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Japan Encourages a Wider Evacuation From Reactor Area

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TOKYO — New signs emerged Friday that parts of the crippled Fukushima Daiichi nuclear plant were so damaged and contaminated that it would be even harder to bring the plant under control soon.

At the same time, Japanese officials began encouraging people to evacuate a larger band of territory around the complex.

Speaking to a national audience at a news conference on Friday night, two weeks after the magnitude 9.0 earthquake and the devastating tsunami that followed it, Prime Minister [Naoto Kan](#) dodged a reporter's question about whether the government was ordering a full evacuation, saying officials were simply following the recommendation of the [Japan Nuclear Safety Commission](#).

"The situation still requires caution," Mr. Kan, grave and tired-looking, told the nation. "Our measures are aimed at preventing the circumstances from getting worse." The authorities said that they would now assist people who wanted to leave the area from 12 to 19 miles outside the plant, and that they were now encouraging "voluntary evacuation" from the area.

Those people had been advised March 15 to remain indoors, while those within a 12-mile radius of the plant had been ordered to evacuate. The United States has recommended that its citizens stay at least 50 miles away.

"The state of the plant is still quite precarious," Mr. Kan said. "We're working hard to make sure it doesn't get worse. We have to ensure there's no further deterioration."

In a new sign of the contamination problem, the Nuclear and Industrial Safety Agency said Saturday a sample of seawater taken Friday from a monitoring station at the plant showed the level of iodine 131 at 50 becquerels per cubic centimeter — 1,250 times the legal limit.

Drinking a half liter of that water would be equivalent to getting a 1 millisievert dose, the agency said, roughly the amount a person gets in one year from natural sources.

Hidehiko Nishiyama, deputy-director general at the safety agency, said that he expected the iodine to dilute rapidly, minimizing the effect on wildlife, and pointed out that fishing had been suspended in the area after the quake and tsunami.

One sign of possible deterioration in the plant itself came at Reactor No. 3. Workers who were trying to connect an electrical cable to a pump in a turbine building next to the reactor were injured when they stepped into water that was found to be significantly more radioactive than normal. On Friday, officials and experts offered conflicting explanations of what had gone wrong — but all pointed to greater damage to the reactor's systems and more contamination there than officials had indicated earlier.

Two workers were exposed to radiation and burned when water poured over their boots and down around their feet and ankles, officials said. A third worker was wearing higher boots and did not suffer the same exposure.

Like the injured workers, many of those risking their lives are subcontractors of Tokyo Electric Power, who are paid a small daily wage for hours of work in dangerous conditions. In some cases they are poorly equipped and trained for their task.

On Saturday, workers were focused on trying to restore the lighting to Reactor No. 2's central control room, an important step toward restoring the unit's cooling system. They were also preparing to pump fresh water on the No. 1, No. 2 and No. 3 units, after days of spraying with saltwater.

The National Institute of Radiological Sciences said that the radioactivity of the water that the three injured workers had stepped into was 10,000 times the level normally seen in coolant water at the plant. It said that the amount of radiation the workers were thought to have been exposed to in the water was two to six sieverts.

Even two sieverts is eight times the new 250-millisievert annual exposure limit set for workers at Daiichi in the days after the disaster; the previous limit was 100. Tokyo Electric officials said that water with an equally high radiation level had been found in the Reactor No. 1 building, The Associated Press reported.

Skin exposures of two to six sieverts will cause severe burns, according to Dr. David J. Brenner, director of the Center for Radiological Research at [Columbia University](#). But if

those doses reach the whole body and not just the skin “you’re at a very high risk of dying,” he said.

At a dose of four sieverts, half of the people exposed will die, Dr. Brenner said. But he said that from the information that had been provided, it was not clear whether the dose to the workers reached their skin only, or penetrated their bodies.

Concerns about Reactor No. 3 have surfaced before. Japanese officials said nine days ago that the reactor vessel might have been damaged.

Hidehiko Nishiyama, deputy director general of the Japan Nuclear and Industrial Safety Agency, mentioned damage to the reactor vessel on Friday as a possible explanation of how water in the adjacent containment building had become so radioactive.

Michael Friedlander, a former nuclear power plant operator in the United States, said that the presence of radioactive cobalt and molybdenum in water samples taken from the basement of the turbine building raised the possibility of corrosion as a cause.

Both materials typically occur not because of fission, but because of routine corrosion in a reactor and its associated piping over the course of many years of use, he said.

The aggressive use of salt water to cool the reactor and its storage pool for spent fuel may mean that more of these highly radioactive corrosion materials will be dislodged and contaminate the area in the days to come, posing further hazards to repair workers, Mr. Friedlander added.

The contamination of the water in the basement of the turbine building poses a real challenge for efforts to bring crucial cooling pumps and other equipment back into use.

One other major worry about Reactor No. 3 is the mox, or mixed oxide, fuel it uses. It is an especially dangerous blend of reprocessed fuel and can be more radioactive when melted than the pure uranium fuel used in other reactors, experts say.

The news on Friday and the discovery this week of a radioactive isotope in the water supplies of Tokyo and neighboring prefectures punctured the mood of optimism with which the week began, leaving a sense that the battle to fix the damaged plant will be a long one.

No one is being ordered to evacuate the second zone around the plant, officials said, and people may choose to remain, but many have already left of their own accord, tiring of the anxiety and tedium of remaining cooped up as the nuclear crisis simmers just a few miles

away. Many are said to be virtual prisoners, with no access to shopping and immobilized by a lack of gasoline.

“What we’ve been finding is that in that area life has become quite difficult,” Noriyuki Shikata, deputy cabinet secretary for Mr. Kan, said in a telephone interview. “People don’t want to go into the zone to make deliveries.”

Mr. Shikata said the question of where those who chose to leave would go was still under consideration. The effort to move people comes at a time when there are already hundreds of thousands of Japanese displaced by the quake and tsunami.

The National Police Agency said Friday that the official death toll from the March 11 quake and tsunami had passed 10,000, with nearly 17,500 listed as missing.

There was some good news. Levels of the radioactive isotope found in Tokyo’s water supply fell Friday for a second day, officials said, dropping to 51 becquerels per liter, well below the country’s stringent maximum for infants.

Hiroko Tabuchi and David Jolly reported from Tokyo, and Keith Bradsher from Hong Kong. Takeshi Takizawa contributed reporting from Tokyo, and Denise Grady from New York.