LESSONS LEARNED FROM THE FUKUSHIMA NUCLEAR ACCIDENT FOR IMPROVING SAFETY OF U.S. NUCLEAR PLANTS

Briefing to Japanese Government and Nuclear Industry

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Background

- The U.S. Congress requested that the U.S. National Academy of Sciences (NAS) carry out a study on lessons learned from the Fukushima Daiichi nuclear accident for improving safety and security of U.S. nuclear plants.

- Congress directed that the U.S. Nuclear Regulatory Commission (USNRC) sponsor the study.

- A committee of 21 technical experts was appointed by the NAS president to carry out the study.

- The NAS report from the study was subjected to peer review by 24 independent technical experts before its release.

Recommendations: Nuclear Plant Systems

USNRC and U.S. nuclear industry should give specific attention to improving

- DC power for instrumentation and safety system control.
- Tools for estimating real-time plant status during loss of power.
- Decay-heat removal and reactor depressurization and containment venting systems and protocols under loss-of-power conditions.
- Instrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools.
- Hydrogen monitoring and mitigation.
- Instrumentation for onsite and offsite radiation and security monitoring.
- Communications and real-time information systems to support communication and coordination between control rooms and technical support centers, control rooms and the field, and between onsite and offsite support facilities.

Recommendations: Training

The USNRC and U.S. nuclear industry should give specific attention to

- Staffing levels for emergencies involving multiple reactors at a site, that last for extended durations, and/or that involve stranded plant conditions.

- Strengthening and better integrating emergency procedures, extensive damage mitigation guidelines, and severe accident management guidelines.

- Training of operators and plant emergency response organizations
  - on the use of ad hoc responses for bringing reactors to safe shutdown during extreme beyond-design-basis events.
  - to reinforce understanding of nuclear plant system design and operation and enhance operators' capabilities for managing emergency situations.

Recommendations: Risk Assessment

- The U.S. nuclear industry and the USNRC should strengthen their capabilities for assessing risks from events that could challenge the design of nuclear plant structures and components and lead to a loss of critical safety functions. The USNRC should support industry's efforts to strengthen its capabilities by providing guidance on approaches and by overseeing rigorous peer review.

- The USNRC should further incorporate modern risk concepts into its nuclear safety regulations using these strengthened capabilities.

- The U.S. nuclear industry and the USNRC should pay particular attention to the risks from beyond-design-basis events that have the potential to affect large geographic regions and multiple nuclear plants. These include earthquakes, tsunamis and other geographically extensive floods, and geomagnetic disturbances.

Recommendations: Offsite Emergency Response

- The nuclear industry and organizations with emergency management responsibilities in the United States should assess their preparedness for severe nuclear accidents associated with offsite regional-scale disasters.

- The nuclear industry and organizations with emergency management responsibilities in the United States should assess the balance of protective actions (e.g., sheltering-in-place, evacuation, relocation, and distribution of potassium iodide) for offsite populations affected by severe nuclear accidents and revise the guidelines as appropriate.

Recommendations: Nuclear Safety Culture

- The USNRC and the U.S. nuclear power industry must maintain and continuously monitor a strong nuclear safety culture in all of their safety-related activities. The leadership of the U.S. Nuclear Regulatory Commission must maintain the independence of the regulator.

- The U.S. nuclear industry and the U.S. Nuclear Regulatory Commission should examine opportunities to increase the transparency of and communication about their efforts to assess and improve their nuclear safety cultures.