

Fukushima Disaster Response and Recovery a Vexing Radiation Colossus

By John LaForge

Eight years into Fukushima's 3-reactor catastrophe of earthquake, tsunami and meltdowns, and after the industry's and government's multiple recovery schemes, an overview is in order.*

The three reactor meltdowns at Fukushima-Daiichi caused the worst dump of radioactivity to the Pacific Ocean in history. "This event is unprecedented in its total release of radioactive contamination into the ocean" wrote Ken Buesseler of the Woods Hole Oceanographic Institution for PBS News Hour in March 2016. Buesseler has been recording Fukushima's Pacific Ocean contamination since it started on 3/11/11. While Fukushima is often called the "2nd worst" radiation accident behind Chernobyl, Buesseler said, "More than 80% of the radioactivity from the damaged reactors ended up in the Pacific—far more than reached the ocean from Chernobyl." Buesseler reported that this radiation gusher continues. "It is incorrect to say that Fukushima is under control when levels of radioactivity in the ocean indicate ongoing leaks, caused by groundwater flowing through the site and enhanced after storms," he wrote.

• "The worst airborne radiation spill in 25 years.": Like the 1986 Chernobyl disaster that spread radiation across the Northern Hemisphere, *Forbes*

White House Wants Reactor Operators to Self-Regulate

Trump Deregulation Frenzy Endangers Health & Safety

Note: This segment is excerpted from a far longer piece by Emily Atkin in The New Republic for April 5, 2019.

[On April 2, 2019] ... the Senate Environment and Public Works committee held an oversight hearing for the Nuclear Regulatory Commission (NRC) ... in part, to discuss a new safety regulation designed to protect [US] nuclear reactors from earthquake and flooding events, like the one that caused the 2011 [triple reactor] disaster at the Fukushima Daiichi [station] in Japan....

The draft version of the rule, released by the NRC in 2016, required all nuclear [reactor] owners to do two things: re-assess all flood and earthquake risks, [and] then implement new safety measures taking the re-assessment into account. But in January 2019, with Trump appointees making up a majority of the commission, [the NRC] approved a final version of the rule making the safety measures voluntary. Nuclear [reactor operators], in other words, will still have to do new risk assessments—but now they can choose whether they want to prepare for those risks or not.

The nuclear industry is also pushing the NRC to cut down on safety inspections and rely instead on [reactor owners and operators] to police themselves. The NRC "is listening" to this advice, the Associated Press reported last month. "Annie Caputo, a former nuclear-energy lobbyist now serving as one of four [NRC] members appointed by President Trump, told an industry meeting this week that she was 'open to self-assessments' by [reactor] operators, who are proposing that self-reporting by operators take the place of some NRC inspections." ...

There's obvious appeal to self-regulation. It's extremely costly to the taxpayer to ensure that industries aren't hurting or killing Americans. ...

But time and again, industries have proven that they will skimp on safety and cheat the rules if the government has made clear that it's not watching. Sometimes that causes millions of Americans to lose their jobs and homes. Sometimes it causes thousands of people to get sick. And sometimes it causes hundreds to die. Trump is doing everything in his power to increase the chance of all of the above.

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reported March 28, 2011 that the US EPA recorded Fukushima's radioactive iodine-131 in rainwater in Pennsylvania and Massachusetts at levels above what the agency allows in drinking water. The EPA's air monitoring also found Fukushima's radioactive iodine-131 in California, Colorado, Hawaii, Washington, and Nevada. Nothing close to this immense, hemisphere-wide radiation dispersal has happened since Chernobyl.

• Japanese foods were tainted widely. Traces of radioactive cesium were found in a popular baby formula according to *Japan Today*, Dec. 7, 2011. Hundreds of thousands of babies may have eaten it before it was pulled from store shelves. The *Japan Times* reported April 22, 2011 that Fukushima's iodine-131 was detected in the breast milk of women living near Tokyo, 150 miles from the meltdowns. The public demanded an investigation into the impact on mothers and babies. In April 2013, Japan's Ministry of Health reported that levels of cesium-137 and cesium-134 found in produce and rice crackers 225 miles away from Fukushima "are high enough to cause residents to exceed the annual radiation exposure limit in just a few months, or even weeks."

• Fukushima is the world's worst reactor disaster by volume of fuel melted and waste in cooling pools. Major reactor meltdowns at Santa Susanna in California (1959), Windscale in England (1957), Three Mile Island in Pennsylvania (1979), and Chernobyl in Ukraine (1986), involved a single reactor fuel inventory. Fukushima's meltdowns involve three reactors full of melted and mangled fuel rods, and an additional 1,573 waste fuel rods in damaged condition in damaged pools of cooling water. The three masses of melted reactor fuel may never be recovered or containerized.

• Fukushima caused the largest evacuation in the history of nuclear power: 160,000 evacuated from the zone first set at 12, and later expanded to 19 miles. (116,000 were forced to leave Chernobyl's dead zone.) Two weeks after the start of the meltdowns, people from between 12 to 19 miles away were encouraged to "voluntarily evacuate." The US government recommended that US citizens stay 50 miles away.

• Of the colossal volumes of radioactive debris produced by the catastrophe, the *New York Times* provided this list in March 2017: 400 tons of contaminated cooling water produced every day since March 2011; 3,519 containers holding 60,000 tons of radioactive mud or sludge; 64,700 cubic meters of discarded protective clothing; branches and logs from 220 acres of deforested land; 200,400 cubic meters of radioactive rubble; and 3.5 billion gallons [17 million cubic yards] of radioactive soil. According to Greenpeace, 11 million tons of this radioactive soil is to be incinerated, which spreads airborne radioactive contamination in fly ash from smoke stacks, and leaves behind radioactively contaminated bottom ash in need of containment. (Will the consequently contaminated soil again be collected for re-incineration?)

• The vexing problems of disaster response have seen ever-changing estimates of the amount of radiation released. The amount released to the air was "twice as large as previous estimates by research institutions both in Japan and overseas," according to a Feb. 2012 report by the Meteorological Research Institute. The volume and variety of contaminated materials that have been collected for disposal is astounding. Greenpeace reported in December 2017 that while towns like Iitate and Namie had contaminated topsoil scraped off from populated areas, the problem remained because the soil removal left "islands ... which are surrounded by forested moun-



Art by Mark L. Taylor for Nukewatch

tains, for which there is no possible decontamination." Consequently, cleaned-up areas "are subject to recontamination through weathering processes and the natural water and lifecycle of trees and rivers." Because of how long cesium-137 persists in the environment, "this will be an on-going source of significant recontamination for ... 300 years."

• The failure of the "ice wall," designed to divert groundwater away from the three reactor foundations which were cracked open by the record 9.0 earthquake, means that hundreds of tons of water keep pouring every day into the wreckage of the reactor chambers. There the water is contaminated by contact with the masses of melted uranium fuel and either rushes out to sea or is collected for filtration in the failed Advanced Liquid Processing System (ALPS).

• The notorious failure of the ALPS, which was intended to partially clean up highly contaminated cooling water and groundwater, means that possibly 1-million tons of waste water now held in 1,000 giant tanks near the coastline is not cleaned up at all, and must be filtered again by an as-yet-unknown method that needs to be designed and engineered from scratch. Meanwhile the tanks are vulnerable to another earthquake that could happen any time. One *Japan Times* headline on March 29, 2018 warned, "Seven years on, radioactive water at Fukushima plant still flowing into ocean, study finds".

*Detailed and well-documented reports by Greenpeace provide some of the best background and investigative information. See:

* Reflections in Fukushima: The Fukushima Daiichi Accident, Seven Years On," March 2018 (<https://www.greenpeace.org/canada/en/publication/1657/reflections-in-fukushima-the-fukushima-daiichi-accident-seven-years-on/>)

* Nuclear Scars: The Lasting Legacies of Chernobyl and Fukushima," March 2016 (<http://www.greenpeace.org/eastasia/publications/reports/climate-energy/2016/nuclear-scars/>)

* Fukushima Fallout: Nuclear business makes people pay and suffer," February 2013 (<https://www.greenpeace.de/sites/www.greenpeace.de/files/20130218-Greenpeace-Report-Fukushima-Fallout.pdf>)

* "Lessons from Fukushima," February 2012 (<http://www.greenpeace.org/slovenia/Global/slovenia/Dokumenti/Lessons-from-Fukushima.pdf>)