SPENT FUEL

The risky resurgence of nuclear power

By Andrew Cockburn

Last June, Bill Gates addressed a crowd of politicians and reporters in Cheyenne, Wyoming. "Fifteen years ago I assembled a group of experts ... to solve the dual problems of global energy poverty and climate change," the sweater-clad multibillionaire declared, speaking by video. "It became clear that an essential tool to solving both is advanced nuclear power." But the technology, he continued, needed to become safer and less expensive. To this end, he had promised to invest $1 billion in TerraPower, a company he founded in 2008 to develop small modular reactors that can be churned out on an assembly line. He was now happy to announce the construction of a plant on the site of a defunct coal facility in Wyoming.

Gates and other backers extoll the promise of TerraPower's Natrium reactors, which are cooled not by water, as commercial U.S. nuclear reactors are, but by liquid sodium. This material has a high boiling point, some 1,600 degrees Fahrenheit, which in theory enables the reactor to run at extreme temperatures without the extraordinary pressures that, in turn, require huge, expensive structures. "It's smaller, cheaper, and inherently safe," Jeff Navin, the director of external affairs at TerraPower, told me.

As concern about climate change grows, nuclear power has gained new appeal, particularly on the left, for its promise as a supplement to wind and solar power in eliminating carbon dioxide emissions. What's more, the prospect of cheaper and "safer" technology may relieve nuclear energy of unsavory historical baggage, notably the disastrous accidents at Chernobyl in 1986 and Fukushima in 2011. Early in her first term, Representative Alexandria Ocasio-Cortez hailed the shutdown of the half-century-old Indian Point nuclear plant just north of New York City, but cautioned that "one plant built decades ago is not emblematic of the technology that we have today," adding that "the Green New Deal leaves the door open on nuclear." She reiterated this position a year later, calling nuclear power "a critical part of this conversation," even if "we have to make sure that the technology is vetted."

Saikat Chakrabarti, who helped draft the Green New Deal in 2019 as Ocasio-Cortez's chief of staff, was less equivocal. "We took a tech-agnostic position on nuclear in the original deal because nuclear is such a polarizing issue," he told me. But their internal analyses concluded that "there's a big baseload problem that cannot be solved with wind and solar," because they are intermittent. Acknowledging residual public fears, he insisted that "nuclear power is now extremely safe to operate, and the technology is improving all the time with these small modular reactors," such as TerraPower's design.

"It's generational," observed Navin. "If you were active in the environmental movement in the Seventies, if you went through Three Mile Island"—the plant near Harrisburg, Pennsylvania, that sparked panic in 1979 when it began melting down—"you're likely to be antinuclear today. But for young people concerned about the environment, anyone under thirty-five, it's not an issue. The polls barely registered a blip over Fukushima." The Sunrise Movement, a grassroots group founded in 2017 to recruit an "army of young people" to fight climate change, has at

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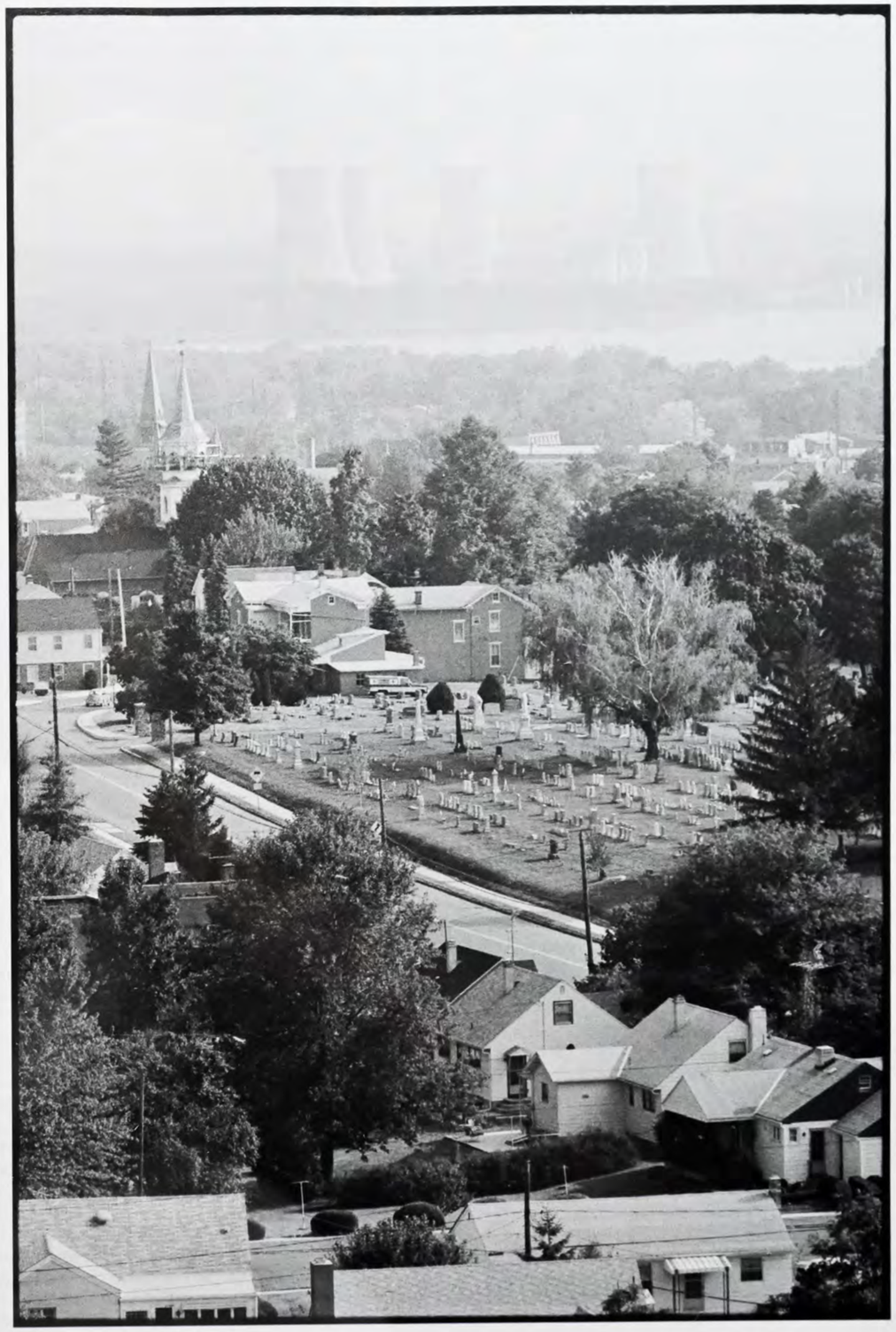


Three Mile Island, Pennsylvania, 1979. Photograph by Thomas J. O'Halloran. Courtesy the Library of Congress

times backed the idea of a hybrid grid that combines renewables and nuclear power. Even groups long noted for opposing nuclear power, such as the Union of Concerned Scientists and the Sierra Club, seem quietly ready to temporize on practical matters, such as allowing existing plants to continue as transitional energy sources. The "sobering realities" of climate change, wrote the UCS's then president Ken Kimmell in 2018, "dictate that we keep an open mind about all the tools in the emissions reduction toolbox—even ones that are not our personal favorites." As Navin put it, "the environmental movement has changed focus from local issues, such as protecting air and water, to climate change. That's the driving focus, a realization that we have to move from climbing a lot of hills to climbing one very tall hill in a very short time." He has no doubt that nuclear power, which he noted is currently generating half of all clean energy in the United States, will play a central role in the path to a carbon-free future.

The nuclear-power industry has long enjoyed establishment support. Navin was acting chief of staff at the Department of Energy under Barack Obama. The current energy secretary, Jennifer Granholm, says that the Biden Administration plans to launch more nuclear energy projects across the country, and touts in particular Natrium's promise of "345 megawatts of clean and affordable and reliable baseload power." The White House climate czar, Gina McCarthy, stresses the need to keep existing plants in operation, as well as the prospects for "these small nuclear reactors, these modular reactors," in which "people are really investing significant resources." The State Department has launched an effort to foster similar small reactor programs abroad. Most significantly, even amid bitter fights over the administration's infrastructure and social-reform bills, the inclusion of $41 billion of industry subsidies in the legislation has received unquestioning bipartisan backing. "We've been getting quite a bit of attention from the administration and from Congress," Maria Korsnick, the president of the Nuclear Energy Institute, told me. "I'm happy that the broader conversation has brought it round to recognition of the positive value of nuclear [for] the environment." But the conversation needs to be much, much broader than that.

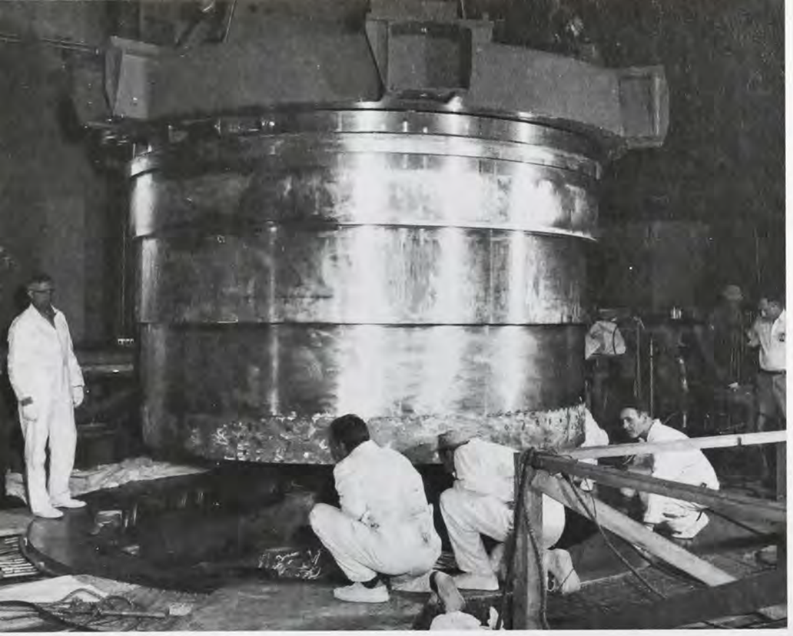
Dwight Eisenhower's "Atoms for Peace" program, unveiled in 1953, set the optimistic tone for nuclear power: "The United States knows that peaceful power from atomic energy is no dream of the future. The capability, already proved, is here today," and would "rapidly be transformed into universal, efficient, and economic usage." Four years later, Moorpark, a small town northwest of Los Angeles, became the first American community to draw its electricity from a nuclear reactor. Moorpark's power came from the Sodium Reactor Experiment, operated by the Atomic Energy Commission at the Santa Susana Field Laboratory twenty miles away. The AEC—a precursor to today's Department of Energy—invited Edward R. Murrow to commemorate the event on his television show. "Enrico Fermi once looked at a reactor and said, 'Wouldn't it be wonderful if it could cure the common cold?'" intoned Murrow. "Here at Moorpark, a chain reaction that started with him washed the dishes and lit a book for a small boy to read." No such lyrical announcement marked the day in July 1959 when the plant's coolant system failed and its uranium oxide fuel rods began melting down. With the reactor running out of control and set to explode, desperate operators deliberately released huge amounts of radioactive material into the air for nearly two weeks, making it almost certainly the most dangerous nuclear accident in U.S. history. The amount of iodine-131 alone spewed into the southern California atmosphere was two hundred and sixty times that released at Three Mile Island, which is generally regarded as the worst ever U.S. nuclear disaster. None of this was revealed to the public, who were told merely that a "technical" fault had occurred, one that was "not an indication of unsafe reactor conditions." As greater Los Angeles boomed in the following years, the area around the reactor site—originally chosen for its distance from population centers—was flooded with new residents. No one informed them of the astronomical levels of radioactive contaminants seeded deep in the soil.

Meanwhile, utilities were commissioning scores of nuclear plants across the country and promising electricity "too cheap to meter," incentivized by the 1957 Price-Anderson Act, which shifted financial liability in the event of a serious accident onto taxpayers. Rapid development throughout the Sixties engendered hopeful predictions from the AEC that more than a thousand reactors would be operating in the United States by the turn of the century. But it was not to be. As the environmental movement gathered strength in the Seventies, the dangers associated with nuclear power—from the routine disposal of radioactive waste to the risk of catastrophic meltdowns—galvanized a determined, informed, and organized opposition. Then, in 1979, one of two reactors at Three Mile Island had a partial meltdown. Officials from the president on down issued soothing reassurances, downplaying the health risks. Negative assessments were discouraged; when the Pennsylvania state health secretary, Gordon MacLeod, criticized the state's response, he was promptly fired by the governor. MacLeod later revealed that child-mortality rates had doubled within a ten-mile radius of the plant. Cost overruns in plant construction, sometimes two times above industry estimates, were a further deterrent to expansion. Ultimately, more than 120 projects were canceled, and construction ground to a halt. "The failure of the U.S. nuclear power program ranks as the largest managerial disaster in business history, a disaster on a monumental scale," *Forbes* magazine commented in 1985, a year before Chernobyl. "Only the blind, or the biased, can now think that most of the money has been well spent."

Amid the gloom, a distant ray of light for the industry began to flicker. On a hot day in June 1988, the NASA scientist James Hansen told a packed Senate hearing, "with ninety-nine percent confidence," that the earth's temperature was at its warmest on record and that this was because of carbon dioxide emissions. By the following January, the *New York Times* was editorializing that THE GREENHOUSE EFFECT IS FOR REAL and calling for "a new generation of safer, cheaper nuclear power plants." Later that year, Hans Blix, the chairman of the International Atomic Energy Agency, told the United Nations that "the public should be aware that nuclear energy emits . . . no carbon dioxide whatever." Given this assumption (which discounts the enormous quantities of carbon dioxide generated during plant construction), nuclear power's high cost could be offset by rewarding its low emissions. One way to limit pollution is to put a price on it, a point not lost on at least one farsighted industry executive. In 1992, John Rowe, then CEO of New England Electric System, which owned several nuclear plants in the region, began making

Former residents of Okuma visit a restricted area, Fukushima Prefecture, Japan, 2017 © Yuki Iwanami. From *Blue Persimmons*, which will be published in February by AKAAKA

A coyote outside the Yucca Mountain nuclear waste repository in Nevada, 2002 © David Howells/Corbis/Getty Images



the case for carbon pricing as a response to climate change.

Other partisans of nuclear power also recognized the relevance of climate alarms. This included Alex Flint, a staffer for the New Mexico senator Pete Domenici. Flint started working for Domenici as a teenager and eventually rose to a position overseeing the billion-dollar budgets of the nation's nuclear weapons laboratories, including Los Alamos and Sandia. (Other Domenici staffers irreverently referred to his office as "the glow-in-the-dark team.") By the mid-Nineties, Flint told me, scientists at the labs had convinced him "that the climate was changing, and we had a very serious problem."

In 2000, following a traditional trajectory for well-connected congressional staffers, he moved over to the private sector as a lobbyist and quickly recruited an impressive list of nuclear-industry clients, including Exelon Corporation. John Rowe, the apostle of carbon pricing, had just created Exelon by merging two giant utilities with extensive holdings in nuclear and coal plants. Rowe proceeded to sell off the coal operations, because, as he later explained, "I thought climate legislation would come sooner or later and that I'd rather have my money in the nuke fleet." At the same time, Exelon spent heavily on lobbying in Washington. Within ten years of its founding, the company had invested more than $35 million in such efforts. Unfortunately for Rowe, the oil and gas industry had even deeper pockets, and was viscerally opposed to any price penalty on its copious emissions. But Rowe's investment still yielded gratifying returns, most notably in the 2005 Energy Policy Act. The bill authorized $13 billion in tax credits, plus additional loan guarantees, for new commercial reactors. This enormous bounty was crafted by none other than Alex Flint, who had returned to public service as the staff director of the Senate Committee on Energy and Natural Resources. (He then moved back to private employ the following year to head the Nuclear Energy Institute's governmental affairs office.) Money authorized under the act began to flow in 2007, when Congress appropriated $18 billion in loan guarantees for new reactors and another $4 billion for uranium enrichment. The largesse sparked hopes of a "nuclear renaissance" as utilities announced plans for new reactors.

By then, climate change had moved to the forefront of public discussion. Obama spoke eloquently of the threat during his 2008 campaign and urged a cap-and-trade initiative to curb carbon emissions. His close ties to Chicago-based Exelon were highlighted by bountiful campaign donations from Rowe and other executives, as well as the prior service of his chief strategist David Axelrod as a consultant for the company. One Exelon lobbyist boasted of serving "the president's utility." But Exelon was not alone in securing presidential favor. In February 2010, Obama announced $8.3 billion in loan guarantees for two new reactors known as Vogtle 3 and 4, to be built in Burke County, Georgia. "We will not achieve a big boost in nuclear capacity," declared the president, "unless we also create a system of incentives to make clean energy profitable." As is traditional with the placement of such industrial facilities, the new reactors were to be constructed adjacent to a poor black community. The neighborhood, Shell Bluff, was already racked by cancers that residents ascribed to existing nuclear facilities. Not surprisingly, they vehemently opposed the project. "We voiced our opinion," one local resident told CNN. "We didn't want them, but we're just the little peons." The president, they said, "doesn't know we're down here."

Eleven years later, the Vogtle plants are still under construction. Originally slated to be finished in 2017, they may now be ready in 2023. Costs have soared from $14 billion to $27 billion, a hefty slice of the overrun being borne by electricity customers in Georgia. Next door in South Carolina, ratepayers are still seeing onerous supplements on their monthly bills for two plants that were abandoned in 2017 because of soaring costs and the bankruptcy of the main contractor. In November 2020, Kevin Marsh, the former CEO of the South Carolina utility SCANA, pled guilty to fraud in concealing the $9 billion cost of the uncompleted reactors. He is now serving a two-year prison sentence.

Passing off additional costs to utility customers would appear to be a standard business model. It tends to require the complaisance of state legislators, who can demand and receive a high price for their favors—unseemly transactions that call into question the notion of "clean" nuclear energy. In November 2016, senior executives at Ohio's FirstEnergy hatched plans to shunt more of the operating costs of their two nuclear plants onto individual customers. As later detailed by an FBI criminal complaint, the scheme involved lubricating the election of a cooperative Republican legislator named Larry Householder as speaker of the Ohio House of Representatives. To this end, $61 million moved via a series of dark money cutouts to Householder, who used the funds both for personal needs and for financing his campaign and those of allies who could supply the necessary votes for the rate increase. It proved a sound investment. Householder was duly elected speaker and proceeded to pass a bill in 2019, with bipartisan support, that authorized $1 billion in rate supplements to bail out the company's two Ohio plants. (One of these, Davis-Besse, outside Toledo, has a hair-raising safety record, including a hole in the reactor vessel and cracks in its concrete containment shell.) Although the bill canceled existing mandates for renewable energy, proponents were eloquent in their concern for the climate. Representative Jamie Callender, for example, who got just under $25,000 from FirstEnergy and served as a primary sponsor of the bill, spoke piously of the need to encourage "zero carbon emissions." A FirstEnergy spokesman applauded Callender and other sponsors "for their efforts in recognizing the important and vital role nuclear energy, along with many other clean energy sources, plays in providing clean, safe, and reliable carbon-free energy to Ohioans."

Unfortunately for the plotters, the FBI had monitored their deliberations. Following disclosure of the bribery scheme, public outrage led to a repeal of the bailout. Householder, indicted along with four associates, denies the charges and has yet to go to trial. FirstEnergy, none of whose employees faced criminal charges, agreed to a $230 million fine, and its generating unit was spun off under the name Energy Harbor. ("We call it Pirates' Cove," joked the Toledo attorney Terry Lodge, who has been litigating cases related to Davis-Besse since 1979.)

While Energy Harbor saw its scheme collapse, Exelon has suffered no such setback in pursuit of bailouts through similar means. A federal investigation revealed that an Exelon subsidiary lavished favors in the form of jobs and contracts on associates of Illinois House Speaker Mike Madigan, long the most powerful politician in the state, and was rewarded with beneficial legislation, most notably a $2.35 billion subsidy enacted in 2016, for two money-losing reactors that the company had discussed closing. The subsidiary agreed to pay a $200 million fine, which was more than balanced by the $694 million subsidy signed into law by J. B. Pritzker in September 2021, a response to Exelon's threats to close two other aging plants—one of which appears to have generated a significant cancer cluster in its neighborhood. Though the Sierra Club opposes nuclear energy, the Illinois chapter supported that legislation because of the measures it included to phase out coal and gas sources. The Illinois bailout is far eclipsed, however, by the federal largesse promised by the Biden Administration's infrastructure and climate legislation. An analysis by the Nuclear Information and Resource Service suggests that 54 percent of the $41 billion will be split between just three companies, with Exelon set to receive $15 billion. (Energy Harbor is the runner-up, with $5 billion.)

For all the hopeful talk about new technology, however, the industry's principal concern is to keep aging

Left: Santa Susana Field Laboratory, California, 1957 © *Valley Times* Photo Collection/Los Angeles Public Library. Center: Part of a nuclear reactor at Southern Company's Vogtle plant in Burke County, Georgia, 2013 © David Walter Banks/*New York Times*/Redux

Gas masks in an abandoned school, Pripyat, Ukraine, 2010 © Rena Effendi

reactors running long after their original life spans, even where this poses serious safety risks. In a process known as embrittlement, for example, vital components such as containment vessels crack following decades of neutron bombardment, leading to the release of lethal radiation. Nonetheless, the Nuclear Regulatory Commission appears happy to grant extensions: plants originally designed to last forty years are being authorized to run for sixty or eighty in total. Point Beach 2, a reactor on Lake Michigan that the NRC itself listed in 2013 among the most embrittled plants in the country, is applying to be relicensed to operate for eighty years. The reactor and its twin, Point Beach 1, have been cited for safety violations and equipment malfunctions more than 130 times. At the NRC, there is even discussion of allowing plants to run for a century, long after their designers and builders are dead. "None of these extreme extensions have addressed critical 'knowledge gaps' for the reliability of major irreplaceable and inaccessible systems," said Paul Gunter of Beyond Nuclear, a tireless watchdog group working to challenge the extensions. In his view, the industry is being allowed to head blindly into the unknown, with no idea how or when age-related cracking and embrittlement will lead to component failure and potential meltdown.

Top: A mother talking with her son at Children's Cancer Hospital near Minsk, Belarus, 1999 © Paul Fusco/Magnum Photos. Bottom: A resident of Opachychi, a village to the southeast of Chernobyl, Ukraine, 2015 © Quintina Valero

Prosperous and 70 percent white, West Hills, California, is one of the communities that have sprouted near the Santa Susana Field Laboratory in the decades since the 1959 meltdown. Unlike the poor, sick, and embittered residents of Shell Bluff, people living in West Hills had until recently only the barest inkling that nuclear power in the neighborhood might have had unwelcome consequences. "Almost no one knew about the Santa Susanna Field Lab, or they thought it was an urban legend," Melissa Bumstead, who grew up in nearby Thousand Oaks, told me recently. In 2014, Bumstead's four-year-old daughter, Grace, was diagnosed with an aggressive form of leukemia. "This has no environmental link," her pediatric oncologist told her firmly. Childhood cancers were rare, and this was just cruel luck. Then, while taking Grace to Children's Hospital Los Angeles, Bumstead ran into a woman who recognized her from the local park where their young daughters played. The woman's child had neuroblastoma, another rare cancer, as did another from nearby Simi Valley, whom they encountered while the children were getting chemo. Back at home, someone on her street noticed the CHILDHOOD CANCER AWARENESS sticker on Bumstead's car and mentioned that another neighbor had died of cancer as a teenager. Bumstead began to draw a map detailing the cluster of cancer deaths in small children just in the previous six years, but stopped working on it in 2017. "I had such severe PTSD when I added children onto it, my therapist told me to stop." But it is still happening, she said, mentioning the unusual number of bald children she had noticed in local elementary schools in recent years, as well as the far-above-average rate of breast cancer cases recorded in the area. A cleanup of the field lab was due to be completed in 2017, but it has yet to begin.

A contaminated Shinto cemetery and a plant processing radioactive waste, Fukushima Prefecture, Japan, 2016 © Alfredo Caliz/Panos Pictures

I called Bumstead because I had been struck by the fact that TerraPower's Natrium reactor resembles in its basic features the long-ago Sodium Reactor Experiment at Santa Susana. (*Natrium* is Latin for sodium.) "That's exactly what we had!" Bumstead exclaimed when I mentioned that liquid sodium is integral to TerraPower's project. "The meltdown was in the sodium reactor." As her comment made clear, such liquid sodium technology is by no means innovative. Nor, in an extensive history of experiments, has it ever proved popular—not least because liquid sodium explodes when it comes into contact with water, and burns when exposed to air. In addition, it is highly corrosive to metal, which is one reason the technology was rapidly abandoned by the U.S. Navy after a tryout in the *Seawolf* submarine in 1957. That system "was leaking before it even left the dock on its first voyage," recalls Foster Blair, a longtime senior engineer with the Navy's reactor program. The Navy eventually encased the reactor in steel and dropped it into the sea 130 miles off the coast of Maryland, with the assurance that the container would not corrode while the contents were still radioactive. The main novelty of the Natrium reactor is a tank that stores molten salt, which can drive steam generators to produce extra power when demand surges. "Interesting idea," Blair commented. "But from an engineering standpoint one that has some real potential problems, namely the corrosion of the high-temperature salt in just about any metal container over any period of time."

TerraPower's Jeff Navin assured me in response that Natrium "is designed to be a safe, cost-effective commercial reactor." He added that Natrium's use of uranium-based metal fuel would increase the reactor's safety and performance. Blair told me that such a system had been tried and abandoned in the Fifties because the solid fuel swelled and grew after fissioning.

In a March 2021 report for the Union of Concerned Scientists, the physicist Edwin Lyman likewise concluded that there was little evidence that reactor designs like Natrium's would be safer than water-cooled models. "When I read about many of the current proposals," Blair said, "it is almost as if they are unaware of all the work that has gone before." Citing the Navy's abandonment of sodium reactors, he suggested that companies such as TerraPower "are unaware, or intentionally choose to ignore history." He recalled that Admiral Hyman Rickover, who ran the Navy's nuclear program for three decades, would personally command the sea trials of every new nuclear submarine. In that spirit, he suggested, "they should only license a small modular reactor on condition that the head of the corporation that built it takes up permanent residence within a quarter mile of the plant."

As the sodium saga indicates, the true history of nuclear energy is largely unknown to all but specialists, which is ironic given that it keeps repeating

itself. The story of Santa Susana follows the same path as more famous disasters, most strikingly in the studious indifference of those in charge to signs of impending catastrophe. The operators at Santa Susana shrugged off evidence of problems with the cooling system for weeks prior to the meltdown, and even restarted the reactor after initial trouble. Soviet nuclear authorities covered up at least one accident at Chernobyl before the disaster and ignored warnings that the reactor was dangerously unsafe. The Fukushima plant's designers didn't account for the known risk of massive tsunamis, a vulnerability augmented by inadequate safety precautions that were overlooked by regulators. Automatic safety features at Santa Susana did not work. This was also the case at Fukushima, where vital backup generators were destroyed by the tidal wave.

No one knows exactly how much radiation was released by Santa Susana—it exceeded the scale of the monitors. Nor was there any precise accounting of the radioactivity released at Chernobyl. Fukushima emitted far less, yet the prime minister of Japan prepared plans to evacuate fifty million people, which would have meant, as he later recounted, the end of Japan as a functioning state. Another common thread is the attempt by overseers, both corporate and governmental, to conceal information from the public for as long as possible. Santa Susana holds the prize in this regard: its coverup was sustained for twenty years, until students at UCLA found the truth in Atomic Energy Commission documents.

Most striking of all is the success of official campaigns asserting that even the most serious accidents have caused little or no harm. The spectacular scale of the Chernobyl disaster, with its mass evacuations and radioactive clouds wafting across borders, made it difficult to downplay health effects. Yet, as Kate Brown, a historian of science at MIT, details in *Manual for Survival: An Environmental History of the Chernobyl Disaster,* the International Atomic Energy Agency and the World Health Organization helped promote the notion that the disaster's health effects had been minimal. In 2005, the UN settled on a figure of 4,000 deaths among those most exposed in Ukraine, Belarus, and Russia—a number at the low end of a strikingly wide range, Brown observed. The IAEA had earlier reported "no health disorders that could be attributed directly to radiation exposure." It was only when Keith Baverstock, a scientist with the World Health Organization, defied a superior and publicly disclosed a sharp increase in extremely rare thyroid cancers among Belarusian children that there was some grudging acceptance of the disaster's deadly consequences. Even so, Baverstock says, he was threatened with firing unless he withdrew his findings; others in receipt of WHO funding claimed the jump in cases was merely the result of intensified screening.

Brown spent ten years in archives across Ukraine, Belarus, and Russia, disinterring records of what happened to the millions of people exposed not only to the invisible cloud, but to its residue in the landscape from which they drew their food. That residue had global reach—a truck carrying Ukrainian blueberries to the United States from Canada was so radioactive it was stopped at the border. Traveling around affected areas, some far from the plant itself, Brown encountered evidence of communities shredded by radiation, such as women who sorted wool from sheep slaughtered in the radiation zone. Toting bales of radioactive wool, Brown has said, "was like hugging an X-ray machine while it was turned on over and over again." Many got sick and died. Yet amid the tens of thousands of pages Brown perused, just one obscure official document furnished a hard figure for Chernobyl-related deaths: 36,525. That was the number of women in Ukraine who received pensions because their husbands had died as a result of the disaster—a toll far in excess of anything reported by Western officials. But that stark number must represent only a small fraction of the total. "That's just Ukraine," she told me, "which received only 20 percent of the radiation. There's no comparable figure for Belarus, which got far more."

While Brown mined records of Chernobyl's effects on humans, Timothy Mousseau of the University of South Carolina and his Danish colleague Anders Møller spent decades studying its consequences on the landscape around the plant. "It's not a complete void of life. It's much more insidious than that," Mousseau told *Harper's Magazine* in 2011. "Because everything's still there, it's just being modified at some low level." Birds, animals, and plants suffer the baneful effects of radiation to some degree. Early on, Mousseau was struck by the near absence of spiderwebs, normally abundant in forests. Studying the area around Fukushima, he saw many of the same results. This conclusion was not popular with the Japanese authorities. "One reason we don't know as much about Fukushima as we should," he told me, "is that the Japanese—the government, academia, the corporation, it's all the same thing—really discouraged research. I was certainly pressured not to publish my findings. It was in the form of sticks and carrots, carrots being, 'Wouldn't it be nice to have an institute for studies of Fukushima, and by the way, you really don't want to publish those papers that you've written recently.'" He published them anyway.

In light of the evidence of post-Chernobyl thyroid cancer, researchers mounted a major effort to screen children in the area around Fukushima. Year after year, the numbers steadily ratcheted up, eventually reaching twenty times normal levels. (As with thyroid cancer in Belarus, officials from UN agencies claimed the rise in cases was merely the result of intensified screening.) Meanwhile, local authorities began a campaign to discourage children from getting screened, advising them of "the right not to know." The campaign had some success, and the number of participating children dropped. Not coincidentally, from 2016 on, the number of reported child thyroid cases started to decline.

"The right not to know" about the effects of nuclear power is currently embraced far beyond Fukushima. In the face of escalating alarm about climate change, the siren song of "clean and affordable and reliable" power finds an audience eager to overlook a business model that is dependent on state support and often greased with corruption; failed experiments now hailed as "innovative"; a pattern of artful disinformation; and a trail of poison from accidents and leaks (not to mention the 95,000 tons of radioactive waste currently stored at reactor sites with nowhere to go) that will affect generations yet unborn. Arguments by proponents of renewables that wind, solar, and geothermal power can fill the gap on their own have found little traction with policymakers. Ignoring history, we may be condemned to repeat it. Bill Gates has bet a billion dollars on that. ■

Top: A radiation clinic in Minsk, Belarus, 1991 © Gueorgui Pinkhassov/Magnum Photos
Bottom: Family photos in an abandoned house, Rahivka, Ukraine, 2017 © Larry Towell/Magnum Photos

A man walks through his abandoned hometown of Futaba, Fukushima Prefecture, Japan, 2015 © Yuki Iwanami