Fukushima radiation levels rise to highest levels yet

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2 May 2011

As the twenty-fifth anniversary of Chernobyl passes, Fukushima looks set to overtake it as the world's worst nuclear disaster. Two weeks ago Fukushima was raised from a level 5 disaster to a level 7 like Chernobyl. But nearly two months after the crisis began, Fukushima is still emitting radioactivity, while Chernobyl's emissions had been contained at this stage.

Robots sent into the Number 1 reactor building have recorded the highest reading of radioactivity so far found at the Fukushima Dai-ichi plant since the emergency began almost two months ago. Two robots found 1,120 millisieverts of radiation an hour was being emitted from the stricken reactor. This level of radiation is more than enough to cause immediate radiation sickness if a human being were exposed to it. The Tokyo Electrical Power Company (Tepco) which runs the Fukushima facility has begun to use robots because it has become impossible to send workers into the plant for long enough to take accurate readings.

The company has just admitted that a woman worker at the plant was exposed to 17.55 millisieverts last month and taken off the job. Her exposure exceeds the 5 millisieverts 3-month dose limit for females. Women have a lower dose level than men because of the potential danger to a foetus if a woman were to become pregnant. The woman worked indoors and her exposure to radiation was limited to clothing and other material brought in from outside her workplace. The fact that she has exceeded the permitted dose gives an indication of the now generalised level of contamination at Fukushima and suggests that no areas of the plant can be classified as safe for prolonged periods. Tepco has laid off 18 other female workers. It has not said what their exposure level is.

The Japanese nuclear industry as a whole is now facing a general crisis as the potential workforce is reduced because of the high exposure levels of the Fukushima workers. The Health Ministry is expected to uprate the legal limit for nuclear workers next month. The current level for non-emergency workers is 50 millisieverts per year. This is expected to be raised allowing workers not directly engaged in emergency work to be exposed to greater levels of radiation.

Permitted levels of exposure are also to be raised for children. The Japanese government wants to increase the limit for children living in Fukushima prefecture to 20 millisieverts per year. That is to say to the same level as adult men working in the nuclear industry and 20 times what is normally accepted internationally for non-nuclear workers. It would currently be illegal for anyone under the age of 18 to work in these conditions in Japan. But under the new proposals this is the level of contamination that will be acceptable in children's playgrounds and schoolyards. When possible contamination from food sources is taken into account children in Fukushima would be exposed to much higher total levels of radiation. Children's cells are dividing roughly 10 times faster than those of adults so that their sensitivity to radiation exposure is far greater.

Meanwhile the union representing Tepco workers has agreed to a 20-25 percent pay cut for its members. Koji Sakata, secretary-general of the Tokyo Electric Power Workers Union told reporters, "Most union members didn't object to a pay cut, considering the situation at the company and the effect on society from the nuclear accident."

Tepco's shares have fallen by 80 percent since the crisis began. The company expects to save 54 billion yen through the pay cuts. Tepco faces a massive bill for compensation from residents who have been evacuated from the surrounding area. Initial payments are expected to reach 50 billion yen, but the government is expected to cover this cost. Effectively, the financial burden of the disaster is being placed on the shoulders of Tepco workers and the majority of the Japanese population who will have to fund the subsidy through their taxes.

The high radiation levels have serious implications for long terms measures to stabilize the plant and bring the four overheating reactors to cold shut down. Tepco had planned to flood the steel containment vessel of number 1 reactor with water, to speed up the cooling process. The high readings suggest that this will not now be possible because the source of the high readings cannot be identified.

The implication is that the containment vessel of reactor 1 is compromised in some way and that the steel structure itself or the seals on pipes connecting to it are damaged. In either case it would be impossible to flood the containment vessel without causing even more contaminated water to collect in the reactor building and potentially flow into the sea. Highly contaminated water is currently flowing into the Pacific Ocean through a leak which Tepco has been unable to plug.

Professor Hironobu Unesaki of Kyoto University said, "Tepco must figure out the source of high radiation. If it's from contaminated water leaking from inside the reactor, Tepco's so-called water tomb may be jeopardized because flooding the containment vessel will result in more radiation in the building."

The sheer quantity of highly contaminated water has become a

serious problem at Fukushima. A floating storage facility is expected to arrive at the plant in the next few weeks. The Mega-Float can hold some 10,000 tons or approximately 10 million litres of water. But the scale of the problem dwarfs even this giant structure. There are thought to be 87.5 million litres of water lying in basements, tunnels and trenches on the site and a further half million litres may be overflowing daily. The Mega-Float could accommodate about one eighth of the water at best.

Much of the water on the site is, in any case, highly contaminated and it would be too dangerous to pump it into a floating storage facility. Some on-site storage is available and more is to be created. A longer-term solution is to decontaminate the water. The French nuclear company Areva is working with waste management company Veolia to construct a flocculation facility at Fukushima which will treat 50 tons of water a day. A cocktail of chemicals is used to bind the radioactive elements into a sludge, which can then be sealed in bitumen or glass and stored in barrels.

The technique is currently used at the La Hague nuclear reprocessing plant and processed wastewater pumped directly into the English Channel. But the system is not without its critics. Health researchers have documented a leukaemia cluster near the La Hague plant. The US Nuclear Regulatory Commission has refused to licence the French technique for use in America. Commission chairman Gregory Jaczko cited “a non-proliferation concern and environmental concerns”.

The full extent of the environmental and health impact of the Fukushima nuclear accident cannot yet be assessed. Some scientists are pointing to serious long-term global concerns. Arnie Gundersen of Fairewinds Associates, who has spent 39 years working in the nuclear industry and now acts as an expert witness, has suggested that the explosion in Number 3 building at Fukushima on March 14 may have been more serious than has so far been admitted.

Gundersen argues that an initial hydrogen explosion caused a prompt criticality in the spent-fuel rod pool at the top of the Number 3 reactor building. Prompt criticality is the term used in the nuclear industry for an exponential increase in the number of fission events. That is to say a runaway nuclear chain reaction may have taken place in the spent fuel rods.

Gundersen postulates that the upward vector, the upward thrust, from the explosion in Building 3 may have been sufficient to carry radioactive isotopes from the fuel rods into the atmosphere and to disperse them over many thousands of miles. He points out that uranium has been found on Hawaii, americium has been found in New England and plutonium dust has been found on the Fukushima site. These latter elements are transuranic, i.e. heavier than uranium, and indicate that nuclear fuel was volatilized at Fukushima.

If Gundersen’s hypothesis is correct then Fukushima will rival or surpass Chernobyl in its global health consequences. The impact of Chernobyl on human health is still disputed. A recent study by Lisbeth Gronlund of the Union of Concerned Scientists estimates that an extra 53,000 cancers and 27,000 deaths can be attributed to the fallout from Chernobyl. This is six times higher than the UN estimate, which only looked at the most contaminated areas.

Interviewed by Lisa Mullins of PRI, Gronlund refused to be drawn on the implications for the potential death toll from Fukushima. “The Fukushima crisis is still ongoing,” she said. “The radiation will continue to be emitted. And after the fact, people will be able to reconstruct the dose that people in those areas will have received. And then you can, from that, estimate the number of additional cancer deaths. But it’s really too soon to say.”

Fukushima has already gone on longer that the critical phase of the Chernobyl accident. At Chernobyl only one reactor was involved while at Fukushima there are four reactors in crisis. Nor did Chernobyl take place in the context of an ongoing disaster, which has killed tens of thousands of people and disrupted essential services. At any point the already devastated plant could be hit by another earthquake and tsunami.

“A big earthquake can strike at any time,” Shigeharu Aoyama, a government adviser, warned, “and we are in the middle of that danger. But we are too focused on how to cool the reactor and how to treat the radioactive water. And although we have 1,500 people working on the problems, we have not built a protective embankment.”

Professor Toshiso Kosako, an expert on radiation safety at the University of Tokyo, has resigned his post as a special government adviser on nuclear issues. He said the government “have ignored the laws and have only dealt with the problem at the moment”. This approach, he warned would only prolong the crisis.

He made explosive charges that the government is not adequately protecting the population from radiation. Noting that a recent government decision allowed children living near the Fukushima plant to receive doses of radiation equal to the international standard for nuclear power plant workers, he said: “I cannot allow this as a scholar.”

He also said limits on radiation exposure for clean-up workers at Fukushima were too high, and that the government was not releasing enough data on radiation levels around the facility.