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Fukushima radiation: US West Coast will likely see peak by end of 2015

At its peak, levels of radioactivity from cesium-137 will still fall far below levels that the US and Canadian governments deem unsafe for drinking water, according to a study published Monday in the Proceedings of the National Academy of Sciences.

By Pete Spotts, Staff writer | DECEMBER 29, 2014

A crane works on the building covering No. 1 reactor (L) at the TEPCO's tsunami-crippled Fukushima Daiichi nuclear power plant in Fukushima prefecture in November. (Shizuo Kambayashi/Reuters/File)

Scientists keeping tabs on the eastward voyage of radioactive byproducts from the 2011 Fukushima Daiichi nuclear-power-station disaster in Japan suggest that radioactivity from the byproducts should peak off the US and Canadian coasts by the end of next year. After that, they are expected to begin a gradual decline to background levels.

The chief concern: Radioactivity from cesium-137, the longest-lived of two forms of cesium released in the disaster, which ocean surface currents have carried east. At its peak, levels of radioactivity from cesium-137 will still fall far below levels that the US and Canadian governments deem unsafe for drinking water, according to data in a study published Monday in the Proceedings of the National Academy of Sciences (PNAS).

The nuclear power station lost emergency power when it was hit by a tsunami triggered by a magnitude 9 earthquake offshore on March 11, 2011. As a result, the plant couldn't keep reactors cool or spent-fuel pools filled. Three of four reactors partially melted, while hydrogen explosions wracked buildings containing the reactors. The event released significant amounts of radiation, including leaks of radioactive water to the ocean.

Combined with background levels of cesium-137 radiation that remain from above-ground nuclear-weapons tests conducted in the 1950s and '60s, the additional cesium-137 from Fukushima is projected to push the isotope's watery radiation levels back up to where they were in the 1980s, the study indicates. At that time, radiation from cesium-137 in fish tissue was so low that people were far more concerned about mercury in tuna than cesium.

The PNAS study builds on research described at an ocean-sciences meeting in Hawaii last February. The work relied on data gathered between 2011 and 2013 from a string of 26 sampling sites that began at the Juan de Fuca Strait and stretched westward for more than 1,000 miles.

The team looked for cesium-134 to herald the arrival of Fukushima's cesium-137. Nuclear reactors produce both, but cesium-134 loses half its radioactivity every two years. Cesium-137, with its 30-year half life, is the more worrisome of the two forms isotopes. If researchers detected only cesium-137, they knew they were looking at the post-nuclear-testing background. If they saw both forms of cesium at the same time, they knew Fukushima's cesium-137 had arrived and could estimate its contribution beyond background cesium radiation levels.

Cesium-137 from Fukushima reached the western end of the sampling string in 2012, and by June 2013 had reached sampling sites on the continental shelf, noted John Smith, a chemical oceanographer at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, at the time.

The new study includes additional data taken in February 2014, data that the team finished processing during the summer, writes Dr. Smith in an e-mail.

"The conclusions haven't changed," he writes, referring to projections that even at its peak, radiation from cesium-137 should remain far below levels that are deemed a threat to human health or to the environment.

The background level runs about 1 Becquerel – the decay of one cesium-137 nucleus each second – per cubic meter of water. At its peak, the radiation level is expected to reach about 3 to 5 Becquerels per cubic meter of water. By contrast, Canada's drinking-water standard for cesium-137 is 10,000 Becquerels per cubic meter.

If the added data haven't altered the team's basic conclusion, they have helped sift among competing projections offered by other research teams. In one projection, cesium-137 levels were slated to begin rising in late 2014 with a peak around 2017. The other had an earlier onset to the increase, with the peak coming in late 2015.

Data available last February were too sparse to provide a reality check on the models. With the additional data, however, the second projection seems the most likely, providing "greater certainty in future projections of the Fukushima radioactivity signal in the eastern North Pacific Ocean," Smith writes.

Meanwhile, Fukushima's cesium-137 also has appeared off the northern California coast, Ken Buesseler, an oceanographer at the Woods Hole Oceanographic Institution in Massachusetts, reported in early November.

Dr. Buesseler and colleagues have enlisted citizen scientists to gather water samples for analysis in a monitoring project that uses crowd-sourced funding to underwrite the effort.

The sample was collected in August about 100 miles west of Eureka. It contained cesium-134, whose radiation was recorded at 2 Becquerels per cubic meter of water, more than 1,000 times less than the US Environmental Protections Agency's maximum level for drinking water.