Impact of the Niigata Chuestu-oki Earthquake on the Tokyo Electric Power Company (TEPCO) Kashiwazaki-Kariwa Nuclear Power Station and Countermeasures

September 2007

The Tokyo Electric Power Company, Inc.

東京電力 TEPCO

1. Status of the Kashiwazaki-Kariwa Nuclear Power Station

- Units 2,3,4, and 7 automatically shutdown when the earthquake occurred. All 7 units, with a total capacity of 8210 MW, are in a stable shutdown condition.
- Upon inspection, no damage to components of high safety significance was detected. Damage mainly occurred to facilities with low seismic safety significance.
- 2,555 non-conformances were confirmed upon inspection, including the following 10 incidents subject to reporting according to decrees and safety agreements as of August 30th :
  - Leakage of water including radioactive material at Unit 6 (1 incident)
  - Water spillage from the spent fuel pool onto the floor at Units 1 – 7 (7 incidents)
  - House Transformer fire at Unit 3 (1 incident)
  - Drive Axis Coupling breakage of the Unit 6 ceiling crane (1 incident)
- Visual inspection has been completed and an in-depth investigation is now in progress. In-core inspection of unit 1 started from August 21st.
- No change has been observed in the monitoring post data since the occurrence of the earthquake; hence no radiation effect to the environment

2. Earthquake-related Issues (1)

[Unit 3 House Transformer Fire]

[Time Line]

July 16

10:13 Earthquake occurs

10:15 Post-earthquake plant walk-down discovers the fire. Initial efforts to extinguish the fire (4 people).

10:27 Shift supervisor contacts the fire department but was asked to use in-house self defense fire brigade.

11:23 Shift supervisor contacts the fire department again.

11:27 The fire department enters the Kashiwazaki-Kariwa NPS.

12:10 Fire is extinguished.

Water could not be sprayed from the fire hydrant due to pipe breakage.

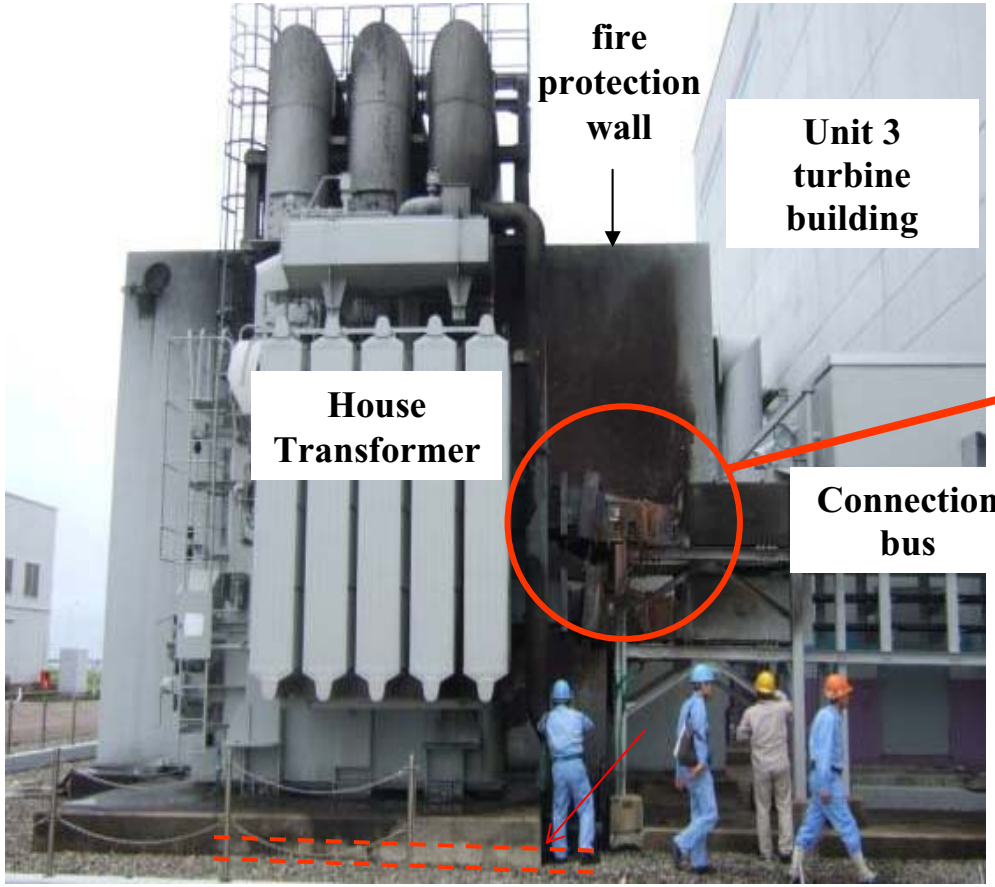
Since oil fire was suspected and difficult to extinguish with water, the workers retreated to a safe area, reported to the emergency H/Q and waited for the arrival of the fire department.

[Status of Damage & Causes]

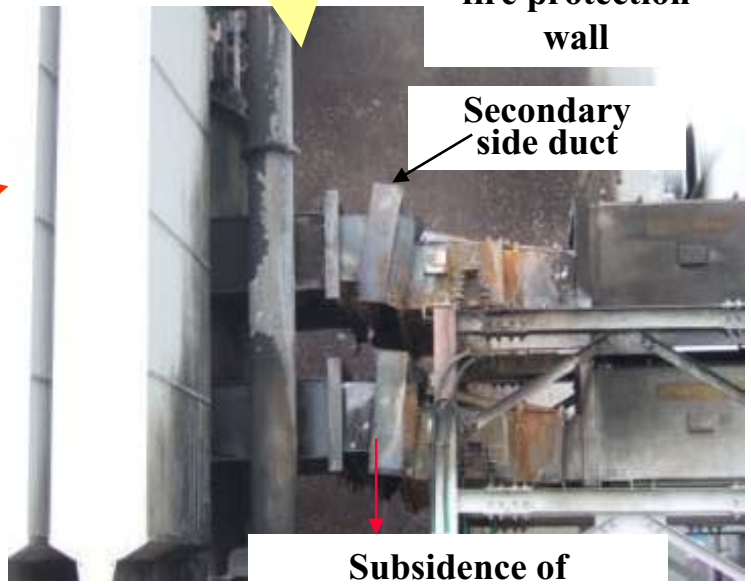
- The fire protection wall prevented the fire from spreading to other areas.
- Soil deformation is presumed to have caused a short circuit. An in-depth investigation is in progress.

2. Earthquake-related Issues (1)

[Unit 3 House Transformer Fire]



Subsidence of the connection bus of the secondary side of the transformer relative to the transformer itself.



2. Earthquake-related Issues (2)

[Release of Radioactive Material into the Sea from Water Leakage at Unit 6]

[Time Line]

July 16

12:50 Identification of water puddles in the non-controlled area of the reactor building.

18:20 Small amount of radioactivity in the puddles confirmed.

20:10 Leakage of radioactive water into the sea via the water discharge outlet confirmed.

21:45 Press release.

Since the water puddle was in the non-controlled area with an amount below reporting level, it was initially considered unnecessary to report to the authority. Afterwards, a sample was taken to detect radioactivity.

Discharge was confirmed by checking possible discharge routes, operational history of the pump, and sampling and measurement of the water tank.

Discharged water: **1.2m^3**

Amount of Radioactivity: **9 x 10^4** Bq

Radiation Dose from the above radioactivity: 2 x 10^{-9} mSv

(1/1,000,000,000 of the radiation an average person is exposed to from natural sources annually.)

[Cause]

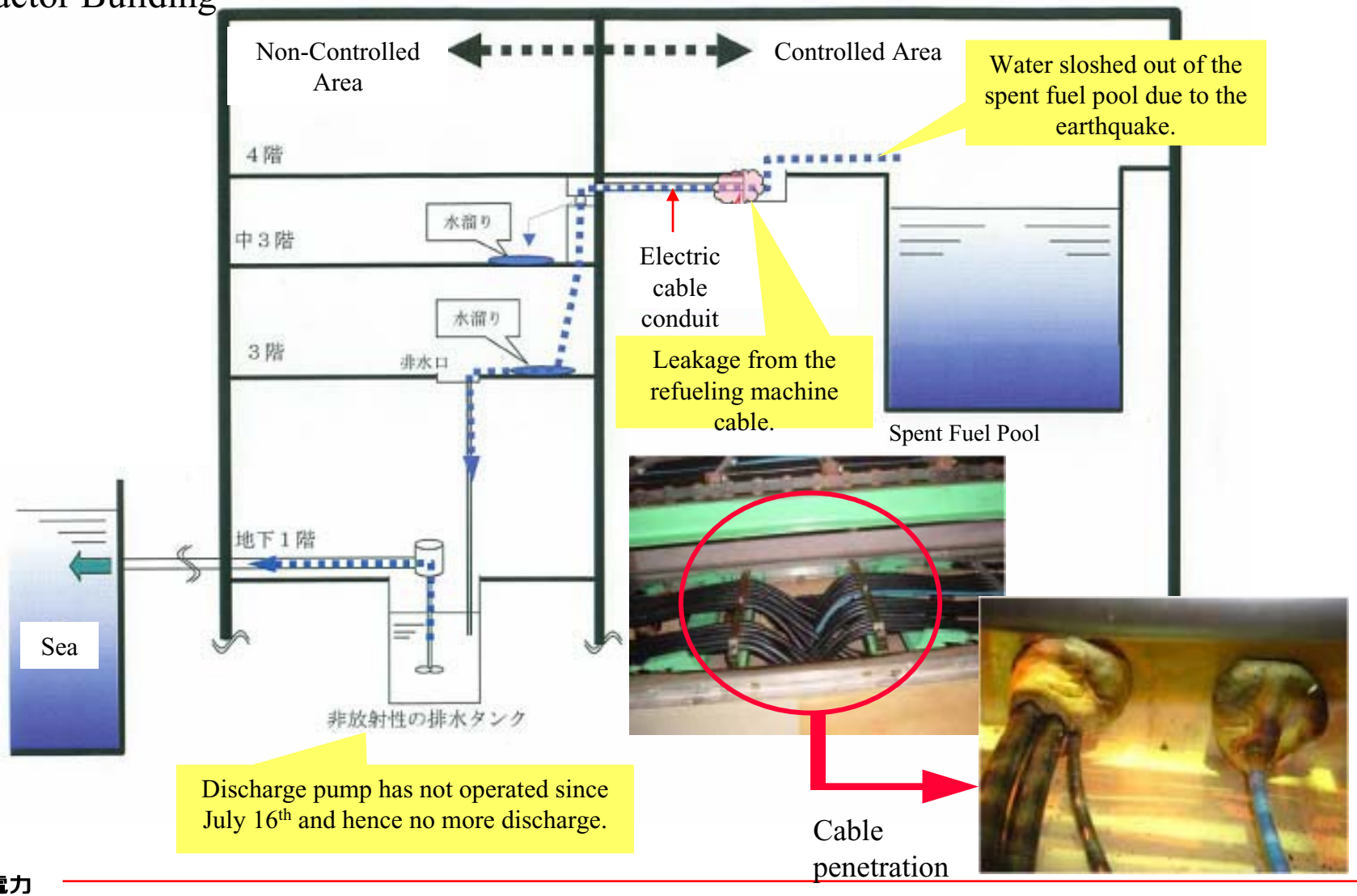
- It is presumed that water sloshed onto the floor from the spent fuel pool and flowed along the electric cable conduit to the non-controlled area.

  (There are currently no leaks).

2. Earthquake-related Issues (2)

[Release of Radioactive Material into the Sea from Water Leakage at Unit 6]

Unit 6 Reactor Building



2. Earthquake-related Issues (3)

[Radioactive Materials Detected from the Unit 7 Main Stack Monitor]

[Time Line]

July 17

13:00 Iodine and radioactive particulate material (Cr-51, Co-60) were detected during weekly periodic measurement of the main exhaust stack.

16:00 Press release.

Total radioactivity: 4×10^{8} Bq

Radiation Dose from the above radioactivity: 2×10^{-7} mSv

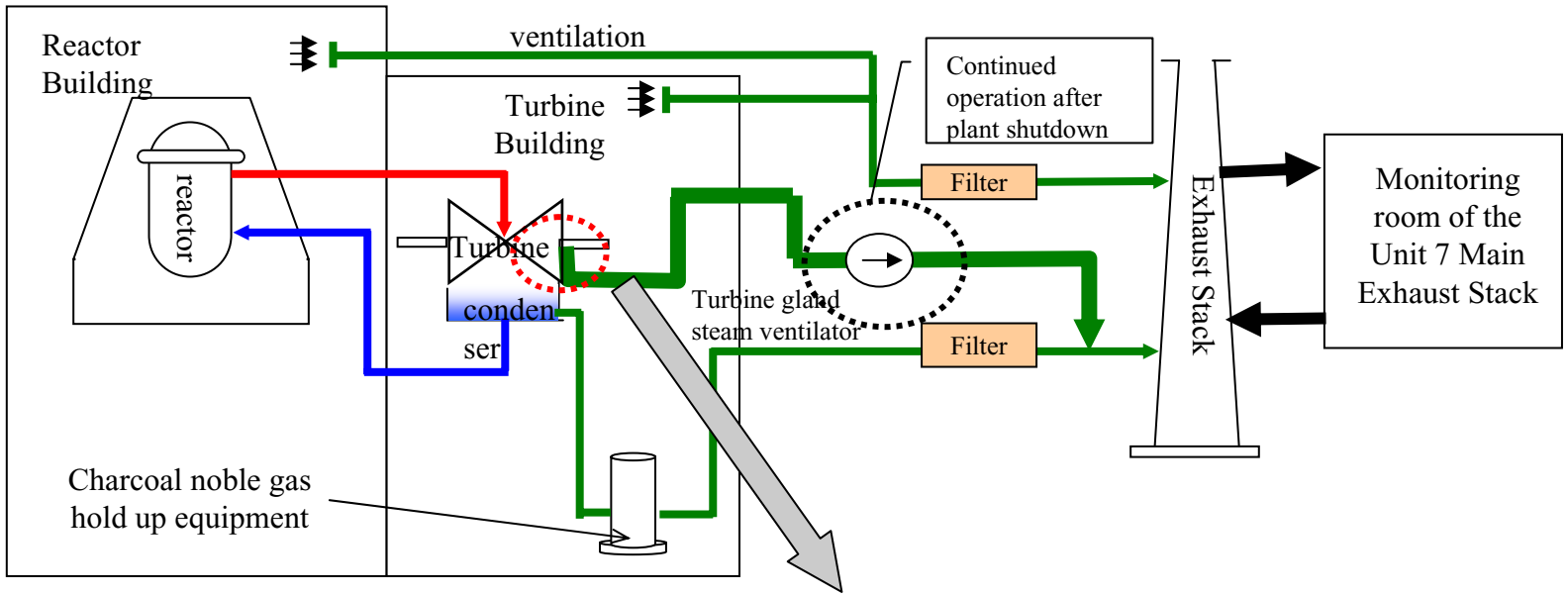
(1/10,000,000 of the radiation an average person is exposed to from natural sources annually.)

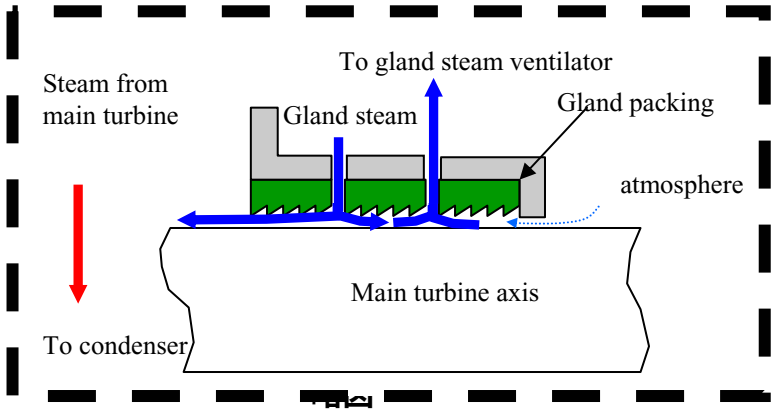
[Cause]

- It is presumed that radioactive materials were sucked out from the condenser and subsequently released from the main stack due to the delay in shutting down the gland steam ventilator after automatic shutdown of the reactor.
- No radioactive material has been detected in measurements after July 19.

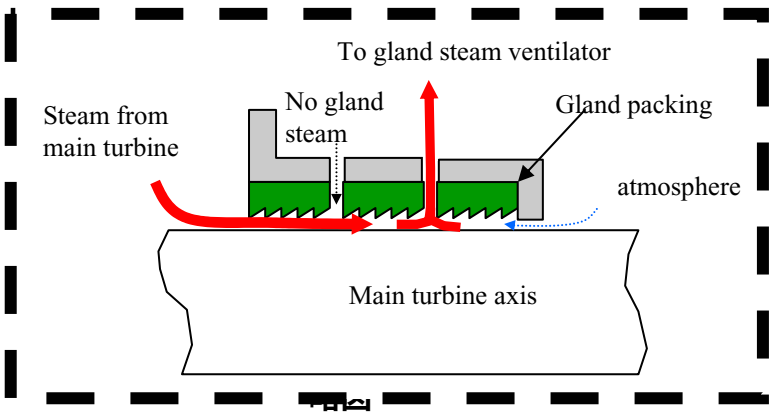
2. Earthquake-related Issues (3)

[Radioactive Materials Detected from the Unit 7 Main Stack Monitor]





Normal Operation



Situation After the Quake

3. Status of Other Generation Facilities

Several hundred drums containing low-level waste in the solid waste storage warehouse tipped over.

Access road in the site. (Close to the Unit 5 water discharge outlet.)

Displacement of exhaust duct.

Breakage found on the coupling of the drive axis of the Unit 6 reactor building ceiling crane.

4. Improvement Issues

Based on METI's order on July 20, an improvement plan was submitted on July 26.

Reinforcement of the Self-Defence Fire Brigade

- Establish a 24-hour fire-fighting crew.
- Deploy a chemical fire engine.
- Secure an exclusive communication line with the fire department.

Chemical Fire Engine & Technical Specialists

Establish a prompt and accurate accident reporting system

- Set-up a radiation measurement organization for nights and holidays.
- Enhance the emergency support center including securing reliable communication facilities.
- Report the possibility of radioactive material leakage at the time confirmed.

5. Provision of Information to the Local Community

[Correspondence with the Media]

- Press release made daily on the status of the NPS since the earthquake occurred (about 80 times).
- Press conferences with the Superintendent of the NPS. (7/20, 8/2, 8/10)
- NPS opened to the Press. (7/21, 7/25, 7/28, 8/15, 8/28)

[Transmission of Information to Local Residents]

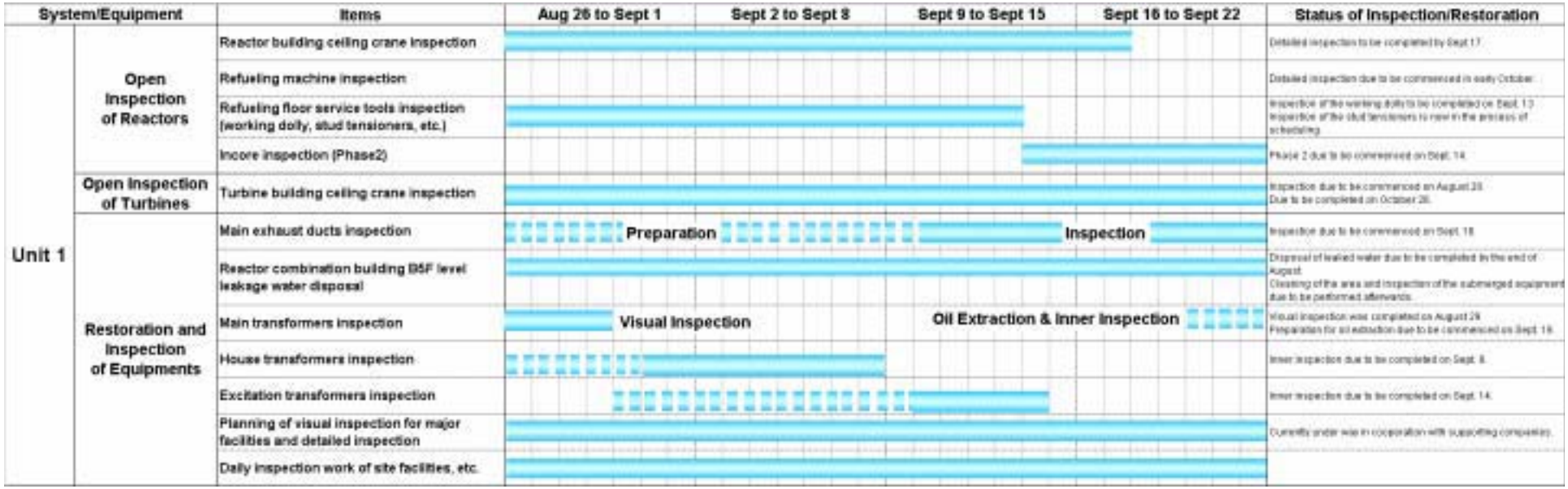
- Newspaper ad on apology by the TEPCO president and update on the status of the NPS.(7/24, 7/27, 8/10)
- Multiple daily radio broadcasts regarding the status of the NPS.
- Distribution of newspaper inserts (7/26, 8/2, 8/9, 8/14, 8/23, 8/24, 8/30 roughly 39,000 copies).
  - TEPCO employees had distributed to 60 Kashiwazaki-Kariwa evacuation centers.
- From July 16, TEPCO employees paid explanatory visits to over 950 people such as local politicians, the Fisheries Cooperative, Chamber of Commerce and Industry, and heads of local communities.
- Earthquake information was consolidated and posted on the company website.
- Posting of apology by the Superintendent of NPS and plant status at the TEPCO Public Relations center.

6. Next Actions (1)

[Inspection & Restoration]

- Upon visual inspection on major components, no significant damage was detected.
- In-depth investigation on the structural soundness of equipments is now in progress.
- With ongoing in-depth investigation, damaged facilities would be restored in series.
  - Analytical verification and in-depth investigation by experts would be done on the components of high safety significance.
  - In-core inspection of upper part of the unit 1 reactor completed on August 23rd. No damage was found.

Inspection Schedule of Unit 1



6. Next Actions (2)

- **Seismic Safety Verification**
  - **Analyze the observation data.**
  - **Conduct geological surveys including sea and land areas around the site.**
  - **Conduct seismic safety verification for safety significant equipments based on seismic motion derived from analyses.**
  - **Take necessary countermeasures based on the results of the seismic safety verification.**
  - **Submitted the "Revision of the Seismic Safety Assessment Execution Plan" to METI on August 20.**
    - Though a seismic safety assessment was in progress based on the former plan submitted to METI in October 2006, due to the earthquake, METI ordered TEPCO to revise the plan. The revision was carried out and submitted to METI.

6. Next Actions (3)

[Outline of the Geological Survey to be Conducted at Kashiwazaki-Kariwa]

- Investigation and verification of active faults in the sea area surrounding the Kashiwazaki-Kariwa NPS.

  <Sonic Prospecting in the Sea Area>

  From August 27th, 2007 to the end of October, 2007.

- Investigation and verification of active faults in the land area surrounding the Kashiwazaki-Kariwa NPS.

  <Subsurface Prospecting>

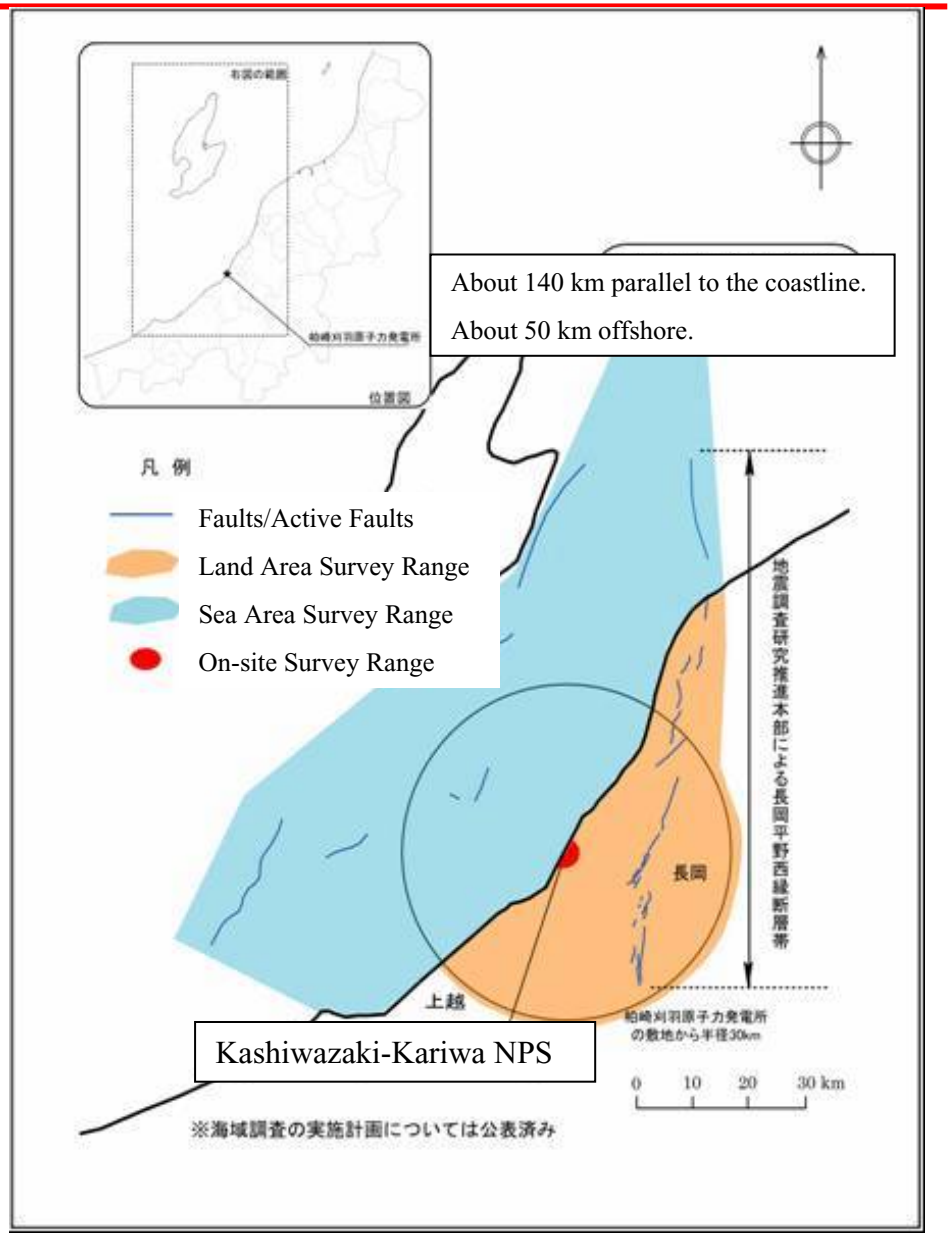
  <Surface Geological Survey>

  From the beginning of September, 2007 to the end of March, 2008.

- Investigation and verification of subsurface structure and ground quality including deep areas on the premises.

  <Boring/Geophysical Survey>

  From the beginning of September, 2007 to the end of March, 2008.



7. Forecast of Electric Demand and Supply (1)

Initial Forecast of Electric Demand and Supply (August)

- Estimated Maximum Demand
  61,100MW (35.3℃)
- Forecast of Supply **(Monthly Average)**

Supply Before the Earthquake : 65,270 MW

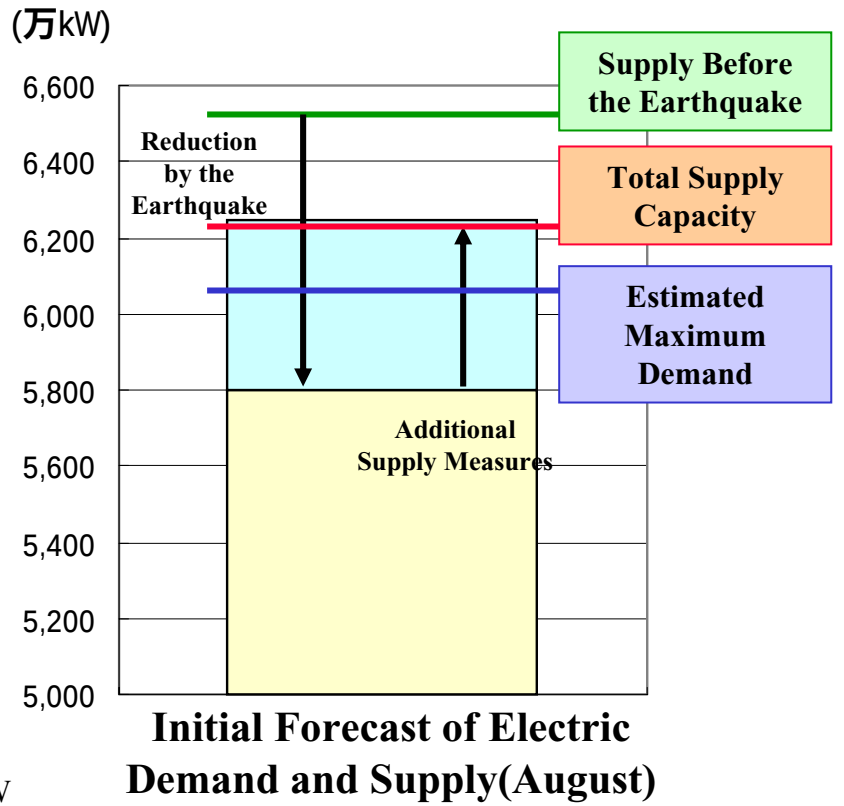
Reduction by the Earthquake : - 7,260 MW

Additional Supply Measures* : + 4,740 MW

Total Supply Capacity : 62,750 MW

*** Additional Supply Measures**

- Output increase : 2,360MW
- The power provided by other companies for emergency support : 1,660MW
- Purchase of electricity from In-house power generation : 720MW



Initial Forecast of Electric Demand and Supply(August)

In case of ordinary summer heat, supply would be enough to cover demand. However, in case of a severe heat wave, we will secure stable supply by exercising measures such as calling our customers for more electricity conservation, reducing demand based on load management contracts (about 1,270MW), and utilizing the Shiobara Power Station (900MW) of which we acquired permit on an emergency and temporary usage.

7. Forecast of Electric Demand and Supply (2)

Situation of Maximum Demand on August 22nd

Maximum Demand：61,470MW (37ºC Tokyo)

<Major Emergency Measures>

- Demand reduction based on load management contracts : 140MW

  The contracts were set in motion since 1991,

  17 years since the last one.

  Requested 23 customers to reduce their demand.

Supply Capacity：64,000MW

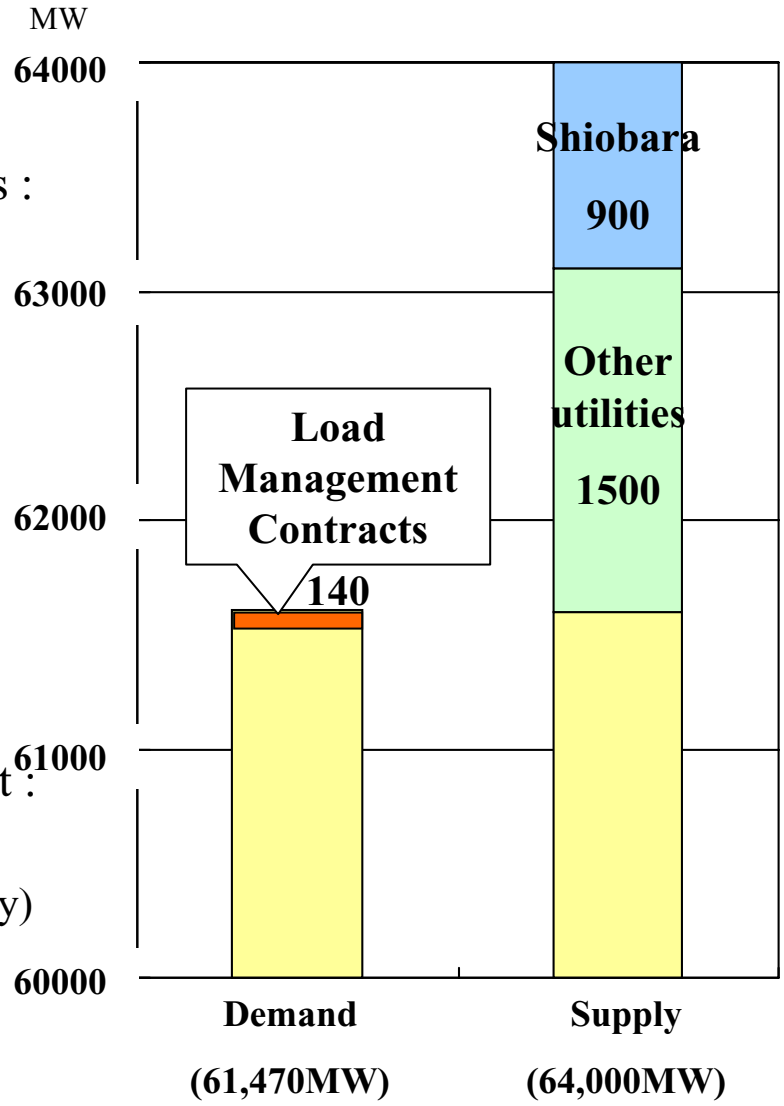
(reserved power 2,530MW, 4.1%)

<Major Emergency Measures>

- Power provided by other utilities for emergency support : 1,500MW

  (From Hokkaido, Tohoku, and Chubu Electric Power Company)

- Emergency and temporary use of Shiobara Power Station (900MW)



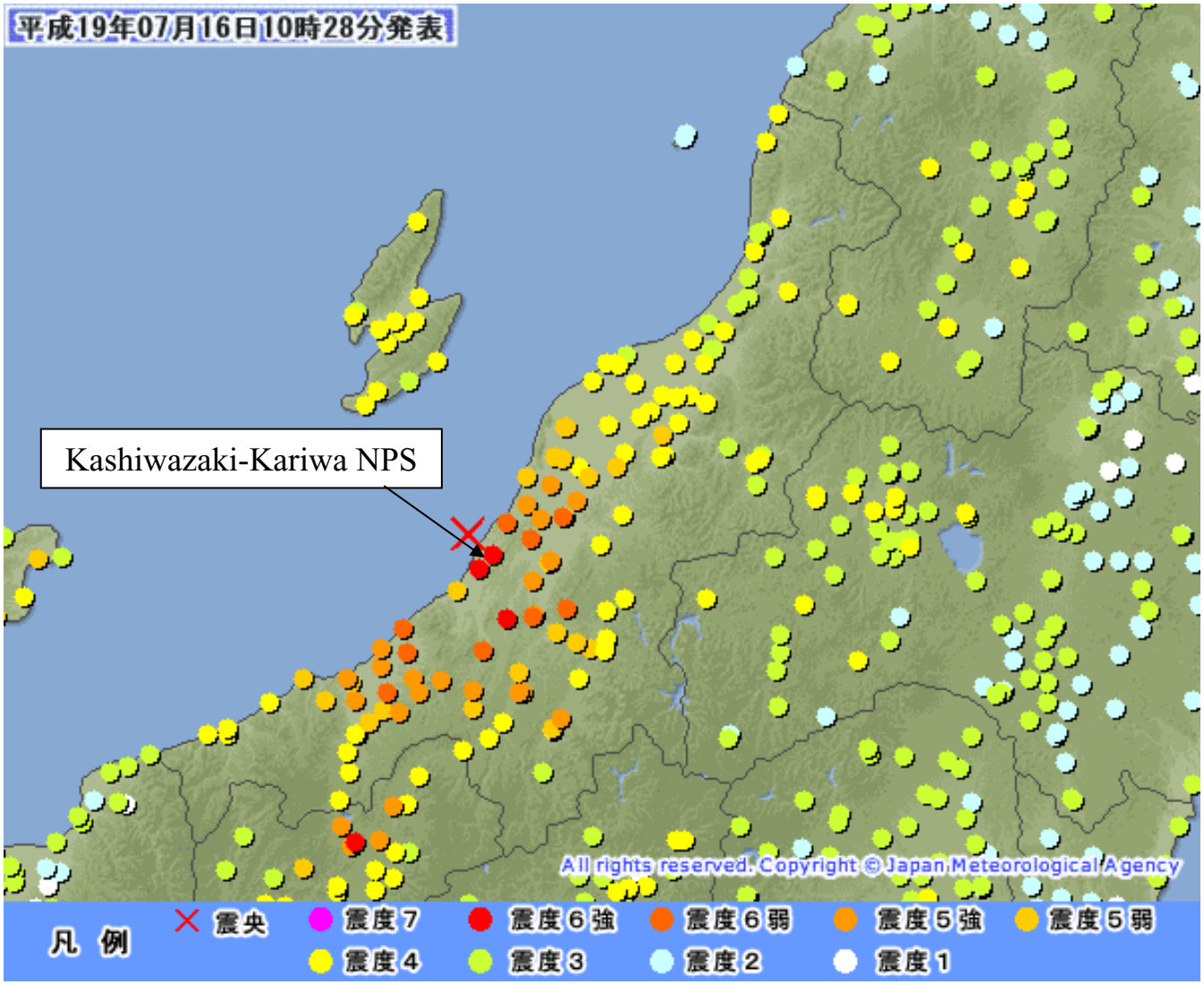
8. Request to Save Electricity in the Tokyo Metropolitan Area

- Broadcasting “Denki Yoho”—an electricity demand forecast of TEPCO’s supply areas — on TV and Radio.
- Posting “Denki Yoho” on the TEPCO website.
- Insertion of “Request to Save Electricity” in newspapers. (Distribution of 16 million issues in the Tokyo Metropolitan Area on August 1st)
- Broadcasting “Request to Save Electricity ” on TV and Radio from August 1st.

8/22 “Denki Yoho”

- Distribution of leaflets to every customer by meter readers.
- Publicize saving electricity through the distribution of leaflets and goods.
- Display posters on saving electricity.
- Individual visitation to extra-high-voltage/high-voltage customers of over 500kW and to their head offices.
- Sending direct-mailers to industry groups.

(Reference 1) Earthquake Overview



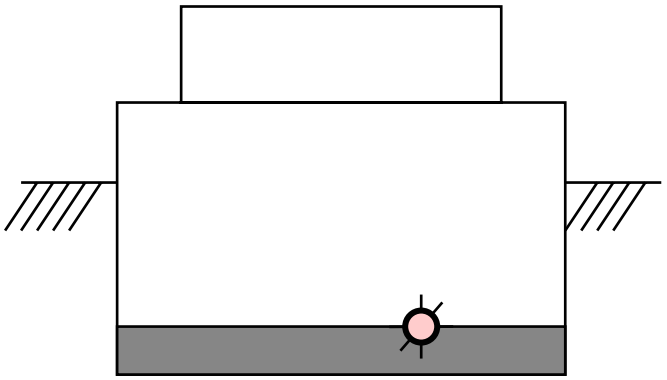
- Date & Time of the Quake:
  July 16, 2007
  10:13 AM
- Source:
  Offshore of Kami-Chuestu-oki Region in Niigata Prefecture
  Latitude: 37 ° N
  Longitude: 138 ° E
- Depth: 17 km
- Magnitude
  M=6.8
- Distance of NPS from:
  Epicenter: 16 km
  Source: 23 km

(Reference 2) Observed Seismic Data

- Observed seismic motion largely surpassed the design-basis seismic motion.

Observed maximum acceleration at each unit / design-basis response acceleration in brackets.

Observation Area	North-South Direction	East-West Direction	Vertical
Unit 1	**311**(274)	**680**(273)	**408**(235)
Unit 2	**304**(167)	**606**(167)	**282**(235)
Unit 3	**308**(192)	**384**(193)	**311**(235)
Unit 4	**310**(193)	**492**(194)	**337**(235)
Unit 5	**277**(249)	**442**(254)	**205**(235)
Unit 6	**271**(263)	**322**(263)	**488**(235)
Unit 7	**267**(263)	**356**(263)	**355**(235)



Seismograph

Measured by the base mat of each reactor building.

Unit of Measurement: (Gal)

- The base of the turbine in Unit 3 experienced the largest acceleration of 2058 Gal in the East-West direction (2.5 times the design-basis acceleration of 834 Gal).

(Reference 3) Actual Record of Demand and Supply