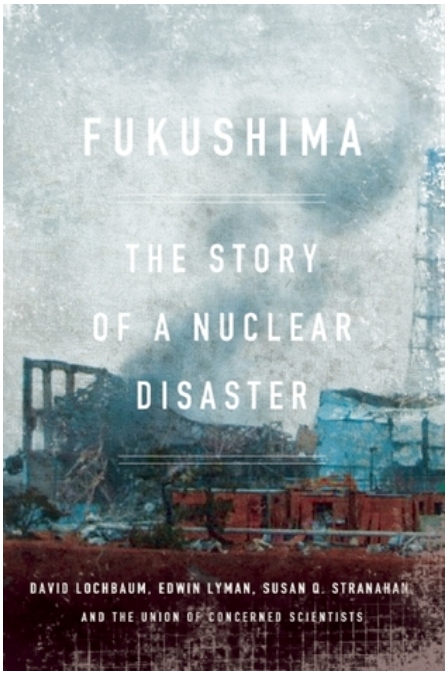

Fukushima: The Story of a Nuclear Disaster

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On March 11, 2011, an earthquake large enough to knock the earth from its axis sent a massive tsunami speeding toward the Japanese coast and the aging and vulnerable Fukushima Daiichi nuclear power reactors. Over the following weeks, the world watched in horror as a natural disaster became a man-made catastrophe: fail-safes failed, cooling systems shut down, nuclear rods melted.

In the first definitive account of the Fukushima disaster, two leading experts from the Union of Concerned Scientists, David Lochbaum and Edwin Lyman, team up with journalist Susan Q. Stranahan, the lead reporter of the *Philadelphia Inquirer*'s Pulitzer Prize–winning coverage of the Three Mile Island accident, to tell this harrowing story. *Fukushima* combines a fast-paced, riveting account of the tsunami and the nuclear emergency it created with an explanation of the science and technology behind the meltdown as it unfolded in real time. Bolstered by photographs, explanatory diagrams, and a comprehensive glossary, the narrative also extends to other severe nuclear accidents to address both the terrifying question of whether it could happen elsewhere and how such a crisis can be averted in the future.

Fukushima: The Story of a Nuclear Disaster Details

Date	:	Published February 11th 2014 by The New Press (first published November 5th 2013)
ISBN	:	9781595589088
Author	:	David Lochbaum , Edwin Lyman , Susan Q. Stranahan
Format	:	Hardcover 320 pages
Genre	:	Nonfiction, History, Science, Technology, Physics, Cultural, Japan

From Reader Review Fukushima: The Story of a Nuclear Disaster for online ebook

Tony says

FUKUSHIMA: The Story of a Nuclear Disaster. (2014). David Lochbaum et al. ***.
The first quarter or so of this book closely holds the readers' attention. The latter part of the book drags on and on. I was truly interested in the many things that went wrong at this site, and the authors delivered on them in a very distinctive manner. Once through with the various things that went wrong as a result of the earthquake and resultant tsunami that inflicted havoc on the nuclear plant, the authors then proceeded to lay out blame. This is called Monday-morning-quarterbacking, i.e., if only… One can only hope that future developments in the design and construction of nuclear plants will include as many of the improvements as can be realistically made. The whole point of this exercise should be to learn more about how to keep nuclear generating stations as safe as possible. If we turn away from this technology, then we're back to the old coal stoves in the basement again. The Union of Concerned Scientists is also listed as a contributor to this work – without saying what it was exactly they contributed. There will always be industrial accidents involved with the implementation of new technology. That's the price we have to pay for progress. We should not sit back crying: "Woe is me…"

Converse says

The authors, who appear to be associated with the Union of Concerned Scientists, describe the disaster at the Fukushima plant, which had several boiling water nuclear reactors that were manufactured by General Electric. They do not confine themselves to the disaster and the Japanese response to it, but also discuss how nuclear power plants are regulated in the United States. It was the tedium of the latter aspect that caused me to abandon the book. Just because I got bored doesn't mean the topic is unimportant. I did find the switching between topics a bit jarring.

On July 11, 2011, an earthquake and associated tsunami struck Japan. It appears that it was the tsunami that did the most damage to the Fukushima plant. The take-away point to me was that even when not producing electricity, boiling water reactors (and their engineering design cousins, pressurized water reactors) require electricity to run pumps to circulate water about the core containing the rods of uranium encased in zirconium, and to activate various controls and sensors. Absent circulating water, the cores will overheat and the uranium will melt, fall to the bottom of the containment vessel, and start eating its way through the containment vessel. For cooling to occur, there must also be a source of water, either an outside source or the condensation of the steam produced by the heating of the water by the core.

Though the reactors shut down as they were supposed to, with graphite rods descending into the cores to absorb neutrons and thus bring down the rate of reaction, the cores were still in need of cooling. Unfortunately, the second tsunami at 3:335 pm on July 11 flooded the basements in which all but one of the diesel back-up generators, and all the electrical panels were located. With the electrical panels damaged, there was no way to run the pumps and so on even if power had been available. In addition, the wide-spread destruction meant that it was days before electrical power could be brought in from outside of the plant.

When the zirconium encased uranium rods, either in a core or in a storage pool for used fuel, heat up the

zirconium can reach a temperature at which it can burn. Hydrogen gas is generated when a reactor core is not cooled. On July 12 a hydrogen explosion destroyed most of the building containing Unit (reactor) 1. On July 14 a similar but larger explosion destroyed the building containing Unit 3. On July 15 an explosion occurred in Unit 3: unlike the earlier explosions, this explosion was associated with the spent fuel rods stored in the reactor building, the pool having apparently sprung a leak allowing more numerous and radioactive than usual spent fuel rods to overheat.

The crew of the power plant, with outside help, eventually managed to stop the cores from melting all the way through the containment vessels by pumping seawater into them - I seem to recall that fire trucks and mobile pumps were involved in this endeavor. The now radioactive seawater went back into the Pacific. Radioactive iodine and cesium was released into the atmosphere during the accident. The staff's efforts to contain the disaster were severely hampered by the high radioactivity in the plant, which meant that personnel could venture outside and towards the damaged units only for brief periods, or sometimes not at all.

The Japanese government only slowly released information about how bad the accident was, and the evacuation area had to be widened beyond what had been anticipated. I suspect that the government's frequent injunctions that the citizenry should remain calm were counter-productive, especially as information at variance with the, and less reassuring than, government's announcements became available through foreign news sources and the internet.

The authors discuss the multiple agencies involved in regulating Japan's nuclear power industry; the level of regulation doesn't appear to be much different from that in the United States. They justify their discussion of regulation in the United States by stating that the United States provides an important example to the rest of the world.

The authors paint a sorry pictures of the Nuclear Regulatory Commission (NRC) of the United States. From their perspective, which I suppose starts with skepticism towards nuclear power, it appears to be a sclerotic bureaucracy that has hamstrung itself with cost-benefit rules that essentially make new regulations difficult to justify. Consequently, it relies on trying to persuade the industry to take safety measures; and because these steps are voluntary, the NRC cannot demand that these measures meet any minimum criteria. On top of that, the safety analyses of the NRC presume that any worst-case scenario is so unlikely that it can be ignored. By the NRC's standards, what happened at Fukushima should have been impossible.

I got to page 235, but discussions of the U. S. Nuclear Regulatory Commission's lack of response to Fukushima wore me down and I did not wish to expose myself to more discussions of bureaucracy.

Ron says

"Fukushima: The Story of a Nuclear Disaster" is just that. The 9.0 Tohoku earthquake off the coast of Honshu Island, the main island of Japan occurred on 11 March 2011 at about 5:30am local time. The earthquake lasted some 6 minutes on the land closest to the earthquake and the tsunami, created by the quake, arrived some 50 minutes after the initial earthquake. The tsunami, 14 metres (46 ft) high overwhelmed the plant's seawall, which was only 10 metres (33 ft) high. The tsunami water flooded the low-lying rooms in which the emergency diesel generators were housed. They began to fail soon after and were replaced by emergency battery-powered systems. When the batteries ran out the next day on 12 March, active cooling systems stopped, and the reactors began to heat up. The power failure also meant that many of

the reactor control instruments also failed. With no power and no way to cool the housing around the reactors, they produced hydrogen which concentrated with the air and caused multiple hydrogen-air explosions in Reactors 1,2 and 3 from 12 March to 15 March. When the hydrogen had to be evacuated from the reactor pressure vessel, explosions occurred in the upper secondary containment building in all three reactors. Therefore there were meltdowns of the fuel rods in Reactors 1, 2 and 3 and the top to floors of Reactor 4 were reduced to bare frames from another hydrogen-air explosion.The meltdowns of Reactors 1, 2 and 3 in the previous sentence were not in that order and were not nearly as simple as making a sentence. Unit 1 was the first priority of the management at Fukushima-Daichi, when the diesel generators being in the basement and underwater from the tsunami stopped operating, The battery backup kicked in and kept electricity available to most of the plants site. But only for a couple of hours and the battery backup power dwindled to zero. The management at Plant Fukushima was now on its own to keep further destruction from occurring. The systems operations manual on restoring power after a failure of this type had ended when the power of the battery backups ended. The plant manager at Fukushima was Masao Yoshida, who thought the first explosion in Reactor 1 was another strong aftershock, then came the news that the top of the Unit 1 reactor building had blown off- this was still within the outer containment dome. a check of the water level around Unit 1 showed that it was about 5 feet below the top of the fuel. The melting of the fue had started about twenty hours previously. They had received three strikes on the first batter and there was one out. Now batter number two swung and missed- the emergency response center had been working for hours to lay an insulated cable on the ground and were within minutes of connecting the cable to restore power to units 1 and 2. Falling debris from the explosion had damaged that cable and also damaged the firehoses that the workers had put in pplace to inject sea water into Unit 1. The government operations response to the disaster was now at the prime ministers level. They were having trouble keeping the media and therefore the country aware of the continuing story.

The Authors of Fukushima, the book, are the three named authors Lockbaum, Lyman, and Stranahan and the Union of Concerned Scientists. These scientists have a good knowledge of the workings of a nuclear power plant and they have a theoretical knowledge of how the metals and other chemicals react to produce nuclear energy generation along with the knowledge of which elements create the deaddly radiation that is normally contained in the reactor itself. Ground was broken for the first nuclear reactor at Fukushima in July, 1967 will General Electric as the supplier and main contractor. TEPCO (Tokyo Electric Power Company) was the owner of the generation at this site and the largest supplier of electricity in Japan. They would choose GE to build the other five nuclear reactors at Fukushima-Daiichi and two of the four at Fukushima-Daini. There are two main types of nuclear reactors for generating electricity- they are the Boiling Water Reactor (BWR) and the Pressurized Water Reactor (PWR). The plants were to become a financial bonanza for the local communities and cities around these plants because they supplied the greater majority of the taxes these cities and towns used to operate. They also provided more than enough laborers to create full employment in the areas. There is a massive system of fault lines criss-crossing the islands of Japan and make it the country with the most earthquakes. the designers of the power plants had to make them extra strong to survive in tact from the very strongest earthquakes. But the companies who had the plants designed seemed to take the mostly likely strongest earthquakes and not the uniquely strongest earthquakes. In the Japanese language this often meant 90-95 percent of the strongest earthquake. The government officers who regulated the power companies and therefore regulated their nuclear power plants appeared to have a good cooperative working relationship with the power company officers and designers. It was much like the U.S. Congress and the private companies and individuals who befriend congressmen and give aid and advice for creating the laws Congress makes. With the Japanese these close working relationships seemed to sometimes bend the rules so that a plant construction project could come into fruition for a few dollars less. The story grows more unpredictable as the disaster moves from bad to worse, and the safety systems with backups for the backups failed like dominoes in a row.

The evacuation zone around Fukushima-Daiichi and Fukushima-Diani was now a ten mile semicircle around both plants and people in those areas were relocated. Seven or eight days into the disaster, relations between

Japan and the U.S. tightened up again when the NRC was wanting the evacation extended from twenty kilometers to thirty kilometers. The U.S. reasoning was that Uniit 4 Reactor at Fukushima-Daiichi was still not under complete control and could still infuse radioactive material into the atmosphere and be blown over a wider area while Japan said that was highly unlikely and the increase in the largeer ara would add more unsettlement to the Japanese public. The results of this disaster are still in active study four years after the disaster has been contained to the ground area of Fukushima-Daiichi and a contaminated area around the plant. There is no measureable radioactivity coming from the plant site. The government and TEPCO received great criticism for not building the plannts more robust, for not building the 10 meter seawall to 15 meters and placing the diesel generators in the basement. The government of Japan and Tepco say on the other hand that no one could project an earthquake of magnitude 9.0 Mw {1} and a tsumami 50 feet high at the Fukushia Daiichi location and that these two events were the cause of the disaster at that location. These discussions will continue until a such time as they are no longer relevant to either party or until the next large nuclear power disaster occurs. There were several other reviews of this book which I read before finishing this book and a common objection in most of those reviews the writers thought the first part of the book which deals with the actual earthquake, tsunami, and nuclear meltdowns were well written and interesting but that the latter half discussed the various agencies, their reason-to-be and their opinions were too esoteric to be included in this book and signified a black mark on the story. I disagree with that theory.
"On 10 March 2015, a Japanese National Police Agency report confirmed 15,891 deaths, 6,152 injured, and 2,584 people missing across twenty prefectures, as well as 228,863 people living away from their home in either temporary housing or due to permanent relocation."{2}
{1} The moment magnitude scale for measuring earthquakes
{2} From Wikipedia, the free enclopedia- article-'2011 T?hoku earthquake and tsunami'

Chris Chester says

A wonderful and essential read for anybody with any level of interest in the future of nuclear power in the U.S. energy cocktail.

I should probably preface the rest of this review by pointing out that this book is not *really* about the 2011 disaster at the Fukushima Daiichi nuclear plant. The first half of the book does go into the Fukushima accident in great detail, but it is subsequently used as a frame to examine the U.S. regulatory framework. So if you're looking for narrative journalism, this is not your book.

The view from 10,000 feet conveyed in this book is that the convoluted regulatory framework surrounding nuclear energy in the United States is not just dysfunctional, it's potentially dangerous. On a number of levels.

It's not enough that the NRC maintains a too-cosy relationship with the industry its supposed to regulate — that would be an easy criticism to make and an easy book to write. The problem is that nearly all of the NRC's underlying assumptions are suspect and nearly impossible to change with the nuclear industry pushing back.

The NRC does not factor in accidents that go beyond plants' design-basis, their models are limited by single-reactor accidents, best-case scenarios, and magical response times from state and federal authorities. The limits of these models, which are used to justify the regulatory framework, were exposed as utter fraud by the realities the Fukushima accident.

It's hard to even be angry about the failure of imagination on the part of regulators — their hands seem tied in many ways. It just leaves one frustrated and confused ... and leery about living downwind from a nuclear plant.

The book is impeccably researched and clearly written. I'd be interested to hear someone's argument that it casts the NRC and the nuclear industry in an unfairly negative light, because I don't see a lot of flaws in either their timeline or the conclusion.

I'll be digesting this book for some time.

Peter Mcloughlin says

This book was put together by a collaboration of investigative journalists and scientists who work for the Union of Concerned Scientists. It concerns the Fukishima nuclear disaster following the massive earthquakes and tsunami which hit Japan in march 2011. Nuclear power was and is having a bit of a renaissance in the past few years as an alternative to greenhouse gas belching conventional plants. However the disaster at Fukishima like Three Mile Island and Chernobyl has raised the question of safety again over nuclear power. My own pro-nuclear stance has come in for questioning since the breech at Fukishima. Most plants are designed for certain contingencies but not much consideration is given for extreme events like the unprecedented 9.0 earthquake and tsunami which went beyond the safety measures the Japanese nuclear industry had foreseen.
This book gives a blow by blow analysis of the accident and its aftermath. It also has implications for The American Nuclear industry. 30 plants in America are downstream from major dams. If those dams were breech it could take out the back up power to a nuclear plant and possibly allow for a meltdown and radiation exposure to the surrounding community. Extraordinary events such as a dam breech whether caused by an earthquake, accident or malicious intent could cause a disaster in the U.S. like Japan. The author argues if Nuclear Power is to be allowed the public must make sure it uses its opportunity to make the Nuclear Regulatory Commission place safety regulations which take extraordinary events into safety planning. This is a short opportunity while Fukishima is still fresh in the public mind to take care of this problem.

Kamarul Mansur says

Very interesting book about the recent nuclear disaster happened in Japan. Nuclear power plant has been touted one of the safest technology available. With all procedures and safety measure etc. Well, that’s before I read the book. The Fukushima disaster begin with an earthquake large enough that the building can’t withstand the impact. During the incident in Japan, the Japan’s government took so much time to acknowledge what’s actually happened in Fukushima nuclear plant. At the plant, the worker are at danger of overexposure to the radioactive that begin to release. Some necessary action badly needed to contain the mess but they need to wait for the approval. Again, the approval come late. Not to mention the information fed to the citizen are different from what is actually happening at the plant. Those who have internet will find that it was more severe that what the government told on TV. There are some issue of under-trained team member to deal with this matter. The evacuation taken places and the distance is getting further and further. Later on, the evacuee can return to their home but everything has changed. This book should stop at Chapter 8. Chapter 9 onward, there are drama after drama whether the same thing could happen in the US. But in nuclear industry, all are the same, the attitude of “It can’t happen here”.

Susan Paxton says

This book started off promisingly, but faded halfway through. The early days of the response to Fukushima were described vividly, but then seemingly were forgotten as the focus changes to the worldwide regulatory response (nothing wrong with that, but I was pretty absorbed in the work of the crews at the plant). It's worth reading, but I was disappointed at the change in emphasis and the lack of attention paid to the local population and their reactions.

Alicia Devero says

Wow! I had no idea that Japanese can be so corrupted, irresponsible and insubordinate ... a huge moral leap backwards from the honorable Samurais to the heads of greedy companies in the corporate world, leaders and politicians disconcerted about public safety.

Covering the truth, hiding important details, delaying information and making wrong decisions. A domino reaction of mistakes that led to a nuclear disaster on the same scale as Chernobyl. It cause environmental disaster and human loss that could’ve been easily avoided if people were not that shortsighted and if there was an honest and timely flow of information.

Technology is a blessing and a curse at the same time ... there are no boundaries that nature couldn’t break ...

Statement “It will take many more tragedies and many more victims to make the public safe from nuclear power disaster” is beyond disturbing

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Steve Crane says

As others have said, the first part of the book is engaging, going into the details of the accident and responses to it. Then it gets quite boring, becoming a ramble about the politics of United States nuclear regulatory bodies. Not being from the US or having a scientific or bureaucratic level of interest in nuclear power generation I reached the point where I was no longer absorbing the words being read (audiobook) and it was just background noise. Therefore I quit 80% of the way through, my time better spent on books I will absorb and enjoy.

Michele says

This book suffers from a split personality. The first half is an engaging, well-researched account of what initially happened at Fukushima. Nearly a blow by blow description. Its a a detailed analysis of the events, from the earthquake to the tsunami and how things went wrong so badly.

The weakness of the book, starting in chap. 9, is the extrapolation from Fukushima to US nuclear reactors.

The book has extensive coverage of the discussions and policies of the Nuclear Regulatory Commission related to both Fukushima and US reactor safety in general. They rehash Three Mile Island as if it were nearly the same as Fukushima, which it was not. Sadly, the last chapters were filled with bias against nuclear energy, effectively breaking the nice neutral tone that the first half of the book possessed.

Katia M. Davis says

I feel the majority of people don't realise how close the events at Fukushima were to an extreme disaster. Based on my memory of the news coverage at the time, the reporting felt 'things aren't great but everything is under control, don't worry'. That wasn't really the case. This was a very thorough analysis of the incident at Fukushima and the neighbouring plant. It detailed the events leading up to the Level 7 accident and issues as they developed. There was a quite extensive look at the ongoing clean up of the site and the evacuated area including problems of storage of contaminated material. There was also an overview of the history of nuclear safety in Japan and other nuclear power sites which was particularly interesting as it discussed they ways in which hazard data is 'spun' to appear less damaging. Overall a good read, especially is you are interested in nuclear accidents.

Rebecca McNutt says

Anyone else recall this on the News? I was in the 7th grade at the time, and the whole thing, being labeled by the media as a "New Chernobyl", was very disturbing. This book captures this terrifying moment in history with apt detail and impressive imagery.

Dave says

Clearly Lochbaum and his anti nuke buds are lock in step in their fuming hatred of Nuclear energy, and that clouds the reporting of events here. They are quick to dreg up Three Mile and Chernobyl and place blame on lack of industry over site, both local and worldwide. A simple telling of the events would have sufficed. Perhaps it's nothing to have a melt down about, but it bugs me to my nonfiction core!! Imagine if a book about a school shooting would advocate closing schools and banning all guns? These kinda writers give "nonfiction" a bad name.

Valiant Thor says

It's been a while since I read this, but I recall it being a well-written and thorough account of the Fukushima disaster and its literal and figurative fallout. Probably due for an updated edition by now.

Mark says

The Book-list review says that this book is "Thriller-like". It isn't. The first 20% of the book which recounts the facts of the story certainly holds ones attention, but the book is published by the Union of Concerned Scientists and it has an ax to grind with the Nuclear Regulatory Commission, who get worked over pretty well here. As a member of the UCS, I must say that I support their view point, it just can be a little dull. There is extensive detailed description of various committee meetings and there is considerable repetition. Most times that the NRC's RASCAL model is mentioned, it is also stated that it was only good to 50 miles out. By the middle of the book, I felt that I could pose as a RASCAL model expert; if anyone mentioned it, I would say, "please!..everyone knows that it is only good to 50 miles".
