

## International Contributions of JNES on Seismic Safety Areas

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**Abstract.** JNES actively promotes the international cooperation in seismic safety areas, aiming to play a role as the important international hub for it. To meet this purpose, JNES is now mainly focusing on the increased support of the international organizations including IAEA and the technological improvement in the seismic related assessment of Asian countries. This paper summarizes these efforts made by JNES.

### 1. Introduction

The interests those are extremely high from the foreign countries are seismic safety evaluation technology and information gotten from back check to the revised seismic reviewing guide and the safety evaluation of Kashiwazaki-Kariwa NPPs that experienced July 2008 Niigata-ken Chuetsu-oki Earthquake which exceeded design basis earthquake.

In addition, Japan experienced many tsunamis, such as March 2010 Chilean Tsunami and has advanced evaluation technologies based on observed phenomena.

There are considerable countries in Southeast Asia, Near and Middle East, and South America where the construction of the nuclear power plant is planned in or near the plate boundary areas like Japan. Requirement to improve evaluation technology and to develop standards in these countries are high. We think Japan have responsibility to share and disseminate such information and technology.

Under environment described above, as a Japanese TSO, JNES is implementing supporting works for IAEA and OECD, bilateral cooperation with foreign organizations such as USNRC providing latest seismic information and technologies in Japan.

JNES think shearing of information and technologies will contribute not only to improve safety of NPPs of the world but also improve JNES's abilities.

Here, international activities of JNES related to seismic/tsunami safety evaluation are described.

### 2. Outline of international collaboration in seismic safety area by JNES

The international activities which JNES is focusing on are :

- (1) Contribution to the seismic safety improvement of NPPs of the world through lessons learned through Kashiwazaki experiences, and dissemination of the latest evaluation technology,
- (2) Mutual improvement of seismic safety evaluation technology through the cooperation with international organizations such as IAEA, OECD and USNRC
- (3) Contribution to the developing countries through bilateral cooperation or training seminars of seismic/tsunami evaluation
- (4) To foster human resources involved seismic safety through (1) to (3)

Table-1 shows major international activities of JNES in seismic related areas and the outline of

major activities is discussed in next section.

Table-1 Major activities of JNES in seismic area

Implementing items		FY2009	2010	2011	2012
Contribution to international organizations	IAEA	Tsunami EBP (Dissemination of evaluation code and info. system)	▼ Final steering comm.. ▲ Workshop		
		New EBP	▼ New seismic EBP steering comm.. ▲ Establishment of ISSC		
		Development of safety standard (Seismic hazard, Flooding Volcano etc.)	▼ Improvement of DS422(Seis. Hazard)		
	OECD/NEA/IAGE (Seismic experience, Seismic test and Back check information)	▼ Info. exchange annual mtg ▼ Participation to bench mark study	▼	▼	▼
Bilateral cooperation	USNRC (RES and NRR)	▼ Annual info. exchange mtg	▲	▲	▲
	France, Germany, Taiwan and others	▼ GRS mtg. ▼ IRSN mtg. ▼ NUSTA mtg	▲	▲	▲
Support for developing countries (Taiwan, China, India, Pakistan, Indonesia, Vietnam and others)			▼ Seismic training seminar		
Dissemination of information of seismic safety evaluation		Seis. WS at Taiwan, IAEA WS at Kasshiwazaki, RIC2010, IAEA symposium, JNES symposium, ITER WS etc			

### 3. Outline of the main international collaboration items

Outlines about major international collaborations that JNES is carrying out are described in this section.

#### 3.1 Cooperation to the IAEA tsunami extrabudgetary program (EBP)

This project was carried out to disseminate (1)disaster mitigation information system around NPP site, and (2)tsunami hazard evaluation technology by IAEA from April, 2007 to March, 2010. This project was carried out with enthusiastic support of JNES, who provide tsunami analysis cords, and tsunami disaster mitigation information system (TiPEEZ) and personnel to instruct the usage.

Participating nations of this EBP is shown in fig. - 1.



Fig.-1 Participating countries in IAEA tsunami extrabudgetary program

This project was completed in March, 2010 through the process shown in Table-2.

Table-2 Implementing Process of Tsunami EBP

Fiscal year	Disaster mitigation system (TIPEEZ)	Methodology and evaluation code of tsunami
FY2007	Dec., 2007 : Kick off meeting in Tokyo	
	Modification of the system	Feb., 2008 : Provision of analysis code to IAEA
FY2008	Jun.,2008 : First steering mtg. at Korea	
	Preparation sample map topo.	Jun.,2008 : First seminar and WS at Korea
	Mar.,2009 : Second steering mtg. at Turkey	
	Mar.,2009 : Provision topo editor and sample topo data to India and Korea	Mar., 2009:Second seminar and WS at Turkey
FY2009	April-May,2009 : Training to India and Korea Nov.,2009: Consulting to India	Support and guide to use analysis code to India and Korea
	Feb.,2010:Support of emergency training to India	Co-organization of external flooding ES in India with IAEA and others
	Mar.,2010 : Wrap up mtg. at Tokyo	

In the wrap up meeting, it was reported by IAEA and participating countries that all mandates were completed and big result has been gotten.

### 3.2 Support for IAEA's new EBP

Following successful tsunami EBP, IAEA is planning a new seismic EBP aiming improvement of seismic safety evaluation, and JNES is going to support it with all effort.

The technical items where JNES can contribute in this are as follows.

- Seismic hazard evaluation to the earthquakes with no source definition
- Improvement of wave propagation evaluation method through deep ground motion observation project
- Methodology of seismic risk evaluation as plant level
- Development of the standard for seismic isolation application
- Methodology of seismic risk evaluation for multi-plant site
- Continuous improvement of the tsunami evaluation technology
- International shear of the knowledge gotten from Kashiwazaki experience etc.

### 3.3 Cooperation with Working Group on Integrity and Ageing of Components and Structures (IAGE WG) of OECD/NEA

JNES has been providing information about back-check and kashiwazaki evaluation, seismic tests and earthquake experience of NPPs in Japan continuously to the Seismic subgroup. Furthermore, JNES is proposing to host an OECD workshop on ground motion evaluation utilizing the output of JNES project "Ground motion observation in very deep underground" which was started in April, 2010.

As for the Concrete subgroup, information of aging plant evaluation was presented.

JNES is also participating in the benchmark project of seismic response evaluation of eccentric structure.

### **3.4 Support for Asian countries to improve seismic safety**

JNES held a training seminar aiming for mutual improvement of seismic/tsunami safety evaluation of Asian countries in February, 2010 in Tokyo. Twenty five persons from China, Indonesia, Thai, Philippine, Vietnam and Malaysia were participated in this two weeks seminar. In the seminar, JNES explained latest knowledge gotten from kashiwazaki and back check evaluations including tsunami evaluation. Trainings of seismic response analysis and the tsunami analysis, tours to the earthquake observation network facility and the fault preservation museum which appeared on ground surface in past big earthquake also implemented in the seminar.

JNES is aiming to hold this seminar once every two years continuously.

### **3.5 Information exchange and cooperation with USNRC**

JNES has been continuing information exchange and cooperation for long time with the Office of Nuclear Regulatory Research of USNRC, and recently began same kind cooperation with the Office of New Reactors.

For information exchange items carrying out currently are fragility tests information, seismic margin evaluation, knowledge from back-check and kasiwazaki evaluation, and seismic isolation.

## **4. Conclusion**

The information of back-check to the revised seismic design reviewing guide and Kashiwazaki evaluation for the Niigata Chuetsu-oki earthquake gathered great interest from the world, and information from JNES has been increased the importance.

Interest of the world for tsunami evaluation is also increased after Indian Ocean tsunami. Dissemination of these technology and development of evaluation standards are big interest matters of IAEA's next EBP.

JNES think that JNES's contribution to such an international activity is essential to improve seismic safety of the world NPPs. JNES is planning to promote cooperation through the international organization or bilateral cooperation.

The projects described here are required to be implemented not only in short term but also in long term, and it requires fostering of human resources. JNES will positively address on these issues, and accomplish international contributions.