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The Fukushima Crisis Prevails, Worse than Before. Failures in the Disposal of Radioactive Waste

And the radioactive waste from Fukushima goes to: Fukushima!

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Nobody in the world knows how dispose of radioactive waste safely and permanently. That's a given. The Japanese central government is presumably aware that anything it does with still the unmeasured, but vast amount of radioactive waste from Fukushima's six nuclear power generators will be temporary. Leaving it in place is not an option. So Tokyo announced August 29 that the Fukushima waste would be stored for 30 years in Fukushima prefect, in an "interim facility" to be built probably in nearby Okuma or Futaba (now evacuated).

"We've screened and confirmed safety and regional promotion measures as offered by the state," Fukushima prefect Governor Yuhei Sato said when announcing the decision. The temporary plan was proposed by the environment minister in late 2013, an offer few thought the Fukushima officials could refuse.

The negotiated terms of the plan include a government lease of about 4,000 acres (16 square km) from some 2,000 landowners around the Fukushima site. No leases have yet been signed. The terms also include government subsidies to the prefect of $2.9 billion (301 billion yen) over thirty years, as well as a personal visit in Tokyo for Gov. Yuhei with Japanese Prime Minister Shinzo Abe.

According to Kyodo News, the Japanese government has made the same kind of promise governments around the world have made and failed to keep ever since the first nuclear waste was generated. Tokyo has "vowed to secure a site outside the prefecture for final disposal of the radioactive waste after the 30-year period, although the site has not been decided."

Kyodo News also reported that 88 plaintiffs, who were Fukushima residents at the time of the March 2011 meltdowns have sued tor Japanese government and the prefect government for damages for governmental failure to protect children from radiation. Each plaintiff seeks $9,600 (100,000 yen) in compensation: "They said in a written complaint that the central and prefectural governments failed to promptly release accurate data of radiation levels in the air after the nuclear crisis was triggered by a massive earthquake and tsunami in March 2011, neglecting their duty to prevent residents' radiation exposure as much as possible, and exposed children to unnecessary radiation."

Plutonium levels from Fukushima may be relatively low in Pacific

The same day the plan to store Fukushima's radioactive waste next door to the Fukushima

nuclear complex was announced, the MarineChemist blog on Daily Kos reported on measurements of Plutonium in the Pacific Ocean made in April 2014. The conclusion from those measurements, made within about 90 miles (150 km) of the Fukushima plant, was that the triple meltdown at Fukushima had not added measureable amounts of Plutonium to the ocean near the site. As the study put it: "Our results suggested that there was no significant variation of the Pu [Plutonium] distribution in seawater in the investigated areas compared to the distribution before the accident."

That sounds like good news. But all it really means is that the added Plutonium from Fukushima, so far, may be relatively trivial in comparison to the already-elevated level of Plutonium contamination from nuclear weapons testing more than fifty years ago. The isotopes most relevant, Plutonium-240 and Plutonium-239, have half-lives of 6,500 years and 24,100 years, respectively. The half-life is the time it takes for half the amount of a radioactive element to decay into something else (which may be more radioactive, or less).

And Plutonium is but one part of the radiation load. There are thousands of nuclides and isotopes. Some have a half-life of almost no time at all. Many others, including those released by Fukushima – Cesium, Strontium, Tritium, Iodine, Tellurium – have half-lives measured in years, decades, and centuries during which time they remain dangerous, albeit decreasingly. [According to a report in the journal Environmental Science and Technology in 2013, the amount of radioactive Cesium from Fukushima measured in central Europe in 2011 was under-reported by orders of magnitude.]

The Pacific study apparently ignored everything but Plutonium in its study of ocean radioactivity. It also ignored all radioactivity in the rest of the Pacific Ocean, all the areas more than 90 miles from Fukushima.

The worse news is that there is little or no reliable, systematic, continuous measurement of radiation levels anywhere, not just related to Fukushima. Nor is there any honest, comprehensive, serious study of the effects of the radiation that's not being measured. Independent scientists have sharply criticized this failure to gather reliable data in what amounts to a pattern of global denial. The Nobel Peace Prize winning organization,International Physicians for the Prevention of Nuclear War, issued a report in June sharply criticizing the United Nations work on Fukushima. The physicists said that the UN's optimistic assumptions had no credible basis in current research. Even stronger criticism was reported in the August 22 London Times:

"The United Nations is deliberately ignoring evidence of genetic damage caused by the Fukushima nuclear disaster, according to international scientists who point to signs of mutations in animals, birds and plants. Members of the US-based Chernobyl and Fukushima research initiative have denounced a recent UN report on the 2011 disaster in Japan which, they say, fails to take proper account of symptoms as diverse as spotty cows, infertile butterflies, and monkeys with low blood cell counts.

National and international agencies continue to behave as if ionizing radiation wasn't that big a deal, as if they still operated in a world where radiation was officially measured in "sunshine units," as if they still operated in the pre-1945 world where background radiation was stable or decreasing. That world is gone. Background radiation, the more or less inevitable level of exposure humans can expect, on average, is increasing – only slightly, to be sure, but also inexorably.

Clean water continues to flow into the Fukushima plant, where it is irradiated by the melted down reactors' nuclear waste. Radioactive water flows continuously into the Pacific at the rate of about 107,600 gallons (400 tons) per day. Efforts by the plant's owner/operator, the Tokyo Electric Power Company (TEPCO), to mitigate this pollution have, so far, achieved little.

Court rules TEPCO liable for damages in woman's suicide

In the first such ruling by any court, Fukushima district court ruled on August 26 that TEPCO was responsible for causing one of at least 130 suicides linked to the March 2011 meltdowns. As a result of the regional radiation contamination, Hamako Watanabe, 58, was forced to evacuate from Yamakiya with her husband and their children. The government assigned parents and children to different locations. The family lost its livelihood and its home. In July 2011, Hamako Watanabe set herself on fire and killed herself. In May 2013, her surviving family sued TEPCO for $900,000. The court awarded them about $490,000. Previous, similar suicide lawsuits had been settled through pre-trial mediation. After this decision, TEPCO issued an apology:

"We apologise from the bottom of our hearts again that the Fukushima Daiichi nuclear power plant accident is causing much inconvenience and concern to Fukushima prefectural residents and many people. Also, we offer our sincerest prayers for the late Mrs Hamako Watanabe's soul. We will closely examine the content of the ruling and continue to respond sincerely."

Fukushima Effects More Lingering than Hiroshima or Nagasaki?

Now it turns out that the multiple meltdowns at the Fukushima Daiichi nuclear power plant were worse than originally reported after the March 11, 2011, shut down of the six-reactor complex (one of the 15 largest in the world). Even after viewing underwater robot video footage of the collapsed reactor interior in May 2011, according to Japanese officials, "Experts believe that the fuel rods, not visible in the clip, were left largely undamaged despite the disaster."

That was not true.

By November 2011, the official story changed: Fukushima Unit 3 suffered "only" a partial meltdown, involving about 63% of the reactor's core, according to TEPCO. Unit 3 contains mixed oxide (MOX) fuel that is about 6% Plutonium. The core of 548-566 fuel assemblies with 63 fuel rods each (more than 35,000 rods) is estimated to weigh about 89 tons. Radiation levels inside the reactor have remained lethal since March 2011.

On August 6, 2014, more than three years after the accident, on the 69th anniversary of the atomic bombing of Hiroshima, TEPCO announced that its revised assessment was that 100% of the reactor core had melted down and pooled at the bottom of the concrete containment vessel. There, TEPCO now believes, the molten fuel rods have penetrated about 68 cm (about 27 inches) into the concrete bottom of the vessel, but the mass remains contained.

In the Fukushima Unit 1 meltdown, TEPCO estimated in November 2011, that the core had had penetrated about 65 cm into the concrete bottom of the containment vessel.

The concrete bottoms of the containment vessels at Fukushima are about 7.6 meters,

according to TEPCO. If the core has penetrated 65 cm, then there is still about 90% of the containment holding the melted fuel. But no one knows for sure at the moment.

Early preparations to begin the clean-up of Unit 3 went awry on August 29, when a remotely-operated crane was lifting the operating console of a fuel-handling machine into place to begin removing debris covering the fuel rods. The crane dropped the 880 pound (400kg) console into the unit 3 fuel pool, according to TEPCO. Cooling water has kept the fuel pool relatively stable for more than three years. TEPCO reported no injuries and no radiation release as a result of the accident. Shortly after the crane dropped the console into the fuel pool, there was an offshore earthquake of about 5.0 magnitude, but it caused no further damage.

Radioactive water build-up; rice paddies and monkeys contaminated

American media (perhaps world media) continue to under-report news about Fukushima, providing almost no reliable, continuous coverage for assessing a critical event that has potentially global consequences, even though it's unfolding minute-to-minute. The failure of governments to address the spread of radiation, and its intensity creates an information vacuum. Rather than doing their own reporting, most mainstream media report only anecdotally, or not at all. This allows scare-mongers to take a serious, on-going crisis and make it apocalyptic (for example, "How The Entire Pacific Is Polluted And Can Kill All Sealife").

In a limited effort to provide some perspective, here are a few summaries of recent reports of some of the ongoing difficulties at Fukushima:

Thousands of gallons of radioactive water are currently held in hundreds of Fukushima holding tanks that are reaching full capacity. On August 7, TEPCO announced its plan to release most or all of this water into the ocean, but would first "purify it with a state-of-the-art cleaning system." The plan has not yet received any permits. Japan Times reported on August 31 that TEPCO had given up this cleanup plan for Unit #1, although TEPCO officially says the cleanup process will be completed by the end of fiscal 2014.

TEPCO is currently impounding roughly 100 million gallons (almost 400,000 tons) of radioactive water on the Fukushima site. Another 100,000-plus gallons (400 tons) of fresh water is being irradiated daily. The system TEPCO has been using is effective only at reducing the amount of Strontium in the water, not any of the other radioactive substances.

TEPCO's plan to build an ice wall to contain radioactive water has not been going well, the company acknowledged August 5. Engineers have yet to overcome the difficulty in freezing highly toxic, radioactive water already pooled on the site. Refrigeration rods emplaced in April failed to freeze the water. They were removed after three months.

Now TEPCO is putting ice in the trenches filled with some 11,000 metric tons (almost 350,000 gallons) of water contaminated with radioactive materials including Uranium and Plutonium. Although TEPCO has dumped in 58 tons of ice, the water has yet to freeze. The company plans to try dry ice next.

Japan's Nuclear Regulation Authority (NRA) has urged TEPCO to solve this problem before the radioactive water starts spilling into the ocean. According to authority chairman Shunichi Tanaka on August 6, "The biggest risk is the trench water. Until that matter is addressed, it

will be difficult to proceed with other decommissioning work…. It appears that they are getting off track."

TEPCO has yet to make significant progress in controlling groundwater that flows into the site clean and is then contaminated as it flows through, and out. The company has not attempted to divert water around the plant site, as recommended by the International Research Institute for Nuclear Decommissioning (IRID). The water problem is complicated by basic ignorance of realities: TEPCO does not know the exact locations of the three melted reactor cores, nor does it know the precise routes of water entering or leaving the site.

Muon imaging technology and tracking detectors may help TEPCO find the melted cores. On August 8, Decision Sciences International Corp. (DSIC) announced that it had a contract to:

"design, manufacture and deliver a detector and tube arrays that fit into the power plant building. The detector will be part of Toshiba's overall Fukushima Complex project to determine the location and condition of the nuclear fuel inside the plant….

Muon imaging technology makes use of cosmic ray muons to determine material density and type of material scanned…. Muon tracking detectors detect and track muons as they pass through scanned objects. Subtle changes in the trajectory of the muons as they penetrate materials and change in direction correlate with material density. Nuclear materials such as Uranium and Plutonium are very dense and are relatively easy to find."

Rice paddies outside the Fukushima evacuation zone have been contaminated with radioactive material, according to a July report from Japan's agriculture ministry. The ministry suspects that the contamination (especially Cesium) came, at least in part, from the removal of radioactive wreckage around Fukushima's Unit 3, When the debris was moved, apparently, radioactive dust trapped beneath it was exposed and blew away. TEPCO did not immediately inform the public of the ministry's findings.

Since at least 2013, the Japanese government has allowed farmers to grow rice in evacuation zones in Fukushima prefect, as close as 6 miles from the nuclear complex. The rice is sold commercially. Farmers use Potassium fertilizer in an effort to reduce the amount of Cesium absorbed into the rice. The government has said it would test all Fukushima rice for radioactivity before allowing it to go to market.

Wild monkeys living 43 miles away from Fukushima have detectable levels of radioactive Cesium, while wild monkeys living farther away had no detectable levels of Cesium, according to Scientific Reports on July 24. The contaminated monkeys also have lowered counts for both white and red blood cells, counts that indicate a damaged immune system. Professor Shinichi Hayama, at the Nippon Veterinary and Life Science University in Tokyo, told the Guardian that:

… during Japan's snowy winters the monkeys feed on tree buds and bark, where Cesium has been shown to accumulate at high concentrations.

"This first data from non-human primates — the closest taxonomic relatives of humans — should make a notable contribution to future research on the health effects of radiation exposure in humans," he said….

"Abnormalities such as a decreased blood cell count in people living in contaminated areas have been reported from Chernobyl as a long-term effect of low-dose radiation exposure."

Japan to spend at least $3.7 billion storing dirt contaminated by radiation from Fukushima. $3.7 billion is the amount announced to begin a project that has no end date. On August 8, Japan's Environment Minister Nobuteru Ishihara announced the grant to local governments, to help them move their contaminated dirt to national government storage centers that have yet to be built.

South Korea will return radioactive scrap metal to Japan, the Korean nuclear safety commission announced August 10. The commission has radiation detectors at all major ports. According to Yonhap News Agency, "Miniscule traces of Cesium-137 were detected in about 20 kilograms of scrap metal, which are being kept at a quarantine facility." The total shipment was 20 tons.

Multiple reports of "radioactive cars" from Japan include news of countries including Jamaica, the Netherlands,Kyrgyzstan, and Russia detecting them and returning them to Japan. Russia reports a sharp decline in radioactive objects seized by customs since 2011. In April 2011, the European Union established a "safe" level of radiation (above background radiation) for all ships coming from Japan. This level is slightly lower than the "safe" level of radiation exposure Japan has set for the Fukushima region. The European limit is non-binding and may or may not be implemented by individual countries at their ports.

South Korea continues to ban the import of fish from Fukushima prefecture and seven other prefectures around the site of the multi-meltdowns that have contaminated the Pacific Ocean continuously, at varying intensities, since March 2011.

The Unit 4 fuel pool, teetering about 100 feet above ground, has been about 77% emptied since the fall of 2013.Japan's NRA announced on August 6 "that 1,188 out of a total of 1,533 spent and unirradiated (sic) fuel assemblies in the Unit 4 Spent Fuel Pool at Fukushima Daiichi Nuclear Power Station have been transferred to the Common Spent Fuel Pool on site," a safer location. Removal was suspended July 1 for legally required maintenance that is expected to last into early September.

Three former TEPCO executives should face criminal prosecution for their failure to take action to prepare the Fukushima plant to survive the likelihood of earthquake or tsunami, an 11-member independentjudicial panel of Japanese citizens concluded August 5. In 2013 the Tokyo prosecutor decided not to prosecute any TEPCO officials, saying the disaster was unforeseeable. The panel decision requires the Tokyo prosecutor to re-open the investigation and its decision is expected in about three months, when it will be reviewed by the panel.

TEPCO did not respond to warnings in 1990 by the U.S. Nuclear Regulatory Commission (NRC) in a report first circulated in draft form in 1987. According to Bloomberg in March 2011, the NRC report reviewed reactors of the same design as those at Fukushima and "identified earthquake-induced diesel generator failure and power outage leading to failure of cooling systems as one of the 'most likely causes' of nuclear accidents from an external event" – which is what happened at Fukushima 20 years later. Bloomberg added:

"The 40-year-old Fukushima plant was hit by Japan's strongest earthquake on record March 11 only to have its power and cooling systems knocked out by the 7-meter (23-foot) tsunami that followed. Lacking power to cool reactors, engineers vented radioactive steam to release pressure, leading to as many as four explosions that blew out containment walls at the plant 135 miles (220 kilometers) north of the capital.

While the appropriate measures that should have been implemented are still to be evaluated, more extensive waterproofing of the underground portion of the reactor could have helped prevent the cooling systems' failure, said [a nuclear researcher], who questions the use of nuclear power in Japan because of its seismic activity."

There were earlier warnings as well, as reported in March 2011 by BBC filmmaker Adam Curtis: And in 1971 the Atomic Energy Commission did a series of tests of Emergency Core Cooling systems. Accidents were simulated. In each case the emergency systems worked – but the water failed to fill the core. Often being forced out under pressure.

As one of the AEC scientists says in the film ["A is for Atom"]: "We discovered that our theoretical calculations didn't have a strong correlation with reality. But we just couldn't admit to the public that all these safety systems we told you about might not do any good"

TEPCO built Fukushima on an ocean-front bluff, but lowered that bluff some 30 feet closer to sea level, partly to build on bedrock as a defense against earthquakes, but also to save money on the cost of running seawater pumps. TEPCO built a seawall to protect Fukushima against tsunamis, but when TEPCO was warned that the seawall was too low to be effective, TEPCO did nothing.

The perspective of the nuclear industry remains focused on expanding nuclear power as its first priority, subtly suggesting that any problems are the fault of inadequate government regulation (which the industry generally resists as much as possible, because regulation tends to cost money, at least in the short term). This perspective shows up in statements like this from the World Nuclear Association, a self-declared industry trade group: "An analysis by the Carnegie Endowment in March 2012 said that if best practices from other countries had been adopted by TEPCO and NISA at Fukushima, the serious accident would not have happened, underlining the need for greater international regulatory collaboration."

Given the decades of industry lies, deceit, and minimization, a more forthright analysis is that, for failing to follow best practices, even when warned of specific dangers, TEPCO and its executives should be prosecuted for reckless endangerment and negligent homicide.

Meanwhile, Japan's Environment Ministry has decided to raise the maximum "safe" level of exposure to radiation in the Fukushima clean-up region by more than 200 per cent above background radiation. And at Fukushima, almost all decommissioning work paused August 9 for a week-long summer vacation.

In Japanese, "Fukushima" means "Island of Good Fortune."

Boardman