



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 – 0001**

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MEMORANDUM TO: ACRS Members

FROM: Cayetano Santos, Chief /RA/
Technical Support Branch
Advisory Committee on Reactor Safeguards

SUBJECT: AMERICAN NUCLEAR SOCIETY MEETING, JUNE 24-28, 2012

The enclosed trip report summarizes highlights from Girija Shukla's trip to the 2012 annual American Nuclear Society (ANS) meeting on June 24-28, 2012. The major sessions attended by Mr. Shukla were: opening plenary session on managing the global impact of economic and natural events on nuclear science and technology; president's special session on low-level radiation and its implications for Fukushima recovery; new nuclear construction around the world; evaluation and impacts of Fukushima; Generic Issue-199 on seismic hazards; post-Fukushima update on emergency planning and preparedness; and progression and status of small modular reactors (SMRs).

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**TRIP REPORT
2012 ANNUAL ANS MEETING,
CHICAGO, IL
JUNE 24-28, 2012**

ATTENDEE: Girija Shukla, Senior Staff Engineer, ACRS

The 2012 annual American Nuclear Society (ANS) meeting was held in Chicago, Illinois, during June 24-28, 2012. I attended the following major sessions of this meeting: opening plenary session on managing the global impact of economic and natural events on nuclear science and technology; president's special session on low-level radiation and its implications for Fukushima recovery; new nuclear construction around the world; evaluation and impacts of Fukushima; Generic Issue-199 on seismic hazards; post-Fukushima update on emergency planning and preparedness; and progression and status of small modular reactors (SMRs).

During this meeting a Presidential Citation was presented to Commissioner Kristine Svinicki, an ANS member since 1988, for courageous leadership, dedication to public service, and strong commitment to a regulatory framework that enables and facilitates the safe and secure use of nuclear technology.

SUMMARY

- **Opening Plenary Session on “Nuclear Science and Technology: Managing the Global Impact of Economic and Natural Events”**

In this plenary session, the following speakers provided their views on managing the global impact of economic and natural events on nuclear technology.

Congressman Michael Simpson from Idaho provided a congressional perspective on the subject and how a partnership between the government and industry can be helpful to manage impacts of natural events on nuclear technology.

Dr. Hans Wanner, Director General, Swiss Federal Nuclear Safety Inspectorate (ENSI), provided an international approach for managing impacts of natural events on nuclear industry.

Dr. Sylvain Costes from Lawrence Berkeley National Laboratory provided aspects of research activities for managing impacts of natural events.

NRC Commissioner Kristine Svinicki provided an overview of regulatory activities that can be helpful to manage impacts of natural events on nuclear industry.

- **President's Special Session on Low-Level Radiation and its Implications for Fukushima Recovery**

The following speakers provided an update of the ongoing recovery efforts in the Fukushima evacuation area: Kazuaki Matsui of the Institute of Applied Energy, Japan; Kiyohiko Sakamoto of Tohoku University, Japan; Jerry Cuttler of Cuttler Associates, USA; Ronald Mitchel of AECL, Canada; and Douglas Boreham of McMaster University, Canada.

The speakers stated that after the Fukushima event a large number of people were evacuated from their homes and businesses. Most of these people are fearful about potential adverse effects from exposure to the radioactivity that was released from the Fukushima site.

They may not be allowed back for a long time because of radiation. However, the speakers noted that the radiation levels are not dangerously high as compared to those found naturally occurring in several parts of the world where people have lived healthy lives even after being exposed to radiation levels in some cases many times higher than most of the Fukushima evacuation zone.

The speakers stressed that radiation protection policies at Fukushima follow international standards and practice, and discussed the current Fukushima radiation levels and their potential health effects. It was suggested that early return of people into the evacuation area can be justified on the basis of available scientific information.

- **New Nuclear Construction around the World**

The following speakers provided an overview of progress and planning for new reactor construction around the world. Key issues discussed included the ability of the regulatory framework to address all aspects of licensing including siting, design certification, and subsequent combined operating license (COL) issues. Speakers referred the nuclear industry as not confined to any country but as an international industry. In general, the speakers were supportive of the growth of nuclear energy around the world.

Ms. Joyce Connery of the White House National Security Council discussed U.S. policies of non-proliferation, recent nuclear cooperation agreements between the U.S. and other countries, as well as exports and imports of nuclear materials and equipment.

Ambassador Ro-Byug Park, Ambassador for Korea-U.S. Nuclear Cooperation, provided a status of progress and planning for new reactor construction in South Korea. He also briefly described the cooperation between Korea and the United Arab Emirates (UAE) and the nuclear power plants being built in UAE with Korean cooperation.

Ambassador Hamad Al Kaabi, UAE Representative to the IAEA, provided an overview of progress and planning for new reactor constructions in United Arab Emirates (UAE). UAE has awarded the prime contract for the UAE civilian nuclear energy program to a consortium led by the Korean Electric Power Corporation (KEPCO) to design, build and operate four 1,400 MW (APR1400) nuclear power plants in the UAE. The first nuclear plant is expected to start operating in 2017. The other three plants are scheduled to be completed and operational by 2018, 2019 and 2020. The APR1400 design was developed by KEPCO and licensed by the Korean nuclear safety regulator, the Korea Institute of Nuclear Safety (KINS). The design is based on the System 80+ design, which was previously certified by the NRC. Four APR1400 units are now under construction in South Korea, with the first of these scheduled to be connected to the grid by 2013. These units will serve as the “reference plants” for the UAE. The UAE’s nuclear plants will be adapted to suit the UAE’s climate conditions and any specific requirements of the UAE nuclear safety regulator.

Mr. Aurimas Kontautas of the Lithuanian Energy Institute, Lithuania, provided an overview of progress for new reactor construction in Lithuania.

- **Fukushima: World-wide Evaluations and Impacts**

In this session the panelists discussed what has happened in the aftermath of Fukushima event. Throughout the world countries have conducted or are conducting reviews of existing facilities and new plant requirements. Some countries have renounced the nuclear option; others have delayed implementation. Industry organizations are reassessing their capabilities and roles

related to international nuclear requirements, nuclear events and related communications and recovery support. Public opinion and support for nuclear power has been impacted due to Fukushima event.

The NRC staff report on the Fukushima event has been issued and implementation of lessons learned recommendations is under development. The U.K. evaluation report was issued in December 2011, but has limited impact. Other European nuclear power plant owners have completed evaluations of plant susceptibilities using a stress test process.

Typical technical areas identified are:

- Station Blackout times
- Hydrogen mitigation and control
- Multi-Unit Events
- Emergency Planning
- Passive systems
- Spent fuel pool monitoring & makeup
- Flood protection
- H₂ protection – fuel storage
- Seismic, flood proof and wind proof building for backup equipment
- Examine the integration of design basis events (LOCAs) and other postulated events (SBO, Fire, Seismic) to integrate together
- Beyond design basis requirements
- Backup connections
- Instrument and monitoring capabilities

The panelists Gary Pavis (Constellation); Philip Webster (CNSC); Gustavo Alonso (ININ); James Lyons (IAEA); and Chuck Casto (NRC) provided an overview of world-wide evaluation and impacts of Fukushima event, as summarized below:

Gary Pavis, Project Director, Fukushima Lessons Learned Implementation Project, Constellation Energy Nuclear Group, provided a description of the US nuclear industry response of Fukushima event, regulatory timeline, US nuclear industry mitigating strategies, and seismic and flooding hazard evaluations and related walkdowns in nuclear power plants.

Mr. Philip Webster of the Canadian Nuclear Safety Commission (CNSC) provided details of the Fukushima CNSC Lessons Learned and the Action Plan. Mr. Webster further described CNSC Actions; CNSC Safety Review Criteria (Canadian 'Stress Test'); assessments against their Safety Review Criteria; the CNSC Fukushima Task Force Report; and CNSC Management Response. The overall lessons learned were that risk of a major nuclear accident is very low but real, socio-political considerations play a consequential role in implementing an effective safety culture.

Mr. Gustavo Alonso of the Mexican Instituto Nacional de Investigaciones Nucleares (ININ) provided details of their Laguna Verde nuclear power plant and post-Fukushima activities of the Mexican regulatory body Comisión Nacional de Seguridad Nuclear y Salvaguardias (CNSNS). He stated that CNSNS in general applies the USNRC regulations and has required no physical plant changes at the Laguna Verde nuclear power plant, the only nuclear power plant in Mexico, as a result of the Fukushima event, but implemented several verification, assessment, inspections, and analysis activities to mitigate the consequences of Fukushima event. Compliance with 10 CFR Part 50.54(hh) is now being required by CNSNS. Also, CNSNS is compiling and analyzing the results of their verifications and assessments and may impose future regulatory requirements based on the analysis.

Mr. James Lyons, Director, Division of Nuclear Installation Safety, Department of Nuclear Safety and Security, International Atomic Energy Agency (IAEA) provided an overview and discussion of the following IAEA 12-point Action Plan on strengthening global nuclear safety:

1. Assessment of safety vulnerabilities
2. Strengthen IAEA peer reviews
3. Strengthen Emergency Preparedness and Response
4. Strengthen the effectiveness of National Regulatory Bodies
5. Strengthen the effectiveness of operating organizations
6. Review and strengthen IAEA Safety Standards
7. Improve the effectiveness of the International legal framework
8. Member States embarking on Nuclear Power program
9. Strengthen and Maintain Capacity Building
10. Protection of People and Environment from ionizing radiation
11. Communication and dissemination of Information
12. Research and Development

Mr. Chuck Casto, Regional Administrator, Region III, NRC, also provided an update of NRC post-Fukushima activities and the Fukushima Lessons Learned Actions. He stated that the NRC directed a methodical and systematic review of the safety of U.S. facilities in light of events in Japan, and the Near-Term Task Force (NTTF) report was issued on July 12, 2011.

The Task Force recommendations were related to: seismic and flooding protection, including seismically induced fires and floods; prolonged loss of AC power; containment venting; spent fuel pool cooling; severe accident procedures; emergency preparedness (EP); regulatory framework for low probability, high consequence events; and greater attention to defense-in-depth for low probability events.

The Fukushima Steering Committee prioritized the recommendations into 3 groups: Tier 1 - To be implemented without unnecessary delay; Tier 2 - Could not be initiated in the near term due to resource or critical skill set limitations; and Tier 3 - Require further staff study to support a regulatory action.

Tier 1 Activities included: (i) issuance of Orders EA-12-049 – Mitigating strategies beyond design basis events, EA-12-050 – Hardened vents for Mark I and II containments, and EA-12-051 – Spent fuel pool instrumentation; (ii) request for Information under 50.54(f) for Seismic and flooding walkdowns, Seismic and flooding reevaluations, and Enhanced EP staffing and communications; and (iii) rulemakings on Station blackout (SBO) and Integration of emergency procedures. The NRC has approved the staff's plan to implement Tier 1 activities, and Orders and Requests for Information were issued on March 12, 2012.

Tier 2 Recommendations included: (i) order licensees for spent fuel pool makeup capability; (ii) require licensees' actions regarding Emergency preparedness; and (iii) request licensees reevaluate external hazards (other than seismic and flooding).

Tier 3 Recommendations included: ten-year confirmation of seismic and flooding hazards; enhanced capability to prevent /mitigate seismically induced fires and floods; reliable hardened vents for other containment designs; hydrogen control and mitigation inside containment or in other buildings; emergency preparedness (EP) enhancements for prolonged SBO and multiunit events; Reactor Oversight Process modifications; and staff training on severe accidents.

- **Generic Issue-199, “Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants”**

The panelists Jon Ake (NRC); Norman Abrahamson (PG&E); Gregory S. Hardy (Simpson, Gumpertz, and Heger); Kimberly A. Keithline (NEI); and Robert J. Budnitz (LBNL), provided a discussion of Generic Issue 199 (GI-199), which has been the subject of extensive research work for the past several years. The reason for GI-199 is that our understanding of certain features of the seismic ground motion that might occur in the central and eastern United States has changed over the past decade. For some nuclear reactor sites, the ground motions are higher than was thought earlier, although this is highly site-dependent.

In this session, the panelists discussed the current understanding of the science related to GI-199 and explored the anticipated path forward for both the operating U.S. nuclear plants and the new plants now being planned, in terms of the NRC’s regulatory requirements and the industry response to them.

- **Update on Emergency Preparedness and Planning Post-Fukushima**

The panelists Kevin Williams (NRC); Carl Mazzola (Shaw Environmental); and Jim Riley (NEI) provided discussions on the role of emergency preparedness and planning as an integral part of safety requirements that are likely to evolve rapidly after the Fukushima event. The new focus is likely to be on beyond-design-basis accidents and on defense-in-depth. There is also likely to be significant differences between what may be acceptable for existing plants versus designs under review and combined license applications. As more information becomes available from Japan, there is a need to have representatives from major stakeholder organizations evaluate technical aspects of the changes and how they will affect current emergency planning and preparedness practices.

- **SMR: Progression and Status**

Mr. Charles Hess of the Shaw Group provided a discussion of the business case for small modular reactors regarding when the SMRs are viable and cost effective to build and operate in the present circumstances of the nuclear industry.