Tsunami Research Status in IAEA after Fukushima Event

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1. Introduction

On March 11th, 2011, a tremendous earthquake and tsunami occurred on the east coast of Japan. This 9.0 magnitude earthquake was the fifth greatest earthquake ever experienced on the planet. The most remarkable problem was that the Fukishima NPP sites. After Japan earthquake, many international researches about tsunami and earthquake event were started or revised. Especially, the most remarkable point of the great earthquake in east coast of Japan was tsunami event. Before this earthquake, the Niigata earthquake occurred in 2007 and the Kashiwazaki Kariwa nuclear power plant had little damaged. The research about the safety of nuclear power plant against earthquake events was activated by 2007 Niigata earthquake. However, the researches about a tsunami event were very few and only tsunami simulation was only focused. After the Fukushima accident, the international society became very interested in tsunami event as a major external event. Therefore in this study, the tsunami research status in IAEA after Fukushima event and the role of Korea are introduced.

2. The Whole Framework of IAEA ISSC

The ISSC(International Seismic safety Center) has been established within the IAEA Department of Nuclear Safety and Security as a global focal point on seismic safety for nuclear installations worldwide, including an integrated treatment of external events affecting those installations at the end on 2008. The motive of the establishment of ISSC was the 2007 Niigata earthquake in Japan. The background of the ISSC is as below; Seismic safety of nuclear installations is a subject that has received substantial attention at the IAEA within the frame of its statutory functions, and of the corresponding programmatic projects, for establishing safety standards and assisting member states for its application[1].

The objectives of ISSC are as below;

1. Enhance seismic safety of nuclear installations – new and existing- in Member States;
2. Help in the development, revision and improvement of related safety standards;
3. Pool expert knowledge and assist nuclear operators and regulators in the aftermath of major seismic events;
4. Promote knowledge sharing among the international nuclear community.

The structure of ISSC are summarized in Figure 1.

Figure 1. The structure of ISSC

3. Tsunami Hazard Researches in IAEA

ISSC developed EBP working area about seismic and tsunami. All working area of ISSC EBP categorized as 10 working area (WA) as below. Also, each working areas were subdivided as 17 sub working group as shown in figure 2. As shown in figure 2, tsunami hazards were considered as WA5 in ISSC EBP.

WA1: Seismic Hazards
WA2: Seismic Design and Qualification
WA3: Seismic Safety Evaluation
WA4: External Events Preparedness and Response
WA5: Tsunami Hazards
WA6: Volcanic Hazards
WA7: Engineering Aspects of Protection against Sabotage
WA8: Site Evaluation and External Events Safety Assessment
WA9: Information and Notification System
WA10: Public Communication, Dissemination of Lessons Learned and Capacity Building

Work Area	Working Group	Leader
WA1	WG1-1	JNES & USNRC
	WG1-2	JNES
	WG1-3	JNES
	WG1-4	JNES
	WG1-5	USNRC
	WG1-6	ISPRA
WA2	WG2-1	EDF
WA3	WG3-1	USNRC
	WG3-2	JNES & USNRC & CEA
WA4	WG4-1	TEPCO
WA5	WG5-1	JNES & USNRC
	WG5-2	JNES
WA6	WG6-1	USNRC
WA7	WG7-1	CNSC
WA8	WG8-1	USNRC
WA9	WG9-1	USNRC & JNES
WA10	WG10-1	JNES & ITER
10 Areas	17 Working Groups	

Figure 2. summary of Implementation Framework

The WA5 tsunami hazards researches are constructed 3 major tasks. The title of each task and contents are summarized as below;

Task 5.1: Development of detail guidance for tsunami hazard assessment:
Subtask 5.1.1: River run-up, debris and sedimentation
Subtask 5.1.2: Volcano-induced tsunamis
Subtask 5.1.3: Landslide-induced tsunamis
Subtask 5.1.4: Safety report on tsunami hazard assessment
Subtask 5.1.5: TECDOC on case study of tsunami hazard assessment program
Task 5.2: Development of detail guidance on probabilistic tsunami hazard assessment
Task 5.3: Assist in the application of TiPEEZ software:
Subtask 5.3.1: Safety report on emergency preparedness
Subtask 5.3.2: Application of TIPEEZ system to MSs (e.g. Chile)

Basically, the leaders of WA5 are decided as JNES and USNRC. And some member states participate in each interested Task/Subtask. The framework of WA5 is shown in figure 3 and figure 4[2].

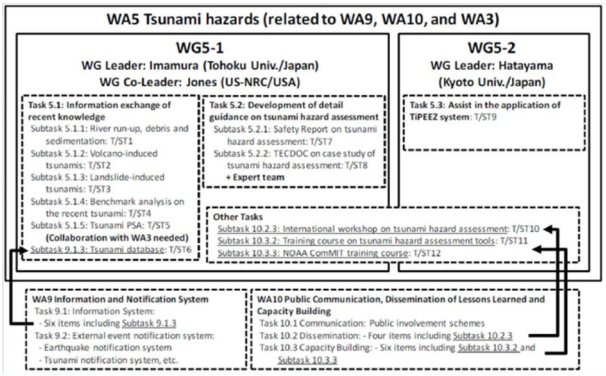

Figure 3. The framework of WA5

WG	T/ST	WA	Task	Subtask
WG5-1	T/ST1	Tsunami hazard (WA5)	Task 5.1: Information exchange of recent knowledge	Subtask 5.1.1: River run-up, debris and sedimentation
	T/ST2			Subtask 5.1.2: Volcano-induced tsunamis
	T/ST3			Subtask 5.1.3: Landslide-induced tsunamis
	T/ST4			Subtask 5.1.4: Benchmark analysis on the recent tsunami
	T/ST5			Subtask 5.1.5: Tsunami Probabilistic Safety Assessment
	T/ST7		Task 5.2: Development of detail guidance on tsunami hazard assessment	Subtask 5.2.1: Safety Report on tsunami hazard assessment
	T/ST8			Subtask 5.2.2: TECDOC on case study of tsunami hazard assessment
	T/ST6	Information and Notification System (WA9)	Task 9.1: Information System	Subtask 9.1.3: Tsunami database
WG5-2	T/ST9	Tsunami hazard (WA5)	Task 5.3: Assist in the application of TiPEEZ system	
WG5-1 and WG5-2	T/ST10	Public Communication, Dissemination of Lessons Learned and Capacity Building (WA10)	Task 10.2: Dissemination	Subtask 10.2.3: International workshop on tsunami hazard assessment
	T/ST11		Task 10.3: Capacity Building	Subtask 10.3.2: Training course on tsunami hazard assessment tools
	T/ST12			Subtask 10.3.3: NOAA ComMIT training course

Figure 4. Covered Tasks/Subtasks of WG5-1 and WG5-2

4. Role of Korea in Tsunami Hazard Researches

As shown in figure 4, WA5 tsunami hazards part are divided as 12 T/ST. KAERI participated in T/ST5 as a co-leader and T/ST1, T/ST7, T/ST8 and T/ST9 as a member.

KAERI participated in T/ST5 as a co-leader, performing a develop tsunami PSA procedure and methodology.

KAERI participated in T/ST1 as a member and perform provision of research results especially debris caused by tsunami. And also, KAERI participated in T/ST7, T/ST8 and T/ST9 as a member, for discussion and review of the results.

KAERI presented 'A Status of Tsunami PSA Research in Korea' at the kick-off meeting of WG5-1 and WG5-2 at Austria in July 2011 and 'Outcomes of Tsunami Probabilistic Safety Assessment (T/ST5)' at the first meeting of WG5-1 and WG5-2 in November 2011. During the presentation, KAERI introduced that tsunami hazard analysis method, tsunami fragility method and tsunami system analysis procedures and an application of real NPP site. In the case of tsunami hazard analysis, KAERI presented empirical method for assessment of tsunami hazard curve. In the case of tsunami fragility analysis, KAERI introduced evaluation method for tsunami fragility and sample calculation results for target NPP structures and equipment. In the case of system analysis, tsunami run-up and draw down were considered for core damage frequency[3,4].

5. Conclusions

In this study, the tsunami hazards researches after 11 March 2011, the great earthquake in Japan in IAEA are introduced. Before the Fukushima event, tsunami was one of imaginary external event, but after the Fukushima accident, tsunami became a major extreme initiating event. Therefore IAEA develop an international research framework for tsunami hazards assessment and perform an international collaboration research. Also, KAERI participates as a major role of tsunami hazards research area.

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