

FUKUSHIMA DAI-ICHI: THE NUCLEAR BLACK SWAN



“A nuclear accident anywhere is a nuclear accident everywhere.” This aphorism has encapsulated the nuclear industry’s creed that one major accident can sink the global nuclear fleet. Since March 11, the accident and ongoing crisis at the Fukushima Dai-ichi Nuclear Power Plant have been testing this zero tolerance policy.

In the past two months since the start of the accident, I have heard some interesting narratives that are trying to put this crisis in context. One view from some people in the nuclear industry is that this accident will ultimately be good for the industry because it will demonstrate that even a “worse-case” accident has resulted in no near-term deaths from exposure to ionizing radiation. In comparison, the earthquake and tsunami killed many thousands of people. So, even though the economic damage from the nuclear accident will soar into the tens of billions of dollars, the industry still has a good news story to tell in terms of the harm to human health.

A related view is that this extraordinary event was well beyond the normal design basis for this nuclear plant. That region of Japan had not experienced such a powerful combination of earthquake and tsunami in more than 1,000 years. The implication here is that this is a freak event and should not cause undue alarm for almost all other nuclear plants. An opposing view is that this accident shows that nuclear power is too dangerous and that countries need to phase out the existing plants and not build additional plants.

I propose that this event was an example of a “Black Swan,” a high consequence catastrophe that deviated far from the statistical norm. But it should not have come as a surprise as I argue below. The norm for nearly 25 years since the Chernobyl accident was an industry that appeared to have steadily improving safety at almost all plants that were generating more and more electricity by operating the plants near maximum capacity.

This improvement in safety and power performance was a huge success story that partially renewed interest during the past decade for a “nuclear renaissance.” But even before the accident, that renaissance was having trouble lifting off because of the high capital costs (several billion dollars) for a large reactor and long time (typically 8 to 12 years) for licensing and building a reactor at least in the United States. The U.S. nuclear industry had asked for and received additional financial incentives in the Energy Policy Act of 2005 for the next handful of new plants. But these incentives were not enough for utilities to place a bet on a risky construction project.

The Fukushima Dai-ichi accident will erect additional barriers to new nuclear plants unless the industry comes to terms with the major lessons. The magnitude of the damage to the plant would not have been as great as it was if the authorities (plant owners, inspectors, and regulatory agencies) had not put a damper on the safety concerns that were repeatedly raised for decades. By allowing the plant to fail inspections early on, the authorities would most likely have avoided the substantial damage to multiple reactors by either fixing the problems or shutting down any reactors permanently if corrective action could not meet high safety standards.

As recent news reports have described, this nuclear plant had accumulated numerous safety concerns and problems. For example, according to a March 11 *New York Times* story, the emergency diesel generators had known stress cracks. Also, after the license extension was approved for reactor one just one month before the accident, the Tokyo Electric Power Company, the owner, admitted that it had not inspected 33 pieces of safety equipment associated with the plant’s cooling systems. Furthermore, according to a 2004 investigation, the company had falsified information from a number of plants, including Fukushima Dai-ichi. Critics of the Japanese regulatory system have often warned about the unhealthy ties between the plants’ owners and the regulators.

Thus, one of the primary lessons is to ensure that regulatory agencies have the independence and authority they need to order unsafe plants shut down and corrective safety measures implemented before a plant is allowed to operate. A related lesson is to ensure that the whistleblowers are protected. Moreover, the industry should not have been in a rush to extend the licenses of older design plants especially when newer designs have significantly improved safety features. Until Japan and other nuclear power producing countries seriously address these problems, the world should not be shocked to witness other nuclear Black Swans.

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