

Quotes from the Book

From the Introduction in ***Fukushima – The Story of a Nuclear Disaster***,
http://www.ucsusa.org/nuclear_power/making-nuclear-power-safer/preventing-nuclear-accidents/fukushima-book.html by David Lochbaum, Edwin Lyman, Susan Q. Stranahan, and the Union of Concerned Scientists <http://www.ucsusa.org/about/>

“The story of Fukushima Daiichi is a larger tale, however. It is the saga of a technology promoted through the careful nurturing of a myth: the myth of safety. Nuclear energy is an energy choice that gambles with disaster.

Fukushima Daiichi unmasked the weaknesses of nuclear power plant design and the long-standing flaws in operations and regulatory oversight. Although Japan must share the blame, this was not a Japanese nuclear accident; it was a nuclear accident that just happened to have occurred in Japan. The problems that led to the disaster at Fukushima Daiichi exist wherever reactors operate.

Although the accident involved a failure of technology, even more worrisome was the role of the worldwide nuclear establishment: the close-knit culture that has championed nuclear energy – politically, economically, socially – while refusing to acknowledge and reduce the risks that accompany its operation. Time and again, warning signs were ignored and brushes with calamity written off.” <Page vii>

Chapter 1 – March 11, 2011: “A situation that we had never imagined.” (p. 1 – 33)

“Well before Fukushima, critics argued that predicating reactor safety on the ability to handle design-basis accidents left nuclear plants vulnerable to far worse events that are more probable than the industry would like to believe and than the public would be willing to accept.” (pg. 14, Chapter 1)

“These were two more holes in an emergency plan that was turning out to be full of them.” (pg. 20, Chapter 1)

Chapter 2 – March 12, 2011: “This may get really ugly” (p. 34-54)

“What the NRC staffers could not yet know was how clearly Fukushima Daiichi would demonstrate the dangers that arise when regulators become too close to the industry they oversee. Japan is not the United States; the relationships between government and business in the two nations are as different as other aspects of their cultures. But the history of nuclear power in Japan, and the incestuous practices that fostered it, do provide dramatic evidence that giving the nuclear industry the benefit of the doubt can lead to unimaginably dire consequences.” (pg. 36, Ch. 2)

“Headlines scattered over the decades built a disturbing picture. Reactor owners falsified reports. Regulators failed to scrutinize safety claims. Nuclear boosters dominated safety panels. Rules were buried for years in endless committee reviews. “Independent” experts were financially beholden to the nuclear industry for jobs or research funding. “Public” meetings were padded with industry shills posing as ordinary citizens. Between 2005 and 2009, as local officials sponsored a series of meetings to gauge constituents’ views on nuclear power development in their communities, NISA [the nuclear regulator] encouraged the operators of five nuclear plants

to send employees to the sessions, posing as members of the public, to sing the praises of nuclear technology.” (pg. 46, Chapter 2)

“In the United States, NRC inspectors audit only about 5 percent of the activities at nuclear plants, according to senior managers at the commission. Most of these audits involve reviewing the records of tests and inspections performed by plant workers. The NRC inspectors themselves witness only a small fraction of actual tests and inspections. If safety inspectors could not trust a plant’s paperwork, they would have to personally observe many more activities than they do now to gain confidence that their assessment of the plant’s safety was a reflection of reality. To put this another way: when workers feel free to prepare fictional accounts of tests and inspections, nuclear safety assurances begin morphing from nonfiction to fiction as well.” (pg. 49, Chapter 2)

“TEPCO management feared that a tall barrier in front of a nuclear plant would send the wrong message to the public.” (pg. 53, Ch. 2) (The sea wall needed to be built higher – but this was NOT done.)

**** Chapter 2 explains how in 2008 experts proposed that tsunami predictions might have been underestimated, how TEPCO did not consider calculations about this “realistic” and put off doing research when the facts conflicted with their modeling. Four days before the disaster, “TEPCO did eventually get around to reporting new tsunami damage assessments to NISA – on March 7, 2011.” (pg. 54, Chapter 2)

Chapter 3 – March 12 through March 14, 2011: “What the hell is going on?” (p. 55-78)

“This lackadaisical attitude informed the way spent fuel pools were designed and built.” (pg. 70, Ch. 3)

“But the bad news hadn’t stopped arriving. Jim Trapp called to say that an admiral at the U.S. naval base at Yokosuka, south of Tokyo and 188 miles from Fukushima Daiichi, was reporting radiation measurements of 1.5 millirem (0.015 milliesievert) per hour, apparently because of the wind shift. The NRC team was astonished that such a high dose rate would be detected at such a great distance from the plant.” (pg. 78)

Chapter 4 – March 15 Through 18, 2011: “It’s going to get worse...” (p. 79-102)

“There were 408 spent fuel assemblies in dry storage at Fukushima. Although jostled by the earthquake and submerged temporarily by the tsunami, these assemblies survived without the need for helicopters dropping water from above or fire trucks spraying water from below.” (pg. 83, Chapter 4)

“A large radiation release from a pool could result in thousands of cancer deaths and hundreds of billions of dollars in decontamination costs and economic damage. The crowded spent fuel pools at U.S. reactors pose hazards.” (pg. 84, Ch. 4)

“Yoshida [site superintendent at the Fukushima plant] would later tell government investigators he believed TEPCO’s chain of command during the accident was “disastrous.” (pg. 86, Ch. 4)

[[At a March 16, 2011 Senate subcommittee briefing on Fukushima]] “Tony Pietrangelo, chief nuclear officer of the institute [Nuclear Energy Institute (NEI)] “the primary nuclear industry lobbying group “in Washington, DC], chose his words carefully: “I think I understand your concern, because I share it, that people are seeing what’s happening in Japan and they’re scared.

We can never say that that could never happen here. There's no such thing as a probability of zero....But what I would tell you is it doesn't matter how you get there, whether it's a hurricane, whether it's a tsunami, whether it's a seismic event, whether it's a terrorist attack, whether it's a cyberattack, whether it's operator error or some other failure in the plant, it doesn't matter. We have to be prepared to deal with those events."

[*Same event*] "Edwin Lyman of the Union of Concerned Scientists agreed that a Fukushima-type event could not be ruled out in the United States: "We have plants that are just as old. We have had a station blackout. We have a regulatory system that is not clearly superior to that of the Japanese. We have had extreme weather events that exceeded our expectations and defeated our emergency planning measure[s], [such as] Hurricane Katrina." (pg. 94, Chapter 4)

Chapter 5 – Interlude – Searching for answers: "People ... are reaching the limit of anxiety and anger" (p. 103-120)

"The International Atomic Energy Agency was faulted for its sluggish and confusing response." (pg. 105, Chapter 5)

"Perhaps the greatest chasm between what was being said and what the public needed to hear concerned the complex issue of radiation exposure and health risks."

"Time and again the government bungled its handling of the radiation and health issue." (pg. 108, Chapter 5)

"It wasn't until June, for example, that officials publicly acknowledged meltdowns at the three reactors – information the government had possessed since March 12..." (pg. 109, Ch. 5)

"You shouldn't assume that people can't handle the truth," says Bromet [U.S. psychiatric epidemiologist who has done research on Three Mile Island, Chernobyl and Fukushima nuclear disasters]. "It may be difficult to swallow, but it's better to be open and straight with them." (pg. 111, Ch. 5)

"Many had no idea why their lives had been turned on end. Without power, the ability to obtain news was gone. While the rest of the world was watching the nuclear crisis unfold, those most threatened by the deteriorating conditions inside the reactors were living in an information bubble.

As the displaced populace waited for explanations, the evacuation zones kept expanding outward. In those first tumultuous days, some evacuees were forced to relocate six times or more, fleeing ever farther from the reactors, their few belongings stuffed in bags or tucked under their arms. Others, however, were forgotten, with fatal consequences." (pg. 117, Chapter 5)

"In a society accustomed to order and predictability, the accident response increasingly seemed chaotic and leaderless. The confusing and incomplete information coming from the government offered little guidance for Japanese seeking to understand the threat from Fukushima Daiichi. Later, officials would defend their withholding of facts by claiming they did not want to alarm people. But for many, this show of paternalism was tantamount to putting lives at risk." (pg. 118, Ch. 5)

Chapter 6 – March 19 through 20, 2011: “Give me the worst case” (p. 121-140)

“While the Japanese had never anticipated an accident as complex as the one unfolding at Fukushima, neither had the NRC. This didn’t stop the agency from engaging in backseat driving, though.” (pg. 125)

“The agency [NRC] had spent years downplaying the risks of nuclear accidents, contending that a real “worst case” could never happen. Now, it was being asked to assume the opposite.” (pg. 126)

“Radiation monitors at California’s Diablo Canyon and San Onofre nuclear plants had already picked up readings of iodine-131 just slightly above what the NRC described as “the minimal detectable activity level.” It presumably was blowing in from Fukushima, 5,400 miles away. If these levels continued to increase, there was a chance that the president would later have to reverse himself and order countermeasures like banning milk shipments from certain areas. That could result in a major loss of confidence among the public.” (pg. 129)

“However the dose rate data did support an evacuation zone of about thirty to forty miles (fifty to sixty-seven kilometers) from Fukushima Daiichi, still a much larger distance than the twelve-mile (twenty-kilometer) zone initially established by the Japanese government or the ten-mile emergency planning zone in existence in the United States for reactor accidents.” (pg. 140)

“For the NRC, Fukushima Daiichi redefined “realistic” – something the agency had stubbornly resisted for decades. Its reluctance to seriously consider the likelihood of a severe accident with a large radiological release, even for planning purposes, reflected the commission’s propensity to view accident risks and consequences through rose-colored glasses.” (pg. 140, Ch. 6)

*** lots in this chapter about various U.S. agencies/individuals involved, & some of the paralysis & poor communications. Also, “source term” explained, defined, discussed + programs used to measure the path of radioactivity.*

Chapter 7 – Another March, Another Nation, Another Meltdown (p. 141 – 154)

“But some critical factors that contributed to the Three Mile Island accident were swept under the rug by regulators both in the United States and abroad. These unlearned lessons remained unheeded three decades later when the waves bore down on Fukushima. Both accidents followed from one common and dangerous belief: that an accident like Three Mile Island, or Fukushima Daiichi, just could not happen.” (pg. 142, Ch. 7)

Kemeny Commission on causes of Three Mile Island accident, in Oct. 1979: “[T]he fundamental problems are people-related and not equipment problems,” the commission wrote. “[W]herever we looked, we found problems with the human beings who operate the plant, with the management that runs the key organization, and with the agency that is charged with assuring the safety of nuclear power plants.” The commission also pointed a finger at “the failure of organizations to learn the proper lessons from previous incidents.” As a result, “we are convinced,” the commission wrote, “that an accident like Three Mile Island was eventually inevitable.” (pg. 150, Ch. 7)

About emergency exercises: “In 1980, the NRC required that plant owners draw up evacuation plans for the public within ten miles of each plant. (Compare that with the NRC’s recommendation that U.S. citizens within fifty miles of Fukushima be advised to leave.) It also mandated that biennial emergency exercises be conducted at each nuclear plant site. During the

exercise, a plant accident is simulated and the Federal Emergency Management Agency evaluates the steps local, state, and federal officials take to protect the public from radiation. In parallel, the NRC evaluates how well plant workers respond to the simulated accident and work with off-site officials.

The biennial exercises are better than nothing, but not by much. In the simulation, winds are assumed to blow in only one direction, conveniently but unrealistically limiting the number of people in harm's way. The evacuations are only simulated, so there is no way to tell if the complicated logistics of evacuating all homes, businesses, schools, hospitals, and prisons could be successfully carried out. Instead, the exercises merely verify that officials have the right phone numbers and contractual agreements for the buses to carry evacuees and the hospitals to treat the injured and contaminated.

These exercises only provide an illusion of adequate preparation. As the Fukushima experience painfully demonstrated, rapidly moving people out of harm's way in the midst of a nuclear crisis is exceedingly difficult, yet critical.

Although the various Three Mile Island reviews converged on the need for major nuclear safety upgrades, there was no consensus on how wide-ranging the reforms should be. At the heart of the safety debate were these questions: Should the reforms address only the issues raised by the last accident? Or would that be tantamount to fighting the last war? If the next accident were triggered by a completely different event and proceeded along a different track, the failure of a too-narrow approach would be evident. Because of the NRC's regulatory focus on design-basis accidents that followed a certain script, it had never taken a comprehensive look at the universe of beyond-design-basis accidents – that is, everything else that could go wrong – or the need to protect against them.” (pg. 152-3, Ch. 7)

“Had the NRC followed that advice, the regulations and operation of the nation's reactors could have been transformed. But breaking out of its traditional focus into this new realm of oversight was not in the cards. Instead, in the face of Three Mile Island's evidence to the contrary, the NRC ultimately returned to its belief that beyond-design-basis accidents were rare enough to largely ignore, and it limited the scope of the subsequent regulatory reform primarily to fighting the last war.” (pg. 153, Ch. 7)

“The NRC had blown its chance to develop a comprehensive approach to preventing meltdowns and thus had failed to learn one of the most significant lessons from Three Mile Island: that if one type of beyond-design-basis could occur, so could others.” (pg. 153-4, Ch. 7)

Chapter 8 – March 21 through December 2011: “The safety measures are inadequate” (p. 155-181)

NRC's Near-Term Task Force (NTTF) begins its work March 30, 2011 (pg. 166)

“It seemed the NRC's only fallback was to say yet again, in effect, “It can't happen here.” The task force had its work cut out for it.” (pg. 168)

“The largest and most influential of those stakeholders [NRC stakeholders], of course, is the nuclear industry. And that industry has always believed that the best defense is a good offense. Its leaders were hurriedly organizing their Fukushima response hoping to head off new rules. From the industry's point of view, voluntary actions it devised on its own were preferable to mandatory ones handed down by the NRC, and it soon put forward its own ideas. (This tactic was nothing

new. The NRC's embrace of industry-proposed measures over many years was responsible, in part, for the patchwork of regulations criticized by the task force and others.) (pg. 173)

"The industry's answer to Fukushima was a plan it called FLEX, shorthand for "diverse and flexible mitigation capacity." "The industry patterned FLEX after a response to the September 11, 2001, terrorist attacks and the NRC's B.5.b order requiring emergency backup equipment in the event of a fire or explosion caused by an airplane crashing into a nuclear facility." (pg. 173)

"(In other words, the B.5.b equipment could legitimately have come straight off the shelf from Home Depot.)" (pg. 173)

"After the quake in Virginia [August 23, 2011, 12 mile from the North Anna nuclear facility], an expert offered a takeaway lesson: "[W]hat I would say in terms of lessons learned from Fukushima and now yesterday's quake [at North Anna] is that setting reactor design ... hazard limits just above recorded human experience is turning out to be really shortsighted," said Allison Macfarlane, a geologist and environmental policy professor at George Mason University. "With something like a nuclear reactor," she told a reporter, "I would like a large safety margin. Macfarlane's opinions would soon carry additional clout. In mid-2012, she would take over as chairman of the NRC [when Jaczko resigned]. The threats posed by earthquakes, she promised, would move up on the NRC's priority list." (pg. 176)

Chapter 9 – Unreasonable Assurances (p. 182 – 203)

"The "it can't happen here" mindset is deeply rooted at the NRC, just as it was among Japan's nuclear establishment at the time of Fukushima." (pg. 185, Ch. 9)

"Back in 1989, the NRC staff warned the commissioners that "Mark I containment integrity could be challenged by a large scale core melt accident, principally due to its smaller size." Staff experts recommended that the NRC require Mark I reactor owners to implement measures to reduce the risk of core damage and containment failure.

If the commissioners had taken effective action – action that would have sent a strong message to Mark I operators around the world, including those in Japan – it is quite possible that the worst consequences of Fukushima might have been avoided. Instead, the matter fell into a regulatory morass of competing interests and emerged with a resolution that accomplished little. It wasn't the first time that had happened." (pg. 186, Ch. 9)

"In fact, several months after Three Mile Island, NRC chairman Joseph Hendrie said in a speech that "adequate protection means what the Commission says it means." *L'état, c'est moi.*" (p.187)

"Over time, the NRC staff appeared to lose its appetite for grappling with the industry over new requirements to reduce severe accident risk. Even worse, in response to growing political pressure, the NRC decided to sweep other stubborn issues under the rug. In fact, as Three Mile Island receded into the past and no other Western-designed reactor experienced an event to jolt the memory (Chernobyl didn't really count, as it was considered an exotic Soviet beast), the agency in the 1990s embraced a sentiment that its requirements were not too lenient but rather too strict." (pg. 201)

"Reservations about the validity of probabilistic risk assessments faded as more and more utilities began to use them in regulatory applications. And why not? They seemed to enable the utilities to

get what they wanted: less regulation. But even though PRA methodology had advanced, it still suffered from many of the same problems, including huge uncertainty factors when addressing earthquakes, other external events, and reactor shutdowns (when the risk of an accident can be surprisingly high). (pg. 201)

“In the years following Three Mile Island, the Japanese closely studied the NRC’s regulatory reforms, and in many cases emulated them.” (pg. 202)

“Japan’s severe accident management measures also shared many of the defects of the U.S. approach. All of the AM [accident management] measures were rooted in the belief that the possibility of severe accidents was so low as not to be “realistic from an engineering viewpoint”; hence these steps were not considered essential.” (pg. 202)

“Suppose that decades ago the NRC staff had succeeded in pushing through a much more aggressive approach for dealing with Mark I core damage and containment failure risks, including the challenges of a prolonged station blackout. There is no guarantee that the Japanese would have followed suit, but they would have been hard-pressed to ignore the NRC’s example. The NRC staff in the 1980s had all but predicted that something like Fukushima was inevitable without the fixes it prescribed, but the agency’s timidity – or perhaps even negligence – contributed to the global regulatory environment that made Fukushima possible. The NRC’s reliance on the flawed assumption that severe accident risks are acceptably low helped to perpetuate a dangerous fallacy in the United States and abroad. Ultimately, the NRC must bear some responsibility for the tragedy that struck Japan. And the commissioners must acknowledge that unless they fully correct the flawed processes of the past, they cannot truthfully testify before Congress, that a Fukushima-like event “can’t happen here.” (pg. 203, Ch. 9)

Chapter 10 – “This is a closed meeting, right?” (p. 204 – 221)

Simply must be read to be believed to get a real grasp on how the NRC works...

“Nearly three decades earlier, in November 1982, Representative Edward Markey of Massachusetts held a press conference in Boston with Eric van Loon, executive director of the Union of Concerned Scientists, to disclose troubling information: the NRC was suppressing the results of a study that estimated the consequences for human health and the environment of severe accidents for every nuclear power plant site in the United States. The NRC staff had drafted a report on the study for public consumption, but the commission had been sitting on it for over six months.” – the CRAC2 study (pg. 206)

This chapter explains a # of studies done, the assumption from the NRC always being that “the chances of an accident severe enough to produce such death and destruction were so slight as to be hardly worth mentioning.” (pg. 208)

“Aside from a series of carefully constructed and vaguely reassuring talking points, the NRC provided few details beyond “Trust us.” (pg 209)

<<SOARCA (State-of-the-Art Reactor Consequence Analyses) study, the motivator for it, & its veil of secrecy (takes the whole chapter to explain this one); Jaczko, btw, dissenting on the secrecy part.>>

“Technical Study of Spent Fuel Pool Accident Risks at Decommissioning Nuclear Power Plants” or NUREG-1738 (Jan. 2001) – later another group of experts using the data from this concluded

“that the U.S. practice of tightly packing spent fuel in pools was risky. It called on utilities to move most of the fuel to safer dry storage casks.” (pg. 211)

“Over the years as the SOARCA study progressed, it had revealed the potential for a natural disaster to cause a truly horrific event: an accident that involved multiple reactors, rendered most emergency equipment useless, and contaminated large areas with radiation plumes far beyond emergency planning zones due in part to the vagaries of weather. Yet instead of taking action to prevent such an accident, the NRC convinced itself that even if the accident did happen, the consequences would be minor. Difficult issues were disregarded or put off for another day.” (pg. 221, Ch. 10)

Chapter 11 – 2012: “The Government owes the public a clear and convincing answer” (p. 222-243)

Regarding proposed re-start of Japan’s reactors:

“Those findings drew a scathing public rebuke from two nuclear experts who served as NISA [Japan’s nuclear regulator] advisors. The tests, the two men said, failed to take into account complex accident scenarios as well as critical factors such as human error, design flaws, or aging equipment. At a news conference, Masashi Goto, a former reactor designer, labeled the stress tests “nothing but an optimistic desk simulation based on the assumption that everything will happen exactly as assumed.” (pg. 225, Ch. 11)

“Madarama [head of Japan’s NRC, Nuclear Safety Commission] asserted forcefully that Japan’s nuclear regulatory framework was flawed, out of date, and below international standards.” (pg. 225, Ch. 11)

“Shortly before leaving his job as chairman [of the U.S. NRC] in July 2012, Jaczko offered a candid observation to a Washington audience of energy insiders: ‘I used to say the one thing that kept me up at night was the thing we hadn’t thought of. Today the things that keep me up at night are those things we know we haven’t addressed.’” [pg. 232, Ch. 11]

“Although Fukushima had proven that beyond-design-basis accidents were a real threat, the NRC’s obsolete guidelines still ranked them as very low-probability events, meaning that the calculated benefits of reducing the risk would also be very small. And the benefit could even be zero if the calculation addressed an event that had been left out of the risk assessment models used for the cost-benefit analyses.” (pg. 234, Ch. 11)

Regarding U.S. nuclear industry’s FLEX (diverse and flexible mitigation capability) program, post-Fukushima accident:

“The Peach Bottom FLEX [diverse and flexible mitigation capability] plan is a perfect example of the mind-set that led to Fukushima. It represents industry and regulators scripting an accident with little room for improvisation. If a single assumption fails – say, that workers don’t have time to move FLEX equipment to safety in advance of an impending flood – then all the other barriers would collapse like dominoes. Without the FLEX generator, the batteries would fail after five and a half hours and the RCIC [reactor core isolation cooling system] could no longer be counted on to cool the reactors. Operators would eventually lose the ability to vent the containment and it would over-pressurize. Backup equipment, located a thousand miles away in Tennessee – and possibly on the other side of massive floodwaters or earthquake destruction – probably would not arrive in time to save the day. Nobody apparently thought these possibilities were worth considering, even after Fukushima Daiichi.” (pg. 238, Ch. 11)

“The tactic [getting out in front with the industry FLEX plan] worked. The FLEX program, for all its flaws, did not conflict with the NRC’s ambiguous mitigation strategies order. After many months of deliberation with the NEI [Nuclear Energy Institute, the primary nuclear industry lobbying group in Washington] on the guidance document it had prepared for the use of FLEX equipment, the NRC largely endorsed NEI’s approach. The tail had wagged the dog.” (Pg. 239, Ch. 11)

Chapter 12 – A Rapidly Closing Window of Opportunity (p. 244-261)

Fingerpointing:

“Nuclear power supporters indicted the user of the technology – in this instance TEPCO – instead of the technology itself, and thus avoided answering larger safety questions.” (pg. 244)

“TEPCO initially pointed fingers at Mother Nature, asserting that the event was unavoidable. But the utility also blamed Japanese government regulators for not forcing the company to meet sufficiently stringent safety standards.” (pg. 244)

“The Japanese Diet Independent Investigation Commission laid blame at the feet of both TEPCO and Japanese regulators for their incompetence, lack of foresight, and even corruption. (pg. 244)

“It is too simplistic to say either that the accident was fully preventable or that it was impossible to foresee. The truth lies in between, and there is plenty of blame to go around.” (pg. 245)

“I cannot support issuing this license as if Fukushima never happened.” [Gregory Jaczko speaking of NRC licensing of 2 AP1000 reactors at Vogtle site, in Georgia, Feb. 2012] (pg. 245)

On small modular reactors:

“There is no question that nuclear safety can be improved through thoughtful design of new reactors. However, nuclear power’s safety problems cannot be solved through good design alone. Any reactor, regardless of design, is only as robust as the standards it is required to meet. Unless regulators expand the spectrum of accidents that plants are designed to withstand, even enhanced safety systems could prove of little value in the face of Fukushima-scale events such as an extended blackout or a massive earthquake.” (p. 246)

“Perhaps the strongest vote of no confidence comes from the reactor vendors themselves. Even as they heavily promoted the new designs in the United States, the vendors in 2003 successfully lobbied Congress to reauthorize federal liability protection for all reactors – new and old – under the Price-Anderson Act for another twenty years. While they asserted that the next generation of plants would pose an infinitesimally small risk to the public, they wanted to make sure there would be limits on the damage claims they have to pay if they were wrong.” (pg. 246)

“There’s no question that TEPCO and the Japanese regulatory system bear much responsibility. ... But that is too narrow a focus. TEPCO and government regulators were merely the Japanese affiliate of a global nuclear establishment of power companies, vendors, regulators, and supporters, all of whom share the complacent attitude that made an accident like Fukushima possible.” (pg. 247)

“The catastrophe at Fukushima should not have been a surprise to anyone familiar with the vulnerabilities of today’s global reactor fleet. If those vulnerabilities are not addressed, the next accident won’t be a surprise, either.” (pg. 247)

<<<This chapter discusses the industry’s “defense-in-depth” approach & where it breaks down. (“common-mode failure”).>>>

“The true curse of defense-in-depth is that it has fostered complacency. The existence of multiple layers of defense has excused inattention to weaknesses in each individual layer, increasing the vulnerability to common-mode failure.” (pg. 250)

“The last defense-in-depth barrier was evacuation. But at Fukushima, emergency planning proved ineffective at protecting the public. Evacuation areas had to be repeatedly expanded in an ad hoc manner, and in some cases the decisions were made far too late to prevent radiation exposure to many evacuees.” (pg. 251)

“But such an approach [meaningful change] would be a turnabout for the nuclear establishment. Historically, when responding to events like Three Mile Island, the industry and regulators have worked hard to narrow the scope of the response, simply patching holes in the existing safety net rather than asking whether a better net is needed. To put it bluntly, unless this process is radically overhauled, it will take many more nuclear disasters and many more innocent victims to make the safety net as strong as it should be today.” (pg. 251-2)

“Safety requires specificity. Lack of specificity invites a free-for-all. Such is precisely what the NRC’s Near-Term Task Force tried to avoid in its proposals for reducing vulnerabilities at U.S. nuclear plants.” (pg. 252)

“Safety IOUs are worse than worthless. They represent vulnerabilities at operating nuclear plants that the NRC knows to exist but that have not yet been fixed. They are, simply put, disasters waiting to happen.

The NRC’s practice of identifying a safety problem and accepting a non-solution continues. The post-Fukushima proposals are just the latest example – albeit the most worrisome.

Severe reactor accidents will continue to happen as long as the nuclear establishment pretends they won’t happen. That thinking makes luck one of the defense-in-depth barriers.” (pg. 257)

“So how safe is safe enough? In that critical decision, the public has largely been shut out of the discussion. **This is true in the United States, in Japan, and everywhere else nuclear plants are in operation.** Nuclear development, expansion, and oversight have largely occurred behind a curtain. [bolding here mine]

Nuclear technology is extremely complex. Its advocates, in their zeal to promote that technology, have glossed over unknowns and uncertainties, thrown up a screen of arcane terminology, and set safety standards with unquantifiable thresholds such as “adequate protection.” In the process, the nuclear industry has come to believe its own story.

Regulators too often have come to believe that there is a firmer technical basis for their decisions than actually exists. Officials, in particular, must grapple with overseeing a technology that few thoroughly understand, especially when things go wrong. Fukushima demonstrated that.” (pg. 257)

Fukushima – The Story of a Nuclear Disaster: Quotes

“The NRC must protect against severe accidents, not merely pretend they cannot occur.” (pg. 258)

“In the end, the NRC must be able to tell the American public, “We’ve taken every reasonable step to protect you.” And it must be the public, not industry or bureaucrats, who define “reasonable.” (pg. 260)

“In other words, when computer models cannot fully explain yesterday’s accident, they cannot accurately simulate tomorrow’s accident. Yet the nuclear establishment continues to place ever-greater reliance on these codes to develop safety strategies and cost-benefit analyses.” (pg. 268)