

August 1, 2013

## **External review of survey on the shatter zones in the site of Tsuruga power station**

### 1. Purpose of the external review

Give a scientific assessment of survey and evaluation on the shatter zones in the site of Tsuruga Power Station by domestic and international experts.

### 2. External review organization

#### (1) Third-party Review Meeting (TRM)

TRM is organized by Scandpower, a member of the Lloyd's Register Group of Companies, head quartered in Norway.

#### (2) International Review Group (IRG)

IRG is a group of experts in geology led by Professor Neil Chapman of the University of Sheffield, who is an international expert in the field of geological waste disposal.

[Attachment 1]

### 3. Experts in attendance of today's briefing session

#### (1) TRM

- Mr. Woody Epstein (Scandpower, PSA),
- Professor Koji Okumura (Hiroshima University, Geology),
- Dr. Hirokazu Kato (The National Institute of Advanced Industrial Science and Technology (AIST), Geology),

#### (2) IRG

- Professor Neil Chapman, (University of Sheffield, UK, Environmental Geology)
- Dr. Kelvin Berryman (GNS Science, New Zealand, Geology)
- Dr. Pilar Villamor (GNS Science, New Zealand, Geology)

[Attachment 2]

### 4. Past Meetings and Investigations

March, 2013	TRM/IRG are commissioned by JAPC
3/29-30	TRM meeting and site survey

4/24	TRM/IRG joint expert meeting
5/20-21	TRM/IRG joint site survey, meeting, interim report, press conference
7/29	TRM/IRG joint site survey
7/30-31	TRM/IRG joint expert meeting, finalizing report
8/1	Briefing session

## 5. Outline of organization

### (1) TRM

Scandpower, which plays a coordinating role for TRM, is a risk management company in providing consulting services and software to the international market for oil companies, nuclear power entities, companies in the transport industries and so on.

In 1971, Scandpower was established at the urging of the then Norwegian Minister of Industry. The objective was to form an engineering company to target the growing nuclear power and petroleum industries.

For nuclear power business, Scandpower provides consulting services of wide range field to nuclear power entities and regulatory authorities based on the risk management, such as aging management, licensing renewal, human factor and probabilistic safety analysis. The probabilistic safety analysis software “RiskSpectrum” developed by Scandpower is used at many nuclear power plants.

From 2009, Scandpower became part of the Lloyd's Register Group. Nuclear division is based in Sweden.

### (2) IRG

Professor Chapman, who plays a coordinating role for IRG, is a geologist with 35 years experience in radioactive waste management, working for government agencies, implementing organizations and regulatory authorities worldwide.

IRG is an expert group of geologists led by Professor Neil Chapman which consists of Dr. Kelvin Berryman of GNS Science (NZ), Dr. Pilar Villamor, and others.

TRM/IRG joint expert meeting  
The Japan Atomic Power Company

### External review members

TRM (Third-party Review Meeting)

Name	Specialty	Organization/ Title
Mr. Woody Epstein	PSA	Senior Principal Consultant, Scandpower, Manager of Risk Consulting, Japan Visiting professor at the École polytechnique, Paris, 2013.
Dr. Koji Okumura	Geology	Professor, Department of Geography, Graduate School of Letters, Hiroshima University
Dr. Hirokazu Kato	Geology	Emeritus researcher, the National Institute of Advanced Industrial Science and Technology
Prof. Koji Okamoto	Nuclear Engineering	Professor, Nuclear Professional School Graduate School of Engineering, The University of Tokyo
Dr. Peter Yanev	Earthquake Engineering and Risk Management	Senior consultant, The World Bank Earthquake engineering and Risk management, Yanev Associates Council of Department of Civil and Environmental Engineering, University of California
Dr. Lloyd Cluff	Geology	Former researcher of PG&E (Diablo Canyon) Former associate professor, Department of geology and geophysics, University of Nevada

IRG (International Review Group)

Name	Specialty	Organization/ Title
Prof. Neil Chapman	Environmental Geology	MCM Consulting, Switzerland (Project Manager & Report Compiler) Professor of Environmental Geology, University of Sheffield, UK
Dr. Kelvin Berryman	Geology	GNS Science, New Zealand
Dr. Pilar Villamor	Geology	GNS Science, New Zealand
Dr. Aybars Gurpinar	Civil and Geological Engineering	Independent Consultant, Austria, Former member of IAEA
Dr. William Aspinall	Geology	Aspinall & Associates, UK
Mr. David Mallard	Civil engineering	D. Mallard Associates, UK
Dr. Mark Stirling	Geology	GNS Science, New Zealand

Experts in attendance of today's briefing session is marked by bold square

## Experts in attendance of today's briefing session

### Mr. Woody Epstein



- Specialty: Probabilistic Safety Analysis (mathematics of risk assessment, natural hazards, and Black Swan risks)
- Organization: Scandpower (Risk Management Company, member of the Lloyd's Register Group)
- Notes: Mr. Epstein was a member of NASA's Probabilistic Risk Assessment team after the Space Shuttle accident, safety analysis for Mitsubishi Aircraft, risk analysis for the Abandoned Chemical Weapons in China, risk analysis for more than 30 nuclear power units in Japan, the US, and Europe, and team member on the IAEA mission to Onagawa.

### Professor Koji Okumura



- Specialty: Geology, Earthquake and active fault studies, Tephrostratigraphy, Radiocarbon chronometry
- Organization: Professor, Department of Geography, Graduate School of Letters, Hiroshima University
- Notes: Prof. Okumura is a committee member, the Science Committee of the IAEA International Seismic Safety Center.  
Vice president of INQUA, International Union for Quaternary Research  
Associate member of the Science Council of Japan  
He was an expert member, Nuclear Safety Commission.  
He was an expert panel member, the Headquarters for Earthquake Research Promotion.

**Dr. Hirokazu Kato**



Specialty: Geology

Organization: Emeritus researcher, the National Institute of Advanced Industrial Science and Technology

Notes: Japan Society For Natural Disaster Science, International Award of Hazards 2000 (received in 2005),

Hanamaki City, Iwate Prefecture, 17th Miyazawa Kenji Award (received in 2007)

Analysis of geologic structures: Field analysis of faults and folds  
Development of a method of analyzing mechanics forming faults and folds using model tests

Elucidation of geology in the Tertiary and Quaternary Period, diastrophism and neotectonics of the northern Fossa Magna

Making geological maps at scales from 1/50,000 to 1/5,000,000

Research into the relationship between active faults/active folds and the occurrence of earthquakes using geology and an earth scientific method in Japan and abroad. Editing a number of neotectonic maps

Research into geological disasters (earthquakes, landslides and others), leading editorial plan for Eastern Asia geological hazards maps with international cooperation, and editing them.

Others: Participating in International Year of Planet Earth (IYPE) under the United Nations, geopark activity and geotourism, engaging in the popularization and enlightenment of geology. Geological research on Kenji Miyazawa.

## **Professor Neil A. Chapman**



**Specialty:** Geologist with 35 years experience in radioactive waste management, working for government agencies, implementing organisations and regulatory authorities worldwide.

**Organizations:** Partner in MCM Consulting (Switzerland) and part-time Research Professor in the Department of Materials Science and Engineering at the University of Sheffield, UK.

**Notes:** Member of the International Technical Advisory Committee for the Japanese implementing agency NUMO/Manages NUMO' s scientific programme on tectonic stability and repository siting. /Chief geosciences evaluator for Swedish and Finnish nuclear regulatory authorities (SSM and STUK) for the national spent fuel repository construction license applications. /Chairman of the Technical Advisory Panel for UK Nuclear Decommissioning Authority' s Radioactive Waste Management Directorate. Has worked on numerous international overview groups from the 1980s. Has written more than 180 papers and 8 books on radioactive waste management, including the one illustrated below.

## **Dr. Kelvin Berryman**



**Speciality:** Coastal neotectonics, Paleo-earthquake and fault behavior studies. Earthquake and tsunami hazard and risk assessment throughout New Zealand and in many circum-Pacific countries

Organization: GNS Science (Principal Scientist & Manager, Natural Hazards Research Platform)

GNS Science (NZ) is New Zealand's principal provider of scientific research and consultancy of geoscience (including natural hazards such as Earthquake, Landslide, Tsunami and Volcano).

Notes: Dr. Berryman has been an international expert member of International Tectonics Meeting (A meeting on developing methods for siting a high-level radioactive waste repository). He has about 30 years of experience in the fault studies of Japan, including invitations to international meetings on the Hyogoken nanbu earthquake and the Niigataken chuetsu-oki earthquake.

### **Dr. Pilar Villamor**



Specialty: Active faulting studies, interactions between faults and volcanoes, structural geology, and Seismic hazard assessment in New Zealand, Spain, and Central America.

Organization: GNS science (Senior Scientist & Manager, Active Landscapes Department)

GNS Science (NZ) is New Zealand's principal provider of scientific research and consultancy of geoscience (including natural hazards such as Earthquake, Landslide, Tsunami and Volcano).

Notes: Dr. Pilar Villamor has 21 of experience in active faulting studies. She has collaborated with the Spanish Nuclear Waste Commission. She has been an international expert member of International Tectonics Meeting (A meeting on developing methods for siting a high-level radioactive waste repository), and collaborates with the Geological Survey of Japan