

## WM2012 Conference Panel Report

### PANEL SESSION 3: Fukushima – Worldwide Perspectives on WM Issues

**Co-Chairs:** John Mathieson, *NDA (UK)*  
Larry Camper, *US NRC (USA)*

**Panel Reporter:** Simon Wisbey, *NDA (UK)*

#### **Panelists:**

1. Kazuhiro Suzuki, *Ministry of Economy, Trade and Industry, (Japan)*
2. Lisa Edwards, *Senior Program Manager, EPRI, (USA)*
3. Charles Miller, *Chair of the US NRC Task Force, US NRC, (USA)*
4. Ute Blohm-Hieber, *Head of the Nuclear Energy, Transport, Decommissioning & Waste Management Unit, DG for Energy, EU*
5. Irena Mele, *Head of Waste Technology Section, IAEA, (Austria)*

About 160 people attended this session, which focused on world-wide policy and program implications of the Fukushima event in March 2011. The panel session consisted of a series of short presentations, followed by a general discussion of key issues. Each of the speakers was invited to provide answers to each question – where appropriate, a summary of the overall answer is provided here rather than a verbatim account.

**John Mathieson** gave a short summary of events at Fukushima in March 2011, referring to the excellent description provided shortly before by Takao Fujie, at the plenary session. He noted in particular that national reaction around the world had been quite varied. In Germany and Switzerland, it is now policy to phase out nuclear energy, by 2022 in the former and by 2034 in the latter. Other national programs have been paused for review. John then invited the panel speakers to make their presentations.

**Kazuhiro Suzuki** explained that the focus in Japan is currently on restoration from the tsunami-induced events at Fukushima. He noted that at the time of the incident there were 1,500 fuel elements in the reactors and about 2,700 in the reactor cooling ponds. Since the incident work has progressed well so that Reactor 1 now has a weather-proof cover, and more than 31,000 m<sup>3</sup> of solid debris has been accumulated from the site. The volumes of water being treated on the site by ion exchange are very large. Cooling of the damaged reactors continues with daily use of about 600 m<sup>3</sup>, whereas groundwater is being intercepted and treated at a rate of about 500 m<sup>3</sup> per day. This has led to very substantial installed ion exchange capacity and a rapidly growing backlog of used IX resin.

**Lisa Edwards** summarized the EPRI support to TEPCO, conducted from Tokyo, following the incident. She highlighted several areas of evaluations and recommendations including chloride-induced cracking of stainless steel and seismic shutdown analysis. Concern about the corrosion cracking of stainless steel was due to the use of sea water for cooling in fuel storage ponds. The high temperature and high levels of chloride ion could result in cracking within relatively short exposure times. The seismic shutdown analysis was very similar in form to that conducted for Three Mile Island. She went on to note that EPRI are seeking to create a single database for dispersion of activity, to avoid multiple competing datasets.

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**Charles Miller** noted that following the incident the US NRC went into response mode, to ensure that any threat to the USA was properly understood. The creation of a Task Force, which he chaired, resulted in a number of recommendations, in particular that there is a need to:

- Evaluate and upgrade the suite of design-basis accidents,
- Extend station blackout mitigation capability,
- Upgrade the vent design for BWRs,
- Ensure that spent fuel pools have better instrumentation and make-up capability, and
- Provide on-site emergency response capabilities.

He noted that this was the first time that multi-unit impacts have been observed from a single initiating event – previously they had been believed to be essentially impossible. The Task Force concluded that there was no imminent threat to the US operation of BWRs, but that the regulatory framework should be enhanced for low probability/ high impact events.

**Ute Blohm-Hieber** noted that the European Union (currently 27 sovereign nations) also went into response mode, with the intention of ensuring safety through a risk assessment of the reactors operating in the EU. Within 3 days a set of ‘stress tests’ had been agreed, covering initiating events, loss of safety functions and severe accident management. The 27 Heads of State (plus non-EU Ukraine and Switzerland) had mandated the criteria and a plan of action before the end of March 2011 and a final report is due by June 2012. The European Nuclear Safety Regulators Group (ENSREG) is taking the lead, with adjacent nuclear countries (Armenia, Russia, Turkey and Croatia) all doing parallel work.

**Irena Mele** noted that an Emergency Centre had been set up by the IAEA and that a ministerial conference was held to develop an action plan for development and implementation. This was adopted by the Board of Governors and the General Assembly in September 2011, with the ultimate goal of strengthening nuclear safety worldwide. The Action Plan consisted of 12 major points. Expert missions were established in May 2011 to consider extreme natural hazards, and in January 2012 to address environmental remediation. The intention is now to share ‘lessons learned’, with plans to establish an IEM on decommissioning following accidents. Work is due to start on this in March 2012, to include a conference with a venue in Asia.

### Q&A

A female science writer (name not recorded) asked whether there were there any surprising conclusions from the analysis of the incident. Both **Charles Miller** and **Lisa Edwards** mentioned the effect of a single event on multiple units, which had previously been considered to be beyond the design basis. **Kazuhiro Suzuki** noted that the design and management of the Fukushima plant had met all relevant safety requirements and **Irena Mele** noted the large quantities of waste that are being generated.

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**John Raymont** (Kurion, Inc.) asked whether, given the nature of the rapidly evolving event, the decision-making sequence operated at an appropriate pace and led to correct decisions. In response, **Irena Mele** was concerned about the ability to obtain and communicate information quickly enough, whereas **Lisa Edwards** noted that the shipping of previously used equipment into Japan was slowed or even prevented by governmental agreements.

**Gordon Crawford** (EnergySolutions) questioned whether the choice of design basis was correct, given that the magnitude of the initiating earthquake was larger than the mitigating measures were designed to defend against. In response **Charles Miller** emphasized the need to review the science periodically, to take account of new understanding. He went on to state that the reactor design is now more than 30 years old, and that the location of key switchgear in a basement below the flood plain was a clear vulnerability. **Ute Blohm-Hieber** agreed and stated that the science was not wrong; it was simply that there could never be 100% certainty.

In response to a question from **Peter Galison** (Harvard University) about the state of the fuel pool at Reactor 4, **Charles Miller** said that investigators are still awaiting information on the state of the pools. He went on to say that when the information is available it would inform the debate over pool storage versus dry cask storage, and **Irena Mele** noted that re-racking of fuel pools has made them more vulnerable to loss of cooling. **Peter Galison** also asked for clarification of the timing of the comprehensive report from EPRI. **Lisa Edwards** responded that it may take 4 to 5 years before publication.

Noting the remarkable achievements in Japan, an IAEA staffer (name not recorded), asked whether the panel would comment on the success of water treatment methods in reducing activity levels. In response **Kazuhiro Suzuki** stated that current measures remain temporary, and that more reliable systems are coming. He also noted that one of the major problems is the on-going leakage of groundwater into the basements of contaminated buildings.

A final question from the audience (both name and affiliation were unclear) asked whether the sea wall would have been effective if it had been higher and what should be done now that is different from the past. **Charles Miller** responded that the sea wall was designed primarily as a breakwater, but stated that future mitigation measures should be enhanced to deal with accidents of larger magnitude. **Ute Blohm-Hieber** agreed and stated that the conclusions of the EU study would form part of the future requirements for new build reactors.

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