



International Symposium on

Earthquake, Tsunami and Nuclear Risks
after the accident of TEPCO's Fukushima
Daiichi Nuclear Power Stations

東京電力 福島第一原子力発電所事故後の
地震・津波と原子力リスク

30 October 2014

The Shiran Hall, Kyoto University

KUR Research Program for Scientific
Basis of Nuclear Safety

**Programme
&
Abstracts**

Preface

The nuclear accident at the TEPCO's Fukushima Daiichi Nuclear Power Stations in March 2011, which followed an earthquake and a tsunami, brought serious impacts on society. This accident inevitably underlined the necessity of establishing new and comprehensive scientific research for promoting nuclear safety. Facing this situation, the Kyoto University Research Reactor Institute (KURRI) developed a new research program called the "KUR Research Program for Scientific Basis of Nuclear Safety" from 2012. In this program, it is planned to hold an annual series of international symposia along with identified research activities for promoting nuclear safety.

The first in the series of symposium, entitled "The International Symposium on Environmental monitoring and dose estimation of residents after accident of TEPCO's Fukushima Daiichi Nuclear Power Stations" was held on December 14, 2012, dealing with the radiological effect of the accident on the public. The purpose of the symposium was to collate data on environmental radioactivity and the radiation dose on residents, to discuss and verify the data, and to clarify the actual situation of environmental contamination and resultant radiation exposed to residents.

The second in the series of symposium, entitled "International Symposium on Nuclear Back-end Issues and the Role of Nuclear Transmutation Technology after the accident of TEPCO's Fukushima Daiichi Nuclear Power Stations" was held on November 28, 2013. It is thus needed to address the current status of the back-end issues and to discuss the future direction of research and development on radioactive waste treatment and disposal.

This third symposium in this series deals with Earthquake, Tsunami and Nuclear Risks after the accident of TEPCO's Fukushima Daiichi Nuclear Power Stations. Safe regulation is performed by the basis of the deterministic approach which aimed at absolute safety, such as requirement of dry site for tsunami and prohibition of installation of especially important facilities on the outcrop of the active fault. Since many uncertainties exist in natural phenomena, such as an earthquake and tsunami, a risk concept to the seismic motion and tsunami beyond design-basis is indispensable. We believe that the social decision making by the people based on an earthquake risk is important.

This symposium will deal with the uncertainties in the safety evaluation and PRA of the earthquake and tsunami, fault displacement hazard evaluation, risk in a nuclear system and risk communication, etc.

Approximately 9 invited lectures and 19 scientific papers will be presented in the symposium. Almost all the presentations have been written as original scientific papers, peer reviewed by specialists of the relevant research fields. On behalf of all the participants of the symposium, I sincerely hope that this symposium will contribute to the reduction of public anxiety and will promote further progress in the research on nuclear safety.

Hirotake Moriyama

Director, Kyoto University Research Reactor Institute
Chair of the organizing committee

Host Organization

Kyoto University Research Reactor Institute (KURRI)

Support organization

Atomic Energy Society of Japan

Organizing Committee

Chair: Prof. Hirotake Moriyama (Director, KURRI)

Dr. Katsumi Ebisawa (CRIEPI and Visiting Professor of Tokyo City University)

Prof. Akira Yamaguchi (Osaka University)

Prof. Katsuhiko Kamae (KURRI)

Prof. Sentaro Takahashi (KURRI)

Prof. Ken Nakajima (KURRI)

Prof. Hajimu Yamama (KURRI)

International Advisor

Prof. Hajimu Yamana (KURRI)

Program Committee

Chair: Prof. Katsuhiko Kamae (KURRI)

Prof. Tomotaka Iwata (DPRI, Kyoto University)

Dr. Katsumi Ebisawa (CRIEPI and Visiting Professor of Tokyo City University)

Prof. Michihiro Ohori (University of Fukui)

Prof. Takashi Kumamoto (Okayama University)

Prof. Hideaki Goto (Hiroshima University)

Prof. Tsuyoshi Takada (University of Tokyo)

Prof. Taketoshi Taniguchi (UTokyo Policy Alternatives Research Institute)

Prof. Satoshi Fujita (Tokyo Denki University)

Prof. Nobuhisa Matsuta (Okayama University)

Prof. Hiroshi Miyano (Hosei University)

Prof. Ken Muramatsu (Tokyo City University)

Conference Secretariat

Chair: Prof. Hirotoshi Uebayashi (KURRI)

Prof. Hidenori Kawabe (KURRI)

Ms. Maki Nakatani (KURRI)

主催

京都大学原子炉実験所

後援

日本原子力学会

組織員会

委員長：森山 裕文（京都大学原子炉実験所）

蛭沢 勝三（電力中央研究所, 東京都市大学 客員教授）

山口 彰（大阪大学大学院）

釜江 克宏（京都大学原子炉実験所）

高橋 千太郎（京都大学原子炉実験所）

中島 健（京都大学原子炉実験所）

山名 元（京都大学原子炉実験所）

国際アドバイザー委員会

山名 元（京都大学原子炉実験所）

プログラム委員会

委員長：釜江 克宏（京都大学原子炉実験所）

岩田 知孝（京都大学防災研究所）

蛭沢 勝三（電力中央研究所, 東京都市大学 客員教授）

大堀 道広（福井大学 附属国際原子力工学研究所）

隈元 崇（岡山大学大学院）

後藤 秀昭（広島大学大学院）

高田 毅士（東京大学大学院）

谷口 武俊（東京大学 政策ビジョン研究センター）

藤田 聡（東京電機大学）

松多 信尚（岡山大学大学院）

宮野 廣（法政大学大学院）

村松 健（東京都市大学）

事務局

委員長：上林 宏敏（京都大学原子炉実験所）

川辺 秀憲（京都大学原子炉実験所）

仲谷 麻希（京都大学原子炉実験所）

Program

- 08:30-09:30 Registration, Poster Reception
- 09:30-09:45 Opening Remarks
- 09:45-10:30 **Nuclear Risk Management and Society**
Dr. Shunsuke Kondo (Nuclear Waste Management Organization of Japan (NUMO))
- 10:30-11:00 **Taxonomy and Evaluation of Uncertainties of Active Fault Datasets for Earthquake Source Fault Model**
Prof. Takashi Kumamoto (Okayama University)
- 11:00-11:30 **Design Basis Ground Motion Ss Required in New Regulation**
- **Evaluation of uncertainties in parameters for ground motion prediction** -
Prof. Katsuhiko Kamae (KURRI)
- 11:30-12:00 **External Hazards and Safety of Nuclear Facilities with System Safety through Design and Maintenance -**
Prof. Hiroshi Miyano (Hosei University)
- 12:00-14:00 Lunch and poster session
- 14:00-14:45 **PRA a Framework for Public Risk Communication**
Dr. Sujit Samaddar (IAEA, ISSC, Centre Head)
- 14:45-15:15 **Current Status of Nuclear Risk Evaluation against External Events including Seismic and Tsunami events**
Dr. Katsumi Ebisawa (Tokyo City University)
- 15:15-15:45 **Technology Governance for Nuclear Safety under External Events**
Prof. Hiroyuki Kameda
(Prof. Emeritus, Kyoto Univ. and Research Advisor Emeritus, CRIEPI)
- 15:45-16:15 Coffee break and poster session
- 16:15-16:45 **Lessons Learned from Deficit Analysis of Nuclear Risk Governance**
Prof. Taketoshi Taniguchi
(Policy Alternatives Research Institute, The University of Tokyo)
- 16:45-17:10 **Transparency and trust ~from the residents' perspective~**
Ms. Yoshiko Arano
(Community Association for Transparency at the Kashiwazaki Nuclear Power Plant)
- 17:10-17:45 Discussion
- 17:45-18:00 Closing Remarks
- 18:15-19:40 Reception

Program

- 08:30-09:30 受付開始
- 09:30-09:45 開会挨拶
- 09:45-10:30 原子力リスク管理と 社会
近藤 駿介（原子力発電環境整備機構 理事長）
- 10:30-11:00 震源断層モデル構築のための活断層データの不確実性の分類と評価
隈元 崇（岡山大学 大学院 准教授）
- 11:00-11:30 新規制基準で求められる基準地震動 S_s
-地震動評価における不確かさとその評価-
釜江 克宏（京都大学原子炉実験所 教授）
- 11:30-12:00 原子力発電設備の外的事象に対する安全確保
-システム安全による設計と維持-
宮野 廣（法政大学大学院 客員教授）
- 12:00-14:00 昼食、ポスターセッション
- 14:00-14:45 リスクコミュニケーションの為のPRA構造
Sujit Samaddar（IAEA国際耐震安全センター長）
- 14:45-15:15 地震、津波等外的事象に対する原子力リスクの現状
蛭沢 勝三（東京都市大学 客員教授）
- 15:15-15:45 外的事象に対する原子力安全の技術ガバナンス
亀田 弘行（京都大学名誉教授・電力中央研究所名誉研究アドバイザー）
- 15:45-16:15 ポスターセッション（コーヒードリンク）
- 16:15-16:45 原子力リスクガバナンスの欠陥分析からの教訓
谷口 武俊（東京大学 政策ビジョン研究センター 教授）
- 16:45-17:10 透明性と信頼 ～住民の視点から～
新野 良子（柏崎刈羽原子力発電所の透明性を確保する地域の会 会長）
- 17:10-17:45 質疑 及び総括
- 17:45-18:00 閉会挨拶
- 18:15-19:40 懇親会

Poster sessions

Topics 1 PRA with external hazard

- 1 Hidemasa YAMANO, Hiroyuki NISHINO, Kenichi KURISAKA, Yasushi OKANO, Takaaki SAKAI, Takahiro YAMAMOTO, Yoshihiro ISHIZUKA, Nobuo GESHI, Ryuta FURUKAWA, Futoshi NANAYAMA, Takashi TAKATA, and Emiko AZUMA
Development of PRA and margin assessment methodology of decay heat removal function against external hazards
- 2 Masato MIZOKAMI, Shuhei MATSUNAKA, Takashi UEMURA, Yoshihiro OYAMA, Yasunori YAMANAKA, Shinichi KAWAMURA
External Event PRA for Kashiwazaki-Karwiwa NPS Unit 7
- 3 Hiroyuki MIZUTANI, Shinya TANAKA, Shinichi KAWAMURA
Probabilistic Seismic Hazard Analysis for Kashiwazaki-Karwiwa NPS
- 4 Tomoyuki TANI, Ken YANAGISAWA, Tadashi ANNAKA, Makoto TAKAO, Shinichi KAWAMURA
Probabilistic Tsunami Hazard Analysis for Kashiwazaki-Karwiwa NPS
- 5 Hitoshi MUTA, Ken MURAMATSU, Tomoaki UCHIYAMA, Akemi NISHIDA, Tsuyoshi TAKADA
Development of a New Mathematical Framework for Seismic Probabilistic Risk Assessment for Nuclear Power Plants – Plan and Current Status

Topics 2 Fragility of nuclear facilities and equipments

- 1 Masakazu JIMBO, Kunihiko SATO, Tetsuo IMAOKA
Development of fragility estimation method for fatigue damage related to seismic isolation
- 2 Kenichi KAKU, Hiroshi WATANABE, Satoru SUZUKI
Confirmation of safety of the Japanese deep geological disposal project and efforts on public acceptance in light of the lessons learned from the Great East Japan Earthquake
- 3 Kazuo HIRATA, Masayuki HIGUCHI
Re-evaluations and countermeasures of earthquake and tsunami at Onagawa nuclear power station
- 4 Kohta JURAKU
Deficits of Japanese Nuclear Risk Governance as “Structural Disaster”

Topics 3 Active fault and seismic source modeling

- 1 Takashi KUMAMOTO, Hideaki GOTO Hideaki, and Takashi NAKATA
Examination of correlation between tectonic landforms and shallow sub-surface structural dataset for earthquake size estimation
- 2 Takashi KUMAMOTO, Masataka TSUKADA, and, Masatoshi FUJITA
Multivariate statistical analysis for seismotectonic zonation by the use of earthquake, active fault and crustal structure datasets
- 3 Hideaki GOTO
Detailed Topographic Anaglyph Images in and around Japan Island Produced from Digital Elevation Model
- 4 Nobuhisa MATTA, Masayuki MURASE, Cheng-Hong LIN, Wen-Shan CHEN, Naoji KOIZUMI
An episodic and continuous creep detected by levelling surveys along the central part of the Longitudinal Valley Fault, eastern Taiwan, in 2011-2014
- 5 Ken MIYAKOSHI, Kojiro IRIKURA, Katsuhiro KAMAE
Re-examination of scaling relationships between source fault length and seismic moment ($L-M_0$) of the inland crustal earthquakes in Japan based on the waveform inversion of strong motion data

Topics 4 Seismic motion

- 1 Toshimi SATOH, Atsushi OKAZAKI
Relation between stress drops and depths of strong motion generation areas based on previous broadband source models for crustal earthquakes in Japan
- 2 Michihiro OHORI
Simulation of Broadband Strong Motion based on the Empirical Green's Spatial Derivative Method
- 3 Kazuo DAN, Masanobu TOHDO, Atsuko OANA, Toru ISHII, Hiroyuki FUJIWARA, Nobuyuki MORIKAWA
Heterogeneous dynamic stress drops on asperities in inland earthquakes caused by very long faults and their application to the strong ground motion prediction
- 4 Osamu UCHIDA, Hiroto UEBAYASHI, and Katsuhiro KAMAE
Modeling of Spatial Variation of Seismic Motions in Hard Soil Based on Dense-Array Strong-Motion Observation Records

Topics 5 Risk and Society

- 1 Naoki YAMANO
A Community-based Risk Communication Approach on Low Dose Radiation Effect