

Report on the impact of the Niigata-Chuetsu Oki Earthquake on the Kashiwazaki-Kariwa Nuclear Plant and response by Tokyo Electric Power Company (TEPCO), national and local governments and other bodies (Progress in November 2007)

Date	TEPCO and other power utilities and JANTI (Japan Nuclear Technology Institute)	National and local government																																
Thursday 1 November	<p>TEPCO press release: nonconformities identified in post-earthquake inspection and restoration program (weekly report dated November 1) Notification of inspection and restoration process at Kashiwazaki-Kariwa Nuclear Power Station following the Niigata Chuetsu Oki earthquake</p> <p>1. Inspection and restoration</p> <ul style="list-style-type: none"> + Inspection/restoration work completed between October 27 and November 1 2007: <ul style="list-style-type: none"> - No. 1 reactor: inspection of turbine room ceiling crane completed October 26 - No. 1 reactor: external inspection of main transformer to be completed November 1 - No. 3 reactor: inspection of ceiling crane in turbine building completed October 30 - No. 3 reactor: oil extraction and internal inspection of main transformer completed October 26 - No. 5 reactor: reactor opening process completed October 29 - No. 6 reactor: inspection of main transformer (transported to factory) completed October 31 - Oil extraction and internal inspection of low startup transformer 3SA (receiving) completed October 26 + Inspection/restoration work due to commence between November 2 and 8 2007 <ul style="list-style-type: none"> - No. 1 reactor: inspection of reactor pressure vessels to commence November 5 - No. 2 reactor: preparations for external inspection of excitation transformer to commence November 8 - No. 3 reactor: inspection of reactor pressure vessels to commence November 8 - No. 4 reactor: preparations for inspection of reactor pressure vessels to commence November 5 - No. 4 reactor: check internal status of turbines to commence November 8 - No. 5 reactor: inspection of main generator to commence November 3 - No. 6 reactor: reactor opening process to commence November 5 - Nos. 6 and 7 reactors: ;internal pump input transformer (preparations for transport to factory) to commence November 1 - No. 7 reactor: inspection of main generator to commence November 2 - No. 7 reactor: operational check of feeder and recirculation pumps to commence November 6 <p>2. Nonconformities identified in inspection/restoration work following the Niigata Chuetsu Oki earthquake Report of issues identified in the period October 25 - 31 2007</p> <p>1) Issues related to the Chuetsu Oki earthquake</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 40%;">October 25 - 31 2007 (cumulative total since 10 August 2007)</th> <th colspan="2" style="width: 50%;">By category (cumulative total since 10 August 2007)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">No.</td> <td style="text-align: center;">0 (3)</td> <td style="text-align: center;">I</td> <td style="text-align: center;">0 (0)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">II</td> <td style="text-align: center;">0 (0)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">III</td> <td style="text-align: center;">0 (3)</td> </tr> </tbody> </table> <p style="margin-left: 20px;"><October 25 - 31 2007></p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 15%;">Category</th> <th style="width: 15%;">Date identified</th> <th style="width: 30%;">Name</th> <th style="width: 40%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">I</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">II</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">III</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> </tbody> </table> <p>2) Other</p> <ul style="list-style-type: none"> - Removal of water from the No. 7 reactor well began on October 26 and was completed on October 27. This almost completely stopped stemmed the flow of water into the leak detector pipes of the reactor well liner by October 28. Further, the volume of water seeping from the wall on the 2nd floor of the reactor building declined as the water level in the reactor well dropped. It was concluded that the leakage was from the reactor well surrounds, and the reactor will be inspected to identify the leakage sites. - The control rod that initially could not be removed from the No. 7 reactor was subsequently extracted on October 24 (as notified on October 25). The cause of this problem will be investigated, and the control rod drive mechanism will be disassembled for inspection. Internal reactor components including the control rods, control rod guide tubes and fuel support brackets will also be inspected once the inspection of the reactor well liner has concluded. 		October 25 - 31 2007 (cumulative total since 10 August 2007)	By category (cumulative total since 10 August 2007)		No.	0 (3)	I	0 (0)			II	0 (0)			III	0 (3)	Category	Date identified	Name	Description	I	-	-	-	II	-	-	-	III	-	-	-	<p>NISA press release: Earthquake update (report No. 32)</p> <ul style="list-style-type: none"> - Report from TEPCO as per left-hand column - Inspection of the Nos. 1 through 7 reactors for damage and significant deformation is continuing. - NISA inspectors are currently investigating the causes and other details at the plants based on TEPCO findings - There are no significant changes in the main air stack radiation monitor and monitoring posts <p>NISA Chuetsu Offshore Earthquake Nuclear Power Plant Investigation and Countermeasures Committee Operational Management and Equipment Safety WG (3rd session)</p> <p>Agenda:</p> <ul style="list-style-type: none"> (1) Operational management at the time of the earthquake (2) Equipment safety evaluation
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III	-	-	-																															
Friday 2 November	<p>TEPCO press release: Contamination check of palettes used for drums in solid waste storage facility (restricted area)</p> <ul style="list-style-type: none"> - Drums were found to have fallen over in the solid waste storage facility (restricted area), as notified on July 18 2007. - Today the drums were restored to standing position and contamination checks were performed on the damaged palettes prior to transportation. Trace levels of contamination were detected on some of the palettes. - The quantity of contamination had a surface contamination density of 0.84 Bq/cm². A person who spent a day in the vicinity would, at a conservative estimate, be exposed to around of 0.0001 mSv; this is well below the 2.4 mSv to which the average person is exposed over the course of a year from purely natural sources. - The contaminated palette has been sealed up by coating with flame-resistant vinyl sheeting. Radiation testing in the vicinity has confirmed no other contamination. - This incident has not caused any external radiation leakage. 																																	

Monday 5 November

TEPCO press release: Geological and ground surveys at the Fukushima No. 1 and No. 2 nuclear power Stations in light of the Niigata Chuetsu Oki earthquake in Niigata prefecture 1

- Additional geological surveys will be conducted at the Fukushima No. 1 and No. 2 nuclear power stations to supplement existing survey work and provide additional information. To this end, geological studies will be conducted on the land and sea areas in the vicinity of the power stations, including underground surveying on nearby land and marine sonic surveying in the sea areas, as well as a boring study within the site area itself (as notified on August 17 2007).
- The schedule for the boring study within the Fukushima No. 1 and No. 2 nuclear power plant site area has been finalized, and preparatory work is to begin today.
- The boring study involves analysis of the ground type in the site area and its relevance to the seismic safety evaluation of the facilities, and includes boring, measurement of groundwater levels and testing of physical characteristics of the ground.
- Schedules for underground surveying of nearby land and marine sonic surveying in the sea areas will be finalized soon, and surveying will begin as soon as the preparations are complete.

Thursday 8 November

TEPCO press release: nonconformities identified in post-earthquake inspection and restoration program (weekly report November 8)

Notification of inspection and restoration process at Kashiwazaki-Kariwa Nuclear Power Station following the Niigata Chuetsu Oki earthquake

1. Inspection and restoration

- + Inspection/restoration work completed between November 2 - 8 2007
 - No. 1 reactor: inspection of the reactor pressure vessel (support structures) completed November 7
 - No. 3 reactor: oil extraction and internal inspection of excitation transformer completed November 3
 - No. 5 reactor: inspection of reactor pressure vessels (support structures) completed November 2
 - No. 6 reactor: inspection of operating floor service tools (stud bolt tensioners etc) completed November 3
- + Inspection/restoration work due to commence between November 9 - 15 2007
 - No. 1 reactor: check internal status of turbines to commence November 9
 - No. 2 reactor: inspection of reactor pressure vessels (support structures) to commence November 12
 - No. 2 reactor: oil extraction and internal inspection of internal transformer (2A) to commence November 9
 - No. 3 reactor: inspection of fuel exchanger— to commence November 12
 - No. 4 reactor: inspection of reactor pressure vessels (support structures) to commence November 9
 - No. 6 reactor: reactor inspection to commence November 13
 - No. 6 reactor: inspection of reactor pressure vessels (nozzles etc) to commence November 7
 - No. 6 reactor: removal of underwater work stands from spent fuel pool to commence November 14
 - No. 7 reactor: oil extraction and internal inspection of internal transformer (7A) to commence November 13
 - No. 7 reactor: oil extraction and internal inspection of internal transformer (7B) to commence November 7

2. Nonconformities identified in inspection/restoration work following the Niigata Chuetsu offshore earthquake

Report of issues identified in the period November 1 - 7 2007

1) Issues related to the Chuetsu Oki earthquake

No.	November 1 - 7 2007 (cumulative total since 10 August 2007)	By category (cumulative total since 10 August 2007)	
		I	
	0 (3)	I	0 (0)
		II	0 (0)
		III	0 (3)

<November 1 - 7 2007>

Category	Date identified	Name	Description
I	-	-	-
II	-	-	-
III	-	-	-

2) Other

- Inspection of the No. 7 reactor well has been underway since November 2 and is due to conclude on November 11. **Very minor damage with the potential to cause leakage was identified yesterday. The inspection process is continuing** including areas that have yet to be inspected and **provisional repairs will be carried out on any damage identified. Meanwhile, preparations for internal reactor inspection are also underway.**
- The control rod drive mechanism for the **recalcitrant control rod** in the No. 7 reactor was removed over two days from November 1 to November 2, and was disassembled and inspected from November 3 to November 7. A thorough inspection and evaluation including measurement of the dimensions of the labyrinth seal and latch mechanisms **did not reveal anything out of the ordinary (such as foreign matter or major damage) that could be construed as the cause of the problem.** For this reason, it would appear that **the problem is a transient phenomenon.** Nevertheless, we will inspect reactor machinery and mechanisms including control rods, fuel support brackets and guide tubes.
- **Nonconformities (related to Chuetsu Oki earthquake: As excluded)**

1 - 31 October, 2007 (cumulative total since 16 July 2007)	
No.	
	139 (2,997)

NISA press release: Earthquake update (report No. 33)

- Report from TEPCO as per left-hand column
- Inspection of the Nos. 1 through 7 reactors for damage and significant deformation is continuing.
- NISA inspectors are currently investigating the causes and other details at the plants based on TEPCO findings
- There are no significant changes in the main air stack radiation monitor and monitoring posts

Friday 9
November

NISA press release: Equipment and facilities inspection/evaluation program for the Kashiwazaki-Kariwa nuclear power station in Niigata prefecture following the Chuetsu Oki earthquake

1. Background

- NISA has conducted a study of the effects of the Chuetsu Oki earthquake in Niigata prefecture on the operational safety of the TEPCO Kashiwazaki-Kariwa nuclear power station, and has received recommendations from experts particularly from the Working Group on Management Procedures and Equipment Safety within the Nuclear Safety and Security Subcommittee of the Resources and Energy Study Group in regards to future issues to be tackled by NISA and the power companies.
- NISA conducted emergency visual inspections and function checks after the earthquake and determined that the cold shutdown status could be maintained in safety.
- TEPCO will now conduct thorough inspections of all equipment at the facility. NISA is required to check that TEPCO has conducted the equipment assessment processes in the correct manner. To this end, NISA has issued TEPCO with a directive regarding the inspection and assessment program.

2. Actions

- The Working Group will check the inspection and assessment program when submitted by TEPCO.
- The ongoing implementation of the inspection and assessment program will also be subject to evaluation.

<Directive>

1. Developing the inspection and evaluation programs

A separate inspection and evaluation program must be provided for each reactor (No. 1 through No. 7).

2. Scope

The scope of inspection and evaluation of each reactor is as follows:

- 1) All equipment listed in the Construction Plan for electrical structures as per the Electricity Enterprises Law.
- 2) Other supporting structures etc which although not listed in the Construction Plan are relevant to the seismic assessment of the facility.

3. Methodology

(1) Evaluation

- 1) The following equipment must be evaluated on the basis of a combination of inspection and seismic response analysis.
 - a. Equipment ranked as importance class 1
 - b. Equipment ranked as importance class 2 but requiring a higher seismic safety standard (includes equipment of seismic class As and A and other equipment subject to seismic evaluation of dynamic seismic ground motion)
- 2) Other equipment can be evaluated primarily on the basis of inspection findings.

(2) Inspection

- 1) The inspection method should be tailored to the equipment, particularly with respect to the form(s) of damage anticipated from an earthquake, which in turn is based on the nature of the equipment and the installation environment.
- 2) Functional checks should be performed on equipment with key safety functions, such as dynamic system, instrumentation, and protective devices.
- 3) In cases where the analysis returns results with relatively low tolerance, additional inspection processes should be carried out, based on the anticipated form(s) of damage. This may include non-destructive testing, materials and dimensions testing, pressurization and leakage tests, and functional and performance tests.
- 4) Equipment that cannot conclusively be proven safe through in-situ testing should be subject to additional testing such as mock-up tests.

(3) Analysis

- 1) The analysis method should be tailored to the equipment, particularly with respect to the form(s) of damage anticipated from an earthquake, which in turn is based on the nature of the equipment and the installation environment.
- 2) The seismic response analysis uses seismic motion estimates for each individual piece of equipment, which are based on the seismic observation data recorded during the Chuetsu offshore earthquake. A conservative approach may be used, whereby the seismic motion incorporates the estimated seismic motion plus a margin for error.

(4) Other

- 1) It is acceptable to restrict the range of equipment subject to inspection and analysis, for instance by selecting only typical or common types of equipment. However the selection criteria must be clearly enunciated.

4. Inspection and evaluation system

- 1) Inspectors must be appointed on the basis of ability and capability.
- 2) Inspection and evaluation processes must be objective and transparent.
- 3) Inspection findings must be properly recorded and these records must be properly stored.

5. Safety considerations during inspection

The inspection program must incorporate the following safety considerations.

- 1) In order to ensure the safety of the nuclear facility, inspection of key safety equipment cannot commence until the operating status of other systems, interlocks and safety features have been

		checked. 2) Every effort must be made to minimize the potential for radioactive exposure of officials involved in inspection work as far as practicable.																				
Monday 12 November	<p>TEPCO press release: Internal inspection of No. 5 reactor</p> <ul style="list-style-type: none"> - The process of transferring fuel from the No. 5 reactor into the spent fuel pool to enable internal inspection of the reactor began on November 3 and is due for completion on November 13. On November 11, while transferring the 705th fuel unit out of a total of 764 (the outermost section), an alarm indicated excessive load on the fuel exchanger, and auto operation of the fuel exchanger stopped. - Work was immediately stopped and the fuel exchanger was inspected, but no faults or problems could be identified. - The alarm was triggered by removal of the 705th fuel unit. This has since been restored to its original position. All the other fuel will be transferred, and the cause of the problem will be investigated. - In the absence of any significant change in the concentration of iodine in the reactor water, it was concluded that the fuel in the reactor had not been damaged in any way. 	<p>NISA: Equipment Safety Sub-WG (1st meeting) of the Working Group on Management Procedures and Equipment Safety within the Chuetsu Oki Earthquake Nuclear Power Plant Investigation and Countermeasures Committee</p> <p><Purpose of the Sub-WG></p> <p>To check the following aspects of the safety checking process:</p> <ol style="list-style-type: none"> 1) The inspection and evaluation programs (prepared as per the NISA directive dated November 9) 2) The inspection (and/or testing) findings 3) The seismic response analysis findings (for key safety equipment only) 4) The equipment safety evaluation 																				
Tuesday 13 November		<p>NISA Press Release: Application of the International Nuclear Energy Scale (INES) to incidents at the Kashiwazaki-Kariwa nuclear power station</p> <p>The INES Assessment Sub-Committee (chaired by Professor Haruki Madarame of the Tokyo University School of Engineering) within the Nuclear Safety and Security Chapter of the Resources and Energy Study Group of the Ministry of the Economy, Trade and Industry conducted an evaluation on November 13, 2007 as per the appended documentation.</p> <p>The evaluation findings are summarized below.</p> <p>The role of the INES Assessment Sub-Committee is to assess incidents at nuclear facilities under the jurisdiction of the Ministry for the Economy, Trade and Industry from a specialist and technical perspective.</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Facility</th> <th>Details</th> <th>Evaluation</th> </tr> </thead> <tbody> <tr> <td>July 16 2007</td> <td>Kashiwazaki-Kariwa No. 3 unit</td> <td>Fire in internal transformer associated with the 2007 Chuetsu Oki earthquake in Niigata prefecture</td> <td>Outside scope of evaluation</td> </tr> <tr> <td>July 16 2007</td> <td>Kashiwazaki-Kariwa No. 6 unit</td> <td>Leakage of water containing radioactive matter into a non-restricted area of the reactor building in connection with the 2007 Chuetsu Oki earthquake in Niigata prefecture</td> <td>0-</td> </tr> <tr> <td>July 24 2007</td> <td>Kashiwazaki-Kariwa No. 6 unit</td> <td>Damage to power train joints on the reactor building ceiling crane caused by the 2007 Chuetsu Oki earthquake in Niigata prefecture</td> <td>Outside scope of evaluation</td> </tr> <tr> <td>July 25 2007</td> <td>Kashiwazaki-Kariwa Nuclear Power Station</td> <td>Flooding on the operating floors of reactor buildings associated with the 2007 Chuetsu Oki earthquake in Niigata prefecture</td> <td>0-</td> </tr> </tbody> </table> <p>[Extract from items relating to the Chuetsu Oki earthquake in Niigata prefecture]</p>	Date	Facility	Details	Evaluation	July 16 2007	Kashiwazaki-Kariwa No. 3 unit	Fire in internal transformer associated with the 2007 Chuetsu Oki earthquake in Niigata prefecture	Outside scope of evaluation	July 16 2007	Kashiwazaki-Kariwa No. 6 unit	Leakage of water containing radioactive matter into a non-restricted area of the reactor building in connection with the 2007 Chuetsu Oki earthquake in Niigata prefecture	0-	July 24 2007	Kashiwazaki-Kariwa No. 6 unit	Damage to power train joints on the reactor building ceiling crane caused by the 2007 Chuetsu Oki earthquake in Niigata prefecture	Outside scope of evaluation	July 25 2007	Kashiwazaki-Kariwa Nuclear Power Station	Flooding on the operating floors of reactor buildings associated with the 2007 Chuetsu Oki earthquake in Niigata prefecture	0-
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Wednesday 14 November	<p>TEPCO press release: Regular scheduled inspection of No. 7 reactor commences</p> <p>The No. 7 reactor stopped generating as a result of the Chuetsu OKi earthquake in Niigata prefecture. Inspection and restoration work is currently underway. The 8th regular inspection procedure will commence as scheduled on November 15. The ongoing post-earthquake inspection and restoration work to determine the effects of the earthquake will be implemented in accordance with a separate inspection and restoration program to be formulated. .</p> <p>TEPCO press release: Application of the International Nuclear Energy Scale (INES) to incidents at the Kashiwazaki-Kariwa nuclear power station associated with the Chuetsu Oki earthquake in Niigata prefecture</p> <ul style="list-style-type: none"> - On July 25, the Kashiwazaki-Kariwa nuclear power station submitted to the Ministry of the Economy, Trade and Industry reports on equipment faults and failures and associated electrical problems at the power station in relation to the Chuetsu Oki earthquake in Niigata prefecture. The following four incidents identified in the reports were assessed on November 13 by the INES Assessment Sub-Committee* of the Nuclear Safety and Security Chapter of the Resources and Energy Study Group of the Ministry of the Economy, Trade and Industry. - The INES assessment** rated two of the four incidents as 0- (= not a safety problem; no impact on safety), and classified the other two as being outside the scope of the assessment system. <p>Four incidents examined by the INES Assessment Sub-Committee</p> <ol style="list-style-type: none"> 1) Leakage of water containing radioactive matter into a non-restricted area of the Kashiwazaki-Kariwa nuclear power station No. 6 reactor building: 0- 2) Flooding on the operating floors of the Nos. 1 - 7 reactor buildings in the Kashiwazaki-Kariwa nuclear power station: 0- 3) Damage to power train joints on the ceiling crane of the No. 6 reactor building at the Kashiwazaki-Kariwa nuclear power station: outside scope of assessment 4) Fire in the internal transformer (B) of the No. 3 reactor of the Kashiwazaki-Kariwa nuclear power station: outside scope of assessment <p>* INES Assessment Sub-Committee</p>	<p>NISA: Chuetsu Oki Earthquake Nuclear Power Plant Investigation and Countermeasures Committee Working Group on Internal Fire Protection Systems and Liaison Structures at the time of the Chuetsu Offshore Earthquake (4th meeting)</p> <p>Agenda</p> <ol style="list-style-type: none"> (1) Reporting to the Nuclear Safety Commission (2) Liaison and information disclosure (3) Draft outline of report (4) Other <p>NISA/JNES: NISA-JNES 2007 Symposium</p> <ul style="list-style-type: none"> - Improving safety standards in the aftermath of the Chuetsu Oki earthquake in Niigata prefecture - <p>Date and time: Tuesday November 14, 2007, 1:00 - 5:30 p.m.</p> <p>Venue: Yurakucho Asahi Hall (Chiyoda-ku, Tokyo)</p> <p>Program</p> <ol style="list-style-type: none"> 1. Opening remarks 2. Keynote address Engineering perspective on the impact of the Chuetsu Oki earthquake in Niigata prefecture on the nuclear power facility 3. Panelist presentations <ol style="list-style-type: none"> (1) Conclusions in seismic studies derived from the Chuetsu Oki earthquake in Niigata prefecture (2) Impact on the Kashiwazaki-Kariwa nuclear power plant and the associated response (3) Studies and investigations at the facility in the aftermath of the earthquake 																				

Thursday 15 November	<p>TEPCO press release: Nonconformities identified in post-earthquake inspection and restoration program (weekly report dated November 15) Notification of inspection and restoration process at Kashiwazaki-Kariwa Nuclear Power Plant following the Niigata Chuetsu offshore earthquake</p> <p>1. 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Nonconformities identified in inspection/restoration work following the Niigata Chuetsu offshore earthquake Report of issues identified in the period November 8 - 14 2007</p> <p>1) Issues related to the Chuetsu Oki earthquake</p> <table border="1" data-bbox="338 1367 1611 1539"> <thead> <tr> <th colspan="2">November 8 - 14 2007 (cumulative total since 10 August 2007)</th> <th colspan="2">By category (cumulative total since 10 August 2007)</th> </tr> </thead> <tbody> <tr> <td>No.</td> <td style="text-align: center;">1 (4)</td> <td>I</td> <td style="text-align: center;">0 (0)</td> </tr> <tr> <td></td> <td></td> <td>II</td> <td style="text-align: center;">0 (0)</td> </tr> <tr> <td></td> <td></td> <td>III</td> <td style="text-align: center;">1 (4)</td> </tr> </tbody> </table> <p><November 8 - 14></p> <table border="1" data-bbox="397 1570 1611 1877"> <thead> <tr> <th>Category</th> <th>Date identified</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>I</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td>II</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td>III</td> <td style="text-align: center;">Nov 13 2007</td> <td>Fuel assembly slipped free of holding bracket</td> <td>While transferring fuel assemblies during internal inspection of the No. 5 reactor, the fuel exchanger stopped automatically. Investigation using an underwater camera revealed that one of the fuel assemblies had slipped free of its proper loading position. It appears that the fuel assembly had not been loaded correctly, and had subsequently been dislodged by the force of the earthquake. The matter will be investigated further.</td> </tr> </tbody> </table> <p>2) Other</p> <ul style="list-style-type: none"> - Trial operation of emergency reactor core cooling systems has been completed for all but the three systems in the No. 1 reactor which were in the process of regular inspection at the time of the earthquake. No problems were identified (November 9). - Inspection of the No. 7 reactor well was completed on November 14. Minor damage associated with leakage (of length approximately 3 mm and 2 mm) was identified in two locations. Provisional repairs involving covering with waterproof stainless 	November 8 - 14 2007 (cumulative total since 10 August 2007)		By category (cumulative total since 10 August 2007)		No.	1 (4)	I	0 (0)			II	0 (0)			III	1 (4)	Category	Date identified	Name	Description	I	-	-	-	II	-	-	-	III	Nov 13 2007	Fuel assembly slipped free of holding bracket	While transferring fuel assemblies during internal inspection of the No. 5 reactor, the fuel exchanger stopped automatically. Investigation using an underwater camera revealed that one of the fuel assemblies had slipped free of its proper loading position. It appears that the fuel assembly had not been loaded correctly, and had subsequently been dislodged by the force of the earthquake. The matter will be investigated further.	<p>(4) Identifying topics for the panel discussion</p> <ol style="list-style-type: none"> 4. Dialog-style panel discussion 5. Discussion among delegates 6. Closing remarks <p>NISA press release: Earthquake update (report No. 34)</p> <ul style="list-style-type: none"> - Report from TEPCO as per left-hand column - Inspection of the Nos. 1 through 7 units for damage and significant deformation is continuing - TEPCO will conduct a thorough investigation into the cause of the problem at the No. 5 reactor where one of the fuel assemblies could not be removed, and will develop strategies to prevent a reoccurrence of the problem. - NISA inspectors are currently investigating the causes and other details at the plants based on TEPCO findings - There are no significant changes in the main air stack radiation monitor and monitoring posts
	November 8 - 14 2007 (cumulative total since 10 August 2007)		By category (cumulative total since 10 August 2007)																															
No.	1 (4)	I	0 (0)																															
		II	0 (0)																															
		III	1 (4)																															
Category	Date identified	Name	Description																															
I	-	-	-																															
II	-	-	-																															
III	Nov 13 2007	Fuel assembly slipped free of holding bracket	While transferring fuel assemblies during internal inspection of the No. 5 reactor, the fuel exchanger stopped automatically. Investigation using an underwater camera revealed that one of the fuel assemblies had slipped free of its proper loading position. It appears that the fuel assembly had not been loaded correctly, and had subsequently been dislodged by the force of the earthquake. The matter will be investigated further.																															

	<p>steel plating were completed on November 14. We will investigate the cause of the damage via impact load evaluation using slot plugs (concrete barrier blocks) and mock-up tests of weld joints at the factory. Internal inspection of the No. 7 reactor (Phases 1 and 2) is due to commence on November 20.</p> <ul style="list-style-type: none"> - External inspection (via underwater camera) of the recalcitrant fuel assembly that could not be removed from the No. 5 reactor revealed that the fuel assembly had been dislodged from the holding bracket (November 11). The inspection did not find any major deformation or damage to the fuel assembly or holding bracket (as notified November 14). The fuel assembly will be transferred to the spent fuel pool and investigated further. - Internal inspection of the No. 2 reactor (Phases 1 and 2) was scheduled for the period November 3 through 14. With the discovery of streaks on the outer circumference of the shroud support cylinder, the inspection was extended through to today. The streaks, which were successfully removed on November 14 by rubbing with a rubber spatula, were concluded to be deposits associated with cladding (rust and other metallic contaminants). - Visual inspection of the inside of the spent fuel pool in the No. 6 reactor during removal of the underwater work stands (which was completed on November 14) revealed minor rubbing in three locations on the work stands and three locations on the side walls of the pool. 	
Tuesday 20 November	<p>TEPCO Press Release: Internal inspection of turbine in No. 4 unit</p> <p>The low-pressure turbine (A) casing was opened up on November 8 and inspection has been in progress ever since. At 4:40 p.m. on November 19, during inspection of fixed and moving blades in the turbine (stages 9 and 10*), evidence of friction (maximum length approximately 4 mm) was discovered on the tips of the moving blades (shroud** stages 9 and 10), and this was thought to be the result of contact with fixed blades. Similar evidence of contact friction (maximum length approximately 2 mm) was discovered on the base of the moving blades (stage 9) and on the fixed blades.</p> <p>We will look at replacing the tips of the moving blades and repairing the base sections. We will also continue the inspection of the remaining fixed and moving blades on the low-pressure turbine (A) (from stage 11 to stage 17) as well as the high-pressure turbine. The findings will be released in summary form.</p> <p>* Stages 9 and 10 The fixed and moving turbine blades are arranged in bilateral symmetry. The No. 4 reactor has low-pressure turbine from stages 9 through 17, and high-pressure turbine from stages 1 through 9.</p> <p>** Shroud A fixed covering over the outer tips of the moving turbine blades designed to boost the steam power generation efficiency.</p>	
	<p>TEPCO Press Release: Internal inspection of No. 5 reactor</p> <p>The fuel assembly that become dislodged from its fuel holding bracket (notified on November 12 and 14) was today successfully transferred to the spent fuel pool.</p> <p>Further investigation will be conducted, including inspection of the fuel assembly and loading bracket and measurement of channel box curvature.</p>	
Thursday 22 November	<p>TEPCO Press Release: Nonconformities identified in post-earthquake inspection and restoration program (weekly report dated November 22)</p> <p>Notification of inspection and restoration process at Kashiwazaki-Kariwa Nuclear Power Plant following the Niigata Chuetsu Oki earthquake</p> <p>1. Inspection and restoration</p> <p>Inspection/restoration work completed between November 16 and November 22 2007</p> <ul style="list-style-type: none"> - No. 1 reactor: oil extraction and internal inspection of main transformer - to be completed November 22 - No. 1 reactor: check skimmer surge tank - completed November 20 - No. 2 reactor: internal inspection (Phase 1 and 2) - completed November 19 - No. 2 reactor: external inspection of internal transformer 2B - completed November 17 - No. 2 reactor: oil extraction and internal inspection of internal transformer 2B - completed November 19 - No. 2 reactor: external inspection of excitation transformer - completed November 17 <p>Inspection/restoration work due to commence between November 23 and November 29</p> <ul style="list-style-type: none"> - No. 1 reactor: inspection of main exhaust duct - to commence November 28 - No. 1 reactor: internal inspection (Phase 3) - to commence November 26 - No. 2 reactor: internal turbine check - to commence November 28 - No. 4 reactor: removal of underwater work stand from spent fuel pool - to commence November 29 - No. 5 reactor: oil extraction and internal inspection of main transformer - to commence November 27 - No. 5 reactor: internal inspection (Phase 1 and 2) - to commence November 22* - No. 6 reactor: internal inspection (Phase 1 and 2) - to commence November 26 - No. 7 reactor: internal inspection (Phase 1 and 2) - to commence November 20* - Inspection of bushing on southern Niigata trunk line No. 2 - to commence November 23 <p>2. Nonconformities identified in inspection/restoration work following the Niigata Chuetsu Oki earthquake</p> <p>Report of issues identified in the period November 15 - 21 2007</p>	<p>NISA Press Release: Earthquake update (Report No. 35)</p> <ul style="list-style-type: none"> - Report from TEPCO as per left-hand column - Inspection of the Nos. 1 through 7 units for damage and significant deformation is continuing - We will closely monitor the investigation by TEPCO into the cause of the problem at the No. 5 reactor where one of the fuel assemblies could not be removed, and the development of countermeasures to prevent a reoccurrence of the problem. - NISA inspectors are currently investigating the causes and other details at the plants based on TEPCO findings - There are no significant changes in the main air stack radiation monitor and monitoring posts

1) Issues related to the Chuetsu Oki earthquake

November 15 - 21 2007 (cumulative total since 10 August 2007)		By category (cumulative total since 10 August 2007)	
No.	1 (5)	I	0 (0)
		II	0 (0)
		III	1(5)

November 15 – 21

Category	Date identified	Name	Description
I	-	-	-
II	-	-	-
III	November 19 2007	Internal check of No. 4 turbine	During the internal check of the No. 4 turbine, inspection of fixed and moving blades of the low-pressure turbine (A) revealed evidence of abrasion (maximum size 4 mm) attributable to contact between fixed and moving blades at stages 9 and 10, as well as contact damage on the base of the moving blades (stage 9) and on fixed blades (maximum size 2 mm). These will be replaced and/or repaired as necessary. Inspection of the remaining fixed and moving blades (stages 11 through 17) and high-pressure turbine is continuing.

2) Other

- During the check of the No. 1 reactor skimmer surge tank on November 19 and 20, three red C type boots were discovered on top of the mesh filter inside the tank. These are in addition to the red boot recovered on August 22, bringing the total to two pairs of boots. (The checking process was completed on November 20.)
- The recalcitrant fuel assembly that could not be removed during the internal inspection of the No. 5 reactor was reattached to its holding bracket in the correct position and transferred to the spent fuel pool on November 20 (as notified on November 20). We will investigate the cause of this problem once the internal inspection is completed, including measurement of curvature of the channel box.
- An inspection of equipment in the No. 7 reactor, where one of the control rods could not be removed, performed between November 17 and 22, did not reveal anything out of the ordinary (such as foreign matter or major damage) that could be construed as the cause of the problem. On the basis of investigation findings to date, it would appear to be a transient phenomenon whereby interference from cladding or other metallic impurities such as rust has temporarily exacerbated friction resistance within the control rod drive mechanism. If the problem occurs again, it can be dealt with via a scram operation or equivalent; it does not represent a functional issue with the control rod drive mechanism.
- Evidence of friction (maximum length approximately 4 mm) was discovered on stages 9 and 10 of the fixed and moving blades of the low-pressure turbine (A) during inspection of the No. 4 unit turbines, as previously reported on November 20. A subsequent inspection of the remaining fixed and moving blades on stages 11 through 17 of the low-pressure turbine (A) revealed abrasion marks of up to 3 mm in length on the moving blades (the shroud) and fixed blades of Stage 11, and abrasion marks of up to 2 mm in length on the fixed and moving blades on Stages 12 to 14 (moisture exclusion blades). The high-pressure turbine will be inspected next.

Friday 23
November

TEPCO Press Release: Internal inspection of No. 6 reactor
 Fuel was transferred from the No. 6 reactor to the spent fuel pool between November 16 and November 25 to enable an internal inspection of the reactor. On November 23, during the process of transferring the fuel and removing the control rods*, one of the control rods proved impossible to remove**. This situation did not pose any safety risks, since all fuel units adjacent to the offending control rod had been successfully removed and the control rod itself was held securely in its holding bracket. The offending fuel rod will be extracted after the fuel has been transferred, and the cause of the problem will be investigated.

* This occurred at the 133rd control rod out of a total of 205 control rods, with 743 of 872 fuel units already transferred.
 ** The same phenomenon occurred in the No. 7 reactor, where a subsequent investigation suggested the cause to be a transient increase in friction resistance within the control rod drive mechanism, as previously reported on November 22.

Sunday 25
November

TEPCO Press Release: Internal inspection of No. 6 reactor
 Fuel was transferred from the No. 6 reactor to the spent fuel pool between November 16 and November 25 to enable an internal inspection of the reactor. On November 25, during the process of transferring the fuel and removing the control rods*, one of the control rods proved impossible to remove**. This situation did not pose any safety risks, since all fuel units adjacent to the offending control rod had been successfully removed

	<p>and the control rod itself was held securely in its holding bracket.</p> <p>The offending fuel rod will be extracted after the fuel has been transferred, and the cause of the problem will be investigated.</p> <p>* This occurred at the 180th control rod out of a total of 205 control rods, with 824 of 872 fuel units already transferred.</p> <p>** The same phenomenon occurred in the No. 7 reactor, where a subsequent investigation suggested the cause to be a transient increase in friction resistance within the control rod drive mechanism, as previously reported on November 22.</p> <p>The same phenomenon had also occurred in the No. 6 reactor while attempting to remove the 133rd control rod (out of a total of 205), as previously reported on November 23.</p>	
Tuesday 27 November	<p>TEPCO Press Release: Submission of equipment safety inspection and assessment program for No. 7 unit following the Chuetsu Oki earthquake in Niigata prefecture</p> <p>TEPCO is preparing equipment inspection and assessment programs for the Kashiwazaki-Kariwa nuclear power station following the Chuetsu Oki earthquake in Niigata prefecture on July 16 2007, in accordance with the written directive* dated November 9 from the Ministry of Economy, Trade and Industry Nuclear Safety Commission/NISA. The inspection and assessment program for equipment at the No. 7 unit at Kashiwazaki-Kariwa nuclear power station was submitted today to the Ministry of Economy, Trade and Industry Nuclear Safety Commission/NISA.</p> <p>Equipment inspection for the overall process will be completed by May 2008, the seismic response analysis by March 2008, and the overall assessment of equipment status by June 2008. Note that this schedule is subject to change depending on the rate of progress of inspection and assessment processes.</p> <p>Inspection and assessment of equipment will be carried out in accordance with the inspection and assessment programs. Inspection and assessment programs for buildings and structures will be added on when completed.</p> <p>Inspection and assessment programs will also be prepared for the Nos. 1 through 6 reactors.</p> <p>Program contents</p> <ol style="list-style-type: none"> 1. Introduction 2. Formulation 3. Equipment inspection 4. Seismic response analysis 5. Overall evaluation 6. Records 7. Inspection and assessment systems 8. Schedule 	
	<p>TEPCO Press Release: Internal inspection of No. 6 reactor</p> <p>The two control rods that could not be removed from the No. 6 reactor (as previously notified on November 23 and 25) were successfully removed by 27 November using a procedure* that was specifically drawn up to deal with the problem. Following attempted motorized extraction in the normal manner, all rods were inserted at the water pressure normally used for scram operations and then extracted again in the normal manner.</p> <p>We will investigate the causes of this problem.</p> <p>The same phenomenon occurred in the No. 7 reactor, and the offending rod was extracted using the procedure described above. A subsequent investigation suggested the cause to be a transient increase in friction resistance within the control rod drive mechanism, as previously reported on November 22.</p> <p>* Procedure used to extract recalcitrant control rod</p> <p>Control rods are normally inserted and removed by electric motor. In an emergency situation, control rods can also be inserted by hydraulic pressure (this is called a SCRAM). This procedure is designed to address the anticipated problems with the electric motors that move the control rods.</p>	
Thursday 29 November	<p>TEPCO Press Release: Nonconformities identified in post-earthquake inspection and restoration program (weekly report dated November 29)</p> <p>Notification of inspection and restoration process at Kashiwazaki-Kariwa Nuclear Power Station following the Niigata Chuetsu Oki earthquake</p> <p>1. Inspection and restoration</p> <p>Inspection/restoration work completed between November 23 and November 29</p> <ul style="list-style-type: none"> - No. 1 reactor: oil extraction and internal inspection of main transformer - completed November 23 - No. 1 reactor: inspection of main exhaust duct - completed November 28 - No. 5 reactor: oil extraction and internal inspection of main transformer - to be completed November 29 - No. 7 reactor: input transformer for internal reactor pump (transportation to factory) - completed November 24 <p>Inspection/restoration work due to commence between November 30 and December 6</p> <ul style="list-style-type: none"> - No. 2 reactor: internal inspection (Phase 3) - to commence December 3 - No. 2 reactor: oil extraction and internal inspection of excitation transformer - to commence December 1 - No. 3 reactor: removal of underwater work stand from spent fuel pool - to commence December 3 	<p>NISA Press Release: Earthquake update (36th report)</p> <ul style="list-style-type: none"> - Report from TEPCO as per left-hand column - Inspection of the Nos. 1 through 7 units for damage and significant deformation is continuing - NISA inspectors are currently investigating the causes and other details at the plants based on TEPCO findings - There are no significant changes in the main air stack radiation monitor and monitoring posts

- No. 4 reactor: reactor opening process - to commence December 4
- No. 4 reactor: oil extraction and internal inspection of main transformer - to commence December 3
- No. 5 reactor: preparations for inspection of reactor pressure vessels (nozzles etc) - to commence December 6
- No. 5 reactor: preparations for internal inspection of reactor (Phase 3) - to commence December 3
- No. 5 reactor: main transformer (preparing for transportation to factory): - to commence November 30
- No. 6 reactor: internal inspection (Phase 1 and 2) - to commence December 4
- Nos. 6 and 7 reactors: preparation for inspection and restoration of water drainage canals - to commence December 3
- No. 7 reactor: preparations for internal inspection (Phase 3) - to commence November 28
- No. 7 reactor: in-depth inspection of turbines - to commence December 3
- No. 1 high startup transformer (transportation and installation) - to commence December 5

2. Nonconformities identified in inspection/restoration work following the Niigata Chuetsu Oki earthquake

Report of issues identified in the period November 22 - 29 2007

1) Issues related to the Chuetsu Oki earthquake

November 22 - 29 2007 (cumulative total since 10 August 2007)		By category (cumulative total since 10 August 2007)	
No.	2 (7)	I	0 (0)
		II	0 (0)
		III	2 (7)

November 22 – 29 2007

Category	Date identified	Name	Description
I	-	-	-
II	-	-	-
III	November 28 2007	Internal turbine inspection at No. 3 unit	During internal inspection of the No. 3 unit turbines, abrasion marks were identified on the following blades in the low-pressure turbine (A): the tips of the moving blades in the shroud section from stages 9 through 11; the moisture exclusion blades from stages 12 through 14; and the base of the moving blades in stage 9. The marks, up to 6 mm in length, are thought to have been caused by contact with fixed blades. The fixed blades also show evidence of abrasion marks consistent with contact, measuring up to 5 mm in length. These will be repaired and the high-pressure turbine will also be inspected.
	November 29 2007	Internal turbine inspection at No. 7 unit	During internal inspection of the No. 7 unit turbines, abrasion marks of up to 3 mm in length were identified on the following blades in the low-pressure turbine (A): the tips of the moving blades in the shroud section from stages 10 through 12; the moisture exclusion blades in stages 12 and 13; and the base of the moving blades in stages 10 through 13. The fixed blades also show evidence of abrasion marks consistent with contact of up to 4.5 mm in length. These will be repaired as necessary.

2) Other

- No. 6 reactor: removal of fuel completed November 26
- No. 6 reactor: the two recalcitrant control rods were successfully extracted by 3 pm on November 27, using the procedure described above that was especially formulated in response to the problem. The cause of the problem will be investigated, as previously notified on November 27.
- No. 1 reactor: inspection of leakage in the main exhaust duct associated with installation of additional operating standards for the ventilation and heating/cooling systems found no abnormalities (completed November 28).

Thursday 29 November

TEPCO Press Release: Internal inspection of No. 3 unit turbine

The turbine cover of the low-pressure turbine (A) in the No. 3 unit was opened on November 21 and an internal inspection of the turbine was performed.

At 10:20 a.m. on November 28, abrasion marks were identified on the tips of the moving blades in the shroud* section from stages 9 through 11; the moisture exclusion blades** from stages 12 through 14; and the base of the moving blades in stage 9. The abrasion marks, up to 6 mm in length, are thought to have been caused by contact with fixed blades. The fixed blades also show evidence of abrasion marks consistent with contact, measuring up to 5 mm in length.

The areas of contact between the fixed and moving blades will be repaired and the high-pressure turbine will also be inspected.

Evidence of contact between fixed and moving blades was also discovered in similar locations on the No. 4 unit, which was inspected first, with the size of the abrasion and contact marks being roughly similar.

* Shroud — a fixed covering over the outer tips of the moving turbine blades designed to boost the steam power generation efficiency.

** Moisture exclusion blades — the fixed and moving turbine blades are arranged in bilateral symmetry. The No. 3 unit has low-pressure turbines from stages 9 through 17 (the high-pressure turbine are from stages 1 through 8), of which the moving blades in stages 12 through 16 are moisture exclusion blades. The moisture exclusion blades employ centrifugal force from the groove etched into the moving blade steam inlet to eliminate moisture in the steam that drives the main turbine, which builds up when the steam loses temperature and pressure as it passes through successive turbine stages. The moisture exclusion blades protrude further into the steam inlet side than the shroud for this reason.

TEPCO Press Release: Internal inspection of No. 7 unit turbine

The turbine cover was removed from the low-pressure (A) turbine at the No. 7 reactor on November 23 and an internal inspection was conducted.

On November 29, the inspection revealed abrasion marks of up to 3 mm in length on the tips of the moving blades in the shroud* section from stages 10 through 12; the moisture exclusion blades** in stage 13; and the base of the moving blades in stages 10 through 13. The abrasion marks are thought to be the result of contact with the fixed blades. The fixed blades also showed evidence of abrasion marks consistent with contact, measuring up to 4.5 mm in length.

The locations of contact between fixed and moving blades will be repaired as necessary.

Evidence of contact between fixed and moving blades was also discovered in similar locations on the Nos. 3 and 4 units, which were inspected first, with the size of the abrasion and contact marks being roughly similar.

* Shroud — a fixed covering over the outer tips of the moving turbine blades designed to boost the steam power generation efficiency.

** Moisture exclusion blades — the fixed and moving turbine blades are arranged in bilateral symmetry. The No. 7 unit has low-pressure turbines from stages 10 through 16 (the high-pressure turbines are from stages 1 through 9), of which the moving blades in stages 12 through 16 are moisture exclusion blades. The moisture exclusion blades employ centrifugal force from the groove etched into the moving blade steam inlet to eliminate moisture in the steam that drives the main turbine, which builds up when the steam loses temperature and pressure as it passes through successive turbine stages. The moisture exclusion blades protrude further into the steam inlet side than the shroud for this reason.

TEPCO Press Release: Internal inspection of No. 5 reactor

Internal inspection (Phase 1 and 2) of the No. 5 reactor commenced on November 22. On November 29, it was discovered that the wedge that has been stuck on top of the inlet mixer of the No. 1 jet pump (which is one of 20 jet pumps) in order to reduce vibration during operation, had been dislodged.

The jet pump inlet mixer is securely attached to the riser tube by means of a high fixed beam, and cannot be detached. The dislodged wedge poses no danger.

The No. 5 reactor was undergoing regular inspection at the time of the earthquake and was not operational.

The other 19 jet pumps will be inspected.

The inspection results will be collated and released once all the jet pumps have been properly inspected.