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June 17, 2011

# Japan Strains to Fix a Reactor Damaged Before Quake

By **HIROKO TABUCHI**

TSURUGA, Japan — Three hundred miles southwest of Fukushima, at a nuclear reactor perched on the slopes of this rustic peninsula, engineers are engaged in another precarious struggle.

The Monju prototype fast-breeder reactor — a long-troubled national project — has been in a precarious state of shutdown since a 3.3-ton device crashed into the reactor's inner vessel, cutting off access to the plutonium and uranium fuel rods at its core.

Engineers have tried repeatedly since the accident last August to recover the device, which appears to have gotten stuck. They will make another attempt as early as next week.

But critics warn that the recovery process is fraught with dangers because the plant uses large quantities of liquid sodium, a highly flammable substance, to cool the nuclear fuel.

The Monju reactor, which forms the cornerstone of a national project by resource-poor [Japan](#) to reuse and eventually produce nuclear fuel, shows the tensions between the scale of Japan's nuclear ambitions and the risks.

The plant, a \$12 billion project, has a history of safety lapses. It was shuttered for 14 years after a devastating fire in 1995, one of Japan's most serious nuclear accidents before this year's crisis at the Fukushima Daiichi Nuclear Power Station. Prefecture and city officials found that the operator had tampered with video images of the fire to hide the scale of the disaster. A top manager at the plant recently committed suicide, on the day that Japan's atomic energy agency announced that efforts to recover the device would cost almost \$21.9 million. And, like several other reactors, Monju lies on an active fault.

Even if the device can be removed, restarting the reactor will be risky, given its safety record and its use of highly toxic plutonium as fuel, said Hideyuki Ban, co-director of the [Citizens' Nuclear Information Center](#), a watchdog group, and a member of an advisory government committee on Japan's long-term [nuclear energy](#) policy. The plant is 60 miles from Kyoto, a

city of 1.5 million people, and the fast-breeder design of the reactor makes it more prone to Chernobyl-type runaway reactions in the case of a severe accident, critics say.

“Let’s say they make this fix, which is very complicated,” Mr. Ban said. “The rest of the reactor remains highly dangerous. And an accident at Monju would have catastrophic consequences beyond what we are seeing at Fukushima.”

Japan badly needs sources of energy. By closing the loop on its nuclear fuel cycle, Japan aims to reuse, recycle and produce fresh fuel for its 54 reactors.

“Monju is a vital national asset,” said Noritomo Narita, a spokesman here in Tsuruga for the reactor’s operator, the government-backed Japan Atomic Energy Agency. “In a country so poor in resources, such as Japan, the efficient use of nuclear fuel is our national policy, and our mission.”

Critics have been fighting the project since its inception in the 1970s. “It’s Japan’s most dangerous reactor,” said Miwako Ogiso, secretary general of the Council of the People of Fukui Prefecture Against Nuclear Power. “It’s Japan’s most nonsensical reactor.”

After promises of safety upgrades, as well as lavish subsidies and public works, the government has wooed local officials into allowing a restart of the reactor. In Fukui, the government had ready allies: with 14 nuclear reactors, it is Japan’s most nuclear-friendly prefecture. (Fukushima, in second place, has 10 reactors.)

Monju was reopened in May 2010, and just three months later, the 3.3-ton fuel relay device fell into the pressure vessel when a loose clutch gave way. In the two decades since the reactor started tests in 1991, the atomic energy agency has managed to generate electricity at the reactor only for one full hour.

In Monju, Japan is pursuing a technology that most countries have long abandoned. Decades ago, a handful of countries, including the United States, started exploring similar programs. But severe technical difficulties, as well as fears about the weapons-grade plutonium that the cycle eventually produces, have led most countries to scrap their programs.

But Japan has remained staunchly committed to the Monju project. The government of Prime Minister Naoto Kan has shielded it from the deep cuts in spending that it has required of other national projects since it came to power in September 2009.

Under a government plan, Japan would use technology developed at Monju to commercialize fast-breeder reactors by 2050.

Mr. Kan has recently hinted at an overhaul of Japan's nuclear policy, though he has not commented specifically on the fate of the Monju reactor.

The commitment to Monju is rooted in the way Japan has sold its nuclear program to local communities, experts say. In persuading towns and villages to provide land for nuclear power stations, Japan has promised that the spent nuclear fuel — which remains highly radioactive for years — will not be stored permanently on site, but used as fresh fuel for the nuclear fuel cycle.

Giving up on any part of the fuel cycle would mean the government would have to find communities willing to become the final resting ground for the spent fuel.

“Of course, no community would accept that, and suddenly Japan's entire nuclear program would become unviable,” said Keiji Kobayashi, a retired fast-breeder reactor expert formerly at the [Kyoto University Research Reactor Institute](#).

But the technology comes with risks. Instead of water, which is used in commercial nuclear reactors, the prototype reactor uses 1,600 tons of liquid sodium, a hazardous material that reacts fiercely with water and air, to cool its fuel. The presence of an estimated 1.4 tons of highly toxic plutonium fuel at the reactor makes it more dangerous than light-water reactors, which use mainly uranium fuel, critics charge.

Meanwhile, other parts of Japan's nuclear fuel cycle are also unraveling. The full opening of a nuclear fuel reprocessing plant in the village of Rokkasho, in Aomori Prefecture, has been delayed countless times, with more than \$20 billion invested in the project.

Still, work continues to restart the Monju plant. In October, engineers used a crane to try to lift up the device, adding about 220 pounds of force a time. After 24 attempts, they gave up, fearful of the strains on the entire reactor.

Since mid-May, workers have been prepping for a different strategy, clearing the reactor's lid of various instruments. As early as next week, workers will try to remove the device by dismantling a part of the vessel's lid with it.

Workers face other dangers in fixing the plant. The reactor contains argon gas, which helps keep the sodium from burning but is a dangerous asphyxiant in confined spaces. And should the device fall farther into the reactor vessel, the damage could be substantial.

The atomic energy agency hopes the extraction will be complete by the end of the month. The agency says it will conduct extensive safety checks, and bolster its earthquake and tsunami defenses, before the reactor is eventually restarted.

“The device will definitely come out this time,” said Toshikazu Takeda, director at the University of Fukui Research Institute of Nuclear Engineering, and head of a government panel that approved the latest repair plans. He said that engineers had recreated removal procedures at a lab and perfected their handling of the crane that will lift the device from the reactor vessel.

Once removed, the device will be checked thoroughly for missing parts or damage, he said. The liquid sodium coolant, heated to almost 400 degrees Fahrenheit, makes it impossible to check fully for any damage the device may have caused to the reactor vessel, however.

Still, Mr. Takeda said he hoped to see Monju complete safety checks and prepare for a restart within a year.

“Japan needs the nuclear fuel cycle,” he said, because supplies of fuels will not last forever. “Uranium will last less than a hundred years. Plutonium will last over a thousand.”