

Fission and Fury in Perry, Ohio:
One town's fight to save their nuclear power plant

by

Kelsey M. Tsipis
B.A. Journalism and Mass Communication
University of North Carolina at Chapel Hill, 2013

SUBMITTED TO THE PROGRAM IN COMPARATIVE MEDIA STUDIES/WRITING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN SCIENCE WRITING AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SEPTEMBER 2018

© 2018 Kelsey M. Tsipis. All rights reserved.

The author hereby grants to MIT permission to reproduce and to distribute publicly paper and
electronic copies of this thesis document in whole or in part in any medium now known or
hereafter created.

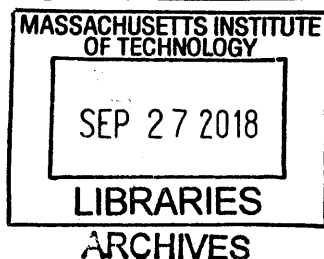
Signature redacted

Signature of Author: _____

Department of Comparative Media Studies/Writing
August 17, 2018

Signature redacted

Certified and Accepted by: _____



Seth Mnookin
Professor of Science Writing
Director, Graduate Program in Science Writing
Thesis Supervisor

Fission and Fury in Perry, Ohio:
One town's fight to save their nuclear power plant

By
Kelsey M. Tsipis
B.A. Journalism and Mass Communication
University of North Carolina at Chapel Hill, 2013

SUBMITTED TO THE PROGRAM IN COMPARATIVE MEDIA STUDIES/WRITING IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN SCIENCE WRITING AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SEPTEMBER 2018

ABSTRACT

Before much of America learned to fear atomic energy, towns like Perry, Ohio, learned to love it. For over thirty years the Perry Nuclear Power Plant has been the linchpin of the small Rust Belt community, bringing flush budgets and well-paying jobs to an area with little other industry. But like many nuclear power plants in the U.S., the Perry plant is aging, costly to maintain, and unable to compete with the nearly two-decade run of record-low natural gas prices. On the isolated shores of Lake Erie, Perry is now caught in a global energy shift. In the coming years, more than two-thirds of the nuclear power plants in America are similarly at risk of shut down, the consequences of which will leave deep voids in the diversity of America's energy grid and depleted tax bases in the rural towns that house nuclear power plants. Residents and town officials in Perry, however, are not going quietly into the retrenchment of America's nuclear energy industry.

Thesis Supervisor: Seth Mnookin

Title: Director, Graduate Program in Science Writing

ACKNOWLEDGEMENTS

A lot of work outside of my own went into the writing of this thesis, and I would like to extend my gratitude to those who contributed their support, time, and talents.

First, I would like to thank my classmates. My time at MIT was remarkably shaped by my relationships with each of you, and I am so grateful to graduate alongside such a pack of stone-cold weirdos. To my friends and family, especially my parents: thank you for your endless love and patience these last few months, and I'm sorry for forgetting to text back. Kelly, thanks for giving up your spot for me. Trees, I'm sorry for all of the drafts I printed and then immediately found typos in.

If this thesis is at all readable, it is due to the tireless work of my thesis advisor, Seth, whose edits and insights made me both a better writer and person. Thank you most of all, Seth, for convincing me that I belonged here.

And, finally, thank you to the town of Perry, Ohio, for giving me my roots.

Contents

1	THE DEATH OF A HOMETOWN
3	ATOMIZATION
5	REMEMBER WHAT HAPPENED IN VERNON, VERMONT
8	NEARLY A NUCLEAR RENAISSANCE
10	THEATER
13	ACCEPTABLE CASUALTIES
15	BLACK START

The Death of a Hometown

East of Cleveland, past Terminal Tower, around Dead Man's Curve, and forty-five miles down Route 2 along the Lake Erie shoreline, there lies a town called Perry, Ohio. And it is dying.

The town of roughly nine thousand sits in the northeastern corner of the state, surrounded by barren nursery farms in every direction. It is, by most accounts, a typical Rust Belt suburb. There are more churches than gas stations, and 1 person in every 22 lives in a trailer. Friday nights are spent at one of two village pubs, where drinks are cheap and small-town gossip spreads quickly. The two-lane highway that cuts through the town's middle features several used car dealerships and the town's lone grocery store, which has been family-run for three generations. This is middle America, and this is the town where I grew up.

At the center of it all is a massive, one-hundred-acre public school campus. The Perry Palace, as it was nicknamed by local press in its early days, is a maze of buildings made up of long walls of windows topped with arching roof lines with stark white trim. A glass bridge with criss-crossing steel beams floats over a valley to connect the high school with the middle and elementary schools. Throughout the campus are endless examples of conspicuous extravagance: an eight-hundred-seat theater, a one-million-dollar bell-tower, a six-lane indoor pool for a school that, when it was built, had no swim team.

The school was built in the early 1990s, a time in which many surrounding communities faced severe financial cutbacks. Meanwhile, in addition to the complex's seventy-million-dollar price tag, Perry paid teachers the highest salaries in state and built athletic facilities modeled after Olympic training centers, including a weather-proof six hundred thousand dollar eight-lane track, a 200,000 square foot fitness center, and a three-million-dollar football stadium.

Behind the stadium's scoreboard stands the reason for all of this opulence: two five-hundred-foot cooling towers—the only noticeable structures on the horizon for miles—one quietly releasing steam into the sky.

The Perry Nuclear Power Plant, located two miles north of the school, has been the linchpin of the community for over thirty years. Since its construction in the 1980s there has been a silent superstition among residents that the plant would insulate Perry from the downturn in manufacturing that has gutted surrounding towns. And for a while that was true.

But in October 2016, Akron-based utility giant, First Energy, announced that, in the absence of a state bailout, it would close or sell the plant by the end of this year. More than seven hundred jobs and nearly fourteen million dollars in tax revenue are at stake; Perry's schools, and the town that evolved around it, are not sustainable without it.

“It was like a punch in the gut,” says Jack Thompson, the school’s superintendent.

Like many nuclear power plants in the U.S., the Perry plant is aging, costly to maintain, and unable to compete with the nearly two-decade run of record-low natural gas prices. In the last five years, five of the country’s 103 operating nuclear reactors have shut down over similar concerns. Fifteen more are scheduled to close by 2025. The prospects for the rest of the country’s plants are pretty grim as well: a recent MIT study predicted that more than two-thirds of the nuclear plants in the country are—or soon will be—unprofitable.

As a nation, we are at an energy crossroads. The rapid decline of the nuclear industry will leave in its wake serious, deep voids in the diversity of America’s energy grid. At present, nuclear energy produces one-fifth of the country’s electricity and, perhaps more importantly, sixty percent of its carbon-free energy.

On the isolated shores of Lake Erie, Perry is now caught in a global energy shift. When First Energy first announced its plan to close the plant, the town looked to state legislators in Columbus for help. But the proposed three hundred-million-dollar bailout for the Perry plant and another First Energy-owned nuclear plant has sat untouched by the Republican-controlled state congress since early 2017. This past January brought more bad news. The Federal Energy Regulatory Commission unanimously decided that it would not subsidize aging, uneconomic coal or nuclear power plants.

“I feel like our little community has been abandoned,” says Jerry Cirino, a county commissioner.

Nevertheless, on an overcast mid-February morning residents slowly filled the green velvet seats of the Perry High School theater. A thick yellow line, left over from the previous night’s performance of *The Wizard of Oz*, wound from the doors of the theater to the stage until it disappeared behind a red curtain. In front of the curtain hung a large screen projector; on it, big block letters spelled out “Support Our Perry Nuclear Power Plant” across an aerial photo of the two cooling towers, which may one day mark what used to be Perry, Ohio.

Atomization

This was supposed to be America's age of atomic energy.

In the early 1950s, less than a decade after the "duck and cover" safety demonstrations of World War II, Americans were sold a future in which harnessing the power of the atom could be used in service of mankind rather than for its demise. In 1953, President Eisenhower's "Atoms for Peace" program earmarked billions for research into the nuclear energy sector; three years later, Disney's film "Our Friend the Atom" depicted nuclear energy as a genie with the answers to any future energy crisis-inspired wishes. By the 1960s, utilities promised electricity that would be "too cheap to meter." In 1967, the US Atomic Energy Commission, led by the former scientists of the Manhattan Project, predicted that more than one thousand nuclear plants would be on the grid in America by the turn of the century.

But this Walt Disney-level optimism does not last long. Atomization, after all, is evidence that things fall apart.

Before towns like Perry learned to love nuclear power, most of America had already learned to fear it. A series of impossible-to-ignore safety concerns in the 1970s became the first cracks in the industry's facade. In 1976, a fire broke out in the Browns Ferry Nuclear Plant in Athens, Alabama, which blazed through a labyrinth of cables that led to the plant's backup system. Though disaster was averted, it was the first evidence that there were single points of failure in reactor designs. Both the public and scientific community recoiled at the gross lack of safety oversight.

Three years later, Americans witnessed a partial meltdown at the Three Mile Island plant in Middletown, Pennsylvania. The fact that no one was killed or seriously injured did little to assuage a public whose trust, by this time, had long eroded. Two months later, 65,000 anti-nuclear protestors marched on Washington and, across the country, fierce anti-nuclear demonstrations took root. Protests even reached Perry's secluded shores. Local newspapers ran pictures of children in overalls holding "Bury Perry" signs while plant construction carried on behind them.

The advent of stricter safety regulations following Three Mile Island pressed pause on lofty post-war promises. Nuclear energy might have been too cheap to meter, but it turned out that the plants were expensive to build safely. In the four years following the accident, over fifty plans for nuclear reactors in the U.S. were canceled. The risks—both in terms of massive upfront capital investment and public alienation—were no longer worth the potential rewards.

Plants like Perry's, where construction had already begun, struggled to balance costs with ever-changing safety regulations. When the first reactor at the Perry plant went live in 1987, it was nearly a decade

behind schedule and four-and-a-half times over budget. As a result, plans for its half-way completed second reactor were abandoned. The fact that the Perry plant was the one-hundredth operational nuclear power reactor in the country felt less like a celebratory milestone and more of a portentous signal of the industry's retreat.

The industry may have been in free-fall, but the plant came to Perry like an economic adrenaline shot. The town's gentle cultivation of tomato and cantaloupe crops was soon replaced by a two-lane highway and neat rows of vinyl-sided homes. Local officials paid themselves thirty times the state's average salary. Highly sought after teachers, lured by the highest salaries in the state, commuted long distances to the Perry Palace. Families like mine soon followed, enticed by the uncommon combination of exceptional education and reasonable real estate. Residents received free cable TV, free water, free sewers, even a new lake-front resort. When, in the late 1990s, a worried town treasurer held a meeting to discuss the town's long-term finances, no one showed up. People have a hard time planning for events they don't want to happen.

But burying your head in the sand doesn't rid of dangers that lie beneath the surface. And for Perry, those threats were about a mile beneath its surface. Below a large portion of the northeast Ohio region are two massive natural gas reserves: the Marcellus shale, the second largest natural gas shale formation in the world, containing 84 trillion cubic feet of gas, and the Utica shale, a nearly two-mile deep reserve spanning the size of Nevada. And just as Perry was hitting its growth spurt, advances in drilling technology were about to make it very easy—and inexpensive—to extract these massive pools of natural gas.

Today, because almost all new nuclear power plant construction was scrapped after Three Mile Island, most of the country's plants are nearing the end of their 40-year lifespans. Nearly all are eligible for or have already received twenty-year license extensions, but such allowances come with hefty price tags, and the slowing demand for electricity and steadily low prices of natural gas have eroded much of their economic rationale. In a perspicacious sign of the times, in 2017, the Three Mile Island plant announced it, too, will close early due to economic troubles.

Instead of an age of atomic energy, the U.S. is entering an era of decommissioning. And for towns like Perry, decommissioning will almost certainly be a death sentence, just like it was for Vernon, Vermont.

Remember What Happened in Vernon, Vermont

Vernon, home to the Vermont Yankee nuclear power plant, is a quiet wooded community tucked away on Vermont's southern edge, just a two-hour drive from Boston. On a Friday night in February, a few heavily-bundled up men sat with fishing lines cast into holes cut in the frozen Connecticut River, illuminated by the faint green utility lights lingering over the plant. Inside Nesbitt's Portside Tavern, the town's sole bar, empty booths lined the perimeter as six people spread out among the dozen or so stools. A birthday banner hung from the ceiling, though no one seemed to be celebrating. A heavy, slow riff from "See You On the Other Side," a track off of Ozzy Osbourne's 1995 album *Ozzmosis*, played from the overhead speakers.

For more than four decades, the Vermont Yankee nuclear power plant generated a third of all of Vermont's electricity as well as staunch anti-nuclear opposition.

When the plant opened in 1972, it brought high paying jobs to an area that, much like Perry, had previously only been peppered with farmland. Decades of flush budgets followed, allowing the town to build a new elementary school and library. Much of the town accepted uranium with a kind of good-natured trust, the way they had accepted volatile weather in their agrarian days.

Surrounding communities, however, that did not see such benefits, were not as enticed. To them, safety concerns surrounding the plant represented a threat to their quiet dairy farms and quaint downtowns. Plant employees and Vernon residents often found themselves fighting fierce anti-nuclear sentiment in the deeply liberal state. Tensions reached a new height in 2011 when surrounding communities, including parts of bordering Massachusetts and New Hampshire, unsuccessfully petitioned the state to get the plant's operating license revoked.

But in the end, it was economics, not environmentalists, that shut down the Vermont Yankee. Despite getting a 20-year license renewal in 2011, in 2013, Entergy, the New Orleans-based utilities company that owns the plant, announced that it would close. The plant's small size—at just 620 megawatts, it's half the size of the Perry plant—coupled with the low cost of natural gas and other market conditions, meant it was no longer financially viable to keep it open.

On December 29, 2014, the Vermont Yankee officially went off the grid.

A month later, half of the plant's nearly six hundred workers were laid off. The high paying jobs that those workers had – according to Entergy, the average Vermont Yankee worker made a six-figure salary – were virtually impossible to replace. Soon, residents started moving away.

"Very few people could afford to stick around," says Ken Fara-

baugh, who worked at the plant for 25 years. Those kind of jobs aren't replaceable at the Walmart or the few restaurants in the area, he says.

As soon as the plant stopped generating electricity, Vernon lost the source of ninety percent of its property tax revenue. By the end of the year, Vernon had axed its entire police department and twice increased property taxes in desperate attempts to make ends meet.

"When you go from living high on the hog, so to speak, to paupers, many people in the public don't understand and are unwilling to compromise," Farabaugh says. "Nobody wants to cut this program or that program."

Meanwhile, the process of decommissioning the Vermont Yankee began. Early days of decommissioning a nuclear power plant are less about dismantling infrastructure and more about slowly moving radioactive materials from one place to another. Nearly seven thousand twelve-foot-long radioactive fuel rods are removed from the reactor core and cooled under sixty feet of water, which glows blue by the radiation thrown off from the fuel rods.

As the rods cooled in Vernon, so did the traffic that local businesses had come to rely on. Like many nuclear plants, the Vermont Yankee operated twenty-four hours a day, seven days a week. Once every eighteen months, it would shut down for about thirty days for refueling and maintenance. During this time, over a thousand contractors flooded into town. The owner of the local Motel 8 says those influxes provided the majority of his income. He estimates that he has lost a quarter of a million dollars in revenue since the plant's closure and is unsure whether he can stay afloat another year.

By April 2016, fifteen months after the plant had closed, as the thousands of fuel rods continued to cool, another 150 of the plant's remaining 300 workers were laid off.

When nuclear power plants were first built, the plan was that after these fuel rods were cooled on-site, they would be sent to a central waste repository. During the Reagan administration, plans were put in place to have that repository become Yucca Mountain in Nevada. Though the mountain has been hollowed out and primed to accept waste, political protests and hundreds of lawsuits later, it remains empty. Without any designated long-term storage site for the highly radioactive waste, fuel rods are instead stored on-site in ten-foot wide by twenty-foot tall concrete cylinders called dry cask storage.

This, perhaps understandably, has never gone over well with the public. But dry cask storage is extremely robust. At Fukushima, after the one-two-punch of an earthquake and tsunami, the plant's dry cask storage remained unscathed. Conservative estimates say the several feet of concrete will keep the radioactive material safe for 100 years, barring threats of global sea-level rise or, perhaps, terrorism.

Dry cask storage doesn't need much in terms of maintenance, which is why only a couple of engineers and a handful of security guards are left at the plant today.

Farabaugh, one of the few former plant workers who remained in Vernon after the shutdown, says the town he once knew is dead. The bartender at Nesbitt's says it's been "pretty quiet" since the closure. He's hoping business will pick up after the sale.

Earlier this year a demolition company offered to buy the remnants of the Vermont Yankee. To be sure, there is money to be made, but it's probably not at Nesbitt's.

Every power plant in the country has a decommissioning trust fund of hundreds of millions of dollars to cover the cost of the full dismantling. Decommissioning companies have popped up offering to buy old plants, claiming they can do it quicker and cheaper. In Vernon, a company named NorthStar has made such an offer, claiming to cut the time to clean-up from 2060 to 2026. The sale is pending approval by the NRC, but it has already renewed safety concerns; rarely do cheap and safe go hand in hand in the nuclear industry.

A couple of years into the decommissioning process, the people of Vernon have some advice for Perry residents: start preparing yourselves.

Last Spring, First Energy officials invited a Vernon county commissioner to Columbus to offer the town as a cautionary tale to Ohio state legislators debating the state bailout—House Bill 178.

"The fate of Vernon does not have to be the fate of communities here in Ohio," he said. "As you consider your state and your community's future in relation to House Bill 178, remember what happened in Vernon, Vermont."

Nearly a Nuclear Renaissance

In the early 2000s, while Ohio was breaking out as a leader in the natural gas industry, bi-partisan agreement on the dangers of climate change brought hopes of a nuclear renaissance.

At the time, nuclear power made up the majority of the country's carbon-free energy and had prevented billions of tons of CO₂ from being released into the atmosphere—more than all other clean energy sources combined, according to The Union of Concerned Scientists. Suddenly, the loss of perhaps our greatest tool in the fight against climate change proved riskier than another Three Mile Island, which, by this time, was two generations ago.

During the George W. Bush administration, the approval of the Yucca Mountain deal eased the public's concerns and about eighteen and a half billion dollars in federal loans eased investors' worries. Nuclear found new allies on the other side of the aisle as well. Promising that "this is only the beginning," in 2010, President Obama announced another eight billion dollars in federal loans for the construction of two reactors in Waynesboro, Georgia.

But, of course, loans are only "loans" if they are paid back. Otherwise they're just bad investments. No new plants were completed—in Georgia or anywhere else.

Even with generous government subsidies and new streamlined regulatory processes, construction for the massive, fortress-like reactors were still plagued by construction delays and budget overruns. Last Spring, a fateful blow to the industry came when Westinghouse, the last private company building nuclear reactors in America, announced bankruptcy. Four months later, the company abandoned two halfway-built reactors in South Carolina, which were more than ten billion dollars over budget.

With them, the hopes of an American nuclear renaissance evaporated.

Against almost all energy experts' expectations, natural gas prices have stayed staggeringly low for two decades, in large part due to technological advances like fracking and horizontal drilling. Nationwide, demand for energy has plateaued due to improved efficiency. Solar and wind have also come into their own, and with the drop in prices came a dimming of support for nuclear power from already-weary environmentalists. And if that confluence of events wasn't enough to dampen enthusiasm, the 2011 Fukushima disaster off the coast of Japan reminded the public of the inherent risks of nuclear power.

Still, natural gas gets a subsidy of its own by not having to clean up its waste. A recent study out of MIT predicts the U.S.'s carbon emissions will rise 3.5 percent following the next round of nuclear plant shut-downs. More studies show that a carbon tax (even a relatively conser-

vative one), which would pull up the price of natural gas, makes nuclear power plants profitable again. However, in today's polarizing political climate, that seems much less likely than it did a decade ago.

There was one last Hail Mary effort out of Washington, courtesy of the Trump administration, whose fiery campaign rhetoric to save a different dying industry helped tip the Rust Belt in his electoral favor. In April 2017, the Department of Energy commissioned a study to see whether the loss of at-risk nuclear and coal plants would lead to an unstable energy grid, prone to wild price spikes and widespread blackouts. Perry town officials, including Thompson and Cirino, traveled to Washington to advocate on the town's behalf. But the study showed that the market is working as intended; the grid will be alright. In January 2018, in a unanimous decision, the Federal Energy Regulatory Commission ruled against permanently subsidizing coal and nuclear plants.

Perry residents got the news three days before a massive blizzard shut down the town. "We're not surprised," said Jennifer Young, a spokesperson for First Energy who lives in Perry, "But we're disappointed."

Theater

There are only about 150 sunny days per year in Perry, Ohio, and Saturday, February 17, 2018—the day of the rally—is not one of them.

Small mounds of snow still clung to the ground from last month's blizzard. An American flag marking Perry High School's entrance quietly sat at half-staff for the Parkland school shooting just three days prior.

Inside, the theater was half-full with town officials, local business owners, parents with kids in tow, retirees, and local news reporters. Six policemen in uniform stood in the back of the auditorium in show of their support for the plant; the loss of which would be "devastating," one tells me.

Few of those in attendance talk as they wait for the event to start; most keep their eyes focused on the picture of the cooling towers on a screen above the stage. The mood is solemn, less like a pep rally and more like a bake-sale for a billion-dollar company; everyone knows that the forces at play run much deeper than what can be fixed here today.

For some time now, First Energy has not been a good neighbor. At the state level, there has been a five-year, multimillion-dollar legal battle for over-charging customers. In Perry, the company has vehemently, and often successfully, fought local officials on how much it will pay in taxes. The announcement to close the plant by this summer led some residents to wonder how the company's dire financial situation popped up seemingly overnight. "I don't think the plant has always been honest with us," says Larry Anderson, a ninety-year-old retiree who has lived in Perry for over sixty years.

Around noon, Superintendent Thompson, takes the stage to begin the event. More so than anyone else on stage, Thompson has been the most immersed in the ongoing political issues. The school system has taken the largest hit in the recent tax battles; "We're bleeding," Thompson says. Still First Energy has asked him and other school officials to testify on its behalf in Columbus. "I don't know whose side to be on," Thompson told me the day before the event.

Perhaps as a result, Thompson's opening is the only message not directly aimed at supporting the bailout. He only obliquely references the plant at all as he describes what is at stake here in Perry. It is the people that make this place special, he says, "not the plant." He asks the audience to raise their hands if they would be affected by the plant closing. Nearly all hands in the theater go up. "That's why we're here today," he says—to show support for each other.

Other speakers are not as measured. Jerry Cirino, the county commissioner who organized the rally, outlines the financial effects of the plant's closure: sixty-five million dollars in lost revenue, thousands of jobs, and hundreds of millions of dollars lost in taxes.

"One of the things that we can't really quantify on top of all the tax revenue losses and sales taxes and other things," he says, "is the impact on the families. I don't think that all of our state officials fully appreciate and understand the impact on the families."

Cirino is, like many in the area, a self-described "die hard" Republican, but, he says, it's his duty to fight for the bailout. "Generally, yes, I don't like handouts, but when it happens to you," he says, with genuine conviction, "you fight."

After the speakers wrap up, the floor is opened to questions. People are obviously worried, but it seems no one knows who is to blame, so fingers point in all directions.

A middle-aged man in a navy cable knit sweater asks how Governor John Kasich can be recruiting new businesses to the state while simultaneously ignoring existing ones, especially ones that pay this well. "He ought to be all over this," he says.

"Just to be totally transparent, the problem is we're asking the people to pay it," says Ron Young, the state representative who has co-sponsored the proposed zero-emissions credit bill in the legislature. "It's going to increase their bills. That's extremely unlikely for a conservative legislature."

Someone from the back asks why more surrounding communities aren't up in arms, as they too will suffer losses in tax revenue.

"It's a great point. We should get more support from them," Cirino says. "While we're talking about support, why aren't we getting support from the environmental groups? I mean zero emissions should be a relevant topic to those folks."

Only Larry Anderson, the ninety-year-old retiree, asks about First Energy. "I understand that you are asking us to consider adding more money to our electric bills," he says. "I haven't heard anything from you gentleman in regards to what the nuclear plant has proposed to help cut the costs."

After some murmurs from the audience, Cirino jumps in. "None of us up here are representing the company, so I would not presume to, I can't really address that question."

And it's true; none of the speakers on stage are from First Energy, but their presence is felt nonetheless. A plant executive sits in the second to last row in a camel blazer, and several attendees leaf through the "Ohio's Green Energy" pamphlets commissioned by the company last year. Jennifer Young, the company's spokesperson, stands by the railings of the stage alongside the TV camera crews throughout the entire event.

Young, who has two children in the Perry school system, is in a difficult position, and you can see it on her face. When I greet her, she apologizes for not getting back to my most recent emails. “You probably heard,” she says. I had. Earlier that week, the company announced the pending closure of a coal plant in West Virginia—four hundred jobs.

When we spoke in January, right after the Federal Energy Regulatory Commission decision, Young said that she would consider moving out of Perry if the plant shut down—for the sake of her children. Her daughter will soon graduate from Perry High School, but her eighth-grade son has a learning disability and benefits greatly from the resources the school system provides. She doesn’t think any other nearby school can offer a comparable level of care. “I don’t want my kids to go to Madison,” she says referring to a neighboring school district.

The rest of the rally is a dizzyingly display of a town in vertigo. For forty-five minutes residents throw out question after question, trying in vain to unearth information about their fate from people who know little more than they do. Will there be layoffs at the school? Not yet, says Thompson, though they aren’t replacing retiring teachers. Has anyone spoken directly with Governor Kasich? Not yet, Cirino answers. Any word from Washington? None.

When the event finally wraps up, plant workers linger at the edge to talk about organizing bus trips to Columbus to protest. Eventually, they are asked to leave by the theater manager; the middle school actors in *The Wizard of Oz* are arriving for their big Saturday night performance.

In the end, the rally in Perry High School’s theater felt just like that—theater, full of fiery rhetoric but with no tangible solutions. No one really got an answer for much of their reason for being there, which is, what is Perry without the plant?

Acceptable Casualties

A month after the rally in Perry High School's theater, in March 2018, First Energy Solutions announced bankruptcy and filed decommissioning permits. The Perry plant is scheduled to be off the grid by 2021.

Back in Perry, Jack Thompson sits at a dark wood desk in his office, located in a one-story red brick building that served as the high school before the plant arrived. In place of his usual suit and tie, Thompson wears a red sweater vest over a white turtleneck: Perry colors. Fridays are for school spirit around here. Lately, however, there has not been a lot to be excited about.

For months, Thompson has fielded calls from anxious families. Without the plant, they ask, what will happen to the schools?

"I mean, what do you tell them?" he says. "It's over. We move on. We had our day in the sun and now the dance is over. It's over."

If Thompson seems quick to surrender, it's because this has been a long battle. He inherited these dire circumstances in 2011 when he was hired as Perry's superintendent.

Even before the announcement from FirstEnergy, he says, the region was not faring well. Next year's first-grade class will have just eighty-seven students—a number the school hasn't seen since well before the plant opened. Thompson rattles off a list of surrounding schools that have had to merge to stay afloat. Without the plant, Perry may join them.

"I think we're going to be very close to making ends meet as far as having a balanced budget next year," he says. "That's the last year we're ever going to."

When Thompson, a self-described "realist," first came to Perry, he started quietly drafting what he calls a compression plan: All Perry students would go to the middle and elementary school, and the high school would be rented out, perhaps to a local community college or satellite campus for Ohio State. So far, however, there have been no offers.

"There is one chink in the armor," he says. "Nobody wants to come here. This is a country rural town. It's not easy to get to."

More than just geographically, Perry is an outlier. For two generations, the Perry public school system has been an embodiment of the American dream. Without seeing a single levy, residents of the largely blue-collar town received an education that similar towns could never have dreamed of affording. And, it turns out, that dream dies hard.

Thompson has learned that it is difficult to wean the town off perks to which it has grown accustomed. He has proposed everything from taking in kids from outside districts to requiring fees to participate in school sports. Each proposal has been met with harsh backlash, sometimes amounting to protests at school board meetings, he says.

"What's the tipping point? How desperate do I have to get?" he says. "We're going to have to do a major culture overhaul and I'm hitting a wall here."

If anyone is tuned to this town's culture, it's Thompson. He grew up poor an hour south of Perry. Most of his high school classmates went to work at the surrounding steel mills, which, as he reminds me, are also gone. His blue collar roots and candor have made him popular amongst Perry residents. Thompson says he grew up with a blind faith and trust in government, that those in power would do right by the people.

"I don't get that sense anymore," Thompson, a lifelong Republican, says. "You've got all of this big business manipulation. And we're just acceptable casualties in that big corporate game. There's no morality.

"What would FirstEnergy do if there was no regulation? What would the gas companies do with unregulated drilling? How far would they have to go before somebody, morally, would say you know what? We're making unlivable habitat in these regions. I don't think there would be much of a conscious to save anything."

I tell him he almost sounds like a liberal. "I know," he says, and laughs. "I'm a mess. I believe in help, I believe in providing services and helping. But I also believe in self ownership and doing it yourself."

Presumably as an example of the latter, Thompson tells me about his mother-in-law, a "tough lady," who grew up during the Great Depression. Every Sunday, she'd cook a turkey and make it last until the next Sunday. Early in the week the family would have roasted turkey dinners. As the week went on, they'd get turkey sandwiches and eventually, "when it got to the carcass part," she'd make soup, he says.

I am not certain whether this is a metaphor for the town itself or the plant being shut down before its time. I ask. And Thompson is uncharacteristically quiet.

"I don't know," he says finally. "I don't have the knowledge to be able to say what we have in Perry anymore. I don't know what the Perry nuclear plant is."

It is the first time since I have met Thompson that I hear him sound truly despondent. But it is, in essence, the question at hand. Most energy experts would argue that the plant is a symbol of a bygone energy era, one in which people lined up for gasoline, ignorant of the vast reserves of natural gas that lay beneath the surface or how cheap it would be to extract it. There are those who say it is our greatest tool in the imminent fight against climate change. Others will counter that it is an unnecessary safety risk to life as we know it.

To the people of Perry, myself once included, the Perry Nuclear Power Plant was simply the source of our prosperity: a monument to the hopes of a small town's citizenry. It was hope that there was some protection against the callous tides of capitalism, that the next generation would have a better education and a better life than the one before it, that progress, technological or otherwise, was pulling them towards an undeniably better future—hope that, today, seems to be corroding along with it.

Black Start

There is an event in the energy industry called Black Start. It is, in essence, the ultimate test of resilience. In the event of a total power blackout, Black Start units are those that can get back online the fastest, safely, and independent of any outside help.

Today, the nuclear industry in America has found itself in a Black Start scenario. With an aging fleet of plants dropping off the grid at an alarmingly fast pace, the resiliency of the relatively young industry is being tested; its future in the American power sector, murky. To prove its place, the industry will need to solve its two often-conflicting technical challenges: the need for increased safety and lower construction costs.

New innovative designs have used the industry's past as prologue, swapping the complex, fortress-like designs of early plants, like Perry's, for smaller, simpler reactors. New safety measures have also been developed that greatly reduce the chances of a meltdown. For instance, in place of traditional water cooling systems (Perry's by Lake Erie, and also like the one that failed at Fukushima), new designs favor coolant in the form of liquid lead, molten sodium, or one-thousand-degree helium, which are "walk away safe" in the event the plant's water supply is cut off.

Following suit in the scaled-down approach, in place of the General Electric's and Westinghouse's, some fifty start-up companies across the country have popped up over the last decade promising to deliver these smaller, cheaper, and safer reactors. At the head of the pack, is a company named NuScale, whose small modular reactor design—a quarter of the size of one of Perry's cooling towers—can be mass produced in factories.

However, not all areas have advanced as quickly as the technology. The new generation still faces the industry's oldest barriers: regulations. NuScale began its application review process in 2009; two million man-hours and five hundred million dollars later, the company announced in March 2018 that it had passed just the first phase of the NRC's certification process.

This lag time isn't good news for aging plants, like Perry's. Rather, it means the competition has plenty of time to innovate. Batteries, which could help scale up renewables like wind and solar, have seen a slow, but steady stream of declining cost and climbing efficiency in recent years. The technical allure of fusion energy has also, at times, won it headlines as the newest nuclear nirvana. However, fusion still faces some pretty major engineering problems (namely, containing temperatures roughly ten times hotter than the surface of the sun), which, if fission's past has taught us anything, ultimately equate to economic problems.

Despite its uncertain future here at home, nuclear power has hit a new stride overseas. Places like China, Russia, India, South Korea—even Japan—have all built new reactors, or are in the process of doing so. All have done so for different economic reasons—increasing energy demand, lack of natural resources—but generally using the same design: mostly Westinghouse designs, in fact, after the company sold off its intellectual property rights before bankruptcy.

The industry's move overseas has renewed concerns over its two biggest blockades: accidents and waste. The U.S. Nuclear Regulatory Commission is the staunchest regulator of the industry. Without its oversight, experts warn that safety standards may not be enforced in an appropriately strict manner. Take Fukushima, for example. The Fukushima Daiichi plant was strongly warned by regulators about safety upgrades, including stress cracks in its backup generators, a month before the disaster; unfortunately, the warnings went unheeded. "In the U.S., we absolutely would have been required to make those safety upgrades," says Dr. Michael Short, an assistant professor of nuclear engineering at MIT. "We can't make laws in other countries."

Nuclear power has also long been linked with nuclear weapon proliferation. The waste produced by commercial plants, plutonium and uranium, are essentially the building blocks of any nuclear bomb. We've also seen the consequences of this play out before, when during the Cold War, Eisenhower's "Atom for Peace" program, in an effort to ward off communism, gave Iran its first nuclear research reactor, along with the fuel needed to run it—highly enriched uranium.

Weapons and wartime are, of course, just one part of nuclear power's sordid social history in the U.S., the consequences of which it seems to be facing today. Public trust is easy to lose and hard to win back—even harder when some of the industry's most glaring social issues, like the absence of a long-term waste repository, remain unsolved. These issues have long overshadowed the tangible societal benefits of nuclear power—enormous amounts of carbon-free energy, well-paying jobs, lifelines for towns like Perry—that could have potentially squared its market challenges. It's a difficult industry to defend, I have found, even when the fate of your hometown depends on it.

Also, for the curious, hydro power usually wins Black Start scenarios. Solar and wind are too weather dependent, natural gas will liquefy in low enough temperatures, and nuclear reactors are slowed by safety measures. But, it turns out, rivers rarely stop running.

Cited Works

- Allison MacFarlane, "It's 2050: Do you know where your nuclear waste is?" *Bulletin of the Atomic Scientists*, Jul/Aug. 2011.
- Chris Mooney, "Three Struggling Nuclear Plants Need an 'Emergency' Government Rescue, Company Plead," *The Washington Post*, Mar. 29, 2018.
- Diane Cardwell and Jonathan Sobel, "Westinghouse Files for Bankruptcy, in Blow to Nuclear Power," *The New York Times*, Mar. 29, 2017.
- Dino DiSanto, "Second nuclear power plant not in near future," *The News Herald*, Feb. 25, 2001.
- Entergy Corp., "Entergy, NorthStar Reach Settlement Agreement with State of Vermont and Other Parties on Terms for the Approval of the Sale of Vermont Yankee," Press release, Mar. 2, 2018.
- Entergy Corp., "Vermont Yankee's Decommissioning to be Accelerated by Decades," Press release, Nov. 8, 2016.
- FirstEnergy Solutions, "FirstEnergy Solutions and FirstEnergy Nuclear Operating Company File Voluntary Petitions for Chapter 11 Restructuring," Press release, Mar. 31, 2018.
- Geoffrey Haratyk, *Early Nuclear Retirements in Deregulated U.S. Markets: Causes, Implications and Policy Options*, Working Paper from the MIT Center for Energy and Environmental Policy Research, CEEPR-WF-2017-009, Mar. 2017. <http://ceep.mit.edu/files/papers/2017-009.pdf>.
- J. Kenneth Shultis and Richard Faw, "Nuclear Power," Chapter 11 in *Fundamentals of Nuclear Science and Engineering* (CRC Press: 2008), pp. 340–379.
- Jeff McMahon, "Author Describes Writing Controversial DOE Grid Reliability Report," *Forbes*, Nov. 12, 2017.
- John G. Kemeny, et al., *Report of the President's Commission on the Accident at Three Mile Island*, ("The Kemeny Commission Report"), October 1979, pp. 1–31.
- Lawrence M. Lidsky, "The Trouble with Fusion," *MIT Technology Review*, Oct. 1983.
- Lucas W. Davis, "Prospects for Nuclear Power," *Journal of Economic Perspectives*, Vol. 26, No. 1 (Winter 2012), pp. 49–66.
- Mark Scott, "Perry prepares for post power plant tax revenue," *The News Herald*, Jan. 12, 2002.
- Matthew L. Wald, "Vermont Yankee Plant to Close Next Year as the Nuclear Industry Retrenches," *The New York Times*, Aug. 27, 2013.
- Mike Donoghue, "Vermont Yankee winds down operations," *Burlington Free Press*, Dec. 29, 2014.
- NuScale Power, "NuScale Power's Small Modular Nuclear Reactor Becomes First Ever to Complete Nuclear Regulatory Commission's Phase 1 Review," Press Release, Apr. 30, 2018.
- Organisation for Economic Co-operation and Development, *Public Attitudes to Nuclear Power* (Paris: OECD Publishing, 2010), <http://dx.doi.org/10.1787/9789264097933-en>
- Peter Geller, "Perry schools are top loser in CEI tax break," *The Plain Dealer*, Dec. 31, 1993.
- Phil Chaffee, "Newbuild Report," *Nuclear Intelligence Weekly*, vol. 11, no. 36, Sep. 2017.
- Tim Warsinkskey, "Perry's Palace: Little School Builds a Big Sports Facility," *The Plain Dealer*, Jun. 10, 1992.
- Tim Warsinkskey, "New campus mesmerizes student body," *The Plain Dealer*, Aug. 29, 1993.
- U.S. Census Bureau. *Profile of General Population and Housing Characteristics: 2010*. (2010 Census). Retrieved from <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>.
- U.S. Energy Information Administration (EIA). *State Nuclear Profiles 2010*. <https://www.eia.gov/nuclear/state/pdf/snp2010.pdf>. 2012.
- Weather Underground. Perry, OH weather information. Retrieved from <https://www.wunderground.com/weather/us/oh/perry>.