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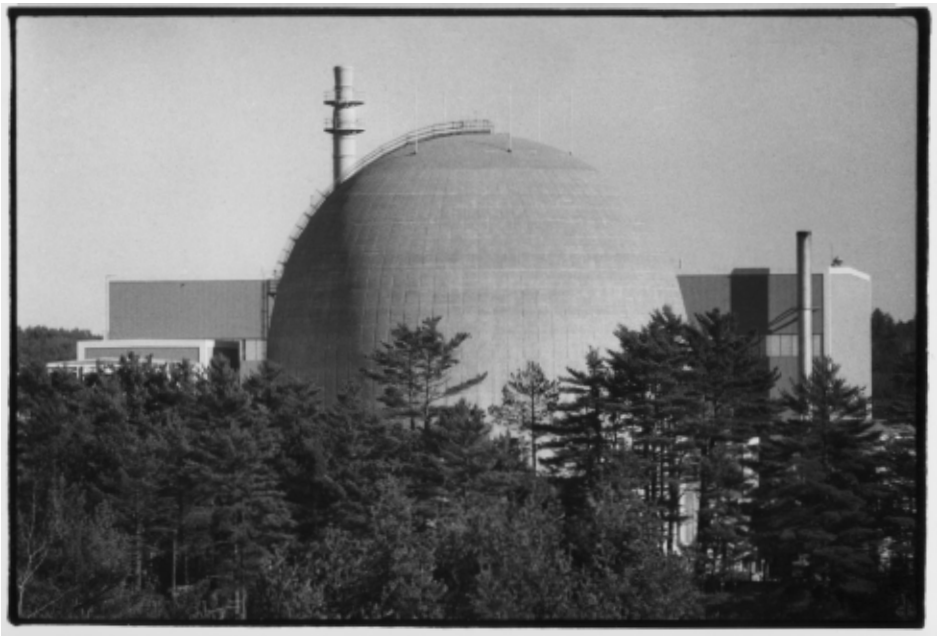


The decommissioned Maine Yankee Nuclear Power Plant is situated on Bailey Peninsula in Wiscasset. The facility went online in 1972 and produced power until the middle of the 1990s. *Maine Historical Society Collections.*

MAINE YANKEE NUCLEAR POWER PLANT: A TECHNOLOGICAL UTOPIA IN RETROSPECT

By Howard P. Segal

The Maine Yankee nuclear power plant, built in 1968 and closed in 1996, provides a revealing case study of the rise and fall of the nuclear power industry in the United States. At its inception, the plant generated a great outpouring of optimistic superlatives promising electricity "too cheap to meter" and a solution to Maine's longstanding energy problems. Its promoters envisioned a technological utopia for Maine communities based on cheap and efficient energy, and based on these promising prospects, the town of Wiscasset welcomed the plant. This article traces the changes in public thinking that led to statewide referenda on the question of nuclear power in 1980, 1982, and 1987, and it highlights the anti-utopian fears that fueled these campaigns. Howard Segal is a professor of history specializing in history of technology at the University of Maine, having joined the faculty there in 1986. His publications include Technological Utopianism in American Culture *(1985);* Future Imperfect: The Mixed Blessings of Technology in America *(1994);* Technology in America: A Brief History *(1989); and* Recasting the Machine Age: Henry Ford's Village Industries *(2001). His current research involves a history of high-tech technological utopias in America.*

THE HISTORY of Maine's only nuclear power plant, Maine Yankee, is a superb case study of the rise and fall of the nuclear power industry in the United States in the second half of the twentieth century. Maine Yankee was the nation's thirtieth nuclear power plant when it opened in 1972. The plant was located on an 800-acre tract six miles from the center of Wiscasset, a town of over 3,600 on Route 1 whose motto has long been "The Prettiest Village in Maine." The town has handsome old sea captains' houses and other remnants from its rich maritime history, and for local citizens the plant did not seem an affront to its charm. Promoters of other scenic Maine communities might disagree over the motto's accuracy, but within Wiscasset, the overall popu-

larity of the plant during most of its years of operation—it closed in 1996—cannot be disputed.

The plant was built between 1968 and 1972 at a cost of 231 million dollars and was granted a forty-year license. The plant's largest shareholder was Maine Yankee Power Company, which owned 38 percent of its assets.[1] The company chose Wiscasset for several reasons: its sufficient land area, its proximity to fresh water and to the ocean, its nearby railroad and highway routes, its nearness to electrical load centers and to transmission lines, its excellent bedrock for foundations, and its "favorable geologic, hydrologic, seismologic, and meteorological characteristics"[2]

The Wiscasset Facility was one of several nuclear power plants built by Maine Yankee Atomic Power Company, which was established in 1954 after President Dwight Eisenhower signed the amended Atomic Energy Act that, for the first time, allowed private companies to build atomic facilities. The legislation was part of Eisenhower's "Atoms for Peace" policy, which was designed to ameliorate national anxiety over atomic power—a sentiment that dates back to the dropping of atomic bombs over Hiroshima and Nagasaki. Moreover, a peaceful civilian role for atomic power shrewdly offset Cold War tensions repeatedly raised by Eisenhower's Secretary of State, John Foster Dulles, whose combative rhetoric suggested the likelihood of nuclear war against the Soviet Union in the not too distant future. Further contributing to the "Atoms for Peace" proposal was the allure of "electrical power too cheap to meter," as promised by Atomic Energy Commission chairman Lewis Strauss in the early 1950s.[3]

A brochure entitled "The Yankee Story," first published in 1960, stated that the company's founders "recognized that an entirely new and plentiful source of energy was to be found within the atom" and that generating electricity in this fashion would first become practical in areas like New England. Water power in New England had been "effectively harnessed" for centuries, while coal and oil had to be "imported from considerable distances." And in the words of company president William Webster: "we felt that here was a job for private enterprise and industry, not the government. Call this the old Yankee pioneering spirit, if you will."[4]

Maine Yankee Atomic Electric Power's first plant, opening in 1960, was Yankee Atomic at Rowe, Massachusetts; it closed in 1992. In 1968 came Connecticut Yankee in Haddam Neck, which closed in 1996. "The Yankee Story" announced four other New England nuclear power plants in its undated seventh edition including: Millstone 1 in Waterford, Con-

necticut, which opened in 1970 and closed in 1998; Millstone 2 and 3, which started in 1975 and 1986 respectively and continue to operate; Pilgrim in Plymouth, Massachusetts; Seabrook in New Hampshire; and Vermont Yankee in Vernon, Vermont.

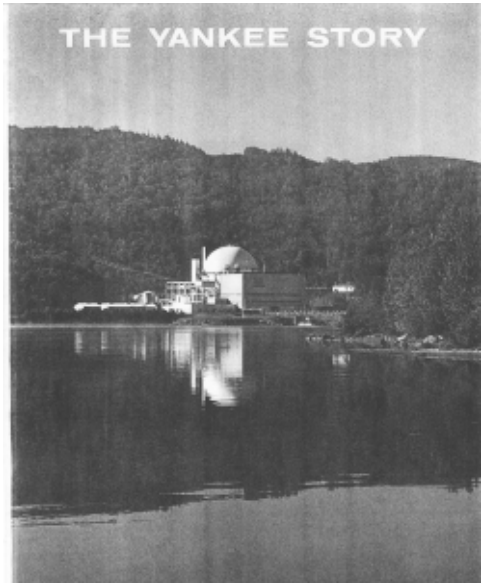
Complementing "The Yankee Story" was another brochure entitled "The Atom, Electricity, and You!"[5] The publication's cartoons feature "The Fosters," as a stereotypical white middle-class family consisting of a father, mother, son, and daughter. The Fosters respond to an invitation from the electric company to attend a presentation on "The Atom, Electricity, and You—Today's Greatest Exhibit."[6] The meeting's speaker, John Blaine, summarizes various appliances that have vastly improved Americans' lives and that have been powered by electricity. Blaine informs the audience that families are "using more electricity than ever before," but the cost per kilowatt hour is dropping. However, Blaine goes on to explain that generating sufficient water power to meet this growing demand for electricity would be much too expensive, and using more coal and oil to manufacture electricity would likewise prove costly. The practical alternative is nuclear energy: "the miracle product of the splitting of the atom."[7]

Blaine then explains the workings of a nuclear power plant. He doesn't mention safety concerns because, presumably, there are none. "And get this: there are no storage problems when this wonderful fuel is used. Plants no longer must store reserve coal or tanks of oil." As for "what happens when the fuel is used up," Blaine responds that it would never be completely exhausted. The fuel rods in the center of the assembly would give out first, and rods from the outer regions would be "moved in turn towards the center."[8]

Regarding any "danger from radiation in the vicinity" of a plant, Blaine reassures his audience that "there's considerably *less* radiation from such a plant than from the radium on the dial of your wristwatch." Every day, moreover, people are exposed to radiation "in mountain vacation areas and jet flights, for example," and those exposures are often "far greater than radiation from nuclear plants—and they don't cause the slightest harm."[9]

Waxing slightly historical about radiation, Blaine reminds his audience that "man's been living with them for quite a few years now, with *no* problems whatsoever," drawing attention to atomic submarines and atomic ships as well as the sixteen existing nuclear power plants. The electric power companies "are very conscious of radiation problems—and have successfully *solved* them."[10]

Not surprisingly, given the trouble-free history of nuclear power in



Pamphlets such as these were used to convince the public of the promise of civilian nuclear technology. Nuclear power, like hydro power a century and a half earlier, would revolutionize New England and the country at large, stimulating continued progress and prosperity. *Maine Historical Society Collections.*

America, "many more nuclear generating plants will be built!" Furthermore, Blaine reminded readers, once nuclear fuel is no longer needed, it could be used for other purposes such as medicine, industry, and space travel. Ordinary citizens could look forward to "nuclear-powered airplanes, automobiles, trains—and just about anything and everything that moves under its own power." The nation has "entered the *nuclear age* that will make our living *easier* and more *productive*!" The Foster family thanks Blaine for his uplifting presentation and concludes that "one thing's sure—it's going to be a *great* thing for all of us!"[11]

Over its lifetime, the single-unit 900 megawatt plant was Maine's largest generator of electricity, producing about 119 billion kilowatt hours. According to retired University of Maine mechanical engineering professor Richard Hill, the average Maine household's annual electricity use is about 7,000 kilowatt hours. With about 400,000 households in the state, Maine Yankee's lifetime production amounted to that used by all of the state's households for roughly forty years, and at a very low cost.[12]

During its years of operation, Maine Yankee contributed twelve million dollars in property taxes to Wiscasset. That in turn cut ordinary residents' property taxes by 90 percent. In addition, the plant's workers—480 full-timers when it closed — spread their incomes through the community. Not surprisingly, the town was able to dramatically improve its schools, parks, and roads, to increase its fire and police departments, to build a new cutting-edge community center, and to provide free ambulance service — to the envy of nearby communities with traditional property tax bases. As local resident John Chester put it, "It was like living in fairyland. Everything you wanted, you got." Or in the words of Judy Flanagan, a member of Wiscasset's board of selectmen, "We called it the golden goose."[13]

Those who worked at Maine Yankee were satisfied with their jobs and employment conditions. Engineer Bryan Selee recounted that a job there "was a good job to have, good benefits, the job security was there." He met his wife at the plant, and his father, stepmother, and father-in-law worked there. Selee believed that opponents often lacked sufficient understanding of the competence and concern of the staff.[14]

The majority of residents of Vernon, Vermont, the site of Vermont Yankee Nuclear Plant, held a similarly positive attitude. The town of 1,200 enjoyed property tax reductions and municipal improvements after Vermont Yankee opened in 1972. Yet within the first twenty months of its operation, numerous faulty parts problems, outages, and minor accidents closed the plant down seventeen times—difficulties that did not

plague Maine Yankee in most of its years of operation. Still, "did you ever buy a car that operated 100 per cent effectively when you got it," asked town official Erma Puffer. Similar sentiments might have arisen in Wiscasset had Maine Yankee experienced comparable challenges in its initial years, and certainly Maine Yankee had like-minded defenders years later, when serious problems did arise. Puffer dismissed concerns over nuclear waste: "if the Good Lord is smart enough to let them build a nuclear plant, He's smart enough to give them a way to get rid of the waste." Significantly, in both communities residents appeared to be quite familiar with the complexities of nuclear power "because of extensive media coverage and well-organized public relations campaigns by the power companies."[15]

Nothing, perhaps, is more reflective of Wiscasset's official warm embrace of Maine Yankee than its inclusion in the fifth edition of a brochure entitled "Wiscasset Invites You" that appeared shortly after the plant opened. The publication, intended for prospective businesspeople, home buyers, and tourists, touted Wiscasset as "a town where a great historical past truly blends with a promising future." After a summary of the community's history and descriptions of some of its municipal buildings, the brochure offered a two-page discussion of the Wiscasset steam-electric generating installation, Mason Station, owned by Central Maine Power, the state's largest hydro company. The station, cited as the town's largest employer next to Maine Yankee, moved to Wiscasset in large part because of the people: "CMP was made to feel that it would be welcome in Wiscasset, whether the installation it planned be small or large."[16] No doubt this explained the site selection for Maine Yankee as well.

Following the articles on Mason Station and Maine Yankee came sections on transportation, schools, municipal improvements, churches, library, art galleries, and historical points of interest. What is revealing about these topics is the inclusion of the two power plants as fully integrated features of the community rather than, as one might have expected, industrial concerns discussed somewhat apart from the conventional institutions and structures one finds in most old Maine communities. It is the very banality of this order of topics that reinforces the notion of Maine Yankee's warm embrace by Wiscasset as just another part of the community.

A similar optimism can be found in the undated brochure published by Maine Yankee for its Energy Information Center. "If you live in Maine, chances are you use electricity from Maine Yankee every day," the brochure states. It was not only the state's single largest source of elec-

tricity but also "the nation's third most productive nuclear plant" — however one measures that. The challenge to visitors was to test one's "Energy IQ." The Center included "wall displays, scale models of the plant, and interactive computer games" intended to "make energy education fun." The Center's staff was prepared "to make scientific principles understandable and to answer your toughest questions"—although one wonders about their reaction to any serious questioning of nuclear power. The Center also offered plant tours for visitors eighteen years old and beyond. "Whatever you *thought* you knew about nuclear power, we invite you to come and find out for yourself"—the subtext being that any skepticism would be overcome by the proverbial unvarnished truth.[17]

In these respects Maine Yankee was a veritable technological utopia, especially in its early years when nuclear power was widely touted throughout the world as a safe, efficient, and inexpensive alternative to conventional energy sources like coal and oil. In those days, there were still echoes of the kinds of genuinely utopian visions held out for nuclear power in the 1950s and 1960s, as outlined in Stephen Del Sesto's now classic 1986 article, "Wasn't the Future of Nuclear Engineering Wonderful?"[18] These claims included a variety of domestic uses: nuclear explosions for excavating irrigation projects; individually operated nuclear-powered cars and even airplanes for easier transportation in big cities; employment of nuclear-powered rocket ships for space exploration and travel; nuclear-powered medical devices to cure cancer, heart disease, arthritis, and other life-threatening ailments; and nuclear mechanisms to transform deserts into agricultural gardens.

The Nuclear Controversy

On December 28, 1977, Maine Yankee Power Company held a party celebrating the plant's first five years of accident-free operation. The plant had produced almost twenty-three billion kilowatt hours of electricity without any environmental problems, saving Maine consumers "some $150 million over five years because it replaced about 40 million barrels of high-priced fuel oil." Yet officials feared that any proposals for other nuclear power plants in the state would be met by strong opposition. "If you want to build a nuclear plant," warned company president Elwin Thurlow, "you will have to spend $50 to $75 million before you know whether the government will let you build the plant." Thurlow

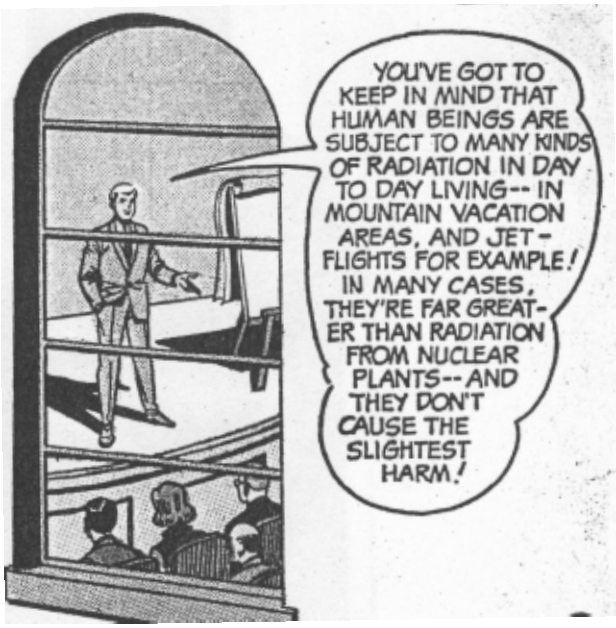
blamed President Jimmy Carter, who was, ironically, a self-proclaimed expert in nuclear engineering, based on his undergraduate studies at the United States Naval Academy.[19]

As Thurlow's comments suggest, concern about nuclear power was rising during Maine Yankee's early years. As early as 1977, at the bequest of parents of schoolchildren, Wiscasset formed a committee to come up with a town evacuation plan in case of a serious accident at Maine Yankee.[20] This concern peaked during the potential meltdown at Three Mile Island near Harrisburg, Pennsylvania, in 1979, and the actual meltdown at Chernobyl in the Ukraine in 1986.[21] Still, it would be wrong to overlook the opposition that had developed before these accidents, not least to Maine Yankee, albeit largely from persons outside of the immediate Wiscasset area. From 1967 through 1972 the Coalition for Safe Power tried but failed to stop construction. It did succeed in convincing the Nuclear Power Commission to enforce stricter environmental standards and monitoring.[22]

In the aftermath of Three Mile Island, opponents managed to launch an official state referendum on the plant's continued operation in 1980 and again in 1982.[23] Both lost, as did a third and final referendum in 1987 following the Chernobyl disaster. Yet the 1980 referendum was the first anywhere in the United States to challenge an existing nuclear power plant. Threats of a referendum a year or two earlier were dropped when proposals for a second plant on Sears Island were dropped.[24] Two years earlier voters in Montana—then one of sixteen states without a nuclear power plant—had voted to ban the construction of all such plants. The 1980 referendum failed by a margin of 230,000 to 160,000. Amazingly, more than half of Maine's eligible voters cast ballots. During the early 1980s opposition throughout New England generated anti-nuclear positions based on cost, safety, and environmental concerns.[25]

All three referenda garnered more than 40 percent of the vote in favor of closing the plant down. Not surprisingly, defenders of Maine Yankee criticized these exercises in democracy as asking ordinary citizens to vote on highly technical matters about which they had no expertise.[26] Yet in so much as Wiscasset residents knew a lot about nuclear power, and Maine voters had access to comparable information through the campaign literature, this complaint seems anti-democratic and technocratic.

Raymond Shadis, spokesman for the anti-nuclear Friends of the Coast-Opposing Nuclear Pollution, cynically called Wiscasset's attitude toward Maine Yankee a "cargo cult," the anthropological term invoked to



During the 1950s and 1960s, the prevailing attitudes toward nuclear power were overwhelmingly optimistic. As depicted in these cartoons, consumers and producers alike believed that nuclear power would provide safe and reliable power at a dramatically reduced cost. This optimism eroded in the wake of the Three Mile Island disaster and growing concerns over the disposal of spent fuel rods and radioactive material. *Maine Historical Society Collections.*

characterize a group's willingness to worship a god in return for its "bounty."[27] Thus others' characterization of the plant as a veritable utopia was for Shadis and his fellow critics the very opposite: the plant was an anti-utopia, or dystopia. Residents of Vernon, Vermont, simultaneously attributed opposition to Vermont Yankee to those "from away," be they recent arrivals in town or city folks. This naturally reduced the legitimacy of the critiques, regardless of actual facts and figures. Shadis, however, lived on a farm in Edgecomb, only two miles from Maine Yankee.[28]

In fact, Maine Yankee's opponents ultimately, if indirectly, prevailed years later when the plant's owners decided to close it down for financial and safety reasons—reasons espoused by the opponents years before. In 1994 officials discovered cracks in the plant's steam generator tubes, and repairs required a year-long shutdown. In 1996 the plant was closed again, and in the following year its owners concluded that the recent passage of Maine's electric restructuring and deregulation legislation made it impossible to operate at a profit, as its monopoly status had been ended. Cheaper electricity could now flow across the state's borders.

Closing Maine Yankee

Some of these problems would surely have been discovered in due course, but an anonymous letter sent in 1995 by someone claming to be an employee with extensive inside knowledge triggered safety inspections by the Nuclear Regulatory Commission. The letter alleged that "engineers manipulated computer simulations and codes to hide potentially serious deficiencies in the reactor's emergency-cooling system."[29] The writer contended that the faulty data and simulations demonstrated that the plant could safely operate at higher power outputs—outputs requiring increased license power levels—when in fact that was a risky strategy.

Commission investigations confirmed these allegations and blamed them, along with other safety and maintenance problems, "on the 'lack of a questioning culture' among managers, who placed cost savings ahead of safety improvements." After the report came out, Maine Yankee's computer "crashed for two days, eight workers were exposed to radioactive gas in the spent fuel area, and a radioactive chair was discovered at the guard station." Additional reviews discovered that the plant had been improperly built, with "redundant" electrical cables having

been "improperly separated." In 1997 the Nuclear Regulatory Commission cited Maine Yankee as among the country's worst run nuclear plants.[30] All of these developments led to the resignation of the company's president and to the board of directors' decision to close the plant, unless a buyer could be found. That decision was greeted enthusiastically by most residents of the adjoining areas.

Not surprisingly, there were no buyers. Officials hoped to dismantle the plant for use elsewhere, but they found no buyers for this approach either, despite an Internet site that attracted 70,000 visits—this at a time when the Internet was relatively new and nowhere as widely used as now. Once the decision to close had been made, an eight-year $500 million decommissioning process began in 1997.[31]

In terms of both safety and budget, this process has gone very well. In 2000 workers began gutting some of the plant's structures; in 2003 the plant's reactor section was put on a barge and shipped to a secure waste facility in Barnwell, South Carolina. On September 17, 2004, the plant's containment building was demolished by explosives, the first such demolition in the history of nuclear power. At 150 feet tall, the dome was too large to be taken apart mechanically. A local newspaper reported approximately 400 people present and that "the mood on site ... was much like a wake before a funeral," though both friends and foes alike "burst into applause."[32]

Longtime critics of Maine Yankee like *Boston Globe* columnist David Nyhan had predicted a dismal scenario that would only confirm the mistake of building the plant in the first place. Nyhan extended his pessimism to the Seabrook Station nuclear plant in New Hampshire that had finally opened in 1990. He lamented that "the meltdown of the nuclear power industry is far more costly and life-threatening than it ever had to be," thanks to those politicians and corporate officials who denied the economic and environmental facts of life. "Now Seabrook is a Wiscasset in waiting," Nyhan concluded, "like 100 other nuclear dinosaurs whose deadly tails will threaten our offspring a thousand generations hence."[33] Ironically, an article in Nyhan's own paper four years earlier had briefly drawn a picture of the town of Seabrook akin to that of Wiscasset: "From the Atlantic shores of Seabrook, New Hampshire, the almost postcard New England view captures the town's contrast: modern concrete buildings of a nuclear power plant against the wooden decks, grassy beach, and private boats."[34]

Where Maine Yankee was built within budget and on time, Seabrook was completed years behind schedule and billions of dollars over

budget. For those reasons the planned two reactors were scaled back to one—and that cost $6.6 billion dollars. More protests surrounded the plant than any other in the region and, for that matter, perhaps in the entire nation.[35]

But Nyhan may have been unduly pessimistic about Maine Yankee, at least in terms of safety. Radioactive material removal continued until 2005, when grass was planted over the area's 800 acres. With so much accomplished, the Nuclear Regulatory Commission then amended Maine Yankee's license, reducing the amount of land under license to the twelve-acre independent Spent Fuel Storage Installation on Bailey Point Peninsula in Wiscasset.[36]

Maine Yankee's remaining task was to store and eventually dispose of the 1,434 spent fuel rods temporarily locked away on Bailey Point. These rods remain toxic for thousands of years. Because of long unresolved political issues surrounding the designated Yucca Mountain storage facility in Nevada, 100 miles from Las Vegas, the storage process could take years, even decades. Many residents of Nevada, and most of its top officials, now oppose ever using that locale. Indeed, John Baldacci, Maine's current governor, has argued that a second such site must be found and opened to accommodate the metric tons now being stored in temporary facilities in Maine and elsewhere—an amount that already exceeds the 70,000 metric tons designated for Yucca Mountain. To make matters worse, Mainers are still paying storage costs that, by the end of 2007, totaled over $189 million, with no end in sight.[37]

The United States Department of Energy had signed a contract with all American commercial nuclear plant owners to have a disposal facility open and receiving spent fuel as needed by January 31, 1998. Consequently, Maine Yankee Atomic Power Company and its sister decommissioned Yankee Atomic Power Company plants—Connecticut Yankee and Massachusetts Yankee Rowe—are in the midst of lawsuits against the federal government for its failure to remove the spent nuclear fuel from these three sites. In 2006 the United States Federal Court of Claims awarded $143 million to those three plants in what might well be the first of several such allocations, but the federal government is appealing.[38]

Life After Maine Yankee

The decision to close the plant prompted a variety of proposals for redeveloping the site (apart from the area containing the spent fuel

rods). In 1998 some suggested a huge natural gas plant that, in one scenario, would utilize pipelines connecting Maine to Sable Island off Nova Scotia. Under this plan, the transmission lines would remain but the buildings would be torn down and the turbines and generators sold. The site's access to large volumes of water was crucial. This proposal even had the support of anti-nuclear activist Raymond Shadis, who called it "a grand idea." Wiscasset's own Town Planner, Dan Thompson, was equally enthusiastic and saw such a facility as a key to a possible industrial park. The plan, however, did not materialize.[39]

In 2003 a group suggested using the area to scrap surplus government ships, a process that would have included removing contaminants and toxic materials and then crushing the steel to be recycled. Several of the area's features seem relevant: excellent roads; first-rate municipal water and sewer treatment facilities; equally fine boat, barge, and rail access; and a nearby small airport. This prompted opposition from environmentalists concerned with the lack of seaworthiness of such vessels and the prospect of accidents in narrow channels, plus the danger of toxic contaminants released into pristine waters. [40]

In 2006 a company called National Resources of Greenwich, Connecticut, purchased the plant site along with a 431-acre buffer zone. The company has two projects underway: on the buffer zone there will be "an office and technology park," while the power plant "eyesore is being turned into eye candy—an old-fashioned waterfront village" to be filled with fine restaurants, microbreweries, upscale stores, art galleries, condominiums, and cottages, and 281 slips for those who wish to park their boats in the river." The state-of-the-art marina will include a repair and retrofit yard and storage facilities, and will be open to vessels of all sizes. This Point East Maritime Village will be a tribute to both a former Wiscasset summer colony and the town's maritime past.[41]

Notwithstanding these projects, in November 2007 the same company offered Wiscasset voters, through four separate ordinances, the prospect of building a new $1.5 billion 700 megawatt coal-fired gasification plant on the site of the former reactor. This would have provided a considerable increase in the community's tax base following the loss of most of Maine Yankee's contribution. According to Scott Houldin, the proposed project's manager, the plant would hardly resemble the stereotypical coal-plant spewing pollutants into the air. "We don't burn coal," he said. "We create gas from the coal and then that gas is cleaned"—to such an extent that the plant would actually reduce the state's total air emissions. The site was attractive because of its electrical transmission infrastructure and its rail and deep water access. However, according to

the environmentally sensitive Maine People's Alliance — whose phone canvass team competed with the company's own — the project would have "a 400-foot barge of coal . . . up the Sheepscot River daily to feed the plant's appetite for coal, turning the river into a barge canal, crippling the local lobster industry, and potentially harming the shellfish and worming industries as well." Meanwhile, the plant would have "released twenty-two pounds of mercury into the air each year, more than any other facility in Maine." Other critics contended that the kind of clean diesel fuel to be produced would not lower greenhouse gases because the diesel would be made out of coal, not biomass. Additional critics faulted the proposed plant's 230-foot height and visual impact on the community. Following outright protests that included a parade of thirty lobster boats whose owners feared damage to their livelihood, all four ballot questions were rejected.[42]

In the years since Maine Yankee closed down, there has been a resurgence of interest in nuclear power to offset the environmental damages and financial costs associated with coal and oil production in the United States. An analysis of global warming type pollution in Maine between 1990 and 2004 concluded that it had increased by twenty-four percent, thanks in part to expanded use of natural gas to make the electricity that replaced the power generated by Maine Yankee until it closed. State fossil fuel consumption was the principal basis on which the study was done.[43]

Proponents of wind, water, and solar power have certainly demonstrated the practicality of those alternative energy sources, but they have not persuaded a majority of Americans that any (or, for that matter, all three) could possibly substitute for traditional energy sources or could possibly replace nuclear power. The George W. Bush Administration made the revival of nuclear power a component of its energy policy, and fears of nuclear power accidents have diminished in many quarters. France's nuclear industry has been tremendously successful in terms of productive capacity, providing 80 percent of the nation's electricity.[44] But despite this success, Electricité de France has been plagued by financial problems—problems that have compounded with the increased cost of storing radioactive material.[45]

Despite the virtual shutdown of the industry in recent decades in terms of new construction, nuclear power still generates about 20 percent of the electricity in the United States. There are currently 104 nuclear power reactors in operation in this country, the last one coming online in 1996, its construction having begun back in 1973. By contrast, 21 companies now expect to seek permission to build 34 new plants, ranging from New York to Texas to Idaho, and factories are being built in

Indiana and Louisiana to manufacture plant parts. Much of the renewed interest derives from the Energy Policy Act of 2005, which "is stuffed with generous subsidies for nuclear power and other alternatives to fossil fuels." As the head of General Electric, Jeffrey Immelt, has argued, "it's hard to believe simultaneously in energy security and reduction of greenhouse gas emissions without believing in nuclear power."[46]

Increasing numbers of environmentalists are conceding this point, among them the famous Stewart Brand, creator of *The Whole Earth Catalog*. Brand confessed to his traditional opponents: "I'm sorry. I was wrong, you were right. I'm sorry."[47]

Ironically, the preponderance of aging plants is a barrier to nuclear power's resurgence in the United States. In order to maintain a 20 percent share in electricity generation, replacement plants will have to be built fairly soon. There are also such mundane challenges as the rising cost of steel and concrete and the diminished number of qualified welders.[48]

Some advocates for an American "nuclear renaissance" believe that increasing the capacity and/or the operating life of existing plants is the most practical measure and certainly a complement to the building of any outright new plants. As of 2004, eight years after the last new plant had been completed, this process had increased the output of the nation's nuclear power plants "by the equivalent of twenty-four new plants." [49]

One possible new—or, more precisely, partially new—plant could be the presently dismantled Unit 2 of Seabrook Station. Although there are no plans to reopen Unit 2, opponents of any revival have made their concerns amply known. At the fortieth anniversary of the Seacoast Anti-Pollution League in 2008, they contended that nuclear power remains obsolete and that renewable energy is still the wave of the future. They note that "FPL Energy, owner and operator of Seabrook Station, is the largest provider of wind energy and has the largest solar fields in the country." So why not use that expertise instead?[50]

In addition, opponents of Vermont Yankee want to shut it down because of safety concerns. In August 2007 the plant's cooling tower collapsed, the apparent result of rotting wooden timbers that had not been properly inspected. No radioactivity was released, but this accident took place just as the plant's owners had applied to the Nuclear Regulatory Commission (NRC) for a twenty-year extension of its license beyond its 2012 expiration date. Key opponents include longtime Maine Yankee critic Raymond Shadis, who contends that the aging plant has other structural problems. Should the NRC, as likely, grant the extension—it

has never rejected one and has approved dozens throughout the country—the state of Vermont may still oppose it. Meanwhile Vermont Yankee provides a third of the state's electrical generation and the same dilemma that converted Stewart Brand confronts residents of perhaps the most environmentally conscious of all of the fifty states. As a *New York Times* reporter noted recently, at present Vermont has "only one commercial wind farm, eleven turbines along a mountain ridge. They have less than one percent of the capacity of Vermont Yankee," itself a relatively small nuclear power plant.[51] Should we be surprised that Maine Yankee's most passionate defenders have made the same point in denouncing that plant's closure?

To be sure, the possibility of another nuclear power plant catastrophe or, perhaps worse, a terrorist attack on a safely operating plant cannot be ruled out. But retrospective analysis of the Three Mile Island (TMI) disaster reveals a personnel and a public relations failure rather than a nuclear catastrophe akin to Chernobyl. In fact, in confirmation of the arguments made by the fictional John Blaine quoted above, the radiation exposure "even in the most extreme cases" was less than what "anyone living in the area receives from natural sources."[52]

Equally important, decline of the nation's nuclear power industry preceded, and so was not caused by, TMI. Where in 1974 President Richard Nixon predicted 1,000 commercial nuclear reactors by the end of the twentieth century, "only 250 were ever ordered, only 170 filed for permits, [and] just 130 opened." Causes of this decline included unexpected building delays and shutdowns, high costs, high interest rates, protests, and, unexpectedly, reduced electricity demand. In sum, TMI "didn't kill the nuclear dream" but instead was "just another nail in the coffin."[53]

It has by now become the conventional wisdom that nuclear power's coffin also contained the remains of self-proclaimed "experts" in the field, whose overly optimistic scenarios received richly deserved burials. Meanwhile the three referenda on Maine Yankee in the 1980s are often characterized as demonstrating the superior common-sense wisdom of ordinary citizens—not least, tough-minded, skeptical Mainers who could cut through the baseless promises of persistently cheap and effective power held out by those often arrogant experts. But this picture is too simplistic.

As historian Brian Balogh demonstrated in his 1991 *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power, 1945-1975*, the fading of these experts' luster steadily gave rise to

the arrival of other experts. The latter's ranks included not only other engineers and scientists without the common ties to the nuclear power industry and government regulatory agencies but also "competing" experts in biology, economics, environmental studies, and public health. Alas, this "counter" expertise did not usually lead to improved public policy formulations or legislation or regulation. Far from it. The naïve traditional expectations of eventual consensus among experts, comparable to the naïve one-time expectations of nuclear power being "too cheap to meter," fell apart amid debate and dissent. In addition, the collapse of Communism and of the Soviet Union in the late 1980s and early 1990s undermined the historic reliance in the United States upon "national security" concerns as a means of imposing consensus. Moreover, the steady fading of the luster and influence of the physicists and other nuclear power experts associated with the Manhattan Project also undermined that once bedrock faith in experts in this area.[54]

Growing public skepticism, protest, and opposition, as with Maine Yankee, must be placed in this more complex context. Critical though it surely was, public dissent alone did not turn the tide against nuclear power and its once untouchable decision makers. As one reviewer phrases Balogh's argument, "the result was a political Catch-22. Experts were always in demand for their authority, but the more they became involved the less creditable they seemed. Nevertheless, no substitute for expertise has yet been found."[55] Instead, the political considerations that had always been critical to the nation's nuclear power, far from diminishing, remained as powerful as ever.

This is not to suggest that Maine Yankee should have remained open in the face of the technical, environmental, and financial challenges that confronted its owners and operators in its final years of operation. It is, however, to suggest that just as Maine Yankee was hardly a genuine technological utopia at any time, neither was it ever a full-fledged technological dystopia. Rather, its history reflects both the positive and negative aspects of nuclear power, not just in New England but throughout the country. The utopian promotional rhetoric of the plant's early years must therefore be appreciated as more than fantasy and naïveté—as having some "core" truth to it. Like all serious utopian schemes, the vision of Maine Yankee and of its peer plants in New England and elsewhere must be played back to illuminate the society and the culture that produced it: an America ambivalent about "atoms for peace" and about technology's promise and technology's peril. It would be a healthy legacy of Maine Yankee if the growing skepticism among ordinary Americans

over other apocalyptic dystopian visions concerning technologies could be viewed in a more balanced, more sophisticated light.

However, lessons from Maine Yankee *are* being discussed in Maine itself, and by proponents of a new nuclear plant in, of all places, Wiscasset and possibly elsewhere in the state. In addition to the familiar arguments that nuclear power is environmentally friendly, that Maine "is at the end of all fossil fuel pipelines" — and so will always be paying more than most other states — and that renewables like solar, wind, wood, biomass, and tidal power can never provide more than a small fraction of the state's energy needs, the traditional stumbling blocks of nuclear waste storage and of reactor rod reprocessing have been partially removed. France in particular has pioneered in these areas, and its nuclear plants have convincing safety records. Today's nuclear power plants require less potentially fallible mechanisms. In addition, the 2005 Energy Policy Act allows for streamlining of the application process for new plants, and plants can now be built much more quickly than decades ago. But all such initiatives must nevertheless come from Mainers familiar with Maine Yankee's history and its fate, since those "from away" have far less interest in enhancing Maine's energy and environmental futures. In these ways, Maine Yankee may be a form of "living history."[56]

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NOTES

1. Other owners included North East Utilities and New England Electric System, both at 20%; Bangor Hydro Electric at 7%; Maine Public Service Company at 5%. The remaining 10% was shared among six other New England utility firms.

2. "Maine Yankee Facts" (Augusta: Maine Yankee Atomic Power Company, circa 1970, 1971, or 1972), 1; no author listed. From the collections of the Maine State Museum, Augusta.

3. Lewis Strauss quoted in Brian Balogh, *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power, 1945-1975* (New York: Cambridge University Press, 1991), 113. The same claim was made in the 1930s by those advocating rural electrification, especially but not exclusively in the Tennessee Valley Authority.

4. "The Yankee Story" (Boston: Maine Yankee Atomic Electric Power, no date but seventh edition of original 1960 edition), 1, 2; no author listed. From the collections of the Maine State Museum, Augusta.

5. There is no publication date, but the cartoons that comprise most of the brochure have a 1968 copyright date. Maine Yankee Atomic Power Company of Augusta is listed as the de facto publisher, but the contents suggest that the brochure might have a generic publication applicable to all nuclear power construction and operation companies of the era. Only three pages-two in the middle plus the last page, showing the actual and planned company plant-are not generic in nature and lack cartoons.

6. "The Atom, Electricity, and You!" (Augusta: Maine Yankee Atomic Power Company, circa 1968), 1; no author listed. From the collections of the Maine State Museum, Augusta.

7. Ibid., 3.

8. Ibid., 6, 7.

9. Ibid., 10.

10. Ibid., 11; italics theirs.

11. Ibid., 11, 13 italics theirs, 15 italics theirs.

12. Richard C. Hill, unpublished letter to the *Bangor Daily News*, January 7, 2008, in reply to Ernie Hilton, "Nuclear Power Not the Solution," *Bangor Daily News*, January 7, 2008, A7.

13. John Chester quoted in Carey Goldberg, "In a Post-Nuclear Town, Some Adjustments Hurt," *New York Times*, July 14, 1998, Judy Flanagan quoted in Ann S. Kim, "Maine Yankee's Dome Coming Down This Week," *Maine Sunday Telegram*, September 12, 2004, A14.

14. Bryan Selee quoted in Kim, A14.

15. All quotations are from Warren E. Leary, "Vermont Nuclear Plant, Despite Problems, Brings Prosperity to Town," Newport (Rhode Island) *Daily News*, May 8, 1974, 31; other papers carrying shorter versions of the same AP article include the Portsmouth, New Hampshire, *Portsmouth Herald*, April 29, 1974, and the Nashua, New Hampshire, *Telegraph*, May 1, 1974.

16. "Wiscasset Invites You," 5th ed. (Wiscasset, ME: no publisher, no date) 5; From the collections of the Maine State Museum, Augusta.

17. Wiscasset, Maine: Maine Yankee Energy Information Center, circa 1980; italics theirs; from the collections of the Maine State Museum, Augusta.

18. See Steven Del Sesto, "Wasn't the Future of Nuclear Engineering Wonderful?" in *Imagining Tomorrow: History, Technology, and the American Future*, ed. Joseph J. Corn (Cambridge: MIT Press, 1986), 58-76.

19. All quotations come from "Maine's Nuclear Plant, Age Five, Is Accident Free," Nashua, New Hampshire, *Telegraph*, December 29, 1977.

20. See Arthur Young, "Wiscasset Readies Evacuation Plan," *Kennebec Journal*, April 12, 1977, 14. But see also Betty Potter, "Planner Expresses Doubts on Evacuation Plan," *Kennebec Journal*, September 21, 1977, 20.

21. On Three Mile Island, see the still important accounts by John L. Campbell, *Collapse of an Industry: Nuclear Power and the Contradictions of U.S. Policy* (Ithaca, NY: Cornell University Press, 1988), and Edward J. Walsh, *Democracy in the Shadows: Citizen Mobilization in the Wake of the Accident at Three Mile Island* (Westport, CT: Greenwood Press, 1988). See also the fine summary in David Whitford, "Going Nuclear," *Fortune*, 156 (Au-

gust 6, 2007), 46. By contrast, Joseph G. Morone and Edward J. Woodhouse, *The Demise of Nuclear Energy? Lessons for Democratic Control of Technology* (New Haven, CT: Yale University Press, 1989), attribute the demise of nuclear energy in the United States in the wake of TMI and less serious malfunctions elsewhere to the wrong choice of reactors. For them, a "technical fix" would solve all problems.

22. See, for example, "AEC Environmental Ruling Could Stop Yankee Plant," *Daily Kennebec Journal*, September 2, 1971.

23. On the 1982 referendum, see Michael Harris, "Maine Vote May Pull Plug on Nuclear Power Station," *Toronto Globe and Mail*, November 1 1982, 10.

24. See "Maine's Nuclear Plant, Age Five, Is Accident Free," Nashua, New Hampshire, *Telegraph*, December 29, 1977, 13.

25. On the referendum, see Michael Knight, "Maine Votes to Keep Its Nuclear Plant," *New York Times*, September 23, 1980, A1; and "Yankee, Yes," *Time*, October 29, 1980. The margin of victory in 1982 was smaller: 56% to 44%. On this opposition, see Jerry Ackerman, "Nuclear Power Pulling Up Short: After 20 Years in the Fast Lane, It's Hobbled by Cost, Safety Concerns, and Conservation," *Boston Globe*, March 2, 1982.

26. In defense of experts' hegemony, see James J. Duderstadt and Chihiro Kikuchi, *Nuclear Power: Technology on Trial* (Ann Arbor: University of Michigan Press, 1979, viii and 194-197; the authors were University of Michigan professors of nuclear engineering.

27. Raymond Shadis quoted in Goldberg, "Post-Nuclear Town."

28. See Warren E. Leary, "Vermont Nuclear Plant, Despite Problems, Brings Prosperity to Town," Newport (Rhode Island) *Daily News*, May 8, 1974, 31.

29. Peter N. Spotts, "Federal Probe of Maine Nuclear Plant," *Christian Science Monitor*, December 12, 1995, 4.

30. Colin Woodard, "Nuclear Power: Yankee Yanked," *The Bulletin of the Atomic Scientists*, 53 (November/December 1997), 11. See also Peter Pochina and Tux Turkel, "Is Maine Yankee Worth Repairing?" *Maine Sunday Telegram*, February 9, 1997, 1A, 6A, 7A.

31. On efforts to sell or reuse Maine Yankee, see Turkel, "Maine Yankee Fails to Find a Buyer," *Portland Press Herald*, June 2, 1998, 1C; and "Effort to Reuse Yankee Site Stalls," *Bangor Daily News*, August 5, 2002, B1, B5. For background on the decision to close the plant, see Carroll R. Lee et al., *Report of the Special Committee to the Maine Yankee Board of Directors*, July 30, 1997.

32. Quoted in Charlotte Boynton, "Maine Yankee Dome Toppled," *Boothbay Register*, September 23, 2004. See also Leanne M. Robicheau, "Power Switch: Yankee Dome Leveled," *Bangor Daily News*, Saturday-Sunday, September 18-19, 2004, A1. A9.

33. David Nyhan, "Maine Yankee's Nuclear Albatross," *Boston Globe*, August 22, 1997, A23. See also Walter Griffin, "N-Plant Safety Tops Concerns; Residents Question Waste Monitoring," *Bangor Daily News*, November 7, 1997, 1, on the Nuclear Regulatory Commission's scheduling only one public hearing on the plant's decommissioning process.

34. See Stephanie Plasse, "Community Profile: Seabrook, N.H., A Community with a Major Contrast," *Boston Globe*, July 24, 1993, 39.

35. Randi Goldberg, "Years Don't Erase 'Line in the Sand' at Seabrook," *Maine Sunday Telegram*, April 20, 1997, 14B; Charles Stein, "Economic Life," *Boston Sunday Globe*, November 10, 2002, C1; and especially Henry F. Bedford, *Seabrook Station: Citizen Politics*

and Nuclear Power (Amherst: University of Massachusetts Press, 1990). See also Hilton's Op Ed, which focuses on Seabrook, and Hill's unpublished response.

36. On Maine Yankee's complex decommissioning process, see The Maine Yankee Decommissioning Advisory Panel's February 2005 report, *A Model for Public Participation in Nuclear Projects: A Report By the Maine Yankee Community Advisory Panel on Decommissioning*. See also on the decommissioning process worldwide: *Decommissioning Nuclear Facilities*, http://www.world-nuclear.org/info; and *World Nuclear Association: Decommissioning: An Overview*, http://www.world-nuclear.org/info.

37. See Mal Leary, "Mainers Still Paying for N-Plant," *Bangor Daily News*, February 27, 2008, A1, A8; Leary, "State Braces for Possible Battle Over N-Waste," *Bangor Daily News*, June 4, 2008, B1, B5; and H. Hebert, "Nevada Vows to Fight N-Waste Dump Plans," *Bangor Daily News*, June 4, 2008, C8. See also Woodard, "Decommissioning: Remember the Maine Yankee," *Bulletin of the Atomic Scientists*, 57 (January/February 2001), 11-13; Woodard, "Nuclear Waste, Terror and Intrigue," October 4, 2001, Tom Paine, Common Sense.www.tompaine.com/Archive.; Whitford, "Going Nuclear," 52, 54 and Daren Briscoe, "Obama's Nuclear Reservations," *Newsweek*, 152 (December 1, 2008), 48.] In his unpublished January 7, 2008, letter to the *Bangor Daily News*, Hill argues that fears over the cylinders are vastly exaggerated that they have a "structural integrity greater than the stones at Stonehenge" in England.

38. See Bruce Geiselman, *Waste News*, 12 (October 23, 2006), 17; and Hebert, "N-Plants Awarded $143 Million," *Bangor Daily News*, October 5, 2006, A1, A2.

39. See Jay Davis, "Maine Yankee Site Eyed for Huge Natural Gas Plant," *Maine Times*, January 8, 1998, p. 11. See also Leo Burnett, "Wiscasset Wants Maine Yankee Cleanup Quickened," *Maine Times*, February 17, 2000, 9; and Phyllis Austin, "Maine Yankee Decommissioning Produces an 'Interesting Inquiry,'" *Maine Times*, March 28, 2002, 4.

40. Charlotte Boynton, "Ship Demolition Proposed For Maine Yankee Site," *Boothbay Register*, August 14, 2003, 1.

41. Ellen F. Kratz, "The Brave New World of Recycled Real Estate," *Fortune*, 153 (March 6, 2006), 176.

42. Scott Houldin quoted in "Wiscasset To Consider Power Plant," *Bangor Daily News*, October 15, 2007, B2; no author listed; and "MPA's Phone Canvass Team Helps Stop Coal Plant in Wiscasset," *The Alliance*, 24 (Spring 2008). See also "Maine Yankee Site Eyed for Coal Plant," *Bangor Daily News*, January 4, 2007, B1; "Global Warming Benefits of Proposed Wiscasset Energy Plant Challenged," *Bangor Daily News*, July 26, 2007, A5; "Lobstermen Protest Proposed Power Plant," *Bangor Daily News*, October 12, 2007, B5.

43. "Report: Maine's CO_2 Output Rose 24 Percent Over 15 Years," *Portland Press Herald*, April 13, 2007, B2. The report was issued in 2007 by the Environment Maine Research and Policy Center and was based on data compiled by the United States Department of Energy.

44. See Gabrielle Hecht, *The Radiance of France: Nuclear Power And National Identity After World War II* (Cambridge: MIT Press, 1998).

45. See Michael Bess, *The Light-Green Society: Ecology and Technological Modernity in France, 1960-2000* (Chicago: University of Chicago Press, 2003), 102.

46. Both these figures and these quotations come from David Whitford, "Going Nuclear," 45, 45-46. See also Matthew L. Wald,, "After 35-Year Lull, Nuclear Power May Be in Early

Stages of a Revival," *New York Times*, October 24, 2008, B3, and Elizabeth Spiers, "The Case for Nukes," *Fortune*, 157 (June 9, 2008), 22.

47. Steward Brand quoted in Whitford, "Going Nuclear," 54.

48. See Ibid., 48.

49. Beth Daley, "Nuclear Plans Stir Concern in Vermont," *Boston Globe*, October 12, 2004, A12.

50. "Group Pushes Renewable Energy," *Maine Sunday Telegram*, June 1, 2008, B3.

51. Kate Galbraith, "Climate Enters Debate Over Nuclear Power: Alternatives Have Their Problems," *New York Times*, May 30, 2008, C4. See also Matthew Wald, "Vermont Nuclear Reactor Is Purchased by Entergy," *New York Times*, August 16, 2001, C4; Daley, A1, A12; "Vermont Yankee Clears Hurdle In Bid to Extend License Twenty Years," *Bangor Daily News*, April 2, 2007, B5; Ross Sneyd, "Report: Vermont Nuclear Waste Highest Per Capita in Nation," *Bangor Daily News*, Saturday-Sunday, May 19-20, 2007, C6; and Dave Gram, "Vermont Yankee Closer to License Extension," B*angor Daily News*, February 26, 2008, B6.

52. Since TMI, technical training has vastly improved. But Whitford, "Going Nuclear," 48-49, 52, discusses a potentially greater disaster than TMI at Ohio's Davis-Besse plant that resulted from inept maintenance and inspection. Fortunately, critical repairs were made in time.

53. Whitford, "Going Nuclear," 46.

54. See, for example, Daniel Kevles, *The Physicists: The History of a Scientific Community in Modern America* (1978; reprint, Cambridge, MA: Harvard University Press, 1995), chs. 20-25 and 1995 preface.

55. Bruce J. Dierenfield, review of Balogh in *American Historical Review*, 98 (February 1993), 270.

56. Richard de Grasse, "Why Not Nuclear for Wiscasset?" *Bangor Daily News*, November 26, 2007, A7; and Bob Walker, "Nuclear Energy Can Help Power Maine's Future," *Bangor Daily News*, October 17, 2007, A7. For some historical perspective on solar and wind energy prospects in Maine, see Evan Rallis, "Solar and Wind Energy Development in Maine: 1973-1997," M.A. Thesis, History Department, University of Maine, 2003.