

Fukushima-Daiichi nuclear accident: Summary

“If there are risks of accidents that could make half the land mass of our country uninhabitable, we cannot afford to take such risks, even if we are only going to be playing with those risks once a century.”

- Prime Minister Naoto Kan, September 7, 2011.

In the year since four nuclear reactors were destroyed at the Fukushima-daiichi nuclear power plant, Japan has shut down 48 nuclear reactors.¹ By May 2012 the third largest generator of nuclear electricity in the world will have no operating reactors. This has been achieved without power shortages during the winter of 2011-2012.² The Japanese people in reacting to its worst ever industrial accident, have instead embraced renewable energy and energy efficiency, with 70 percent demanding a complete phase out of nuclear power.³

The accident

At the Fukushima-daiichi site, the Tokyo Electric Power Company operated six General Electric designed boiling water reactors, which commenced operation between 1971 and 1979. The earthquake and tsunami that struck the nuclear plant on March 11, 2011, led to the meltdown of three reactor cores and the destruction of four of the six reactors at the site. These events led to widespread radioactive contamination of Japan and the Pacific Ocean. Today, one year after the start of the accident, thousands of workers are still battling to maintain a fragile and highly dangerous site.⁴ They are confronted with intensely radioactive molten fuel, tens of thousands of gallons of highly contaminated water, and radiation levels so high that access to key areas is prevented.

In terms of safety, the Fukushima accident reveals that nuclear reactors:

- cannot cope with total loss of electrical power or station blackout;
- cannot withstand major seismic events;
- that the threat from spent fuel pools has been ignored;
- that emergency response measures and evacuation plans are inadequate;
- the industry operates in secret, with a disregard for safety and poor regulatory oversight;
- and operators resist public disclosure of information in a prompt and effective way;

Finally, the so-called safety reviews or stress tests of nuclear reactors being applied in Japan and around the world are flawed.

The human impact

Japan is one of the most densely populated nations on earth, so a catastrophic nuclear accident will effect millions. Yet it took two months to admit the reactors had suffered meltdown, even though this was recognized by independent specialists within days of March 11.⁵

1 See, <http://www.spiegel.de/international/world/0,1518,bild-322529-818567,00.html>

2 See, Nuclear-free society can be achieved much earlier, Asahi Shimbun Editorial, February 27th 2012, <http://ajw.asahi.com/article/views/editorial/AJ201203030025>

3 See, <http://www.asyura2.com/11/genpatu18/msg/183.html> as cited in Nuclear Power and Shifts in Japanese Public Opinion, Matthew Penney, Feb. 13th, 2012 <http://www.japanfocus.org/events/view/130>

4 See, statement of plant chief, <http://www.seattlepi.com/news/article/Plant-chief-Fukushima-Dai-ichi-still-vulnerable-3366418.php>

5 See, http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/atomkraft/Summary_Large_Report_03.pdf



One serious consequence of this failure to inform the public is that evacuation of citizens in Fukushima was too slow, and on too small a scale, to adequately protect public health. Even one year after the accident, when radiation doses to the public could be reduced, the Government is refusing to act. The number of people officially evacuated by the authorities from the exclusion and emergency zones around the reactor site, as of December 2011, was 114,460.⁶

Recommendations have been made for the additional evacuations of tens of thousands more people.⁷ Radiation readings tens of miles from the nuclear site are exposing people to levels as much as 20 times above recommended safety limits. The health of children in Fukushima, and across Japan, is of particular concern because they are far more vulnerable to radiation than adults. Despite Government claims that the levels were too low to have an effect on health, in early 2012 indications of the threat to public health emerged with confirmation of thyroid abnormalities, including enlarged nodules in Fukushima children.⁸ Soon after the accident, mothers of Fukushima children formed coalitions to demand that the Government evacuate from the highest contaminated areas in the region.⁹

Speculation on the number of cancers and ultimate fatalities at this stage would be exactly that, speculation, and provides no comfort to the people of Japan. The priority should instead be minimizing further radiation exposure to below recommended maximum levels,¹⁰ especially for the most vulnerable including pregnant women, babies and children.

Environmental contamination

The meltdown of nuclear fuel inside the Fukushima-daiichi nuclear power reactors guaranteed the release of large amounts of radioactivity into the environment. While radiation from the nuclear plant has spread around the world, the most serious impacts are on the environment of Japan and on the health of its people. By November 2011 it was announced by the Government that as much as 8 percent of the landmass of Japan, or over 18,000 square miles had been contaminated by radioactive fallout from the Fukushima accident.¹¹

The largest releases of radioactivity took place in the first weeks after March 11, 2011, though radiation continues to be released one year after the accident. It is estimated that 80 percent of the radioactive gases released dispersed over the Pacific Ocean, with 20 percent dispersed over Japan.¹² One year after the start of the accident, over 175,000 tons of contaminated water has been processed on the site, but volumes of highly contaminated water are still in excess of 100,000 tons.¹³ Leaks of this water have occurred since the start of the accident.

Rather than evacuate, the Japanese government has announced a decontamination program. The total area in need of cleanup has been estimated at 1,000-4,000 square km (386-1,544 square miles), about 0.3 to 1 percent of Japan's total land area, and cost several trillion yen to more than 10 trillion yen (US\$130 billion).¹⁴ The scale of contamination and efforts to decontaminate, store and dispose of contaminated soil and materials from as much as 1 percent of the entire landmass of Japan means that efforts to reduce radiation levels by half within 2 years will be impossible.

Agricultural impact

Tens of thousands of farmers and hundreds of fishing communities spread over thousands of square miles of Japan have been severely effected by the Fukushima nuclear disaster. The Japanese government's response has been to conduct limited and inadequate testing programs, raise the dose limits of radiation exposure for children and adults and not base their limits in food on overall exposure due to external radiation dose and inhalation.

The first results of radiation testing for foods were published by the Japanese government one week after the start of the accident, with levels of radioactive iodine in milk and caesium in leafy vegetables above safety limits and traces of

6 Investigation Committee on the Accidents at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, December 26th 2011, see, <http://icamps.go.jp/eng/120224Honbun02Eng.pdf>

7 See for example the report from French nuclear agency, IRSN, <http://www.irsn.fr/EN/news/Documents/IRSN-Fukushima-Report-DRPH-23052011.pdf>

8 See, <http://shukan.bunshun.jp/articles/-/1044> in Japanese and here, <http://ex-skf.blogspot.com/2012/02/japanese-magazine-sensationalizes.html>

9 See Friends of the Earth Japan, <http://www.foejapan.org/en/news/110819.pdf>

10 See, ICRP which recommends a maximum of 1 milliSievert per year, http://www.icrp.org/docs/2005_recs_CONSULTATION_Draft1a.pdf

11 See, <http://ajw.asahi.com/article/0311disaster/fukushima/AJ201111210014>

12 See, <http://www.atmos-chem-phys.net/12/2313/2012/acp-12-2313-2012.html>

13 See, http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/111130e1.pdf and See, <http://www.bloomberg.com/news/2011-08-17/tepco-may-not-clear-radioactive-water-in-2011.html>

14 See, Japan aims to halve radiation in affected areas in 2 yrs, Aug 26, 2011, <http://www.reuters.com/article/2011/08/26/japan-nuclear-idUSL4E-7JQ1D620110826>

iodine-131 found in tap water in Tokyo.¹⁵ On March 21, the government announced a ban on the sale of certain products from four Prefectures, including Fukushima.¹⁶ Radiation above safety limits has been detected in produce to the south of Tokyo in Shizuoka Prefecture, more than 200 miles from the destroyed nuclear power plant.¹⁷

Radiation monitoring of cattle involves external monitoring which picks up radioactive fallout, but it has failed to detect internal contamination in the meat, caused as a result of eating contaminated forage.¹⁸ This chaotic situation has inevitably led to contaminated food products including milk, beef, vegetables and fruit entering the human food chain. With caesium-137 remaining a hazard for several hundred years, and other radioactive isotopes such as plutonium with half lives measured in thousands of years, the threat will persist for generations.¹⁹

“The greatest crisis in 400 years...Even if it’s not safe, I need my fields for my work...I have no other place to go. I don’t even want to think about escaping from my land.”

-Mr. Sato, 59, is a 17th-generation family farmer.²⁰

Public concerns over contaminated food has led to a drop in sales of produce from the most affected regions in Japan and restrictions and limited testing programs announced in countries in Asia, Europe and North America. The U.S. Food and Drug Administration issued an “Import Alert 99-33” for milk, vegetables, and certain fish species produced or manufactured in selected Japanese prefectures.²¹ However, FDA testing of imported seafood for example has been criticized as wholly inadequate to protect public health.²²

The future of nuclear power

When Japan’s Atomic Energy Commission warned Prime Minister Naoto Kan that the Fukushima accident could require the evacuation of 30 million people,²³ the future of Japan’s decades long nuclear program became uncertain.²⁴ The financial cost of the accident and its aftermath have ranged from US\$261 billion²⁵ to as high as US\$650 billion – a figure comparable to the cost of the U.S. banking meltdown in 2008.²⁶ The fifty billion dollar nuclear assets that in the space of few hours became worthless liabilities at Fukushima-daichi on March 11, 2011 are only a fraction of the true cost to the people of Japan in the coming decades.

A future non-nuclear Japan is now a real possibility, supported by the majority in Japan.²⁷

While Japan has closed nearly all its nuclear reactors, other nations reacted in different ways to the accident. Reactors of the same design that were destroyed at Fukushima, have continued to operate in the United States. The NRC has failed to demand closure of the 23 boiling water reactors of similar design to Fukushima-daiichi, despite knowing for 40 years that they were unsafe.²⁸ In contrast the conservative government in Germany immediately closed seven of its oldest nuclear reactors and one other.²⁹ All its nuclear reactors are to be closed within 10 years. The fourth largest

15 See, <http://articles.latimes.com/2011/mar/19/world/la-fgw-japan-radiation-food-20110320>

16 See, <http://english.cri.cn/6966/2011/03/21/2743s627721.htm>

17 See, www.jiji.com/jc/eqa?q=eqa&k=2011100700863

18 See, <http://www.yomiuri.co.jp/dy/national/T110717002520.htm>

19 Plutonium-239 has a half life of 24,500 years.

20 See, <http://www.nytimes.com/2011/03/30/world/asia/30farmers.html?pagewanted=all>

21 See, <http://fpc.state.gov/documents/organization/161583.pdf>

22 See, http://www.jhsph.edu/publichealthnews/press_releases/2011/love_seafood.html

23 See, <http://www.nytimes.com/2012/02/28/world/asia/japan-considered-tokyo-evacuation-during-the-nuclear-crisis-report-says.html>

24 See, <http://www.japantimes.co.jp/text/nn20120219a2.html>

25 See, The Fight for Compensation: Tales from the Disaster Zone, Dr David McNeill, in Lessons from Fukushima, Greenpeace International, February 28th 2012, http://www.greenpeace.org/international/Global/international/publications/nuclear_/2012/Fukushima/Lessons-from-Fukushima.pdf, citing - Kobori T (2011). Fukushima crisis estimated to cost from 5.7 trillion yen to 20 trillion yen. The Asahi Shimbun, 1st June 2011 - http://ajw.asahi.com/article/0311disaster/quake_tsunami/AJ201106010334, and Japan Center for Economic Research. (JCER), The 38th Middle-Term Forecast, 2nd December 2011, p.3. http://www.jcer.or.jp/eng/pdf/m38_abstract.pdf.

26 Ibid.

27 Including Japan’s richest person, see, http://www.businessweek.com/magazine/content/11_27/b4235016555525.htm and <http://ajw.asahi.com/article/views/opinion/AJ201109017388>

28 See, <http://www.nirs.org/reactorwatch/accidents/mkistatement10711.htm> and <http://www.fairewinds.com/content/new-containment-flaw-identified-bwr-mark-1>, and http://www.ucsusa.org/assets/documents/nuclear_power/UCS-Response-to-NRC-90-day-recs-8-1-11.pdf and <http://www.nytimes.com/2011/03/16/world/asia/16contain.html>

29 See, <http://www.spiegel.de/international/germany/0,1518,757371,00.html>

economy in the world, and largely untouched by global recession knows its future energy supply will be from wind, solar, biomass and energy efficiency.³⁰

The nation with highest percentage share of nuclear generated electricity in the world,³¹ now has the phase out of nuclear power on the political agenda. Seventy-five percent of the public in France oppose nuclear power.³² The cost of upgrades to each of France's 58 nuclear reactors were already estimated to require US\$1.1 billion before Fukushima.³³ The accident has added at least another US\$13 billion to the French nuclear program and therefore the French taxpayer.³⁴

In Japan, there are credible plans for how renewable energy and energy efficiency can be dramatically scaled up, together with no restart of any nuclear reactors. Such an approach if implemented would still allow Japan to reduce carbon emissions by 25 percent by 2020 (compared to those in 1990).³⁵ One consequence would be that even larger reductions in carbon emissions and the further deployment of renewables in the years to 2050 will become more achievable due to the scale of the changes made in the next few years.

As the anniversary of the Fukushima-daiichi accident passes, the Japanese people know that they have paid too high a price for their electricity. They also know that a nation can shut down its entire nuclear fleet – with no power shortages. This is one of the principal reasons why communities across Japan are determined to stop the start up of Japan's nuclear power plants.

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30 See, <http://online.wsj.com/article/SB10001424052702304584004576417432939804792.html>, for plan for renewables and rapid nuclear phaseout, http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/energie/DerPlan.pdf

31 See, Nuclear generates 75% of France's electricity, <http://www.world-nuclear.org/info/inf40.html>

32 See, http://www.nuclearpowerdaily.com/reports/French_Greens_seek_nuke_power_phase-out_999.html

33 See, <http://www.reuters.com/article/2012/01/31/nuclear-france-report-idUSL5E8CV46820120131> and <http://www.french-nuclear-safety.fr/index.php/English-version/News-releases/2012/ASN-Report-on-the-Complementary-Safety-Assessments-CSA>

34 See, <http://www.bgcpartners.com/news-centre/in-the-media/97675379.html> and <http://online.wsj.com/article/SB10001424052970203550304577138392366526910.html>

35 See, scenarios calculated by the German Aerospace Center (DLR) with support from the Institute for Sustainable Energy Policies (ISEP) for The advanced energy revolution for Japan, European Renewable Energy Council/Greenpeace www.greenpeace.org/japan/Global/japan/pdf/er_report.pdf; also see http://www.isep.or.jp/e/Eng_index.html