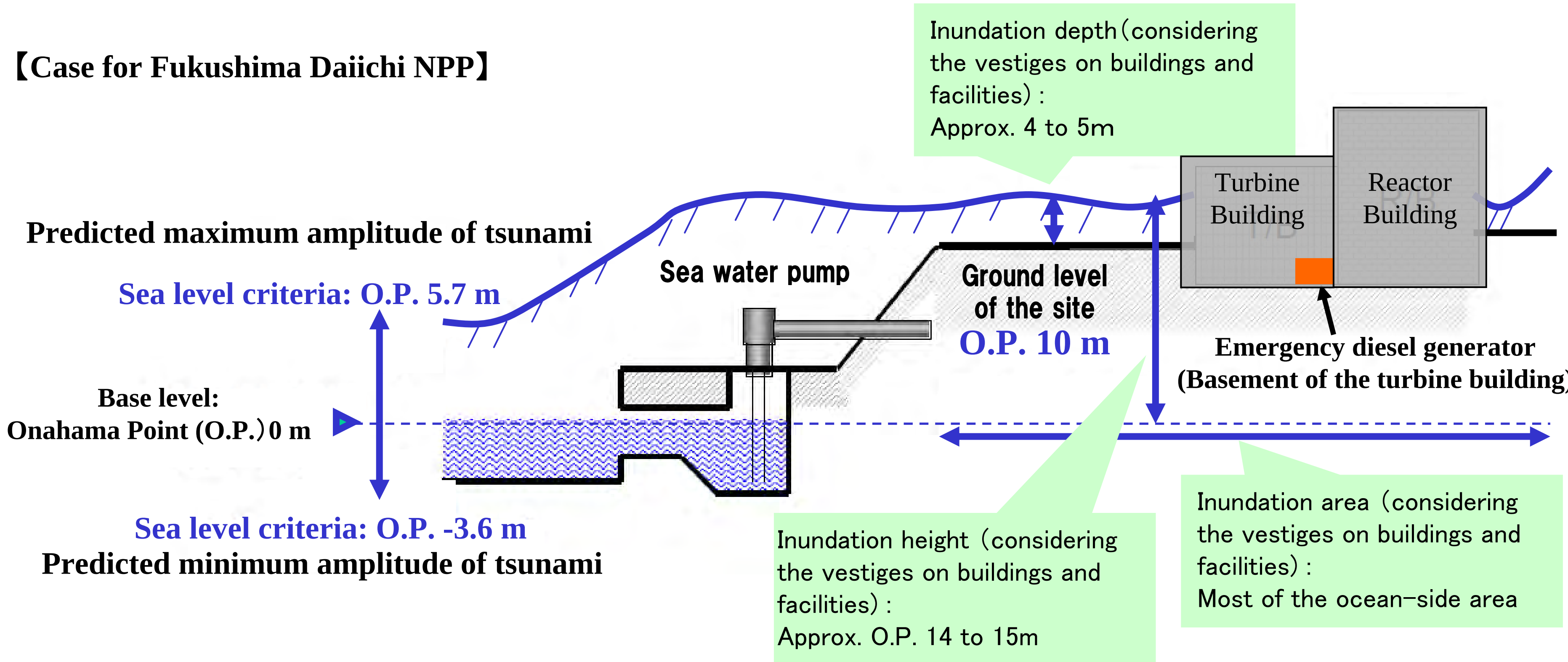
The ground accelerations observed at were almost at the same levels, except some points, to those corresponding to GBGM Ss which were formulated in accordance with the "Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities" (revised in 2006)

Unit: Gal

	Peak ground acceleration (actually recorded)			Peak ground acceleration corresponding to GBGM Ss		
Direction	N-S	E-W	Vertical	N-S	E-W	Vertical
Unit 1	460	447	258	487	489	412
Unit 2	348	*550*	302	441	438	420
Unit 3	322	*507*	231	449	441	429
Unit 4	281	319	200	447	445	422
Unit 5	311	*548*	256	452	452	427
Unit 6	298	444	244	445	448	415

Tsunami Countermeasures at Nuclear Power Plants

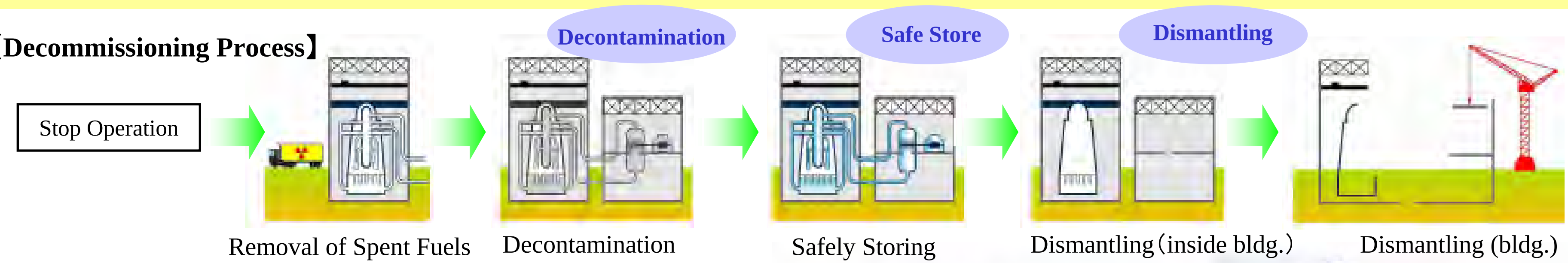
- Based on the "Safety Design Examination Guidelines" and the concept of "Tsunami Evaluation Technology (Japan Society of Civil Engineers)," water levels were determined for countermeasures to be taken by individual power plants by examining past tsunamis and evaluating the results of tsunami simulations for the largest tsunami predicted.
- At Fukushima Daiichi NPP, countermeasures for tsunami were established with a water level criteria of +5.7 m and as a margin, the site level of the plant was set as 10 m.



How Reactor Decommissioning Should Proceed.

- Reactor decommissioning should proceed through three processes, which are Decontamination, Safe Store and Dismantling.
- In Japan、 the Japan Power Demonstration Reactor had finished the decommissioning and dismantling. The Tokai NPP and the Advanced Thermal Reactor “Fugen” are proceeding through decommissioning programs.
- The Decommissioning program for the Fukushima Daiichi NPP is to be discussed in the future.

【Decommissioning Process】



Decommissioning of the Japan Power Demonstration Reactor (of former Japan Atomic Energy Research Institute)

Decommissioning of the Maine Yankee Reactor (USA)

Past Experience with Rolling Blackouts

- **In Japan, power consumption was restricted due to insufficient electricity following the chaos after World War II (1946 to 1947) and at the beginning of the establishment of 9 electric power utilities.**

  * Kansai Electric Power Co.,Inc implemented rolling blackouts in 1952 due to an imbalance in demand and supply caused by a drought.

- **In California, excessive electricity deregulation caused an imbalance in demand and supply, resulting in rolling blackouts in 2001.**

  * Due to electricity deregulation implemented since 1998, utilities were unwilling to build new plants and the electricity supply did not sufficiently increase in California. Meanwhile, the concentration of IT firms in Silicon Valley led to a surge in electricity demand, exacerbating the electricity shortage, resulting in six rolling blackouts in January, March and May 2001. The blackouts caused factories to shut down, put automatic teller machines out of service, and stopped traffic lights, which caused traffic accidents.

- **During the oil crisis in Japan, electricity consumption was restricted due to the possible shortage of fuel for power generation according to the Electricity Business Act, Article 27. Large customers (highest contract electricity: 500 kW or more) were ordered to reduce their power consumption by 15%. The use of non-urgent electricity, such as for neon and advertising lights, was prohibited in principle.**

  * Electricity Utilities Industry Law, Article 27 (outline)

  The Minister of Economy, Trade and Industry has the authority to restrict power consumption and set an upper limit within a required range when a power shortage will adversely affect the economy, people's lives and the public interest.

  * The order to restrict electricity consumption was approved at a Cabinet meeting on January 11, 1974; it continued to the end of May 1974.

Possibility of Electric Power Exchange

- **The exchange of electric power between western Japan (60 Hz) and eastern Japan (50 Hz) must go through frequency converters with a total installed capacity of 1,000 MW**
- **There are three frequency converters between Tokyo Electric Power Co.,Inc(50 Hz) and Chubu Electric Power Co.,Inc(60 Hz):**

• Shin-shinano frequency converter (a 600-MW facility in Nagano prefecture owned by Tokyo Electric Power Co.,Inc.)

• Sakuma frequency converter (a 300-MW capacity facility in Shizuoka prefecture owned by Electric Power Development Co., Ltd.)

• Higashi-shimizu frequency converter (a 100-MW capacity facility in Shizuoka prefecture owned by Chubu Electric Power Co.,Inc)

• Frequency converter (Shin-shinano)

- The electric power exchange from Hokkaido Electric Power Co.,Inc (50 Hz) is transmitted through the 600-MW Kitahon interconnected line with a capacity of 600-MW.

•Reference: What was the origin of the different frequencies between eastern and western Japan?

• ・In the Meiji and Taisho eras, the eastern region introduced 50 Hz generators from Europe, while the western region introduced 60 Hz generators from the U.S. The approximate boundary is the Fuji river (Shizuoka prefecture) and Itoi river (Niigata prefecture).

• ・Efforts to unify the frequency failed due to the huge cost and time required.