Human Meltdown: Why the Fukushima Nuclear Disaster Was Preventable

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On March 11, 2011 at 2:46pm local time, a 9.0-magnitude earthquake hit off the Northeast coast of Japan. The strength of the earthquake created many large tsunamis, arriving as early as only fifteen minutes after the earthquake with the largest reaching over a hundred feet in height (para. WRPO). Over a hundred miles away from the epicenter of the earthquake, the Fukushima Nuclear Power Plant (owned by Tokyo Electric Power Company, or TEPCO) is positioned on the coast line of the Tohoku region of Japan to take advantage of the seawater as coolant for the nuclear cores. The plant consists of four 'Units' making up six individual reactors that use nuclear cores to generate electrical power. The nuclear cores create constant heat, which is removed by running water up by the individual cores that boils and leaves the core as steam (para. USNRC 3-2). When the earthquake reached the facility, the tremors damage the electricity transmission to the plant, cutting off all electric power to the site. The following tsunami flooded and destroyed the emergency diesel generators for the seawater cooling pumps, causing the cores for Units 1, 2, and 4 to heat uncontrollably. The overheating cores went critical, undergoing an exponentially increasing rate of nuclear reaction. Within thirty minutes of the initial earthquake, the cores had begun to spew radioactive material into the cooling vents and thereby into the facility (para. Kurokawa 12). The resulting radioactive fallout was rated a seven on the International Nuclear Radiological Event Scale (INES), the highest danger level of nuclear fallout previously only achieved by the Chernobyl reactor in 1986.

This level of natural disaster is nothing to gawk at, and it would seem reasonable to assume that a magnitude nine earthquake and hundred foot tsunamis would get even the best of nuclear power plants. However, the Onagawa Nuclear Power Station (NPS) that was stationed 120 kilometers north of Fukishima and nearly on top of the epicenter of the earthquake "experienced very high levels of ground shaking—among the strongest of any plant affected by the earthquake—and some flooding from the tsunami that followed, but was able to shut down safely" (UN). The NPS was "remarkably undamaged" according to the UN, especially in comparison to Fukushima.

So why did the Fukushima reactor fail so catastrophically? TEPCO thought their facility was the pinnacle of safety, and they only discovered their error once the paradigm they held dear was violently ripped from underneath them. This paradigm, like all wrong paradigms, was supported by a heap of fallacies: most notably confirmation bias, groupthink, and disagreement deficit. “March 11, 2011, was a transformational moment for the Japanese people. It not only shattered the public myth of absolute safety that had been nurtured by the Japanese nuclear-power industry and its proponents. It also destroyed Japan’s self-image as a “safe and secure nation” that grew out of the country’s pacifism since World War II” (Funabashi).

One of the first and foremost causes of this disaster is the groupism found in both in Japanese culture and the culture of TEPCO. Since the disaster Fukushima and Chernobyl have become inescapably linked. As the only two level seven nuclear disasters, it is easily imaginable that they would often be compared and contrasted. Despite this, the two fallouts could not be more different. Unlike the meltdown at Chernobyl, the failure of the Fukushima reactor didn’t seemingly come out of nowhere. Evidence of its fragility was frequently ignored or conveniently forgotten in the years leading up to the failure. “What must be admitted—very painfully—is that this was a disaster ‘Made in Japan’” explains Kurokawa, the representative of the diet of Japan that led the investigation of the disaster. “Its fundamental causes are to be found in the ingrained conventions of Japanese culture: our reflexive obedience; our reluctance to question authority; our devotion to ‘sticking with the program’; our groupism; and our insularity” (Kurokawa 9).

In her book “Being Wrong,” Schulz describes one of her error theories known as ‘groupthink’ as “communities that are overly insulated from internal and external criticism, and that perceive themselves as different or under attack from outsiders” (Schulz 152). This was identified by Kurokawa above as the single main cause of this disaster. Plenty of external sources came to TEPCO and the Japanese government with concerns about the safety of the Fukishima reactor’s design since it was constructed.

> The construction of the Fukushima Daiichi Plant that began in 1967 was based on the seismological knowledge at that time. As research continued over the years, researchers repeatedly pointed out the high possibility of tsunami levels reaching beyond the assumptions made at the time of construction, as well as the possibility of core damage in the case of such a tsunami. TEPCO overlooked these warnings, and the small margins of safety that existed were far from adequate for such an emergency situation (Kurokawa 27).

In addition to refuting and refusing information and data from scientists, other governments, predominantly the United States, expressed concerns as well that were promptly ignored. Kurokawa describes this as a general "negative attitude toward the importation of new advances in knowledge and technology from overseas" and goes on to say that if they adopted the "measures that were included in the B.5.b subsection of the U.S. security order that followed the 9/11 terrorist action… the accident may have been preventable" (Kurokawa 16). This is stereotypical groupthink. Instead of considering all evidence and looking for the faults to try to increase safety, the agencies believing in their own superiority and their employees following in the words and steps of their agencies ignored the advice and counsel of these external sources.

As Kurokawa described above, this issue fundamentally goes back to parts of the Japanese culture. A contributing player of the culture than contributed to this mindset of groupism and solidarity was "Influential bureaucrats tend to side with the nuclear industry—and the promotion of it—because of a practice known as *amakudari*, or descent from heaven" that "allows senior bureaucrats, usually in their 50s, to land cushy jobs at the companies they once oversaw." (Onishi). By not only condoning but actually encouraging this mindset, they unwittingly created a recipe for disaster: creating a situation in which it was more important to support the company than to follow protocol. This is exacerbated further by the collectivist nature of Japanese society, further increasing the importance of the opinion of the group over the opinion of those on the outside looking in. Observing this in his own analysis, Kurokawa states that "had other Japanese been in the shoes of those who bear responsibility for this accident, the result may well have been the same" (Kurokawa 9).

TEPCO also fell prey to their own confirmation bias in the list of causes leading up to the accident. In addition to ignoring external studies and inquiries, TEPCO also had a tendency of disregarding its own data suggesting fault with the plant design in favor of more beneficial data. Some of TEPCO's own research showed the same potential for fault in the design as that which actually caused the catastrophic failure.

> Since 2006, the regulatory authorities and TEPCO have shared information on the possibility of a total outage of electricity occurring at Fukushima Daiichi should tsunami levels reach the site. They also shared an awareness of the risk of potential reactor core damage from a breakdown of seawater pumps if the magnitude of a tsunami striking the plant turned out to be greater than the assessment made by the Japan Society of Civil Engineers (Kurokawa 27).

In her book, Schulz describes another error concept called ‘confirmation bias’ as “the tendency to give more weight to evidence that confirms our beliefs than to evidence that challenges them” (Schulz 124). The earthquake and tsunami that hit Japan in 2011 were not unique in Japanese history. As recently as 2006 Japan was hit by an 8.3 magnitude earthquake, large enough to cause core damage to the reactor (Magnitude 8.3—KURIL ISLANDS). TEPCO had all the evidence at hand to make the now-blatantly-obvious observation that the facility was not safe, but instead ignored it in favor of their other evidence that supported their beliefs. Instead of improving the structural integrity of the facility to account for these possibilities, they made no changes to the design. In his assessment, Kurokawa states that “TEPCO and the Nuclear and Industrial Safety Agency (NISA) were aware of the need for structural reinforcement…” and yet “the Commission has discovered that no part of the required reinforcements had been implemented… by the time of the accident.” (Kurokawa 16). With all the information staring them in the face, they hadn’t even begun to start the repairs their data conclusively showed were necessary five years earlier.

In addition to this study, at the time of the plants design several of the engineers responsible for the design quit their job at GE for fear of potential problems. “Dale G. Bridenbaugh and two of his colleagues at General Electric resigned from their jobs after becoming increasingly convinced that the nuclear reactor design they were reviewing—the Mark 1—was so flawed it could lead to a devastating accident” says Mosk, a reporter for ABC News. This is another link back to the groupism engrained in Japanese culture and the TEPCO Corporation. Though these were the engineers designing the reactor that said it was insufficient to handle the stresses that would likely be put on it, they ignored their case. They might have been the closest experts working with TEPCO, but as external employees of another company, their voice was drowned by the mountains of evidence TEPCO wanted to hear. An interview with Bridenbaugh revealed that “The problems [Bridenbaugh] identified in 1975 were that, in doing the design of the containment, they did not take into account the dynamic loads that could be experienced with a loss of coolant” (Mosk). The same exact problem that led to the fallout of Fukishima thirty five years later.

One of the most fascinating parts of the errors leading up to the disaster at the Fukishima plant is not, however, how readily available the information was that something was going to go wrong, but rather how unassuming that information was. The information was very readily available to foreshadow what happened, and yet most of the world still felt blindsided by the incident, especially among the Japanese citizens living in the areas surrounding the plant. In her

book, Schulz discusses a causation of error she calls the ‘disagreement deficit.’ According to Schulz disagreement deficit “comes in four parts…. First, our communities expose us to disproportionate support for our own ideas. Second, they shield us from the disagreement of outsiders. Third, they cause us to disregard whatever outside disagreement we do encounter. Finally, they quash the development of disagreement from within” (Schulz 149). We have already discussed the first part with confirmation bias, where TEPCO ignored the negative information and only looked at and recognized the positive information supporting themselves. We have also already discussed the second and third with groupthink, where all outside information was similarly ignored. The final step of Schulz part to disagreement deficit is quashing disagreement from within, removing those who disagree with the paradigm.

In a report for the New York Times titled ‘Culture of Complicity Tied to Stricken Nuclear Plant,’ Norimitsu Onishi describes in depth the inability to make any questions to the safety of Nuclear power in general prior to the Fukushima melt down. Similar to the original culture argument made by Kurokawa, Onishi suggests that culture had the largest impact on creating an environment in which those who disagreed would be unheard. “Just as in any Japanese village, the like-minded—nuclear industry officials, bureaucrats, politicians and scientists—have prospered by rewarding one another with construction projects, lucrative positions, and political, financial and regulatory support” Onishi explains. “The few openly skeptical of nuclear power’s safety become village outcasts, losing out on promotions and backing” (Onishi). This hold on the image of nuclear power has given these individuals the ability to run out anyone who disagreed with the national consensus on the safety of nuclear power. “Until recently, it had been considered political suicide to even discuss the need to reform an industry that appeared less concerned with safety than maximizing profits” Onishi says. “Even academics who challenge the industry may find themselves shunned” (Onishi). In his dissertation on the Japanese culture and its effect on the business success and strategies of the Nissan Corporation, Tegen Bensley discusses a similar groupism effect on the automotive business. “Japanese culture de-emphasizes the individual and places significance on the importance of conformity and the success of the group,” Bensley explains. Raising questions opposed to the group is frowned upon, creating a situation in which only those who continue to believe in and support the current paradigm of the company have the opportunities for advancement and success in general.

Compounding this problem is the method of safety oversight that has allowed the rules to be constructed by the same people that have highly influential positions within the nuclear industry at the same time that they work with the Nuclear and Industrial Safety Agency. According to

Onishi, while in the United States the members of the safety board are independent of the industry “in Japan… the Nuclear and Industrial Safety Agency lacks the technical firepower to draw up comprehensive regulations and tends to turn to industry experts to provide that expertise” (Onishi). This environments that forces everyone like Bridenbaugh and his colleagues (the GE employees who quit over the unsafety of the plant design) to either leave, be removed, or to quietly do their job unquestioningly: creating the dangerous situation that ultimately led to the deaths and injuries of the plant failure.

The events at the Fukushima reactor have caused large ripples through the nuclear industry internationally. In her report to the Bulletin titled “Fukushima crisis: Can Japan be at the forefront of an authentic paradigm shift?” Mycle Schneider describes the effects that the Fukishima meltdown has and will continue to have on the nuclear industry worldwide.

> “Chernobyl demonstrated the flaws of this model, 9/11 rendered it obsolete, but it took Fukushima for the world to understand that the equation sold to countries around the world…
>
> Very Large Danger Potential x Very Low Accident Probability = Acceptable Risk
>
> …is not acceptable after all, anywhere” (Schneider).

While it is true that the problem was greatly exacerbated by TEPCO’s gross oversight, there is no guarantee some of those same problems could not occur to some degree here. Many United States plants have glaring errors in function in the case of extreme disaster as well. “In the U.S., regulators require most nuclear plants to have an emergency plan to deal with a station blackout of no more than four hours. The station blackout at Fukushima lasted for 10 days” (Hiltzik). The United States employs several nuclear plants of the exact same make and model as the one in Fukushima, and if they haven’t been repaired and maintained properly they are subject to the same catastrophic failure that we saw in Japan. Since the incident, many countries have taken the opportunity to greatly revise their nuclear programs. Japan had a temporary cease in function of all nuclear reactors and has made it a national goal to end dependence on nuclear energy by 2030. France has also committed to completely phasing out nuclear power in his nation. Many other countries are reducing the number of nuclear plants or halting investments into future ones. The paradigm has shifted, and everyone now sees the potential danger in nuclear power everywhere and is trying to diminish the risk at all costs.

“The consequences of negligence at Fukushima stand out as catastrophic, but the mindset that supported it can be found across Japan. In recognizing that fact, each of us should reflect on our responsibility as individuals in a democratic society.” (Kurokawa 9)

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