Regarding Actions Based on the Results of Analysis of Seismic Data Observed at Onagawa Nuclear Power Station at the Time of the Earthquake off the Coast of Miyagi Prefecture on April 7, 2011.

The result of analysis of seismic data observed at Onagawa Nuclear Power Station (NPS) at the time of the earthquake off the coast of Miyagi Prefecture on April 7, 2011 was reported to Nuclear and Industrial Safety Agency (NISA) by Tohoku Electric Power Co. Inc. (Tohoku Electric) on April 25, 2011. In light of the content of the report, NISA directed Tohoku Electric to make “plans regarding inspection/evaluation” concerning the validity assessment of integrity evaluations of buildings/structures, to implement detailed evaluations of factors why the earthquake was larger than the expected seismic motion and then to report the results.

1. Tohoku Electric submitted a report on the results of analysis of seismic data observed at Onagawa NPS at the time of the earthquake off the coast of Miyagi Prefecture on April 7, 2011 (hereinafter referred to as “the Earthquake”), which was occurred at 23:32 on April 7, 2011.

2. According to the report, the acceleration values calculated from the standard seismic ground motion $S_s$ developed in reference to the seismic response analysis of reactor buildings was observed to exceed its maximum value in the vertical direction at the rooftops of Unit 2 and 3, and the 3rd floor of Unit 3.

   In addition, the response spectra of seismic data observed at the equivalent position of base stratum exceeded the standard seismic ground motion $S_s$ in some periodic bands though mostly equivalent to or below the standard $S_s$.

   In contrast with 476.3 Gal of the maximum acceleration in the vertical direction observed by the seismograph for safety confirmation * installed on the base mat of Unit 1, 381 Gal of the maximum acceleration was observed by a seismograph installed on the base mats
in other locations.

3. In light of the above-mentioned analyses by Tohoku Electric concerning the Earthquake, NISA has judged that safety of facilities that are important to seismic safety and have been affected by a series of earthquakes needs to be confirmed.

As to Tohoku Electric, NISA has already directed in writing to submit a report on a detailed evaluation using seismic response analysis. In addition, NISA has issued a direction effective yesterday to make “plans regarding inspection/evaluation” concerning the integrity evaluation of buildings/structures by the end of May and to perform evaluations in detail on factors why the Earthquake exceeded the estimated seismic motion by the end of July.

*It indicates the maximum acceleration value immediately after the earthquake and is employed as an aim for inspection and prompt announcement. It is installed in the 2nd basement floor of the reactor building of Unit 1 of Onagawa NPS.

Attachment 1: Report regarding the analysis of seismic data observed at Onagawa NPS at the time of the earthquake off the Coast of Miyagi Prefecture on April 7, 2011. (Abstract) (Tohoku Electric Power Co’s web page in Japanese)

Attachment 2: Regarding actions based on the results of analysis of seismic data observed at Onagawa Nuclear Power Station at the time of the Earthquake off the Coast of Miyagi Prefecture on April 7, 2011. (Directions)
Regarding Actions Based on the Results of Analysis of Seismic Data
Observed at Onagawa Nuclear Power Station at the time of the Earthquake
off the Coast of Miyagi Prefecture on April 7, 2011 (Directions)

A report on analysis of the seismic data observed at the time of the earthquake off the coast of Miyagi Prefecture on April 7, 2011 (hereinafter referred to as “the Earthquake”), which occurred at 23:32 on April 7, 2011, was submitted by your company on April 25, 2011.

According to the report, the acceleration values calculated from the standard seismic ground motion $S_s$ developed in reference to the seismic response analysis of reactor buildings was observed to exceed its maximum value in the vertical direction at the rooftops of Unit 2 and 3, and the 3rd floor of Unit 3.

In addition, the response spectra of seismic data observed at the equivalent position of base stratum exceeded the standard seismic ground motion $S_s$ in the horizontal direction in certain periodic bands. Although the response spectra of the observed seismic data of every reactor building of all units exceeded the seismic response analysis by the standard seismic ground motion $S_s$ in some periodic bands, it mostly marked equivalent to or below the standard seismic motion $S_s$.

The maximum acceleration (476.3 Gal) in the vertical direction observed on the seismograph for safety confirmation * installed on the base mate of
Unit 1 is specifically higher compared to those observed on seismographs installed on the base mats in other locations. (Maximum observed was 381Gal)

In light of the above-mentioned analyses by your company concerning the Earthquake, Nuclear and Industrial Safety Agency (hereinafter referred to as NISA) has judged that safety of facilities which have been affected by the Earthquake needs to be verified in order to ascertain the integrity of facilities that are important to seismic safety of Onagawa NPS.

In addition to 04.08.2011 Nuclear Number 4 issued by NISA on April 13, 2011, which directed your company to submit a report of detailed evaluation using seismic response analysis on the facilities that are important to seismic safety and affected by the Earthquake, the following item 1 and items 2 and 3, concerning the Earthquake, shall be reported to NISA by the end of May and July, 2011 respectively.

Required items

1. In order to ascertain the validity of integrity evaluation of buildings/structures implemented by your company regarding the impacts on Onagawa NPS by the Earthquake and the 2011 Tohoku District - Off the Pacific Ocean Earthquake, “plans regarding inspection/evaluation” for each Unit from Units 1 to 3 shall be made based on the ideas on the attached sheet.

2. Results of detailed evaluation of analysis of factors why the Earthquake was larger than the expected seismic motion. (especially the response spectra of the observed seismic data exceeded the standard seismic ground motion Ss at the equivalent position of base stratum in the horizontal direction in some periodic bands)

3. Results of detailed evaluation of causes of the difference observed between the observed data of seismograph for safety confirmation installed on the base mat of Unit 1 of the NPS and seismograph for building observation.
1. Making plans regarding inspection evaluation

“Plans regarding inspection/evaluation” shall be made for each Unit from Units 1 to 3 of Onagawa NPS of Tohoku Electric.

2. Subjects of inspection/evaluation

Buildings/structures subject to inspection/evaluation for each Unit are as follows:

① Buildings and structures specified on the construction projects of electricity facilities for business use pursuant to the Electricity Business Act

② Buildings and structures that fall under the indirectly supporting structure of facilities that have seismic importance

③ Buildings and structures that fall under the safety importance classification 1

3. Method of inspection/evaluation

(1) Method of evaluation

① Inspection and seismic response analysis shall be implemented on buildings and structures important to seismic safety and their integrity shall be evaluated based on the results.

② The integrity of buildings and structures other than the above-mentioned shall be evaluated based on the results of inspection, etc.

(2) Method of inspection

① Estimated impacts from an occurrence of earthquake shall be determined by structural style of the subjected buildings and structures and reflect them on the method of inspection.

② In case the integrity of the subject is not sufficiently verified by visual inspection, the implementation of non-destructive testing, etc. shall be appropriately discussed.

③ When inspection is difficult from the perspective of reducing exposure of workers and personal safety, a rational evaluation method shall be drawn up using the results of inspection and analysis of structurally similar parts as necessary.
(3) Method of analysis
   ① Damage expected from an occurrence of earthquake shall be analyzed and reflected on the method of analysis.
   ② With regards to the seismic response analysis, analysis model shall be developed based on the observed seismic motion so that earthquake observation record coordinates with the analysis.

(4) Others
   ① It is allowed to narrow down inspection items and analyzing subjects, etc. by picking the representative buildings and structures, etc. In that case, ideas behind the process shall be clarified.

4. System of inspection/evaluation etc.
   ① Inspectors who have the appropriate ability to complete the task shall be appointed.
   ② It shall be noted that objectivity and transparency need to be preserved through inspection and evaluation.
   ③ Record of inspection results shall be produced and appropriately stored and managed.
1. Drawing up plans for inspection evaluation
   As for plans, drawing up one for each Unit is appropriate considering that every Unit operates under a different state and has different building/structural design.

2. Subjects of inspection/evaluation
   Fundamentally, the NPS operator shall inspect/evaluate all the buildings/structures on the NPS premises.

3. Methods of inspection/evaluation
   As to inspection/evaluation, an appropriate and rational method shall be employed depending on its significance. In accordance with “Regulatory Guide for Reviewing Classification of Importance of Safety Functions for Light Water Nuclear Power Reactor Facilities” and “Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities,” not only the buildings and structures that specifically fall under the classification of importance 1 and the category of indirectly supporting structures of facilities of seismic importance shall be inspected but also have seismic response analysis from the perspective of intensively confirming the integrity.
   In inspection/analysis, appropriate inspection and analysis methods corresponding to the form of damage shall be taken due to the fact that estimated form of damage corresponding to buildings and structures caused by earthquake differs.

4. Inspection/evaluation system
   As for inspection and analysis, it is important that inspectors have the ability to accurately complete the task. It is also important to preserve subjectivity and transparency so that the results can be ascertained ex-post facto and that the record is stored and managed appropriately.