What Will be the Lessons of Fukushima?

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While ongoing investigations into what went wrong at Fukushima Daiichi Nuclear Power Station after the March 11 magnitude 9 earthquake and tsunami continue, for now, rightfully, the priority is on working to contain the radiation and safely shut down all operations.

Ironically, the 1979 nuclear accident at Unit 2 of the Three Mile Island (TMI) nuclear plant outside of Harrisburg, Pennsylvania also occurred in the month of March. While the underlying causes for the two incidents were completely different – a massive natural disaster in Fukushima and a combination of operator error, design deficiencies and component failures at TMI – the lessons learned in Pennsylvania and the subsequent changes implemented throughout the nuclear energy sector as a result offers us insights into what will likely happen next in Japan and the global nuclear industry as the situation stabilizes.

With respect to TMI, equipment failures and improper operator actions led to a loss of coolant in the reactor, extremely high temperatures and partial melting of the nuclear fuel. The melted fuel was contained in the plant's reactor building and relatively little radiation was actually released to the environment. A study undertaken by the American Nuclear Society after the incident showed that the average radiation dose people living within 10 miles of the facility received was less than (0.8) of a chest X-ray.[1]

While the exact level of radiation exposure experienced by Japanese residents living near Fukushima is still being determined, we note the Japanese authorities acted very quickly to promptly and safely evacuate all residents within 20 kilometers of the site. This is especially impressive when taking into account that the authorities were simultaneously dealing with the thousands of dead and missing as well as a devastated infrastructure from the earthquake and subsequent tsunami.

After the TMI accident, numerous extensive investigations and reports were instituted by President Carter, Congress, Pennsylvania, the Nuclear Regulatory Commission (NRC), and nuclear industry groups. The NRC undertook numerous public rulemaking proceedings that resulted in significant changes to the design and operation of the nation's nuclear power plants, and the creation of comprehensive emergency planning for the areas surrounding the nuclear plants. These investigations and analyses of the TMI accident led to a number of improvements and changes which have shaped the US nuclear industry over the past 30 years.

Among others, TMI resulted in the:

- Nuclear industry's creation of the Institute of Nuclear Power Operations (INPO), the industry's own group charged with a mission to "promote the highest levels of safety and reliability."
- Revamping of operator training and staffing requirements.
- Enhancement of emergency preparedness to include immediate NRC notification requirements for plant events and an NRC operations center that is staffed 24 hours a day.
- Mandatory emergency planning for the jurisdictions around all nuclear plants, including planning for the evacuation of a 10-mile emergency planning zone and the control of potential sources of ingestion of radiation within a 50-mile zone.
- Introduction of a focused safety work environment which we know as "Safety Culture," embodying the principle that plant safety drives every decision and action.
- Expansion of NRC's resident inspector program whereby at least two inspectors live nearby and work exclusively at each plant in the U.S.
- Expansion of NRC's international activities to share enhanced knowledge of nuclear safety with other countries in a number of important technical areas.
- Creation of a mutual insurance company to provide property insurance and outage insurance to spread the risk of nuclear incidents.

No doubt, similar comprehensive investigations and changes will occur in Japan and the lessons learned will be incorporated not only in Japan but also by nuclear plants and nuclear regulators around the world.

Already, the U.S. nuclear energy industry and the NRC have begun to assess the events in Japan and are taking steps to ensure that U.S. reactors could respond to events that may challenge safe operation of the facilities. The European Union has called for "stress tests" to ensure nuclear installation safety against earthquakes, tsunamis, terrorism, or disruptions of operational and back up systems. The head of the International Atomic Energy Agency (IAEA) has called for a high-level conference to discuss what lessons can be learned from the accident at Fukushima. The Japanese government has gratefully accepted the help of other nations, including scientists and researchers from the United States and the international community, in helping to contain the radiation and assess the situation as it moves forward.

In the 60 years since commercial nuclear energy facilities have been in operation, there have been three major accidents, TMI, Chernobyl and now Fukushima. While even one nuclear accident is one too many, the safety record for the nuclear sector is far better than it is for traditional energy companies. After 14,400 cumulative reactor-years of commercial operation of nuclear power plants in 32 countries, Chernobyl (reflecting a severely flawed Soviet-era design) was the only time that radiation-related fatalities occurred—56 in number. The United Nations' Expert Group concluded that there may be up to 4,000 additional thyroid cancer deaths among the three highest exposed groups over their lifetime.[2]

By contrast, currently 10,000 people die from coal mining and related activities each year.[3] According to the National Conference of State Legislatures, 1,087 serious gas pipeline accidents occurred in the U.S. over the past 20 years.[4] And in 2010 alone, more than 14 major oil spills and refinery explosions were reported worldwide, taking the lives of workers and adversely impacting the environment.

No energy technology is without some risk. But as long as the energy demand continues to rise as does the demand for cleaner alternatives, nuclear energy must and will remain one of the solutions for addressing our ever-growing need for electric power. The lessons that we have learned from TMI clearly have reduced the risk of nuclear accidents. At the same time that nuclear plant safety has improved, the U.S. nuclear fleet has dramatically increased its efficiency and power production. Certainly, there will be lessons learned from Fukushima. And if post-TMI history of the nuclear industry is any guide, what we learn from Fukushima will further reduce the risks from this vital energy source moving forward.

Endnotes

1 George Johnson, "Radiation's Afterglow," *The New York Times,* March 26, 2011.

2 http://www.who.int/mediacentre/factsheets/fs303/en/index.html.

3 Johnson, *The New York Times.*

4 March 2011, Pipeline Accidents, www.NCSL.org.

Pillsbury represented the licensed operator of the TMI Unit 2 reactor and its corporate parent General Public Utilities (GPU), in the various legal proceedings stemming from the 1979 accident, including a range of civil, criminal and administrative litigation, and investigations conducted by NRC Staff, NRC's Special Inquiry Group, President Carter's Kemeny Commission, numerous committees of Congress, the Commonwealth of Pennsylvania, and the Department of Justice. Pillsbury also represented GPU during six years of proceedings to win permission to restart the undamaged TMI Unit 1. Since being granted permission, Unit 1 subsequently went on to won NRC awards and set world performance records.

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