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The troubled past of Fukushima: How the stricken nuclear plant failed safety checks and crammed its buildings with more uranium than they could stand

By [Daily Mail Reporter](#)

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Japan's stricken Fukushima nuclear plant had one of the country's worst safety records and was crammed with more uranium than it was designed to hold, it has emerged.

American engineers who masterminded the building had not intended for spent fuel to be housed inside the 'flimsy' shells of the reactor buildings that were rocked by the earthquake on March 11.

But the reactor buildings at the plant held the equivalent of almost six years of the highly radioactive uranium fuel rods produced by the plant when disaster struck.

 Damaged: The Fukushima power plant had one of the worst safety records for nuclear facilities in Japan and was crammed with uranium rods when the quake struck, documents have revealed

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Officials within the Japanese government, the power company and the nuclear watchdog are now likely to face tough questions about why the spent fuel rods were stored inside the building.

A much safer but more costly option would have been to build far stronger separate buildings designed specifically for nuclear storage but the plant has been subject to a cost-cutting drive under its chief executive Masataka Shimizu.

The crisis, which has seen more than 45,000 residents evacuated and a country filled with the fear of a nuclear Armageddon, has focused attention on the plant's safety procedures and its history of failed checks.

 Desperate: Emergency workers have battled to cool the over-heating uranium by spraying water on to the damaged reactor building

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 smoke billows from wrecked Unit 4 at Japan's crippled Fukushima Dai-ichi nuclear power plant in Okumamachi, Fukushima

 In this image taken from a footage released by the Japan Defense Ministry, Unit 3 reactor, left, is seen damaged by explosions at the Fukushima Dai-ichi nuclear complex

Meltdown: The nuclear disaster has constantly threatened to spiral out of control with workers being regularly evacuated from the plant

More than 18,000 people are believed to have been killed by the earthquake and tsunami tidal wave that swept through the country leaving a trail of destruction in its path.

Details of the fuel storage at the power plant emerged in the records a presentation by Tokyo Electric Power Co to a conference organized by the International Atomic Energy Agency.

The cascade of safety-related failures at the Fukushima plant is already strengthening the hand of reformers who argue that Japan's nuclear power industry will have to see sweeping changes from the

top.

Between 2005 to 2009 Fukushima had the highest accident rate of any big Japanese nuclear plant, according to data collected by the Japan Nuclear Energy Safety Organization. The plant's workers were also exposed to more radiation than their peers at most other plants, the data shows.

 In this image released by Tokyo Electric Power Co., smoke billows from the No. 3 unit among four housings cover four reactors at the Fukushima Dai-ichi nuclear complex

'Flimsy': Smoke can be seen pouring from the damaged Number.3 reactor at the plant which has also been damaged alongside the Number.4 reactor in the earthquake

 This GeoEye satellite image captured March 18, 2011 shows a view of the Fukushima Dai Ichi nuclear plant.

 Vehicles driving south out of Fukushima Prefecture, where a troubled nuclear power plant is located, make a traffic jam in Kitaibaraki, north of Tokyo

Wreck: A satellite image shows the damage at the power plant while right, hundreds of cars flee the city

 Workers in radiation protection suites exchange instructions before they start radiation screening in Iwaki city some 30 miles south of the power station

Task: Workers in radiation protection suites exchange instructions before they start radiation screening in Iwaki city some 30 miles south of the power station

'I've long thought that the whole system is rubbish,' said Taro Kono, a Liberal Democratic Party lawmaker and a long-time critic of nuclear power who sees the need for a government-directed reorganization of Tokyo Electric.

'We have to go through our whole nuclear strategy after this,' Kono said. 'Now no one is going to accept nuclear waste in their backyards. You can have an earthquake and have radioactive material under your house. We're going to have a real debate on this.'

On Sunday, Japan continued its battle to avoid large-scale nuclear disaster. Workers restored electrical power to parts of the plant and brought down radiation levels with a marathon water-spraying operation that, among other things, finally flooded Reactor 4's waste-fuel pool.

But the latest incidents add to a record of safety sanctions and misses at Tokyo Electric - more commonly known as TEPCO - that date back a decade and continued into the weeks before the quake.

Under two weeks before Fukushima Daichi was sent into partial meltdown, the power company had told safety regulators it had failed to inspect 33 pieces of equipment at the plant, including a backup power generator, according to a filing.

 Cycle of destruction: A volunteer in a nuclear suit rides his bike to reach stranded residents in Fukushima

Cycle of destruction: A volunteer in a nuclear suit rides his bike to reach stranded residents in Fukushima

 A woman finds her ancestor's gravestone torn down in Fukushima,

 Shunsei Sato sitting on the lap of his mother Maki, from Soma in Fukushima, undergoes a screening test for signs of nuclear radiation by a doctor at a welfare center in Yonezawa

Family: A woman finds her relative's gravestone torn down in Fukushima while right, a young child sits on the lap of his mother while undergoing a screening test for signs of nuclear radiation in Fukushima

 Shelter: Evacuees from Futaba, a town near the tsunami-crippled nuclear plant, rest in spaces divided by cardboard at Saitama Super Arena

Shelter: Evacuees from Futaba, a town near the tsunami-crippled nuclear plant, rest in spaces divided by cardboard at Saitama Super Arena

Nuclear industry analysts say an even more pressing question concerns the storage of fuel rods. It is said that Japan's safety regulations may have given the power company too much room to manoeuvre as it sought to contain costs.

When the quake hit, almost 4,000 uranium fuel assemblies were stored in deep pools of circulating water built into the highest floor of the Fukushima reactor buildings, according to company records. Each assembly stands about 3.5 meters high and even a decade after use emits enough radiation to kill a person standing nearby.

The spent radioactive fuel stored in the reactors represented more than three times the amount of radioactive material normally held in the active cores of the six reactors at the complex, according to Tokyo Electric briefings and its presentation to the IAEA.



Danger: A graphic shows the damage at the different reactors at the plant

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Highlighted satellite image of Japan's Fukushima nuclear power plant with pointers detailing main events and current status of each reactor

When the tsunami wiped out the plant's emergency generators, the water in the spent-fuel pool adjacent to the No. 4 reactor could no longer circulate, and fresh water could not be pumped in.

Rods in the pools began to overheat, causing the water to evaporate as steam and exposing parts of the radioactive rods to the air—a critically dangerous situation. The heat spawned fires and the roof above

the pool was partly destroyed, letting radiation out.

The build-up of used fuel rods in the Fukushima reactor buildings has complicated the response to the continuing crisis at the complex and deepened its severity, officials and experts have said.

That has been especially the case at the No. 4 reactor, which was out of service at the time of the quake and had some 548, still-hot fuel assemblies cooling in a pool of water on its upper floor.

There was also fresh nuclear fuel 'parked' in the reactor waiting to be used.

That reactor, which erupted into explosive flames twice last week, triggered a warning from U.S. officials last week about higher risks for radiation from the stricken plant than Japanese officials had disclosed.

David Lochbaum, a nuclear engineer with the U.S.-based Union of Concerned Scientists, said the spent fuel was vulnerable because it was protected only by the relatively 'flimsy' outer shell of the reactors and reliant on a single, pump-driven cooling system.

'It's a recipe for disaster and that disaster is now unfolding in Japan,' Lochbaum said.

Storage of spent nuclear fuel is a controversial area. Many residents living close to sites proposed for storage facilities strongly object to the buildings amid fears of the radiation.

A medium-term storage facility for waste from Fukushima Daiichi being built in the small village of Mutsu in northern Japan is not scheduled to open until 2012. The plan had been for that facility to hold 20 years worth of spent fuel.

 **Rocked: An aerial view shows Fukushima nuclear power plant a week after the earthquake**

Rocked: An aerial view shows Fukushima nuclear power plant a week after the earthquake



Diagram of the Fukushima Daiichi nuclear plant locating stricken reactors and key facilities with timeline of events

More than 60 per cent of the uranium stored at Fukushima Daiichi made it through the quake and tsunami without being destabilized because it was kept in a separate pool built in 1997 and in a number of metal casks that do not rely on outside power, Japanese nuclear safety officials said.

But the location of the remaining fuel storage pools - on the highest floor of the reactor buildings -

exposed the fuel to additional risks because the pools would have swayed more in the quake and could have lost water through sloshing or leaks, experts say.

As workers at the plant scramble to restore power to the plant and test pumps and other safety equipment, the main focus of the safety response has been to keep water in the storage pools by shooting sprays of water from a hastily assembled battalion of high-powered fire trucks.

The water in the pools serves as both a coolant and a barrier to radiation. When the zirconium cladding on the fuel rods is exposed to air, it can erupt into flames.

Fukushima Daiichi had over time been pushing the limits of the plant's capacity to store uranium fuel on site, according to a Tokyo Electric presentation from November 2010 and now circulating among safety experts and environmental critics.

The Tokyo Electric researcher who prepared that presentation on the safety of spent fuel at the complex, Yumiko Kumano, could not be reached for comment. A spokesman for TEPCO declined to comment on its fuel storage decisions and whether they contributed to the crisis.

'Our focus now is on responding to the situation at Fukushima,' he said.

The Fukushima Daiichi plant is Tokyo Electric's oldest nuclear facility, and it has been the site of a series of high-profile safety lapses going back a decade.

In 2002, TEPCO admitted to safety regulators that it had falsified safety records at the No. 1 reactor at Fukushima Daiichi. In 2003, TEPCO shut down all of its 17 nuclear plants to take responsibility for the false safety scandal and a fuel leak at Fukushima.

In 2007, after a powerful quake hit the area near TEPCO's Kashiwazaki-Kariwa nuclear plant in Niigata, the utility was slow to report two radiation leaks and miscalculated the amount of radiation released in a third incident.

Japanese regulators have also come under fire. In 1999, a study commissioned by the U.S. Energy Department determined that workers at Japan's Tokaimura fuel plant had been given insufficient training before they accidentally touched off an uncontrolled nuclear chain reaction. Three workers were severely injured in the incident, which forced tens of thousands to evacuate.

Japan's Nuclear and Industrial Safety Agency was established in 2001 in part because of that criticism. But critics have questioned whether it has enough distance from the industry it regulates or the resources it needs. The agency's records show that it has about two field inspectors for each of Japan's 54 nuclear plant

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Nuclear power should not be in private companies hands, I am no lefty and I hate nuclear power. Those stored fuel rods are leaking Gamma radiation without a doubt. You know the radiation that cannot be stopped unless it is in direct collision with an atom and that has to be stored behind at least 1 and 1/2 inches of lead or a enormous concrete shields. Shields that are now damaged. Gamma rays are used to kill cancer cells but also kill healthy cells. They are extremely penetrating and penetrate through to bone marrow. They cause bone, liver, lung and other forms of cancer like leukemia, as well as suppressing the immune system. So this is not a joke about bananas, stop trying to trivialize a very serious matter. Bananas do not cause cancer, nuclear accidents which release gamma radiation do. It also pollutes the land and everything that grows and feeds on it for thousands of years.

- Marie, Lancs, 22/3/2011 12:18

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The dangers of profit led industry - Give the poor state of the UK power industry at the moment I say renationalise the lot and bring back the C.E.G.B. (Central Electricity Generating Board).

- jim woods, peterborough, 22/3/2011 11:21

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it is all coming out now!! The Japanese continue to do this, is it is not Nuclear materials , then it is Organic lead compounds and other toxic materials. They have already poisoned much of tier industrial coastline during the 50's onwards, now they are poisoning the ret of the world with their 'do not give a care-money first' mentality.

- bob, china, 22/3/2011 11:20

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'A much safer but more costly option would have been to build far stronger separate buildings designed specifically for nuclear storage but the plant has been subject to a cost-cutting drive under its chief executive Masataka Shimizu'. & 'The Fukushima Daiichi plant is Tokyo Electric's oldest nuclear facility, and it has been the site of a series of high-profile safety lapses going back a decade'so slowly but surely the truth is starting to 'out'. If you cant afford the total cost of the project including all the safety systems required over time, then DONT use the technology.

- grieg, Nuneaton, UK, 22/3/2011 11:16

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One thing that keeps crossing my mind is where is all the water that is being sprayed on to the reactors going? Is it soking into the ground or back out to sea? It must be highly contaminated and a threat to the environment.

- Charlie, Shropshire,U.K., 22/3/2011 10:52

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I think it's time for people to start focusing on the real victims of this disaster. Your grossly inaccurate articles serve no purpose at all. They only stir unnecessary panic and take valuable attention away from all the people affected by this disaster. From now on i will refuse to read this website.

- becky, fukushima, japan, 22/3/2011 10:51

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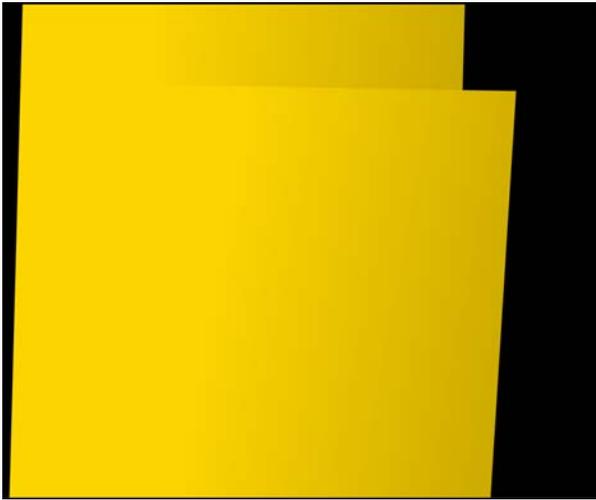
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