

## **Fallout from Japan**

### **A Foreseeable, Yet Unforeseen, Catastrophe? – Some Lessons for the United States**

By Joshua S. Lichtenstein and John T. Carty

The catastrophic events in Japan have created the world's gravest nuclear crisis since Chernobyl 25 years ago. Although the full extent of the environmental damage may not be known for years, Japan is already experiencing a variety of potentially detrimental consequences — including heightened radiation levels detected in food supplies, in the Tokyo water supply and in the seawater near the Fukushima complex.

Could the Tokyo Electric Power Company (TEPCO) have been better prepared for this natural disaster? News articles have reported that TEPCO officials knowingly discounted the potential risk of, and the resulting damage from, a magnitude 9.0 earthquake and the resulting tsunami despite prior analysis that showed it was a real possibility. In a 2001 analysis of the Jogan tsunami that occurred in the year 869, scientists estimated that the Jogan tsunami caused waves as high as 26 feet to crash ashore only 25 miles north of where the Fukushima facility is situated. The 2001 analysis also documented two additional tsunamis comparable in size to Jogan that occurred within the past 3,000 years and consequently concluded that this reoccurrence interval of approximately 1,000 years and the passage of more than 1,100 years since the Jogan tsunami indicated that “the possibility of a large tsunami striking the Sendai plain is high.” Yet a more recent TEPCO analysis postulated that the largest tsunami that could threaten the area of the Fukushima facility would not exceed 18 feet in height.

News reports have also indicated that TEPCO officials based their plant safety analysis on an assumption that the strongest earthquake that could strike the region would not exceed 8.6 in magnitude. TEPCO's assumption appears to have ignored known data documenting the occurrence of earthquakes at least 9.0 in magnitude within the past 50 years in subduction zones located in Chile, Indonesia and Alaska, as well as data that the Fukushima facility is located within a similar subduction zone. If accurate, TEPCO's apparent decision to exclude this historical data from its plant safety analysis probably prevented both TEPCO officials and Japanese nuclear safety regulators from being as fully prepared as they should have been.

In the United States, government regulators and the nuclear power industry should be focused on heeding the lessons of the crisis in Japan and immediately implementing some of those lessons learned. Although it would be understandable for the industry to focus a re-evaluation of nuclear facility safety upon the relative risks U.S. nuclear power facilities face from earthquakes and tsunamis, that would be the wrong lesson to derive from the recent disasters. The location of nuclear power facilities in the United States places them at substantially smaller risk for damage from a large earthquake and tsunami. But the Fukushima disaster has revealed substantial deficiencies in certain reactor designs that can be minimized. In light of the sheer number of U.S. nuclear facilities that are substantially similar, if not identical, to the design of the Fukushima facility, and given the advanced age of so many nuclear facilities currently operating in the United States, it is especially appropriate to engage in a comprehensive re-evaluation of the potential risks that these reactors present, the relative likelihood of those risks occurring, and the costs required to avoid or minimize those risks.

In addition to this comprehensive re-evaluation, the following concrete steps are similarly recommended in order to reduce the risk of an environmental catastrophe both in the short-term and the long-term:

- Mandatory changeover from the use of spent fuel pools that rely on continuous cooling of water for efficacy to the more modern dry-cask method of spent-fuel storage that does not depend upon continuously-operational water-cooling systems for efficacy. At a minimum, the amount of time that spent fuel rods are stored in pools should be reduced, and, at the same time, the transfer of spent fuel rods from cooling pools to dry cask storage needs to be accelerated.
- Shortening the re-licensing period for existing facilities to 10 years.
- As a condition of the re-licensing of existing facilities, regulators should mandate the retrofitting of all operating facilities with state-of-the-art safety features and impose a strict limitation on the percentage of costs associated with retrofitting that nuclear facility owners are authorized to pass on to consumers.

- Mandating immediate upgrades to existing facilities that will enable the critical safety functions of these facilities to operate normally for at least 48 hours in the event that the main power supply and the primary back-up power supply are interrupted. The vast majority of reactors in the U.S. are currently designed to cope for only four hours — an amount of time that the current crisis in Japan has starkly revealed to be woefully inadequate. The Fukushima reactors were designed to cope for eight hours.
- A comprehensive re-evaluation of the Price-Anderson Nuclear Industries Indemnity Act, including: (1) an examination of the relative sufficiency of the current level of financial contribution required of each nuclear facility owner; (2) an analysis of whether the Price-Anderson Act creates disincentives for the nuclear power industry to develop and implement the best-available safety features and to incorporate those features into the older facilities that are probably more vulnerable to failure; and (3) an evaluation of the extent to which removing a portion of the indemnity from liability that nuclear facility owners currently possess would encourage the development and incorporation of feasible safety features consistent with the state of the art.

The crisis in Japan presents countries around the world with an invaluable opportunity to evaluate and adjust current risk management tools and techniques in a manner that will increase safety incentives and improve safety strategies — thereby reducing the chance that such a catastrophe (or one even worse) might occur elsewhere. Given the advanced age of many nuclear reactors currently operating in the United States, government and industry leaders are urged to quickly seize this opportunity.

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