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Timeline: Japan power plant crisis

There are fears about the safety of Japan's nuclear power stations. The authorities are working to prevent a second explosion at the Fukushima nuclear power station, where there was a huge blast on Saturday. An emergency has also been declared at the Onagawa nuclear plant, after high radiation levels were detected. BBC News looks at what has happened.

Friday, 11 March: 1446 local time (0546 GMT)

The 8.9-magnitude earthquake strikes off the coast of Honshu island at a depth of about 24km. The tremor triggers the automatic shutdown of 11 of the nation's nuclear power reactors, including reactor units 1,2 and 3 at the Fukushima Daiichi power plant. Reactor units 4, 5 and 6 were undergoing routine inspections, so were not operating.

The quake causes the power station to be cut off from the national electricity grid. The plant's operators, Tokyo Electric Power Co (Tepco), find that the diesel-powered emergency generators for units 1 and 2 are not working and notify government officials.

1541: Tepco reports that the emergency generators for reactor units 1, 2 and 3 have failed - some reports suggest that the diesel-powered back-up systems are affected by the tsunami.

In the following hours, engineers attempt to install mobile power units to replace the diesel systems and manage to stabilise conditions at units 2 and 3, but not at unit 1.

1600: Japan's Nuclear and Industrial Safety Agency (Nisa) sets up an emergency headquarters to gather information on potential damage to the nation's 55 nuclear reactors.

1930: Chief Cabinet Secretary Yukio Edano announces that Prime Minister Naoto Kan has declared a "nuclear emergency status". Officials reassure people that this is standard procedure in events like this and no radioactive material has been detected in the area surrounding the power station.

2100: Residents within a 3km radius of the power station are told to leave their homes, while those within a 10km radius are told to stay at home in case it is necessary to extend the evacuation area.

Following the automatic shutdown of the reactors, and the failure of emergency generators, pressure in the unit builds up as a result of the pumps in the cooling system not working properly.

The pressure is the result of the reactor's residual "decay" heat causing the coolant, which is not being circulated, to evaporate.

The consequent increase in pressure in the coolant circuit can be controlled by pressure release valves, but this leads to an increase in pressure within the reactor building containment chamber.

Tepco says that the pressure inside reactor unit 1 is more than twice normal levels.

Saturday, 12 March: 0530 local time

In order to release some of the pressure inside the reactor unit, the decision is taken to vent some of the steam, which contains a small amount of radioactive material, into the air.

0819: An alarm alerts workers that the position of one control rod (used to halt the reactor) is unclear (whether it is fully inserted into the reactor or outside the reactor, allowing it to continue generating heat)

1009: Tepco confirms it has released a small amount of vapour into the atmosphere to reduce pressure in reactor unit 1.

1043: Control rod alarm stops, and all rods are confirmed as being fully inserted.

1058: In order to release some of pressure inside reactor unit 2, some steam was vented into the air. Again, this contains a small amount of radioactive material.

1530: TV cameras capture a massive explosion at the power station. The pictures appear to show that the outer structure of one of four buildings at the plant has collapsed. Tokyo Electric Power Co says four workers have been injured in the blast.

2000: Uncertainty surrounds what was the actual cause of the explosion, and what damaged was caused by the blast.

Chief Cabinet Secretary Yukio Edano confirms that the concrete building surrounding the steel reactor container has collapsed as a result of the blast, but the steel containment chamber itself had not been damaged.

2020: Tepco begins pumping seawater, mixed with the element boron, into unit 1's reactor. Boron is used as a shield in nuclear reactors, as it controls the nuclear reaction.

Nisa confirms that monitoring systems in the area have detected presence of radioactive elements caesium-137 and iodine-131 in the vicinity of unit 1. It reports an initial increase in levels of radioactivity around the plant, but says these levels have been observed to lessen.

2300: In its latest update, the plant's operator says: "We are preparing to implement a measure to reduce the pressure of [unit 3's] reactor containment vessels under the instruction of the national government."

Sunday, 13 March: 0122 local time

An official at Japan's nuclear agency rates the incident at 4 on the 0-7 international scale of severity. The 1986 Chernobyl disaster was rated 7, while the 1979 Three Mile Island accident was rated 5.

0320: The World Health Organisation says the risk to the public from the radiation leak at Fukushima is "probably quite low".

0523: The International Atomic Energy Agency says the plant's operator has confirmed that the containment vessel around unit 1 is intact and levels of radioactivity nearby have fallen in recent hours.

0623: An official from Nisa says the emergency cooling system at the plant's unit 3 reactor has failed.

0752: Tepco say it is preparing to release steam - containing a small amount of radioactive material - from unit 3 in an effort to lower the temperature inside. It is also looking for an alternative way to inject water into the reactor because without a continuous flow of water, there is a danger that the fuel rods will become exposed to the air and could melt.

0826: Yukio Edano tells state TV the unit 3 reactor was in danger, but attempts are under way to vent steam. Subsequently, it is reported that radiation has again risen above legal safety limits around the plant.

1326: Mr Edano says venting of unit 3 was completed at 0841 local time, but a partial meltdown in the reactor is still "highly possible".

1538: The Japanese government warns of the risk of another reactor explosion following the failure in unit 3. But a spokesman attempts to reassure people by saying the unit is designed to protect the reactor core in the same way as unit 1, and - so far - the radioactivity

released into the environment does not pose a threat to human health.

2005: In his latest public briefing on the situation, Mr Edano says authorities have begun injecting seawater into the unit 3 reactor to try to lower the temperature - as they did on Saturday with unit 1.

He says the water level inside is thought to be rising to more satisfactory levels, but the gauge, which seems to be broken, is not showing this.

2209: It is reported that Tepco is planning to pump seawater into reactor number 2 at the plant - this is the first time problems have been reported with this third unit.

It is worth noting that using seawater like this is terminal for a nuclear reactor. It is a last-ditch move and renders the reactor permanently unusable.

2241: UN nuclear watchdog, the IAEA, says a state of emergency has been declared at a second Japanese nuclear power plant, Onagawa. The IAEA says high radiation levels had been found around the plant. A fire broke out in the turbine building of one of the reactors at Onagawa on Friday, but was put out.

2350: Japan's nuclear safety agency says there is no problem with the cooling systems at the Onagawa plant. It blames the high radiation levels on radioactive releases from the Fukushima Daiichi complex.

Monday, 14 March: 0053 local time

Malcolm Crick, secretary of the UN Scientific Committee on the Effects of Atomic Radiation, tells Reuters: "This is not a serious public health issue at the moment. It won't be anything like Chernobyl. There the reactor was operating at full power when it exploded and it had no containment."

0207: A cooling pump at the Tokai nuclear power plant, 120 km (75 miles) from Tokyo, has failed, a plant spokesman says. But he says an additional pump is working and is cooling the reactor. Japan Atomic Power Company says the temperatures of the reactor have continued to fall.

0707 For full coverage of the crisis at Japan's nuclear power plants, as well as other developments in the wake of Friday's earthquake and tsunami, please go to our [live page](#).

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