



THE FUKUSHIMA DAIICHI NUCLEAR CRISIS: A SYSTEM PRIMED FOR DISASTER

BY CHETAN DHRUVE



As I'm sure you're aware, a massive earthquake and tsunami hit parts of Japan on March 11 of this year. These events caused serious damage to the Fukushima Daiichi nuclear power plant, situated on the coast in the Fukushima prefecture, about 240 kilometers (150 miles) from Tokyo.

Daiichi literally means "number one." There's another nuclear power plant about 11 kilometers (7 miles) to the south, called Fukushima Daiini (Fukushima number two). Daiini also suffered damage, but the situation was quickly brought under control.

The Daiichi power plant has six reactors, all of a type called "Boiling Water Reactor" (BWR). Five of the six reactors are of a design called Mark 1, while the remaining reactor is of Mark 2 design. Mark 1 is the oldest type of design, dating from the 1960s; Mark 2 and Mark 3 are newer designs. All of Daiichi's six reactors were designed by General Electric (GE). The Daiichi power plant was commissioned in 1971.

Radiation in nuclear plants is contained by a structure known as a containment vessel, which is the last line of defense against seepage into the environment. The containment vessels of two of the three reactors that were running at the time of the earthquake and tsunami have been damaged, according to the Japanese government and the plant's owner and operator Tokyo Electric Power Company (TEPCO).

The Daiichi power plant was built to withstand a quake of 7.9 on the Richter scale. The quake that hit measured 9.0, the strongest ever recorded in Japan.

The real fears about Daiichi are that radiation released into the environment will cause all kinds of

mayhem. On April 12, Japan's nuclear and industrial safety agency raised Daiichi's severity from 5 to 7 on an international scale overseen by the International Atomic Energy Agency, ranking it alongside Chernobyl as the world's

worst nuclear disaster.

While people on the ground still struggle to contain the crisis, to begin to learn from what happened, we need to ask, could this disaster have been averted? At this point, we find that whistleblowers had long pointed out problems, both in the anticipated magnitude of potential natural disasters and in the designs meant to prevent damage. So why were their messages ignored?

The Whistleblowers

About 35 years ago, Dale Bridenbaugh, a GE engineer, and two of his colleagues, Gregory C. Minor (deceased) and Richard B. Hubbard, quit their jobs. The three employees, later called the "GE 3," were reviewing the Mark 1 containment designs and found them to be flawed. When no one took their concerns seriously, they resigned.

Bridenbaugh recently stated that the vessel had "not yet been designed to withstand the loads" of a large accident. He added that, "At the time, I didn't think the utilities were taking things seriously enough. I felt some of the plants should have been shut down while the analysis was completed, and GE and the utilities didn't want to do that, so I left."

In response to the issues with Mark 1, GE retrofitted the containment vessels. Nonetheless, Bridenbaugh said, "What I would say is, the Mark 1 is still a little more susceptible to an accident that would result in a loss of containment." (You can read GE's responses to the Fukushima events and criticisms here).

At Daiichi, whistleblowers who worked on the plant had also pointed out flaws. One, Masashi Goto, was a designer of nuclear containment vessels at Toshiba Corporation, which had supplied two reactors to Daiichi. Goto quit his job over safety concerns. He was quoted as saying, "I came to the conclusion that the vessels being built were not adequate enough to be the last line of defense. They weren't designed to withstand the kinds of problems currently being experienced in the Fukushima plants."

Worst-Case Scenarios

No one had imagined that such a strong quake followed by a devastating tsunami would happen.

TEAM TIP

As a group, analyze whether your team or department is open to honest feedback. Are so-called "whistle-blowers" discouraged from speaking up?



Nonetheless, nuclear power stations are supposed to be prepared for absolutely worst-case scenarios. But they aren't. Goto said, "Seismologists have different opinions and predictions. Some say bigger quakes are coming. Others say a big one is unlikely. Decisions have been made based on the opinion of the more optimistic seismologists and the opinions of the pessimistic ones are ignored."

Another engineer, Shiro Ogura, who worked on the design of the Daiichi reactors, said his bosses told him a quake of over 8.0 magnitude would never happen. Worse, they didn't even plan for tsunamis. He said, "Right before my retirement in 2002, the company reviewed for the first time whether plants can operate in case of a tsunami. But the size of tsunami that the company presumed was much smaller than that of this time."

Leuren Moret, a geoscientist formerly at the Lawrence Livermore Nuclear Weapons Laboratory in California, underscored this point—that of ignoring the possibility of a catastrophic event—in an amazingly prescient article in 2004. In the article titled "Japan's deadly game of nuclear roulette," Moret quotes Katsuhiko Ishibashi, a seismologist and professor at Kobe University, as saying, "[The situation] is like a kamikaze terrorist wrapped in bombs just waiting to explode."

In the article, Moret mentions two additional whistleblowers, Kei Sugaoka, a GE employee, and Yoichi Kikuchi, a nuclear engineer. Moret noted, "Like most whistle-blowers, Sugaoka and Kikuchi are citizen heroes, but are now unemployed." She ended the article by prophetically saying, "It is not a question of whether or not a nuclear disaster will occur in Japan; it is a question of when it will occur." Remember, this was written in 2004.

The DNA of Command and Control

There must have been other potential whistleblowers who felt the same way, but kept quiet. Blowing the whistle takes more than courage—you need to have the money and resources (income, health insurance, family support, and so on) to withstand the setbacks that go with a job loss. Further, whistleblowers almost always find it extremely difficult to get another job because the industry shuts them out.

There's also something very interesting in all these cases: the media blithely reported that the whistleblowers had quit, as though it's a normal course of action to take when you disagree with what your organization is doing. But why should someone who holds a contrary opinion—based on expertise—have to quit his or her job? The reason is that the top-down command-and-control system is embedded in the DNA of our organizations. John Chambers, the CEO of networking giant Cisco (disclosure: I used to work at Cisco), was reported as saying, "I'm a command-and-control person. I like being able to say turn right, and we truly have

67,000 people turn right." In short, teamwork is defined as everybody obeying orders without dissent.

Imagine that—not 5 people, not 10, not 100, not even 1,000 people, but all 67,000 people have to wholeheartedly do what the top boss is ordering! To his credit, Chambers added, "But that's the style of the past. Today's world requires a different leadership style—more collaboration and teamwork, including using Web 2.0 technologies."

Of course, people often quit because they don't want to be a part of something they see as grossly wrong. Nonetheless, in many cases, if they didn't quit, they'd be fired or otherwise targeted anyway. That's the way the world works. The problem is that, despite sanctimonious utterances to the contrary, most organizations are stuck in the past and function the same old way. If the boss says "Jump," thousands upon thousands of employees had better bleat, "How high?" Even so, mature and intelligent adults in free nations should not behave in this "jump how high" fashion. But they do. Why? The reason is, as the American writer Upton Sinclair put it so cuttingly well, "It is difficult to get a man to understand something when his salary depends upon his not understanding it."

Ancient Management Designs

So it's not just the nuclear plants that are using flawed designs from the 1960s. Our management designs are as ancient. Of course, many efforts at retrofitting have been made, including:

- Whistleblower legislation
- Ethics teaching
- Safety culture promotion
- Regulation
- Flattening of hierarchies

And so on. But nothing has really worked, because the underlying system is still the same, with the same emergent property: fear (for a more detailed discussion, see my previous article).

Until we change the power dynamics in our organizational systems, people will continue to walk out or shut up when they witness unethical or unsafe behavior.

The most recent result of this situation is a potential nuclear catastrophe on our hands. ■

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