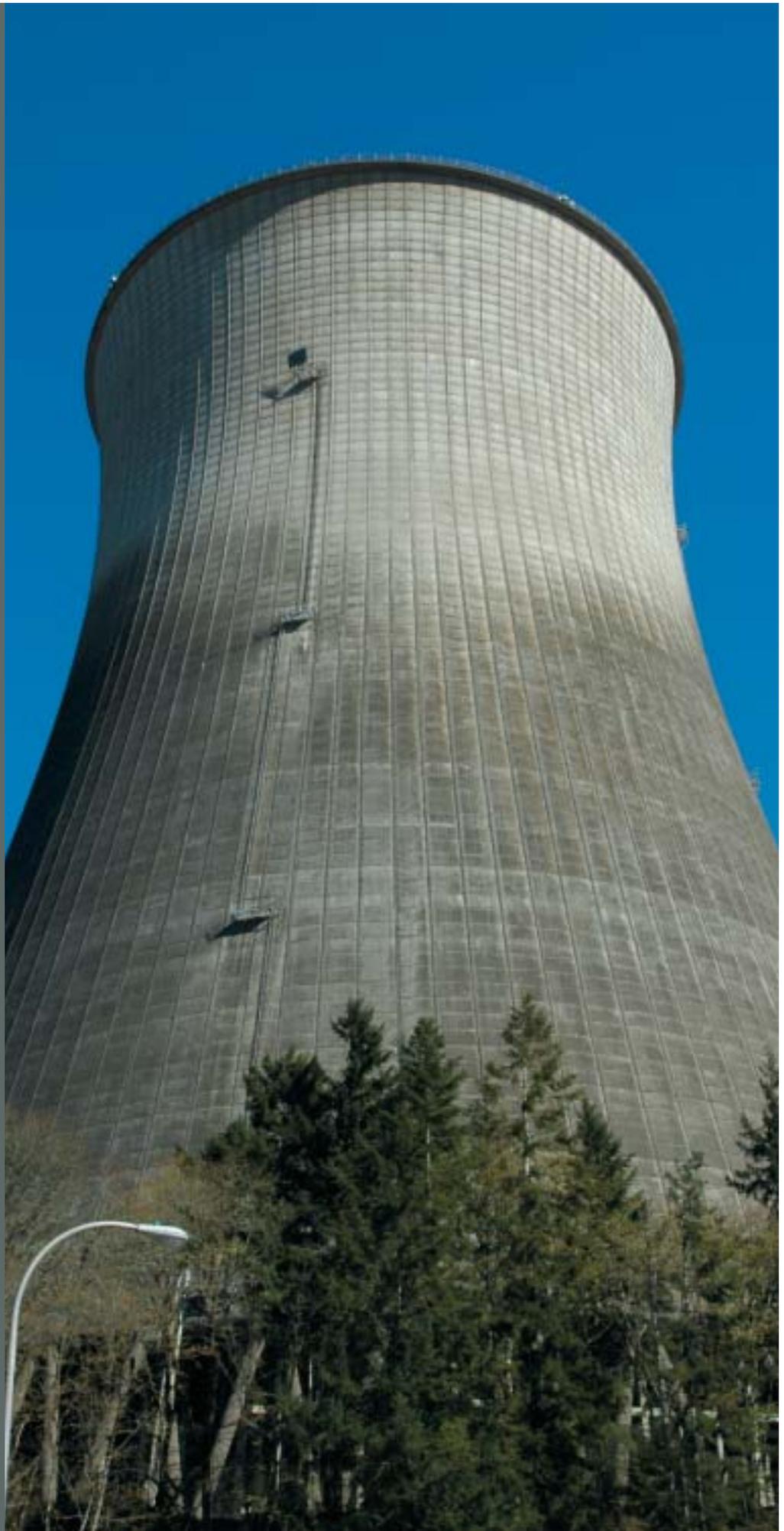


# Challenging Nuclear Power in the States

**Policy and Organizing  
Tools for Slowing the  
“Nuclear Renaissance”**

National Association  
of State PIRGs

Spring 2006



# Challenging Nuclear Power in the States

Policy and Organizing Tools for  
Slowing the “Nuclear Renaissance”

Tony Dutzik  
Rob Sargent

National Association of State PIRGs

Spring 2006

*The State PIRGs:* AkPIRG, Arizona PIRG, CALPIRG, CoPIRG, ConnPIRG, Florida PIRG, Georgia PIRG, Illinois PIRG, Iowa PIRG, INPIRG, Maryland PIRG, MASSPIRG, MoPIRG, MontPIRG, NCPIRG, NHPIRG, NJPIRG, NMPIRG, NYPIRG, Ohio PIRG, OSPIRG, PennPIRG, PIRGIM, RIPIRG, TexPIRG, U.S. PIRG (national advocacy office), VPIRG, WashPIRG, WISPIRG.  
*In partnership with:* Environment California, Environment Colorado, Environment Georgia, Environment Illinois, Environment Maine, Environment Maryland, Environment Michigan, Environment North Carolina, PennEnvironment, Environment Texas.

# Acknowledgments

The authors wish to thank the many people who shared perspectives and information or provided review for this report, including Sara Barczak, Peter Bradford, Scott Cullen, Suzanne Leta, David Lochbaum, Pete McDowell and Jim Warren. Thanks also to Susan Rakov and Elizabeth Ridlington of Frontier Group for their editorial assistance.

The views and opinions expressed here are those of the authors and do not necessarily reflect the views of those who provided review. Any factual errors are strictly the responsibility of the authors.

© Copyright 2006 National Association of State PIRGs

With public debate around important issues often dominated by special interests pursuing their own narrow agendas, the state Public Interest Research Groups (PIRGs) offer an independent voice that works on behalf of the public interest. The National Association of State PIRGs assists PIRGs nationwide in their work to preserve the environment, protect consumers and promote good government.

For additional copies of this paper, please send \$20 (including shipping) to:  
National Association of State PIRGs  
44 Winter St., 4<sup>th</sup> Floor  
Boston, MA 02108

For more information about the state PIRGs, visit [www.pirg.org](http://www.pirg.org).

Cover photo: *Trojan nuclear power plant, Oregon.* (istockphoto.com/Richard Foote)

# Table of Contents

Executive Summary	4
Introduction	7
Nuclear Power: Reasons for Concern	9
Cost	9
Toxic Waste	12
Safety and Security	13
Water Consumption and Local Environmental Impacts	15
The Nuclear Regulatory Commission: An Ineffective Watchdog	15
“New” Nuclear Facility Designs: Are They the Solution?	16
Conclusion	17
Challenging Nuclear Power in the States	18
Outright or Conditional Bans	18
Environmental and Land Use Permitting	19
Energy Facility Siting Processes	22
Public Utilities Commission Processes	23
Energy Policy Decisions	27
Climate Policy and Market-Based Environmental Regulations	31
Organizing Opportunities	33
Conclusion	37
Notes	38

# Executive Summary

Capitalizing on rising energy prices, growing concern about global warming, and a favorable political climate, the nuclear industry is working to achieve a “nuclear renaissance.” After 30 years without a single new order for a nuclear power plant in the U.S., several companies are now in the early stages of proposing new nuclear power plants. Meanwhile, federal officials have begun routinely approving requests to run existing nuclear plants harder and longer than ever.

A “nuclear renaissance” would be a bad deal for American consumers, the environment, public safety and national security. Nuclear power is an expensive and risky way to address global warming—especially when compared to alternatives such as improved energy efficiency and the expansion of renewable energy production. Moreover, the nuclear industry’s shoddy safety record and insufficient response to the growing threat of terrorism suggest that new nuclear power plants—or the continued operation of aging plants—could cause more problems than they solve.

Citizens who attempt to raise these concerns about nuclear power face increasing difficulty in getting their voices heard. The Nuclear Regulatory Commission’s (NRC)

relicensing and new reactor licensing processes are essentially of the nuclear industry’s own design. For example, the NRC’s relicensing procedures for existing plants forbid the consideration of the adequacy of evacuation plans in determining whether a plant should be allowed to continue to operate for another 20 years. In addition, the U.S. Congress and the Bush administration have staked out an aggressively pro-nuclear stance, providing billions of dollars of additional taxpayer subsidies to the nuclear industry through the Energy Policy Act enacted in 2005.

Citizens concerned about nuclear power do have other forums in which to raise their concerns: local and state governments. While the power to license and regulate the operation of nuclear power plants is exclusively in the hands of the federal government, state governments have many opportunities to influence whether, when and how nuclear power plants may operate.

Among these opportunities are the following:

## **Legislative Moratoriums**

- At least six states—California, Kentucky, Montana, Maine, Oregon and

Wisconsin—have placed conditional bans on the construction of new nuclear power plants. Most of the moratoriums expire when and if a permanent solution for the storage of nuclear waste is discovered.

### **Environmental and Land Use Permitting**

- Nuclear power plants are copious consumers of water. Plants using “once-through” cooling systems have a massive impact on the environment—trapping fish and other marine animals in their intakes and changing the temperature of local waterways through the discharge of heated water. The Clean Water Act provides states with the opportunity to require that nuclear power plants use cooling systems that are more protective of waterways and wildlife.
- States also regulate the use of land, particularly in the coastal zone, where federal actions (including the licensing of nuclear power plants) must be consistent with states’ coastal zone plans.

### **Energy Facility Siting**

- In most states, energy facility siting boards determine whether power plants may be built in a particular location. In addition to considerations such as environmental impact, these boards often consider whether a given power plant is needed and sometimes whether other alternatives can serve local energy needs at a lower cost.

### **Public Utilities Commissions (PUCs)**

- PUCs and their equivalents regulate the electric industry in the states. In

states with traditional regulatory structures, PUCs pass judgment on whether a power plant is needed to serve local energy demand, whether it is a reasonable expenditure of ratepayer dollars, and how a utility may recover construction funds from ratepayers. These decisions effectively determine whether a regulated utility can build a nuclear power plant.

- PUCs in states that have “restructured” their electric industries can shape the power purchasing practices of utilities that distribute power to consumers in order to protect consumers from excessive risk. California’s PUC, for example, requires utilities to prioritize energy efficiency and renewable sources of energy over new fossil fuel power plants in planning to serve these customers.
- PUCs and regional bodies also engage in planning for the future of the power grid and set policies regarding how alternative sources of energy—such as renewable energy and distributed generation—will be treated in the marketplace. Policies that treat renewable energy and other alternatives fairly, and that factor in the true costs of nuclear power, can reduce the attractiveness of nuclear power plants as an energy source.

### **Energy Policy**

- State governments have the power to establish energy policies that serve their citizens’ needs. Renewable energy standards, efficiency standards for appliances, financial support for energy efficiency and renewables, and other clean energy policies can reduce the demand for power from new sources and allow for the shutdown of existing nuclear power plants without economic disruption.

### **Climate Policy and Market-Based Environmental Regulation**

- The nuclear industry has pushed to allow nuclear power plants to obtain credits under a variety of state-administered, market-based programs designed to reduce air pollution and global warming emissions. These credits represent a financial windfall to the nuclear industry and should be opposed on the grounds that technologies like nuclear power that have major

environmental impacts should not benefit from environmental programs.

### **Organizing Opportunities**

- Citizens seeking to challenge nuclear power also can direct their efforts at nuclear power companies themselves, using tools such as shareholder resolutions, organizing of power consumers, and publicity drives to educate the public about nuclear power and build broader coalitions around more sensible energy policies.

# Introduction

Rising energy prices, instability in oil and natural gas markets, and increasing concerns about global warming all point to one conclusion: America must transition to a new energy future that is less reliant on fossil fuels and that reduces emissions that cause global warming.

Proponents of nuclear power claim that their technology can meet these challenges—an echo of the claims of 50 years ago that nuclear power would meet America’s growing demand for energy at prices that were “too cheap to meter.”

America’s first experiment with nuclear power has been a disaster. Tens of billions of dollars were spent on the construction of nuclear power plants, some of which were cancelled in mid-stream and never generated a kilowatt of electricity. Serious accidents at Three Mile Island and later Chernobyl caused many Americans to have serious (and justified) concerns about the safety of the nuclear reactors in their midst. And the nation’s nuclear power plants have generated tens of thousands of tons of hazardous nuclear waste, which still does not have a permanent and safe home.

In the wake of this experience, citizens are right to be skeptical about the potential

role of nuclear power in serving America’s future energy needs. Before new nuclear power plants are built in the United States, Americans must be convinced that:

- a) nuclear power plants are the most economical way to achieve the goals of energy independence and reduced impact on the global climate;
- b) new nuclear power plants will be built and regulated in such a fashion as to make the possibility of a catastrophic accident or serious environmental harm vanishingly small;
- c) the long-term storage problem of nuclear waste is resolved in a permanent and environmentally sustainable way;
- d) there are solid safeguards in place to protect the public against the proliferation of nuclear material resulting from commercial nuclear activities.

Unfortunately, proposals for new nuclear power plants (or the relicensing of existing plants) are unlikely to receive this level of critical scrutiny from the federal government, which holds primary authority for the

licensing and regulation of nuclear power. As demonstrated by the 2005 federal Energy Policy Act, Congress has singled out nuclear power for “go to the head of the class” treatment, lavishing generous subsidies on the nuclear industry at the expense of cleaner, more sustainable alternatives. The Nuclear Regulatory Commission (NRC) has altered its licensing and relicensing procedures so as to provide the nuclear industry with a fast track to approval, while squelching legitimate public concerns about safety and terrorism. And the NRC has continually fallen short in its efforts to ensure that the nation’s current fleet of nuclear reactors operates safely—a conclusion shared by the federal government’s chief watchdog, the Government Accountability Office, and the NRC’s own Inspector General.

Former NRC commissioner Peter Bradford puts it succinctly: “The NRC never errs on the side of safety, of environmental protection, or of public involvement. If we were discussing accounting

regulation, this would be the SEC in the years before Enron.”<sup>1</sup>

Citizens who are concerned about the impacts of a “nuclear renaissance” do have options other than relying on a special interest-dominated Congress and a moribund NRC to protect the public interest. State and local governments hold much of the power to determine when, and under what circumstances, nuclear power plants may be built. That power may be exerted directly—in areas of permitting and land-use regulation—or indirectly through the setting of energy policies that give preference to cleaner, less expensive alternatives to nuclear power.

This paper describes some of the tools that citizens and state and local governments may use to challenge the construction of nuclear power plants. With the nuclear industry already seeking approval for sites for new reactors and pushing for relicensing of its existing, aging reactors, the time for citizens to become acquainted with these tools is now.

# Nuclear Power: Reasons for Concern

The original wave of nuclear power plant construction in the U.S. during the 1960s, 1970s and 1980s was an economic and environmental disaster, generating more than 50,000 tons of toxic nuclear waste and imposing billions of dollars in unnecessary costs on electricity ratepayers—costs that are still being paid off today.<sup>2</sup> The nuclear power plants that were built during that period pose serious and continuing threats to public safety.

As a result, citizens have ample reason to be concerned about the impacts of a so-called “nuclear renaissance” in their communities.

## Cost

Nuclear power remains a very expensive option for satisfying the nation’s energy needs.

### Existing Nuclear Reactors

The nation’s existing fleet of nuclear reactors was built between the 1960s and the mid-1990s. For years, poor management, frequent shutdowns, and operational difficulties made nuclear power plants an

economic albatross. When restructuring of the electric industry began in the early 1990s, it was widely assumed that many nuclear power plants would be unable to compete and would eventually shut down.

In recent years, however, the nuclear industry has achieved a remarkable turnaround in the existing plants. The cost of power from existing nuclear reactors has dipped to less than 2 cents per kilowatt-hour—less expensive than most fossil fuel generated power.<sup>3</sup>

But the operating costs of nuclear power plants are just the tip of the iceberg. Below the surface lurk many hidden costs that saddle ratepayers and taxpayers with much of the total bill for nuclear power, making nuclear reactors of dubious economic value.

### Capital Costs

Proponents of nuclear power have pointed to the low cost of operating the current generation of nuclear plants as proof that nuclear power is not expensive.<sup>4</sup> However, focusing on operating costs alone ignores the tens of billions of dollars that have been paid—and that continue to be paid—by electricity ratepayers to finance the capital costs of building those plants.

Under traditional regulatory systems, electricity ratepayers assume the full capital cost (including financing costs) of building power plants, provided that investment in those plants was prudent and that the facility is “used and useful.” (See “Public Utilities Commission Processes,” page 23.) Today, however, most of the nation’s nuclear power plants are in states that have chosen to “restructure” their electricity industries by deregulating the retail side of the electricity business and the generation of power.<sup>5</sup> This is not an accident: the momentum for restructuring during the 1990s was greatest in states that had the highest electricity rates. These states were, not coincidentally, among those that had made the biggest and most costly gambles on nuclear power.<sup>6</sup>

At the outset of restructuring, the architects of the new electricity system were faced with a problem: nuclear power plants were judged to be profoundly uneconomic. In a restructured market in which consumers could buy power from any generator, no one would pay enough for power to cover the capital and operating costs of a nuclear power plant—particularly when less expensive natural gas-fired power plants were free to enter the market and compete. Inevitably, it was thought, someone would have to be saddled with the “stranded” share of the plants’ capital costs—either the utilities themselves or ratepayers.

The amount of money at stake ran to the billions of dollars—in the case of California alone, more than \$20 billion.<sup>7</sup> Most states allowed utilities to recover some or all of these stranded costs through a “transition charge” that would remain on consumers’ utility bills either for a defined period of time or until all the stranded costs were recovered. In most states, the amount of stranded costs was determined at the outset of restructuring or when a utility’s nuclear power plants were sold, and could not be revised later if conditions changed.

The initial wave of nuclear power plant sales in restructured states amounted to a

fire sale of plants at well below their book value. Massachusetts’ Pilgrim nuclear power plant, for example, was sold by Boston Edison to Entergy for \$81 million (including the cost of the plant’s remaining fuel)—less than 15 percent of its book value of \$700 million. Boston Edison was able to pass \$500 million in stranded costs on to ratepayers.<sup>8</sup> The Pilgrim experience was repeated throughout the early years of restructuring: nuclear power plants were sold for pennies on the dollar, with consumers, in most cases, picking up the stranded costs. Some analysts suggested that, when all the financial conditions were taken into account, the initial wave of plants was sold for zero or negative value.<sup>9</sup>

Contrary to early expectations, nuclear power plants have proven to be quite valuable. A combination of rising natural gas prices, improved plant performance and the NRC’s liberal granting of requests for power uprates and license extensions have made existing nuclear power plants a somewhat better investment than they seemed to be in the late 1990s. In 2004, New York’s R.E. Ginna nuclear plant was sold for \$422 million—the first time a nuclear power plant has sold for above its book value and a price more than 40 times higher on a per-megawatt basis than the price fetched by Pilgrim in 1999.<sup>10</sup>

Despite the recent increase in plant sale prices, many ratepayers in both traditionally regulated and restructured states continue to pay off the remaining capital costs of nuclear reactors—in addition to the higher costs they’ve paid for electricity over the past several decades due to poor investments in nuclear power. Ignoring these costs makes nuclear power plants look far cheaper than they actually are.

## Federal Subsidies

Nuclear power plant owners also benefit from generous public subsidies, mostly at the federal level. Indeed, the nuclear industry likely would not exist were it not for

the federal government's underwriting of nuclear research and development, liability insurance and other aspects of nuclear power plant operation. According to one estimate, the nuclear power industry received upwards of \$145 billion in federal subsidies between 1947 and 1999—or more than \$1 billion for every operating nuclear reactor in the U.S.<sup>11</sup> And the subsidies continue to the present: the recently enacted federal Energy Policy Act adds an additional \$4.8 billion in direct subsidies to the nuclear industry, as well as up to \$7.3 billion in tax incentives.<sup>12</sup>

Among the largest ongoing subsidies is the liability protection provided under the Price-Anderson Act. The act caps the liability of the nuclear industry in the case of a catastrophic nuclear accident, meaning that either the victims of a nuclear disaster, taxpayers or both would be held responsible for any additional costs. The nuclear industry denies that Price-Anderson represents a “subsidy,” but the amount of additional insurance coverage nuclear power plants would be required to hold to cover their full liability would be significant—if they could find a willing insurer at all. The value of the Price-Anderson Act subsidy has been estimated at between \$3 million and \$33 million per reactor per year.<sup>13</sup> Again, these are costs that are not included in the cost that the nuclear industry charges for power from its plants, making nuclear power artificially cheap. In addition, the availability of Price-Anderson protection acts as a disincentive for the creation of safer reactor designs, a point acknowledged even by some in the nuclear industry.<sup>14</sup>

## Security Costs

Among the most difficult-to-quantify additional costs of nuclear power are the costs of providing security and emergency support services to nuclear power plants, particularly in the wake of the September 11, 2001 terrorist attacks. Nuclear power plant

owners are responsible for the cost of securing their plants. However, the need to protect against attacks on nuclear power plants has created the need for increased planning at the local, state and federal levels. In addition, in the immediate wake of the September 11 attacks, National Guard and Coast Guard units were dispatched to secure nuclear power plants.<sup>15</sup> In 2005, approximately \$65 million in homeland security funding was allocated to the NRC.<sup>16</sup> These costs for emergency planning, emergency military response or homeland security funding for the NRC are further additional costs that are paid by taxpayers and hide the true cost of nuclear power.

## New Nuclear Power Plants

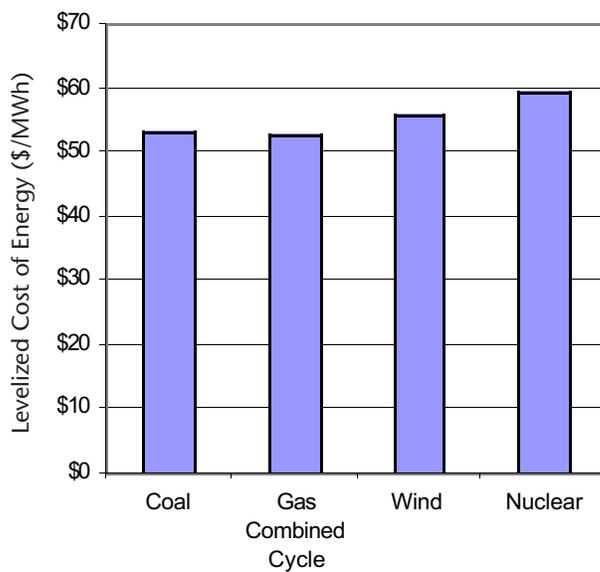
The economics of nuclear power have not changed substantially since the disastrous experience of the 1960s through the 1980s. Indeed, new nuclear power plants remain an economically uncompetitive source of power.

Estimates of the future cost of nuclear power plants vary. A 2003 interdisciplinary study by researchers at the Massachusetts Institute of Technology estimated the cost of energy from new nuclear power plants at 6.7 cents/kWh, compared to 4.2 cents/kWh for new coal-fired power plants and 5.6 cents/kWh for natural gas combined-cycle plants under a high gas price scenario.<sup>17</sup> These costs are significantly higher than the cost of new wind power in much of the country and far higher than the cost of avoided energy use through improved energy efficiency.<sup>18</sup> The MIT study also assumed capital costs for new nuclear power plants of \$2,000 per megawatt, a cost level that has been exceeded in the construction of several new plants in Japan and South Korea over the last decade.<sup>19</sup>

The U.S. Energy Information Administration (EIA) made a similar comparison of energy costs from new power plants assumed to be constructed in the 2015

timeframe. Even with lower assumed capital costs for new nuclear plants than the MIT study, nuclear power remained a more expensive option than coal, natural gas or wind. (See Fig. 1.) The EIA estimate also did not include the current production tax credit for renewables, which would reduce the cost of wind power significantly.<sup>20</sup>

**Fig. 1. Costs of Various Alternatives for Electricity Generation, 2015<sup>21</sup>**



In addition to the high cost of nuclear power, there is also the issue of risk. Nuclear power plant construction projects during the 1970s and 1980s saw cost overruns of as much as 700 percent.<sup>22</sup> The credit rating agency, Standard & Poor's, recently concluded that cost overruns in the construction of new nuclear power plants are "highly probable" and that "[i]n general, nuclear plant ownership tends to be less supportive of credit quality because it introduces added levels of operating, regulatory, and environmental risk to a business profile."<sup>23</sup>

The high risk involved in nuclear power

plant investments makes them even more expensive. Due to the risk of cost overruns or a sudden devaluation of a nuclear plant (as would occur after an accident), investors demand a higher rate of return—pushing up the cost of capital. The only way to reduce those costs is to guarantee the investment, either through assurances that ratepayers will pick up additional costs (as has traditionally been the case) or through federal loan guarantees. Both alternatives represent yet another subsidy for nuclear power and serve only to conceal, not reduce, its ultimate cost.

## Toxic Waste

The operation of nuclear power plants generates highly toxic radioactive waste, which must be safely stored for thousands of years to contain the discharge of radiation. Unfortunately, there are no perfect options for the long-term storage of nuclear waste.

Centralized repositories—such as the proposed Yucca Mountain facility in Nevada—require the transport of high-level nuclear waste across highways and rail lines within proximity of populated areas. The Yucca Mountain facility itself has been criticized for its location on an active earthquake fault, among other weaknesses.<sup>24</sup> Even if Yucca Mountain is eventually completed, it is likely that the amount of nuclear waste generated by U.S. power plants will exceed its capacity, leading either to calls for an additional centralized storage site or the continued on-site storage of waste at nuclear power plants.<sup>25</sup>

On-site storage can be dangerous as well. Nearly all U.S. nuclear reactors store waste on site, often in water-filled pools at densities approaching those in reactor cores. Should coolant from the spent-fuel pools be lost (as a result of earthquake, terrorist attack or human error), the fuel could ignite, spreading highly radioactive compounds across a large area. In 2005, the

National Academy of Sciences (NAS) warned that “[s]pent nuclear fuel stored in pools at some of the nation’s 103 operating commercial nuclear reactors may be at risk from terrorist attacks,” and recommended a series of actions to reduce the danger.<sup>26</sup> One study estimated that a loss of coolant accident that resulted in a spent-fuel pool catching fire could result in between 2,000 and 6,000 additional deaths from cancer.<sup>27</sup>

## Safety and Security

The history of nuclear power in the United States is filled with technical glitches and near-misses. While the Three Mile Island accident in 1979 was the nation’s most serious and most well-known nuclear accident, many other incidents have posed serious threats to workers and residents of surrounding communities. The safety threats posed by nuclear power have only been magnified by the increasing threat of terrorism.

### Nuclear Incidents and Close Calls

The nuclear industry has experienced numerous equipment malfunctions and other incidents over the past several years with the potential to harm public health and safety.

In 2002, the most significant nuclear incident in the U.S. since Three Mile Island took place at the Davis-Besse nuclear plant in Ohio. Workers discovered a football-sized cavity in the reactor’s vessel head. Left undetected, the problem could eventually have led to leakage of radioactive coolant from around the reactor core and, possibly, a meltdown. The U.S. Government Accountability Office (GAO) concluded that the NRC “should have but did not identify or prevent the vessel head corrosion at Davis-Besse” and that the NRC’s “process for assessing safety at nuclear power plants is not adequate for detecting



U.S. Nuclear Regulatory Commission

*Nuclear power regulators failed to prevent the corrosion of the reactor vessel head at Ohio’s Davis-Besse nuclear power plant.*

early indications of deteriorating safety.<sup>28</sup>

In 2004, a pipe burst at the Hope Creek nuclear plant in New Jersey, resulting in the release of a small amount of radioactive steam into the turbine building.<sup>29</sup> In 2003, elevated levels of radioactive tritium were found in groundwater near New Jersey’s Salem nuclear power plant, which is owned by the same utility as Hope Creek.<sup>30</sup> Both plants have experienced a variety of problems and a 2004 NRC investigation found that “there were numerous indications of weaknesses in corrective actions and management efforts to establish an environment where employees are consistently willing to raise safety concerns” at the two plants.<sup>31</sup> The Union of Concerned Scientists (UCS) noted that the safety problems encountered at the two plants were originally identified by the NRC as early as 1998.<sup>32</sup>

In fall 2005, a small leak of radioactive water was discovered from the spent fuel pool at the Indian Point nuclear power plant just up the Hudson River from New York City.<sup>33</sup> Tritium and strontium-90 have been detected in groundwater just 150 feet from the Hudson River and may have reached the river itself.<sup>34</sup> The event came five years after the unplanned release of

radiation to the atmosphere from the plant following a mechanical problem.<sup>35</sup> Nuclear watchdogs have also identified problems with a safety mechanism at Indian Point and more than 60 other nuclear power plants that could reduce the plants' ability to prevent a meltdown in case of an accident.<sup>36</sup>

Along with the leaks of contaminated water at Salem and Indian Point, there have been at least six other incidents in the last decade—including five others within the past year—of leakage of contaminated water from nuclear power plants.<sup>37</sup> At the Exelon-owned Braidwood plant in Illinois, for example, low levels of tritium were found in a drinking water well at a home near the plant in late 2005. Officials estimated that several million gallons of tainted water had leaked from the plant more than five years earlier.<sup>38</sup> Most recently, in March 2006, tritium was discovered in groundwater at the Palo Verde nuclear power plant in Arizona.<sup>39</sup>

In addition, problems have been identified at plants that have undergone NRC-approved “uprates”—increases in their licensed capacity. Three boiling water reactors owned by Exelon in the Midwest suffered vibration-induced damage immediately following increases in their rated capacity.<sup>40</sup>

The continued technical problems experienced by nuclear power plants lead to serious questions about how the plants will perform in the future. The NRC has been regularly approving 20-year license extensions for nuclear power plants across the country, meaning that many will operate well beyond their original 40-year lifespans. In addition, the NRC has approved numerous power uprates that allow the plants to generate more power and operate closer to their margins of safety. Finally, the competitive pressures imposed by deregulated electricity markets could push plant operators to keep plants running in the face of known or suspected safety problems. For example, FirstEnergy, the owner of the Davis-Besse nuclear plant in Ohio, recently

agreed to pay a \$28 million penalty to resolve charges that its employees lied to regulators about safety problems at the plant.<sup>41</sup> All of these developments potentially threaten the future safe operation of nuclear power plants in the U.S.

## **Terrorism and Sabotage**

Nuclear power plants make attractive potential targets for terrorists—either via external assault or internal sabotage. The security record of nuclear power plants is far from reassuring. In tests at 11 nuclear reactors in 2000 and 2001, mock intruders were capable of disabling enough equipment to cause reactor damage at six plants.<sup>42</sup> A 2003 GAO report found significant weaknesses in the NRC's oversight of security at commercial nuclear reactors.<sup>43</sup> In September 2004—three years after the September 11, 2001 terrorist attacks—the GAO reported that the NRC had not yet implemented some of the GAO's earlier recommendations and that the NRC is not yet in a position to assure that plants are able to defend against terrorism.<sup>44</sup> And in March 2006, the GAO was unable to conclude that all nuclear power plants were capable of defending themselves against a plausible terrorist attack, since only about one-third of the plants had conducted the necessary force-on-force inspections. The GAO also questioned changes made to the NRC's standards for protection against terrorist attacks, noting “the appearance that changes were made based on what the industry considered reasonable and feasible to defend against rather than on an assessment of the terrorist threat itself.”<sup>45</sup>

## **Proliferation**

The waste materials produced by nuclear power are of potential interest both to terrorists and to nations that might want to produce nuclear weapons. Conventional nuclear fuel cycles produce radioactive

spent fuel that could be used directly in a “dirty bomb.” Spent fuel contains plutonium, which can be separated from other nuclear waste and used to fuel a second nuclear reaction—thus producing more power—or to create a nuclear weapon.

The nuclear industry has done an imperfect job of keeping track of spent fuel. Since 2000, at least three nuclear power plants reported “missing” spent fuel. While the spent fuel was eventually accounted for in two of three cases (and a plausible case for safe disposal was made in the third), the episodes showcased the lack of effective tracking of spent fuel. The GAO criticized the NRC’s regulation of spent fuel, noting that “NRC regulations and oversight activities are insufficient to ensure control of all spent fuel.”<sup>46</sup>

Reprocessing of spent fuel for use in a second nuclear fuel cycle is potentially an even greater danger. Reprocessing separates the plutonium and uranium in spent fuel from other radioactive waste. Since plutonium is not highly radioactive, it is potentially susceptible to theft (which is far more difficult for unseparated, highly radioactive spent fuel). And since it takes less than 20 pounds of plutonium to make a nuclear weapon, loss of even a small amount of separated plutonium would pose a severe proliferation danger.<sup>47</sup>

Due to the danger of nuclear proliferation, the United States has barred the reprocessing of spent fuel for three decades. However, the Bush administration has proposed a radical change of course, including \$250 million in funding for nuclear spent fuel reprocessing in its fiscal year 2007 budget. Bush’s plan would not only use spent fuel currently stored at U.S. nuclear reactors, but would also import spent fuel from abroad.<sup>48</sup> At a time when nuclear proliferation and the disposal of America’s own nuclear waste are of great concern, the notion of bringing more spent nuclear fuel to the U.S. and creating more material that could be used in nuclear weapons appears highly dubious.

## Water Consumption and Local Environmental Impacts

Power plants are major consumers of water, responsible for nearly half of all water withdrawals in the United States.<sup>49</sup> Nuclear power plants are especially profligate users of water, consuming more than a quarter more water per unit of energy produced than coal-fired power plants and more than twice as much as combined-cycle natural gas plants.<sup>50</sup>

Nuclear power plants can damage ecosystems and wildlife both through the withdrawal of water and the release of heated water back into waterways. When water is withdrawn from oceans or estuaries, marine creatures can become trapped in a plant’s cooling system. At one Florida nuclear reactor, for example, more than 5,000 sea turtles were found in the plant’s water intake system over a 20-year period, of which 190 died.<sup>51</sup> In New Jersey, a 1990 study estimated that water intakes from the Salem nuclear power plant resulted in four times more fish losses than the commercial fishing industry in the area.<sup>52</sup> Damage to marine ecosystems from both the discharge of heated water and the entrapment of adult and juvenile marine animals has been documented in multiple cases across the country.<sup>53</sup> In 2002, for example, discharge of heated water from New Jersey’s Oyster Creek nuclear power plant caused more than 5,000 fish to die from heat shock.<sup>54</sup>

Other technologies for cooling nuclear reactors (such as the cooling towers that have become widely recognized as a symbol of nuclear power) can reduce water consumption and environmental impacts significantly.

## The Nuclear Regulatory Commission: An Ineffective Watchdog

The safety and security problems posed by nuclear power would be less troublesome

if citizens could count on an effective watchdog to probe for potential problems with nuclear power plants and require operators to fix them promptly. Unfortunately, little in the NRC's history instills confidence that it can play this watchdog role effectively.

The NRC's failure to identify the problems at the Davis-Besse nuclear power plant is symptomatic of broader problems in the NRC's development and application of safety regulations. Over a period of just two years, the GAO issued seven reports that detailed the need for improvement in NRC practices to ensure the safety and security of nuclear power plants, the safe storage of radioactive waste, the collection of adequate funds for nuclear decommissioning, and the effective operation of nuclear reactors.<sup>55</sup> In a 2002 internal survey, nearly half of all NRC employees responding thought their careers would be harmed if they raised safety concerns, and nearly one-third of employees who had reported safety concerns replied that they had suffered harassment or intimidation as a result.<sup>56</sup>

The NRC's reviews of nuclear power plant safety are fundamentally flawed. A 2003 Union of Concerned Scientists document identified numerous problems with the reviews, which, combined, lead to an overly optimistic view of the safety of individual reactors.<sup>57</sup>

While the NRC has taken some action to protect reactors against terrorism, the commission has refused to take public concern about terrorism into account in its licensing decisions, calling the threat of a terrorist attack at any single reactor "too speculative and remote."<sup>58</sup>

The NRC's track record does not inspire confidence that the agency will be able to protect Americans from a malfunction at one of the nation's aging nuclear reactors, safety problems at any new nuclear reactors, or a terrorist attack or act of sabotage.

## "New" Nuclear Facility Designs: Are They the Solution?

Proponents of nuclear power claim that new, "advanced" nuclear reactor designs will avoid the safety and operational problems that plagued the first generation of U.S. nuclear reactors.

Lost in the hype around advanced nuclear reactors is the fact that most of the new designs are similar to previous designs. The Pebble Bed Modular Reactor (PBMR) is one of the most frequently touted new reactor designs. The PBMR is a close cousin of the high-temperature gas-cooled reactor, two of which were operated in the U.S.: the experimental Peach Bottom 1 reactor in Pennsylvania and the Fort St. Vrain reactor in Colorado, which was plagued by operational problems.<sup>59</sup> PBMRs are promoted as being meltdown-proof, since the fuel does not reach the temperature needed to provoke a meltdown. However, PBMRs have other potential safety problems, including the release of radioactivity in the event of a fire.<sup>60</sup> In addition, some PBMR proponents propose that the reactors be built without a secondary containment structure, which would reduce costs but also leave the reactors far more vulnerable to terrorism and reduce the safety margin in the event of an accident. Since no PBMRs have entered commercial operation, practical experience with the technology is limited. And there has not yet been an application submitted for certification of the PBMR design in the United States, though an application could be forthcoming soon.<sup>61</sup>

Other new designs likely to be proposed for the U.S. are largely based on existing designs, such as the pressurized water reactor and boiling water reactor. However, these designs are touted as "advanced" due to simpler (and theoretically more cost-effective) designs and the use of "passive" safety measures. Passive safety measures use

natural forces, such as gravity, rather than electric-powered safety systems such as pumps to provide emergency cooling to the reactor core in case of an accident. While such systems may be improvements over current reactors, nuclear power plants remain complex systems containing radioactive material and can thus never be considered inherently safe.

## Conclusion

Any one of the problems listed above—high costs, safety problems, susceptibility to

terrorism, lack of safe long-term storage for nuclear waste, and environmental harm—should be enough to call into question the wisdom of continuing to operate the nation's existing nuclear reactors and building new ones. However, as noted earlier, federal officials have acted to smooth the way for new nuclear power plants and the relicensing of old ones.

The following chapter describes ways that citizens can use state and local governmental processes—as well as political organizing—to challenge the so-called “nuclear renaissance.”

# Challenging Nuclear Power in the States

Citizens have numerous opportunities to challenge nuclear power through their local and state governments. In order to understand which tools are most likely to bear fruit, it is necessary to understand how nuclear power is regulated in the United States.

The 1954 Atomic Energy Act gave the federal government sole responsibility for licensing and regulating the operation of nuclear power plants.<sup>62</sup> State or local governments may not impose additional licensing procedures, safety requirements, or excessively burdensome regulations that impinge on federal authority over safety.

On the other hand, the federal government cannot force a state to accept a nuclear power plant against its will. States largely retain the power to determine how and under what conditions the energy needs of their citizens will be met. In addition, state and local governments enforce numerous environmental and land-use regulations with which nuclear power plants must comply, just like any other major industrial facility.

The sections that follow suggest many tools that can be used at the state or local level to challenge the construction or operation of nuclear power plants. Not every tool is equally suited to every situation, and some

tools are more limited in their application than others. But all should be considered as part of citizens' "toolbox" for challenging nuclear power in their communities.

## Outright or Conditional Bans

While federal law gives primary authority for the regulation of nuclear power to the federal government, state governments retain the authority to decide how to provide for the electricity needs of their citizens. This authority extends to the decision of whether to allow nuclear power plants to be built within the state, and under what economic conditions.

At least six states—California, Kentucky, Montana, Maine, Oregon and Wisconsin—have adopted conditional moratoriums on new nuclear power plants. The conditions vary from state to state. The California, Kentucky, Maine, Oregon and Wisconsin laws are similar in that the main condition set for the permitting of new nuclear power plants is the availability of technology to permanently store high-level nuclear waste.<sup>63</sup> The Kentucky and Maine laws also require that a high-level nuclear waste

storage facility be in operation at the time that disposal of nuclear waste must occur, while the Oregon law also requires that nuclear power proposals be placed on the statewide ballot for approval by voters. The Wisconsin law also requires that a nuclear power plant be judged to be economically advantageous to ratepayers compared with other feasible alternatives.

The Montana law goes several steps further, requiring that no legal limits exist to nuclear plant financial liability in case of an accident, that there be “no reasonable chance” of the discharge of harmful radioactivity, that the safety systems of the plant be demonstrated as effective, and that nuclear facility owners post a bond equal to 30 percent of the capital cost of the plant to cover decommissioning expenses.<sup>64</sup>

In 1983, the U.S. Supreme Court considered whether California’s conditional moratorium on nuclear power plant construction was legal. In a 9-0 decision, the Supreme Court ruled that the state’s conditional moratorium was not pre-empted by federal law. Writing for the Court majority, Justice Byron White stated:

Even a brief perusal of the Atomic Energy Act reveals that, despite its comprehensiveness, it does not at any point expressly require the States to construct or authorize nuclear power plants or prohibit the States from deciding, as an absolute or conditional matter, not to permit the construction of any further reactors.<sup>65</sup>

However, the decision went on to say that states cannot reject nuclear power plants on the grounds of safety, since the regulation of nuclear safety is reserved to the federal government. Rather, the rejection must be based on non-safety criteria, such as economics.

Similar state laws could be adopted that constrain further construction of nuclear power plants, if they have a substantial

nonsafety rationale. The poor economic track record of nuclear power, the unresolved problems of nuclear waste storage, and the availability of energy sources with lower economic costs all provide reasons for states to adopt such policies.

State legislation and regulations also help to create the economic playing field on which nuclear power must compete with other sources of electricity generation and conservation. For example, states might consider adopting legislation requiring nuclear power plant owners to assume more of the “hidden” costs of nuclear power, such as the emergency planning costs incurred by state and local governments to prepare for potential nuclear accidents. For more on strategies to ensure that the full costs of nuclear power are considered in utility decision-making, see “Public Utilities Commission Processes,” page 23.

## Environmental and Land Use Permitting

States may not have the ability to reject nuclear power on safety grounds, but they do have the ability to set conditions on where and how nuclear power plants may operate in order to limit their impact on the environment.

### Environmental Permitting

Nuclear power plants—like most other industrial and energy facilities—must receive a series of environmental permits in order to go into operation.

Plants that withdraw or discharge water for cooling from waterways must obtain a permit under section 316 of the federal Clean Water Act. In 45 states, Clean Water Act permitting authority is administered by state environmental agencies, which have the authority to grant or deny permits according to EPA guidelines.<sup>66</sup>

Section 316(a) authorizes limits on thermal discharges to waterways “that will assure the projection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on that body of water.”<sup>67</sup> Section 316(b) requires that “the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.”<sup>68</sup>

As noted above, cooling water intake and the discharge of heated water can have severe, damaging impacts on ecosystems and wildlife. Section 316 permitting processes give advocates an opportunity to raise those concerns and to ensure that any new nuclear power plant is maximally protective of waterways. The process also gives advocates an opportunity to force technological changes that reduce the impact of existing nuclear power plants on the environment.

The environmental problems caused by cooling water intake and discharge are most severe in power plants that use a “once-through” cooling system, in which water is drawn in large quantities from waterways, used for cooling, and then discharged back into the same waterway. About half of the nation’s nuclear power plants use a once-through system, while the others use systems that are not quite as environmentally destructive, such as cooling towers and cooling ponds and canals.<sup>69</sup>

For decades, the EPA determined whether power plants complied with Section 316(b) on a case-by-case basis, despite the “best technology available” requirement for cooling-water intakes. A coalition of environmental groups sued the agency, resulting in a 2000 settlement that required the EPA to propose national standards for cooling water intakes.<sup>70</sup> However, the standards ultimately proposed by EPA allowed for the continued use of once-through cooling under certain conditions, despite the ready availability of other technologies. A subsequent lawsuit resulted in closed-cycle cooling being deemed the best technology

available for new power plants.<sup>71</sup> More recently, attention has turned to EPA’s “Phase II” regulations for cooling systems of existing power plants. In 2004, six state attorneys general filed a lawsuit challenging EPA’s “Phase II” rule, which again allowed for the continued use of once-through cooling systems.<sup>72</sup>

Requiring the replacement of once-through systems at the 416 U.S. power plants (including several dozen nuclear power plants) that have them could cost as much as \$2.3 billion annually (2001 dollars), though this figure may be overstated.<sup>73</sup> In some cases, the cost of installing cooling systems that are protective of wildlife may alter the economics of the relicensing or continued operation of a nuclear power plant. In any case, citizens should work to ensure that nuclear power plants’ cooling water intake does not damage wildlife or the environment. Regardless of the fate of the legal challenge to EPA’s proposed rule, the Section 316(b) process gives states an opportunity to reduce the damage inflicted by nuclear power plants on marine ecosystems.

States also have the ability to regulate the thermal discharge of power plants under section 316(a) of the Clean Water Act. Power plants—particularly those with once-through cooling systems—discharge large amounts of heated water to waterways, posing a potential threat to ecosystems. Some nuclear power plants raise the temperature of surrounding waters by as much as 30°F.<sup>74</sup> In addition, some nuclear power plants use chemicals to remove marine organisms from their cooling systems, which are then discharged into waterways.<sup>75</sup> However, EPA has interpreted section 316(a) relatively loosely, setting standards for thermal pollution on a case-by-case basis, instead of imposing a strong standard for the amount of thermal pollution that can be discharged into waterways. Challenges under section 316(a) are difficult, but can be used to raise public and decision-maker awareness about the impacts

of thermal discharges on ecosystems and, on occasion, to force technological changes.

## Land Use Regulation

States, counties and localities are primarily responsible for regulating the use of land. The extent of state and local land-use regulation is limited by state and federal laws and the federal constitution.

States' authority to regulate land use is a "police power" that may be exercised only to protect the "public health, safety, morals and general welfare" of the people.<sup>76</sup> Land-use regulation is typically carried out through zoning, in which local governments establish zones of the municipality in which certain activities are permitted or prohibited. For example, a factory may be permitted to be built in an industrial zone, but not within a residential zone. In some localities and states, zoning laws must comport with an overall land-use plan.

In theory, local land-use regulation is a potent tool to limit the potential for nuclear power development. In practice, the power of local land-use regulation is limited.

First, there are several constitutional limitations on local zoning authority. Zoning laws may not amount to an unconstitutional "taking" of private property by rendering the land devoid of economic value. They may not be "exclusionary"—that is, they may not ban legitimate uses of land outright. Zoning may not be discriminatory, nor may it be applied retroactively.

As a result, local governmental land-use regulations may not ban nuclear power plants outright, but merely determine which parts of the locality are most suitable for development and the conditions under which that development might occur. Second, there is no way for a municipality to retroactively revise zoning to force the shutdown of a plant that already exists, although there may be ways to challenge new activities on the site of an existing plant—such as the construction of a new

reactor or of expanded waste storage facilities.

Second, in many states, local zoning authority can be superseded by state energy facility siting boards. In approximately 36 states, these statewide bodies share jurisdiction with local governments or exercise final decision-making authority over the siting of power plants and other energy facilities.<sup>77</sup>

Third, the NRC, in its site review process, considers the degree to which a proposed power plant or other nuclear facility comports with local land-use regulations. While a local government's interpretation of its land-use laws might differ from that of the NRC, the NRC process would, at least in theory, weed out most potential power plant locations where zoning concerns would be an issue.

## Coastal Zone Regulation

Many states have additional regulations and processes that govern development in particular areas—for example, coastal zones. The 1972 federal Coastal Zone Management Act (CZMA) and subsequent amendments require states to develop a planning process for energy facilities in a coastal zone and to give consideration to the "national interest" in the construction of such facilities.<sup>78</sup> Federal actions, including the granting of siting permits and licenses for nuclear power plants, must be consistent with the enforceable policies of the state's coastal zone plan.

Either the federal licensing agency or the applicant for a license must notify the state agency responsible for determining consistency with the plan. The state agency may then reject the proposal if it is found to be inconsistent with the state's coastal management plan. Should an applicant disagree with the state agency's decision, it may appeal to the U.S. Secretary of Commerce.

The CZMA process provides another opportunity for citizens to challenge nuclear power plant operation and associated development—even during the

relicensing of existing nuclear reactors. However, federal primacy in enforcing the law limits states' flexibility in rejecting proposed nuclear plants outright.

## Energy Facility Siting Processes

In most states, energy facility siting boards have a role in the permitting of power plants, including nuclear facilities. The role of these boards varies by state. In some states, the siting board has sole jurisdiction,

superseding the jurisdiction of municipalities or counties. In others, the board shares jurisdiction with local governments, by allowing the applicant the option to choose between state and local jurisdiction, by requiring the state board to ensure that the project meets local land-use requirements, or by giving the local government a voice in the decision.

Siting boards also have links with other state bodies. For example, many states require that an energy facility be deemed necessary before a state siting board can grant its approval. These "determinations of need" or "certificates of public convenience and necessity" are typically issued by the

## Restructuring and Nuclear Power

The restructuring of the electricity industry has profound implications for the future of nuclear power in the United States.

Many existing nuclear power plants have seen their ownership shift from regulated utilities to unregulated merchant generators. The economic pressures created by competition have made plants more efficient, but also pose potential safety concerns as plant owners are pushed to run their plants closer to their operating margins for longer periods of time with fewer staff. The shifting of nuclear power plants to the unregulated sector has also seen ratepayers in many states continue to be saddled with paying the "stranded costs" for utilities' uneconomic nuclear investments, which were originally approved based on unrealistically low projections of costs.

The changes wrought by restructuring could either promote or hinder the construction of new nuclear power plants. On one hand, restructuring laws in the states either eliminated or circumscribed states' authority to block the construction of new power plants on the basis of need, and restructuring at the wholesale level nationally has opened the possibility that nuclear power plants can serve larger, regional markets.

On the other hand, however, the reduction of the role of regulated utilities in power plant construction means that any new nuclear power plant built in a restructured state would likely have to be built by an unregulated merchant generator. These companies and their investors would likely face the majority of the substantial financial risk involved in building a new nuclear power plant. That risk might be enough to prevent the construction of new plants—unless federal policies shift enough of the risk to taxpayers or ratepayers to tip the balance.

state public utilities commission (PUC). In some cases, there is no independent siting board, but siting board functions are discharged by the PUC itself.

The criteria that power plants must meet in order to receive approval from the siting boards vary from state to state. Among the determinations that frequently must be made are that the plant:

- Is needed to satisfy the energy needs of the state or region.
- Minimizes harm to the environment, compared with alternatives.
- Is economically justified, compared with alternatives.
- Is consistent with local and regional land-use plans.
- Is consistent with the state's long-term energy plan.
- Is in the public interest.<sup>79</sup>

In recent years, some states that have restructured their electric utility industries have weakened or eliminated some criteria for power plant siting. States such as California have eliminated the requirement for a demonstration of need.<sup>80</sup> Other states have eliminated or scaled back their electric system planning processes in the wake of restructuring.

In any case, the breadth of the criteria considered by siting boards gives advocates several opportunities to challenge nuclear power plants on the basis of their economic merits, the “need” for energy in a particular area, or their consistency with the long-term energy and land-use plans of a region. Siting agencies typically provide public hearings or opportunities for public comment, enabling citizens to make their case in the public record. In states where siting processes do not include the evaluation of alternatives or the consideration of cost-effectiveness, advocates can work to have these criteria included in energy facility siting laws.

## Public Utilities Commission Processes

In the 32 states that remain under traditional public utilities regulation, the state Public Utilities Commission (or its equivalent) must ultimately sign off on the construction of nuclear power plants by public utilities. State PUCs may or may not have the power to approve the construction of nuclear power plants by non-utility power generators within their states' borders.

PUCs exercise their authority over nuclear power plants in several ways. Many PUCs have the authority to reject a power plant outright if it is judged not to serve a legitimate need. In addition, PUCs in traditionally regulated states have the authority to deny cost-recovery for power plant expenses that are not prudently incurred. PUCs also have the ability to reduce the need for nuclear power through the criteria they use for evaluating utilities' resource plans and through the policies they implement with regard to energy efficiency and alternative sources of power.

### Certificate of Public Convenience and Necessity

In many traditionally regulated states, utilities must seek and receive a “certificate of public convenience and necessity” (a “certificate of need” or, more simply, a “certificate”) before building a power plant. State laws give PUCs varying levels of jurisdiction over different types of power plants. In some states, the PUC must issue a certificate for any power plant built within the state, regardless of its owner. In others, the PUC has authority over plants proposed by public utilities only.

The criteria proposed power plants must meet to obtain a certificate also vary. Florida, for example, requires that a plant both be needed and be the most cost-effective option before a certificate may be granted.<sup>81</sup> Other states simply require a demonstration that the plant would serve a

need either within the state or within a larger region.

Because of the great variation in state certification requirements, the certification process may represent either a useful vehicle for raising concerns over nuclear power plants or a mere formality. Other PUC proceedings, however, are among the most effective potential handles for citizens to use in challenging nuclear power plant construction.

### Rate Cases

Historically, the most important role of state PUCs has been in the regulation of electricity rates. PUCs were established as an antidote to the “natural monopoly”

inherent in providing electricity service. Their historic statutory mission has been to ensure that the rates charged for electricity are “just and reasonable”—both to the utility and its investors and to consumers.

In traditionally regulated states, electricity rates are set based on the cost of providing service; that is, utilities are entitled to recover, dollar-for-dollar, the cost of providing electricity (including payment of interest and fair profit to shareholders). To determine the cost of service, PUCs must decide which facilities are included in the utility’s “rate base.” Generally, facilities included in the rate base must be judged to have been prudent investments at the time those investments were made, and to be “used and useful”; that is, in active use and

## Resources for Citizens: Ratepayer Advocates and Intervener Funding

Formal participation in utility rate cases is a time-consuming and expensive endeavor, often requiring specialized expertise. To ensure balance in the process, states have created a series of mechanisms to guarantee that consumers’ points of view are heard in PUC hearings.

- **Ratepayer advocates** – Most states have professional advocates charged with representing the interests of consumers before utility regulatory bodies. In some cases, ratepayer advocates operate independently. In other cases, the job of advocating for ratepayers is delegated to the state attorney general or to an employee of the PUC.
- **Intervener funds** – Some states have created intervener funds to ensure that municipalities or public interest groups have the resources to represent themselves in PUC proceedings. In California, for example, interveners are eligible to recover their expenses, including attorneys’ fees and expert witness fees, if the PUC determines that they couldn’t otherwise afford to participate.<sup>84</sup>
- **Citizen utility boards** – In Illinois, Oregon, Wisconsin and the city of San Diego, independent “citizen utility boards” exist to advocate for ratepayers. Funded through citizen contributions and non-profit foundations, CUBs are run by democratically elected boards and have a track record of success. The CUB in Oregon, for example, claims to have saved ratepayers more than \$1 billion in the first 20 years of its operation.<sup>85</sup>

contributing to the provision of service.<sup>82</sup>

The disastrous experience with nuclear power plant construction in the 1970s and 1980s posed a major challenge to the utility regulatory system. During the 1980s, PUCs made the first widespread use of prudence reviews and the used and useful test in order to protect ratepayers from billions of dollars in excess costs resulting from nuclear power plant construction. According to an early 1990s analysis by the Edison Electric Institute, approximately \$14.4 billion in investment in nuclear power plants was disallowed by state PUCs under one or more of these tests.<sup>83</sup>

In the wake of the nuclear plant construction debacle, PUCs and utilities created new tools to prevent a recurrence. As a result, while struggles over the after-the-fact inclusion of a new nuclear power plant in a utility's rate base are possible, the real debate is likely to occur before ground is broken on a new nuclear plant.

## Integrated Resource Planning

Historically, cost-based rate-making put PUCs in a reactive posture—passing judgment on utilities' investments after the fact. The experience of high nuclear power plant construction and operating costs and the 1970s energy crises led many state PUCs to develop long-term planning requirements to guide future utility investment decisions.

Integrated resource planning (IRP) requires utilities to periodically develop long-range plans for the adequate provision of reasonably priced electricity with minimal impacts on the environment or public health. Under IRP, utilities identify the "resources" (including both new sources of generation and conservation and demand management resources) that could be harnessed to meet an area's energy needs, and then assemble a portfolio of those resources into a long-range plan.

While the comprehensiveness, enforceability, and degree of PUC oversight over

IRPs differ from state to state, the planning process is a useful and important place for advocates to raise concerns about particular sources of power, for several reasons:

- In some states, the IRP is used by the PUC in determining whether a given investment will eventually be eligible for cost recovery (though inclusion in an IRP is not an absolute requirement for later cost recovery).
- In some states, the IRP process requires the consideration of alternatives—such as other forms of generation, energy efficiency improvements and demand-side management programs.
- In some states, environmental and social "externalities" are incorporated into consideration of how to provide energy supply at the "least cost" to ratepayers and the public generally.<sup>86</sup>

As noted above, the IRP is not the final word on whether a utility will be able to recover costs for a given investment. The final determinations typically come with the issuance of a certificate of public convenience and necessity and PUC decisions on inclusion of the facility in the rate base. In some states, decisions made in the IRP process play a significant role in those decisions; in other states, they have a much less important role.

The IRP process provides several opportunities to challenge plans for new nuclear power plants. The high relative cost of nuclear power versus energy efficiency improvements (and even some forms of renewable power) and the large social and environmental externalities posed by nuclear plants make it unlikely that nuclear power would be considered a "least cost" method of supplying a state's energy needs under any rational planning process. Forcing the PUC or a utility to concede that nuclear power is not a least-cost solution makes it far more difficult for a utility to justify its inclusion in the rate base.

## Project Financing

Nuclear power plants are among the most capital-intensive forms of generation and require among the longest lead times for construction. Capital costs for nuclear power plants easily run to the billions of dollars and construction times of five years or more are common. The traditional regulatory practice of allowing cost recovery only for facilities that are “used and useful”—that is, already producing power—puts utilities and their investors at tremendous financial risk during the construction process. Given nuclear power’s track record during the 1970s and 1980s, it is unlikely that a traditional utility or its investors would choose to build a nuclear power plant without a guarantee of cost recovery and, preferably, the ability to recover some of the plant’s cost during construction.

Some state PUCs have made exceptions to the used and useful doctrine by allowing utilities to recover costs for “construction work in progress” (CWIP). In effect, CWIP financing reduces the financial risk to the utility and lowers the carrying cost of the debt utilities must incur to build a plant. Unfortunately, CWIP financing shifts that risk directly to ratepayers.

Any attempt to provide CWIP financing—or to make other guarantees of cost recovery for nuclear power plants—requires a formal decision by the state PUC. Citizens can and should challenge such financing arrangements on consumer protection grounds. By so doing, they can ensure that the risk of investment in nuclear power plants is fairly allocated among utilities and the public.

## Utility Regulatory Processes Under Restructuring

In 18 states, legislatures or public utilities commissions have deregulated the retail side of the electricity business. At the same time, the federal government has been

moving forward with deregulation of wholesale electricity markets. These twin developments—lumped together as “restructuring”—have brought about a dramatic shift in how power is produced and sold in the U.S., and have major implications for the future of nuclear power.

The nation’s first generation of nuclear reactors was built by traditional, integrated utilities operating under traditional regulation. While there is some chance that new nuclear reactors will be built by utilities, it is also possible that they will be proposed by unregulated “merchant generators” who sell their power on the open market.

Historically, utilities generated the vast bulk of the power they supplied their consumers. Now, many utilities in both restructured and traditionally regulated states buy significant shares of their power on the open market. For prospective merchant nuclear power plant builders, having a firm, long-term commitment for the purchase of power is likely to be an essential part of securing financing for the plants. PUCs in traditionally regulated states generally have the authority to set the rules regarding utility purchases of power. Even in states with retail restructuring, PUCs play a role through their regulation of “standard offer” service—the electricity service provided by distribution utilities to consumers who do not choose an alternative electricity provider (which, given the failure of strong retail markets for electricity to develop in restructured states, includes virtually all residential electricity customers). States have a variety of strategies for procuring power for standard offer service—ranging from competitive auctions to longer-term contracts with generators.

In both traditionally regulated and restructured states, citizens should hold power purchase agreements—and particularly long-term agreements with facilities such as nuclear power plants—to a high level of scrutiny and force utilities to justify those contracts on the basis of cost.

Restructuring has involved other

regulatory changes at the state level. Many states that have undergone retail restructuring have removed or loosened requirements that power plant builders demonstrate the need for their facilities. And because PUCs in these states have a reduced role in the setting of rates for electricity generation, there are fewer instances in which a utility must come before the PUC to justify the inclusion of a nuclear power plant in its rate base.

However, in addition to their role in monitoring power purchase agreements, PUCs and other bodies (such as regional transmission organizations and independent system operators) still make a variety of decisions that affect the future shape of the electric industry—and the role of nuclear power within it. We will discuss some of these decisions in the section on “Energy Policy Decisions” that follows.

## Energy Policy Decisions

One of the most effective ways to challenge nuclear power is to reduce the need for it in the first place. America has vast amounts of unrealized energy efficiency potential as well as abundant wind and solar power resources. In many cases, energy savings can be obtained at lower cost than the construction of new power plants—particularly expensive nuclear plants. The declining cost of wind power and the inherent cost advantages of clean, local power sources make them attractive competitors with nuclear power. There are numerous ways that advocates can promote these clean alternatives to nuclear power.

### Efficiency and Renewables Policies

Over the past decade, states across the country have taken aggressive actions to improve the energy efficiency of their

economies and promote the use of renewable sources of energy. Among the policies states have adopted are the following:

### Appliance Energy Efficiency Standards

States have latitude to impose energy efficiency standards for residential and commercial appliances where the federal government has failed to do so. States may also petition the federal government for a waiver to implement stronger energy efficiency standards for appliances subject to federal regulation. In 2004 and 2005, 10 states adopted stronger energy efficiency standards for a range of appliances. By 2030, those standards will reduce power demand by more than 4,800 megawatts, or nearly five nuclear power plants.<sup>88</sup> The state actions also led to the enactment of new federal efficiency standards for many of the same appliances, which will eliminate the need for about 30,000 megawatts of generating capacity in 2030—the equivalent of about 30 nuclear power plants.

There remain significant opportunities for states to push forward with new efficiency standards for appliances—standards that will save energy and reduce the need for all forms of power generation. The American Council for an Energy-Efficient Economy and Appliance Standards Awareness Project have identified 15 appliances for which standards could be adopted in the near term. Adopting standards for those appliances would reduce demand by about 12,000 megawatts, or about 12 nuclear power plants.<sup>89</sup>

### Energy Efficiency Funding

In the 1970s, utilities (often at the request of regulators) began to create energy efficiency and demand-side management (DSM) programs in order to reduce the aggregate cost of delivering electricity to consumers. These programs grew to the point where utilities were spending nearly \$1.8 billion annually on energy efficiency programs by

1993.<sup>90</sup> In the wake of electric industry restructuring, however, many states assumed that market forces would take over the job of driving improvements in energy efficiency and, as a result, allowed utility energy efficiency programs to wither or expire altogether.

In the late 1990s, however, states began

to experiment with new ways to ensure that the benefits of energy efficiency would continue to accrue to ratepayers and society as a whole. At least 20 states now assess “systems benefit charges”—small surcharges on electricity bills—that are used to raise funds to support energy efficiency programs. In 2003, these programs, along with utility-

## Regional Transmission Organizations and Independent System Operators (RTOs/ISOs)

Regional transmission organizations and independent system operators (RTOs/ISOs) are powerful new players in the utility regulatory scene. Since the creation of the first ISOs in the mid-1990s as part of restructured electricity markets, these organizations have come to play an increasingly important role in setting the rules for electric power markets, operating those markets, planning for the future of the grid, and shaping the energy future of the regions they serve. Citizens concerned about nuclear power should become acquainted with RTOs/ISOs and how they work.

RTOs/ISOs are billed as “independent” organizations, meaning that they are not controlled by any particular player in the market. However, RTOs and ISOs are not publicly accountable bodies; rather, they are typically non-profit organizations whose governance is dominated by electricity generators, transmission owners, utilities and large customers.<sup>87</sup> While RTOs/ISOs typically allow some advisory role for consumer, environmental or public interest “stakeholders,” industry participants typically hold the lion’s share of decision-making power. Moreover, RTOs and ISOs—unlike state PUCs and federal regulators—face no statutory or other requirement to act in the public interest.

RTO/ISO rules and planning processes have major influence on the shape of a region’s energy system. Through the transmission planning process, RTOs/ISOs influence whether a region will continue to receive power from large, centralized power plants, smaller power plants located closer to sources of demand, or improved energy efficiency and conservation. RTO/ISO rules for interconnection to the grid influence whether renewables and smaller-scale sources of power will be able to take advantage of the ability to sell their power on the open market. And RTO/ISO pricing and market rules determine whether these alternative sources of power will be treated equitably.

RTOs and ISOs have limited ability to determine whether a nuclear power plant can be built. But the rules, procedures and plans they establish for regional transmission grids can determine whether nuclear power plants will appear to be feasible or infeasible options for serving a region’s electricity demand. For that reason, citizens concerned about nuclear power should become familiar with the operations of the RTO/ISO in their region.

operated energy efficiency and demand management programs in states with traditional regulatory models, had resulted in savings of 67,000 gigawatt-hours of power—equivalent to the annual output of about eight nuclear power plants.<sup>91</sup>

Yet, the potential for further efficiency improvements is immense. Of the approximately \$1.1 billion spent on energy efficiency programs in 2003, more than 80 percent was spent in just 10 states.<sup>92</sup> In 21 states, including populous states such as Illinois, Pennsylvania, Maryland, Virginia and Georgia, energy efficiency spending represented less than one-tenth of 1 percent of utility revenue.<sup>93</sup>

Expanding energy efficiency funding and programs in the states can reduce future demand for power—thus reducing the perceived need for nuclear reactors. In addition to winning better programs, however, advocates must also push for energy planners—including utilities, PUCs and ISOs/RTOs—to recognize the impact of energy efficiency in their demand growth forecasts, which are often used to justify new power plants.

### **Renewable Energy Standards, Funds and Other Policies**

In addition to reducing consumption of energy, demand for nuclear power can be reduced by promoting the use of clean, renewable sources of energy such as wind and solar power. States have taken a variety of actions over the last decade to dramatically ramp up the generation of power from renewable sources.

At least 19 states have adopted renewable energy standards (often called “renewable portfolio standards”) that require a growing percentage of a state’s electricity to come from renewable sources. The most aggressive standards call for gradual increases—on the order of 1 percent per year—in the share of power coming from renewable sources. In addition, at least 15 states devote some funding to the development of renewable energy sources, with the

funding often coming from small systems benefit charges on utility bills. The combination of renewable energy standards and state funding is projected to lead to the installation of about 22 gigawatts of renewable electricity capacity by 2020—enough to offset at least seven nuclear power plants.<sup>94</sup>

Other public policies can also smooth the way for renewable energy sources:

- **Solar incentives and new home standards** – The California PUC recently approved the nation’s largest investment in solar photovoltaic (PV) power; a \$3.2 billion incentive program, funded through a surcharge on utility bills, that is anticipated to result in the installation of as much as 3,000 MW of solar photovoltaic systems in California over the next decade.<sup>95</sup> California has also contemplated policies to require the installation of solar PV systems in new homes or to require that new homes be “solar ready.”
- **Net metering** – Solar PV systems are more economical for homeowners and businesses when the rules for selling power back into the grid compensate PV owners fairly. Strong “net metering” policies (as well as rules that require utilities to respond quickly to customers’ requests to connect PV systems to the grid) can encourage the installation of solar power systems and other forms of on-site power generation.
- **Fair standards for wind power** – In many parts of the country, new wind power projects face an array of economic obstacles resulting from outmoded regulations and market rules. Wind power projects are often unfairly penalized under old market rules designed for conventional power plants.<sup>96</sup> In addition, many states that have undergone retail restructuring now require utilities to purchase power on the open market in short, one- to

three-year long contracts. Because wind power is capital intensive, the limits on long-term contracts reduce the attractiveness of wind as an investment. State PUCs and regional transmission organizations should adopt policies that allow wind power to play a growing role in supplying energy.

## Power System Planning

Nuclear power plants face a series of fundamental problems as a source of electricity. First, electricity is generally in greatest demand in centers of population—areas where large numbers of people live, work, shop and carry out their daily activities. Nuclear power plants, however, are best suited for areas where population density is low. High population density, for example, would make efficient evacuation difficult, if not impossible, in the event of a nuclear accident.

Nuclear power plants are also generally massive in scale, supplying power for large numbers of homes and businesses. To move power from the nuclear power plants where it is generated to the places where it is used, utilities must invest in transmission lines. Adding transmission capacity is expensive and frequently engenders local opposition. In addition, expanding the transmission network and adding new, centralized sources of power enhance dependence on the nation's interconnected power grid—a grid that failed spectacularly during the 2003 blackout in the Northeast and on several other occasions.

Large-scale nuclear power plants face another disadvantage as a source of power—they require the maintenance of large amounts of backup generating capacity for times when the plant is shut down for refueling or routine maintenance or due to unexpected problems. All sources of power are susceptible to sudden shutdown. But because nuclear power plants are so large, the potential disruption to the grid is

greater. As a result, power systems that rely on large nuclear power plants must maintain higher reserve margins and/or more “spinning reserves” than they would if they relied on a greater number of smaller generators. The discovery of a technological problem common to several nuclear reactors could lead to serious reliability problems.

Finally, nuclear power plants could prove less resilient in the event of a widespread power outage like the 2003 blackout in the northeastern U.S. and Canada. Nuclear power plants are designed to shut down (or “trip”) when a blackout occurs. Restarting those plants after the blackout requires them to draw power from the grid, meaning that power first has to be restored to the nuclear reactors before they can restart and contribute power to the restoration of the grid. Ontario's heavy reliance on nuclear power during the 2003 blackout, for example, led to electricity shortages in the province well after power to U.S. consumers had been restored.<sup>97</sup> In the U.S., the first shut-down nuclear plant to restart began generating power three days after the blackout, with the last not returning to service until eight days after the blackout.<sup>98</sup> By contrast, most fossil fuel and renewable power plants were able to generate power as soon as conditions on the grid were stabilized.

A decentralized and diversified power generation system that takes greater advantage of local sources of power provided by a mix of technologies and resources would provide greater reliability and stability to the electricity system than the current reliance on large, centralized power plants. “Distributed generation” technologies—such as solar power, fuel cells, natural gas-fired microturbines and combined heat-and-power technology—hold the potential to deliver electricity more efficiently and with greater reliability than traditional power generation.

The question of whether to invest in centralized power generation or distributed

generation arises in power system planning. Planning for the electricity system is carried out at several levels—at state PUCs, at the regional level through multi-state organizations, and through independent system operators and regional transmission organizations (ISOs/RTOs). In addition, the siting and construction of transmission lines is also influenced by the decisions of local governments and state energy facility siting boards (in some states).

The benefits of distributed generation are often not considered in power system planning processes that are geared toward today's centralized system of power generation. A 2002 study by the Rocky Mountain Institute found that small-scale distributed generation technologies frequently produce greater value than centralized sources of generation because they are less risky, less dependent on fossil fuels (which are volatile in price), are more efficient, and make the power grid more reactive.<sup>99</sup> In addition, a number of significant barriers—including high fees, cumbersome technical requirements, and burdensome and one-sided contracts—have kept distributed generation from gaining more of a foothold.<sup>100</sup>

Advocates can reduce dependence on nuclear power (as well as other centralized sources of electricity with environmental impacts, such as coal-fired power plants) by working to ensure that the benefits of distributed generation are considered fairly in the utility planning process and by working to remove unjustified barriers to the spread of clean, local forms of power generation.

## Portfolio Management

Some states that had moved toward retail deregulation are now recognizing that most consumers will continue to buy their power from traditional utilities indefinitely and that those utilities should be required to come up with balanced, long-term plans for securing power for those customers. This process is called “portfolio management.”

California's PUC, for example, now requires utilities to submit long-term power procurement plans. The PUC has required those plans to give energy efficiency and demand management top priority, followed by the development of renewable power resources and distributed generation.<sup>101</sup> Only after energy efficiency, demand management, renewables and distributed generation are considered can fossil fuel-fired power plants be proposed.<sup>102</sup>

In states that have restructured their electric industries, but where most customers remain served by traditional utilities, portfolio management can ensure that utilities make sensible choices for the procurement of power. This, in turn, reduces demand for nuclear power by ensuring that less costly and lower-risk options are considered first. States with open retail power markets but little competition should be encouraged to adopt portfolio management processes similar to those in place in California.

## Climate Policy and Market-Based Environmental Regulations

The nuclear power industry touts its product as being clean and safe. The industry's long history of safety problems, its devastating impact on marine ecosystems, and the long-term environmental challenges posed by nuclear waste storage give lie to that claim. But nuclear power does have some legitimate environmental advantages over coal-fired power plants and, to a lesser extent, those fueled by natural gas. Unlike these power sources, nuclear power plants do not release soot or smog-forming pollutants into the air. And the life-cycle impact of nuclear power plants on the global climate is relatively low.<sup>103</sup>

As a result, the nuclear industry has been aggressive in seeking to make its technol-

ogy eligible for credits under a variety of market-based environmental programs. “Market-based” programs are those that use market mechanisms—such as the trading of emission credits—to achieve environmental goals at the lowest aggregate cost. In northeastern states that fail to meet national health standards for ozone, for example, credits for the release of smog-forming pollution are traded. European nations have chosen to implement an emission trading system to reduce global warming pollution. A similar “cap and trade” system for global warming pollution is in the process of being launched in the northeastern U.S.

Market-based policies for the control of air pollution and global warming give nuclear power plants an inherent leg up in the marketplace. Unlike the owner of a coal or natural gas power plant, nuclear power plant owners are not required to buy allowances to emit carbon dioxide or to pay for pollution reductions elsewhere. However, the nuclear industry is pushing aggressively for its plants to receive even more financial advantages by making the plants eligible for consideration as “offsets” or for funding through “set-aside” programs for zero-emission sources of electricity.

“Offsets” allow facilities required to comply with emission limits to pay for emission reductions elsewhere, rather than reducing their own emissions. For example, the owner of a coal-fired power plant could

contribute to the construction of a nuclear power plant in another state or country on the premise that doing so would avoid enough pollutant emissions to compensate for the continued operation of the coal-fired power plant.

“Set-asides” are allocations of valuable emission credits made to jump-start “cleaner” technologies. For example, a cap-and-trade program might require that 5 percent of all emission permits be allocated to the government, with the proceeds from the sale of the permits used to support zero-emission technologies. Ideally, the funds raised through such a sale would be used to promote renewable energy and other technologies that are clearly in the public interest. But a poorly designed set-aside program could also allow nuclear power plants to receive these funds.

Both offsets and set-asides have the potential to become direct subsidies to nuclear power—unless nuclear power plants are explicitly disqualified from receiving these incentives. The parties to the Kyoto Protocol have specifically barred countries with global warming emission reduction targets from using nuclear power projects in other countries as offsets.<sup>104</sup> However, in the United States, the state of New Hampshire has allowed the Seabrook nuclear power plant to qualify for set-aside funding in the state’s nitrogen oxide control program.<sup>105</sup> And the recent cap-and-trade agreement in

## Nuclear Power and Hydrogen

To date, nuclear reactors have primarily been used as a source of electricity. But the recent run-up in oil prices and concerns about long-term oil supplies have led some to push nuclear power as a source of hydrogen fuel for vehicles.

A number of states, including California and Florida, are proceeding with programs to promote the development and use of hydrogen as a vehicle fuel. Citizens need to watch these state programs and federal hydrogen development programs carefully in order to ensure that they prioritize renewable, and not nuclear or fossil fuel-based, hydrogen generation, and that they do not provide a further “back door” subsidy to the nuclear industry.

the Northeast leaves open the possibility that nuclear power plants could be considered eligible for funding under its set-aside provision.

Nuclear power plants ought not to receive undue financial advantage from programs designed to reduce emissions of other pollutants. As a matter of principle, technologies with environmental and safety challenges as significant as nuclear power should not be eligible for subsidies under the guise of environmental protection. And as a practical matter, nuclear power is among the most expensive solutions to global warming and air pollution. Allowing major nuclear facilities to qualify for these funds will tend to crowd out smaller-scale—and often more economically appealing—competitors.

Advocates can take several steps to ensure that nuclear power does not unduly benefit from these programs. First, they can work to ensure that only clean, renewable sources of energy and not “zero-emission” forms, are eligible for financial support. If that fails, they can ensure that offsets and set-asides not be used to support projects that would have occurred anyway without the additional financial incentives.

## Organizing Opportunities

Citizens looking at the political and regulatory climate surrounding nuclear power often have reason to feel discouraged. Large utilities and power generation companies are wealthy and politically powerful. Municipalities that host nuclear power plants may depend on them for tax revenue and oppose efforts to shut the plants down. Powerful business interests may see nuclear power, incorrectly, as the most realistic solution to the long-term energy needs of their region. Utility regulators and system planners often appear pre-disposed toward large additions of generation and transmission capacity, rather than smaller-scale

generation or efficiency improvements. The NRC process for licensing nuclear reactors ignores many key concerns and limits the public’s opportunity to have a voice. And generous federal subsidies supported by Congress and the president add further momentum to nuclear power.

In short, in some parts of the country, none of the many opportunities to challenge nuclear power listed in this paper is likely to be successful unless it is matched by vigorous and sustained action on the part of the public. Only by taking their case directly to the public can advocates ensure that elected officials, regulators, utilities and generating companies are forced to defend proposals to expand nuclear power capacity.

The anti-nuclear movement of the 1970s and 1980s was successful in awakening and channeling public concern over nuclear power. And in recent years, a revitalized movement has brought additional scrutiny to nuclear proposals in a variety of states. To follow are several organizing strategies and techniques that can be used to raise the many serious problems posed by nuclear power in local and state political debates.

## Local Resolutions

Local and county governments have many reasons to be concerned about the operation of nuclear power plants. Local emergency personnel have the immediate responsibility as “first responders” to protect the public in the event of a nuclear accident or terrorism. Municipalities and counties must concern themselves with evacuation plans and other emergency measures. In addition, while nuclear power plants represent an economic boon to some communities, they often saddle communities with an aesthetically unpleasant land use that crowds out other opportunities for residential and business growth.

As a result, many communities are willing to lend their support to resolutions opposing the operation, relicensing or construction of a nuclear power plant.

Passing anti-nuclear resolutions through town and city councils or county governing bodies can add great legitimacy to an advocate's claim to represent the public interest in opposing a nuclear power proposal. In New York, for example, dozens of municipalities, county governments, school boards and other groups have passed resolutions calling for the shutdown of the Indian Point nuclear reactor on the Hudson River above New York City.<sup>106</sup>

Local resolutions are an important demonstration of local opposition to nuclear power in and of themselves. But they also create an opportunity to build support among political leaders at both the state and local level. State representatives, senators, governors and members of Congress tend to be responsive to public concerns in ways that agency officials are not. Elected officials can be important allies in an effort to challenge nuclear power plants, with the power to demand information from government agencies and to put pressure on regulators to do their jobs effectively.

### **Alliances with Emergency Officials**

The increased risk of terrorism in the wake of the September 11, 2001 attacks, coupled with the failure of evacuation procedures in response to Hurricane Katrina, have generated concern among citizens and elected officials about how public safety would be protected in the event of a terrorist attack on a nuclear reactor or spent fuel pools. As "first responders," local and county emergency personnel have a strong interest in ensuring that adequate plans are in place to evacuate citizens in a nuclear emergency.

Incredibly, the issues of terrorism and evacuation plans are not formally considered in the NRC's relicensing process. Instead, the NRC only requires nuclear power plants to maintain adequate levels of safety "under requirements of their original licenses." In other words, any changes that took place over the initial 40-year lifetime

of the plant—other than aging of the plant's components—are generally not considered in relicensing.

As residents living near nuclear reactors can attest, much can change in 40 years. Nuclear power plants that were built in once-remote areas are now in the midst of growing population centers. Population growth in some areas has made evacuation in the event of a sudden nuclear accident virtually impossible. For example, three counties near the Indian Point plant have refused to certify the emergency response plans for the plant because they believe the plans would be ineffective in the event of an actual emergency.<sup>107</sup>

Emergency officials and government agencies may or may not be able to be enlisted in outright opposition to relicensing of a nuclear power plant. They are, however, potentially key allies in ensuring that legitimate issues regarding plant security and emergency planning are at least voiced within the license renewal process, if not actually taken into account by the NRC.

### **Corporate Campaigns**

One way to challenge the construction or relicensing of a nuclear reactor is to convince the corporation proposing the plan to change its mind. This, as might be expected, is not an easy thing to do. But the process of organizing a corporate campaign can identify unlikely allies who can be influential in other forums.

### **Organizing Shareholders**

Corporate management is ultimately responsible to the shareholders. Shareholders can influence the conduct of managers directly through the filing of resolutions at corporations' annual meetings. While few shareholder resolutions ever receive a majority vote, resolutions that attract even a relatively modest vote can draw media attention to the issues surrounding nuclear power and convey shareholder discontent to the management. And in some cases,

shareholder resolutions have helped lead to changes in corporate policy.

Several organizations representing those concerned about nuclear power have filed shareholder resolutions. Typically, these resolutions call attention to the financial liabilities inherent in operating nuclear power plants, particularly the risk of a nuclear accident or issues related to long-term nuclear waste storage. Other advocates have used shareholder resolutions to challenge companies to increase their production of clean, renewable fuels.

### **Organizing Customers**

Utility customers are also an important potential target for an organizing campaign. In the 1990s, for example, New Jersey organizations seeking to close the Salem nuclear power plants encouraged customers of the plant's utility owner to put stickers on their utility bills urging the utility to "Unplug Salem." But residential customers are not the only potential target of an organizing effort.

Industrial customers were among those most badly burned by the 1970s and 1980s experiences with nuclear power. Some industrial consumers would likely welcome the addition of nuclear power (or any major increase in generation capacity) in the hopes that it would deliver cheap and stable electricity over the long haul. But industrial customers in traditionally regulated states have ample reason to worry that addition of nuclear power plant costs to the rate base would increase the prices they pay for power, just as it did during the first wave of nuclear power plant construction. Even in restructured states, some industrial customers might have concerns over the impact of nuclear power on grid reliability or have reasons to support cleaner alternatives such as distributed generation, combined heat and power, or improved energy efficiency.

Industrial consumers may wind up taking positions for or against nuclear power. But in either case, their support or opposi-

tion is likely to have great weight with policy makers, RTO/ISO boards, PUCs and the corporations proposing nuclear power expansion. Finding out where they stand early on, and working to influence their position, can be a useful strategy.

### **Creating Publicity**

Generating media attention is a key part of any corporate-focused campaign. Many advocates have extensive experience with directing the attention of the media to their issues. But the content of publicity in a corporate campaign is just as important as the quantity of publicity received.

A major goal of publicity in a corporate-focused campaign is to put a name and face on objectionable conduct. In the case of nuclear power, this is straightforward: all nuclear power plants have a corporate owner and these owners typically have a public face, the CEO. Increasingly, these corporate owners and CEOs do not live in the communities or states where their plants are located. As a result, a good deal of publicity must be generated around who the companies are and how they do business.

In New Jersey, for example, campaigners opposing relicensing of the Oyster Creek nuclear power plant have focused their attention on the plant's owner: Exelon Corporation of Chicago. Advocates have publicized the company's record in its operation of nuclear power plants in other states, and charged the company with putting profits over public safety in its operation of nuclear plants.

Presenting solid, factual research can also generate publicity. There are many sources of information detailing the corporate practices of nuclear power plant owners. Sources of information that should be consulted include NRC filings, reports from labor unions and insider "whistle-blowers," and Securities and Exchange Commission reports and other regulatory filings.

One key to achieving the best results

from organizing and publicity efforts is to begin them early—well before a relicensing application is filed or plans for a new nuclear plant are announced. Acting early achieves several goals. It establishes the terms of the debate in the public mind at the outset. It also raises the bar for the corporation proposing the relicensing or expansion, demonstrating to them that they will need to marshal more resources to achieve their goals. Acting early can also force proponents to delay their application for relicensing or the licensing of a new reactor, which can play to the advantage of opponents.

### **Building Support for Alternative Energy Sources**

Any campaign to challenge nuclear relicensing or the construction of new nuclear power plants is likely to require an alternative response to a region's energy needs. As described above, energy efficiency, renewable energy, and distributed generation are often cleaner, cheaper and less risky alternatives to nuclear power plants.

Campaigns for alternative energy sources have the potential to bring unusual allies into the fold. Local solar and wind power manufacturers, as well as energy services companies, might be willing to participate

in such a campaign. Advocates for low-income consumers similarly have an interest in protecting consumers against high prices. Rural communities, which will benefit from expansion of renewable power sources such as wind, also have a stake in the issue, as do some labor unions, which stand to benefit from the large number of jobs created by energy efficiency and renewable energy.

Advocates would do well to identify partners and build support for a clean energy agenda at the same time they challenge nuclear power proposals. Presenting a better, and often more popular, alternative to nuclear power allows decision-makers to refute arguments that nuclear power expansion is necessary for a region's economic health and enable advocates to shift the debate in the media to friendlier turf.

### **Intervention in NRC Proceedings**

NRC licensing proceedings, as noted above, are often stacked in favor of the nuclear industry. However, these proceedings give provide a forum to raise critical issues about nuclear power plants, to enlist the support of like-minded groups and individuals, and to create a public record that can later be used to challenge nuclear power in other forums. As such, they provide a useful organizing opportunity—even if the chances of winning outright before the NRC are small.

# Conclusion

There are many reasons for citizens to be skeptical about a “nuclear renaissance” in the U.S. Level-headed analysis of the current state of nuclear power suggests that the safety, security, cost and environmental concerns that have plagued nuclear power over the last 50 years have not gone away.

Each one of these issues leads to a potential policy handle or organizing opportunity that concerned citizens can use to hold nuclear power plants to a higher level of scrutiny. While winning battles at the federal level over safety issues may be difficult due to the pro-nuclear slant of the

NRC and many federal decision-makers, there are ample opportunities to raise the economic, environmental and security concerns at the state and local levels.

With the passage of the pro-nuclear Energy Policy Act of 2005, the accelerated planning for new nuclear power plants by some utilities, and continued concerns over America’s energy future, now is the time for citizens to raise the legitimate concerns about nuclear power in public policy forums and to develop and work for a vision of a cleaner energy future that can satisfy America’s energy needs using clean, secure and stable sources of energy.

# Notes

1 Peter A. Bradford, *Nuclear Power's Prospects*, Power Point presentation to California Energy Commission Nuclear Issues Workshop, 16 August 2005.

2 50,000 tons of nuclear waste: U.S. General Accounting Office, *Spent Nuclear Fuel: Options Exist to Further Enhance Security*, July 2003. Electricity rates have typically been higher in states with greater reliance on nuclear power than in non-nuclear states. See Public Citizen, *States Pay the Price for Relying on Nuclear Power*, 12 June 2001.

3 Nuclear Energy Institute, *Quantifying Nuclear's Economic Value*, downloaded from [www.nei.org/index.asp?catnum=2&catid=49](http://www.nei.org/index.asp?catnum=2&catid=49), 24 January 2006.

4 See, for example, Patrick Moore, "Going Nuclear: A Green Makes the Case," *Washington Post*, 16 April 2006. Moore claims that nuclear power "is in fact one of the least expensive energy sources," citing only the cost of operating existing reactors.

5 Nuclear Energy Institute, *Nuclear Plants in States Implementing Retail Competition*, downloaded from [www.nei.org/documents/nuclearplants.pdf](http://www.nei.org/documents/nuclearplants.pdf), 24 January 2006.

6 States with nuclear power plants have among the nation's highest electricity rates. As of 2001, rates were approximately 25 percent higher in states with nuclear power plants than in states without. Source: Public Citizen, *Consumers in Nuclear States Pay 25 Percent More for Electricity*,

*Analysis Shows*, [press release], 12 June 2001.

7 Nuclear Information and Resource Service, *Talking Points on Bush/Cheney Energy Plan*, downloaded from [www.nirs.org/nukerelapse/bush/talkingpointsonbush.htm](http://www.nirs.org/nukerelapse/bush/talkingpointsonbush.htm), 24 January 2006.

8 Laura Maggi, "Making White Elephants Fly," *American Prospect Online Edition*, 28 February 2000.

9 Edward P. Kahn, "A Folklorist's Guide to the Used Plant Market," *The Electricity Journal*, 12(6): 66-77, 1999, cited in Paul L. Joskow, "Deregulation and Regulatory Reform in the U.S. Power Sector," in Sam Peltzman and Clifford Winston, eds., *Deregulation of Network Industries: What's Next*, AEI-Brookings Joint Center for Regulatory Studies, Washington, D.C., 2000.

10 Price of Ginna sale and book value from *Platt's POWER*, "RG&E Gets Nod for Sales 470-MW Ginna Nuclear Plant," 10 June 2004. Price per megawatt based on sales price of plant only (not including fuel) from Nuclear Energy Institute, *U.S. Nuclear Plant Sales*, updated August 2005.

11 \$145 billion from Marshall Goldberg, Renewable Energy Policy Project, *Federal Energy Subsidies: Not All Technologies Are Created Equal*, July 2000.

12 \$4.8 billion from Taxpayers for Common Sense, *Nuclear Subsidies in the Energy Bill: A Spending Explosion*, downloaded from [www.taxpayer.net](http://www.taxpayer.net), 14 December 2005; \$7.3

billion from U.S. PIRG and Friends of the Earth, *Final Energy Tax Package Overwhelmingly Favors Polluting Industries*, 27 July 2005.

13 Jill Lancelot, Taxpayers for Common Sense, *Price-Anderson Act: Special Subsidies and Protections for the Nuclear Industry*, downloaded from [www.taxpayer.net/energy/priceanderson.htm](http://www.taxpayer.net/energy/priceanderson.htm), 18 January 2006.

14 In July 2005 testimony before a congressional committee, General Atomics Senior Vice President David Baldwin agreed that Price-Anderson was a “disincentive for safety” and should be phased down over time, noting that reactors that were truly “inherently safe” would not need the protection Price-Anderson provides. See *The Next Generation of Nuclear Power*, Hearing Before the Subcommittee on Energy and Resources, Committee on Government Reform, U.S. House of Representatives, 29 June 2005.

15 U.S. Nuclear Regulatory Commission, *Frequently Asked Questions About NRC's Response to the 9/11/01 Events*, downloaded from [www.nrc.gov/what-we-do/safeguards/faq-911.html](http://www.nrc.gov/what-we-do/safeguards/faq-911.html), 24 January 2006.

16 Doug Koplow, EarthTrack Inc., *Nuclear Power in the U.S.: Still Not Viable Without Subsidy*, Power Point presentation to Nuclear Power and Global Warming Symposium, Nuclear Policy Research Institute, November 2005.

17 Massachusetts Institute of Technology, *The Future of Nuclear Power: An Interdisciplinary MIT Study*, 2003.

18 See Amory Lovins, Rocky Mountain Institute, *Nuclear Power: Economics and Climate-Protection Potential*, 11 September 2005. The cost of energy efficiency improvements varies, but the life-cycle cost of electricity saved as a result of state public benefits energy efficiency programs has been estimated at between 2.3 and 4.4 cents/kWh. Source: Martin Kushler, Dan York and Patti White, American Council for an Energy-Efficient Economy, *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies*, April 2004.

19 Bruce Biewald, *Affidavit of Bruce Biewald in the Matter of Exelon Generating Company LLC (Early Site Permit for Clinton ESP Site)*, before the Atomic Safety and Licensing Board, U.S. Nuclear Regulatory Commission, docket no. 52-007-ESP.

20 Levelized cost estimates: U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook 2006*, February 2006,

Figure 58. Capital cost and other assumptions: U.S. Department of Energy, Energy Information Administration, *Assumptions to the Annual Energy Outlook 2006*, March 2006.

21 U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook 2006*, February 2006, Figure 58.

22 Public Citizen, *Consumers in Nuclear States Pay 25 Percent More for Electricity, Analysis Shows*, [press release], 12 June 2001.

23 Standard & Poor's, *Credit Aspects of North American and European Nuclear Power*, 9 January 2006.

24 See Kevin Kamps, Nuclear Information and Resource Service, *The Science and Politics of the Proposed High-Level Radioactive Waste Dump at Yucca Mountain, Nevada, USA*, 28 November 2003.

25 See Environmental Working Group,  *Marks the Spot: We Can't Solve America's Nuclear Waste Problem if We Keep Making More*, downloaded from [www.ewg.org/reports/nuclearwaste/exec\\_summ.php](http://www.ewg.org/reports/nuclearwaste/exec_summ.php), 24 January 2006, which suggests that recent NRC relicensing of nuclear power plants will produce wastes that will well exceed the capacity of Yucca Mountain.

26 National Academy of Sciences, *Spent Fuel Stored in Pools at Some U.S. Nuclear Plants Potentially at Risk from Terrorist Attacks: Prompt Measures Needed to Reduce Vulnerabilities* [press release], 6 April 2005.

27 National Academy of Sciences, Board of Radioactive Waste Management, *Safety and Security of Commercial Spent Nuclear Fuel Storage: Public Report*, National Academies Press, 2005.

28 U.S. Government Accountability Office, *Nuclear Regulation: NRC Needs to More Aggressively and Comprehensively Resolve Issues Related to the Davis-Besse Nuclear Power Plant's Shutdown*, May 2004.

29 U.S. Nuclear Regulatory Commission, *Information Report – October 22, 2004*.

30 U.S. Nuclear Regulatory Commission, *Event Report for July 28, 2003*.

31 U.S. Nuclear Regulatory Commission, *Frequently Asked Questions About Hope Creek and Salem*, downloaded from [www.nrc.gov/reactors/plant-specific-items/hope-creek-salem/faq.html](http://www.nrc.gov/reactors/plant-specific-items/hope-creek-salem/faq.html), 25 April 2006.

32 David Lochbaum, Union of Concerned Scientists, *Letter to Mr. A. Randolph Blough, Director of Reactor Projects, U.S. Nuclear Regulatory Commission Region I, Re: Same Problems at Same*

- Nuclear Plant Deserve Same Protection for the Public*, 21 June 2004.
- 33 Riverkeeper, *Riverkeeper Calls on Governor Pataki and Senator Clinton to Investigate Latest Safety Problem at IP* [press release], 21 September 2005.
- 34 Greg Clary, "Indian Point, NRC Officials Met With Skepticism," *The Journal News*, 29 March 2006.
- 35 New York State Public Service Commission, *Report on February 15, 2000 Event at Indian Point 2*, 16 May 2000.
- 36 Riverkeeper, Union of Concerned Scientists, *Indian Point Energy Center – Petition Pursuant to 10 CFR 2.206 – PWR Containment Sump Failure*, 8 September 2003.
- 37 Five of the six other incidents identified in David Lochbaum, Union of Concerned Scientists, *Petition Pursuant to 10 CFR 2.206 – Enforcement Action – Longstanding Leakage of Contaminated Water*, submitted to Luis A. Reyes, Executive Director for Operations, U.S. Nuclear Regulatory Commission, 25 January 2006. The sixth incident is the leak of water containing tritium from the Palo Verde nuclear plant in Arizona.
- 38 David Lochbaum, Union of Concerned Scientists, *Petition Pursuant to 10 CFR 2.206 – Enforcement Action – Longstanding Leakage of Contaminated Water*, submitted to Luis A. Reyes, Executive Director for Operations, U.S. Nuclear Regulatory Commission, 25 January 2006.
- 39 U.S. Nuclear Regulatory Commission, *Preliminary Notification of Event or Unusual Occurrence: Palo Verde Nuclear Generating Station: Followup for Tritium Contamination Found in Water Onsite*, PNO-IV-06-001, 17 March 2006.
- 40 Union of Concerned Scientists, *Snap, Crackle & Pop: The BWR Power Uprate Experiment*, 9 July 2004.
- 41 Michael Erman, *Reuters*, "FirstEnergy Admits to Nuclear Power Plant Cover-Up," 20 January 2006.
- 42 Union of Concerned Scientists, *Nuclear Reactor Security*, downloaded from [www.ucsusa.org/clean\\_energy/nuclear\\_safety/page.cfm?pageID=176](http://www.ucsusa.org/clean_energy/nuclear_safety/page.cfm?pageID=176), 24 July 2003.
- 43 U.S. General Accounting Office, *Nuclear Regulatory Commission: Oversight of Security at Commercial Nuclear Power Plants Needs to Be Strengthened*, September 2003.
- 44 U.S. Government Accountability Office, *Testimony Before the Subcommittee on National Security, Emerging Threats and International Relations, Committee on Government Reform, House of Representatives: Nuclear Regulatory Commission: Preliminary Observations on Efforts to Improve Security at Nuclear Power Plants*, 14 September 2004.
- 45 U.S. Government Accountability Office, *Nuclear Power Plants: Efforts Made to Upgrade Security, but the Nuclear Regulatory Commission's Design Basis Threat Process Should Be Improved*, March 2006.
- 46 U.S. Government Accountability Office, *Nuclear Regulatory Commission: NRC Needs to Do More to Ensure that Power Plants Are Effectively Controlling Spent Nuclear Fuel*, April 2005.
- 47 Union of Concerned Scientists, *Extracting Plutonium from Nuclear Reactor Spent Fuel*, downloaded from [www.ucsusa.org/global\\_security/nuclear\\_terrorism/extracting-plutonium-from-nuclear-reactor-spent-fuel.html](http://www.ucsusa.org/global_security/nuclear_terrorism/extracting-plutonium-from-nuclear-reactor-spent-fuel.html), 8 February 2006; Union of Concerned Scientists, *Fissile Material Basics*, downloaded from [www.ucsusa.org/global\\_security/nuclear\\_terrorism/fissile-materials-basics.html](http://www.ucsusa.org/global_security/nuclear_terrorism/fissile-materials-basics.html), 8 February 2006.
- 48 *Bloomberg*, "Bush Budget Seeks \$250 Million for Nuclear Fuel Reprocessing Plan," 6 February 2006.
- 49 Susan Hutson, Nancy Barber, et al., U.S. Geological Survey, *Estimated Use of Water in the United States, 2000*, revised February 2005.
- 50 American Wind Energy Association, *Wind Energy and the Environment*, downloaded from [www.awea.org/faq/tutorial/wwt\\_environment.html](http://www.awea.org/faq/tutorial/wwt_environment.html), 24 January 2006.
- 51 Linda Gunter, Paul Gunter, Scott Cullen and Nancy Burton, *Licensed to Kill: How the Nuclear Power Industry Destroys Endangered Marine Wildlife and Ocean Habitat to Save Money*, 2001.
- 52 Ibid.
- 53 Ibid.
- 54 New Jersey Office of the Attorney General, *New Jersey Reaches \$1 Million Settlement with Owner of Oyster Creek Nuclear Power Plant Regarding Fish Kill Caused by Thermal Discharge*, press release, 8 April 2004.
- 55 U.S. Government Accountability Office, *Testimony Before the Subcommittee on Clean Air, Climate Change and Nuclear Safety, Committee on Environment and Public Works, U.S. Senate, Nuclear Regulatory Commission: Challenges Facing NRC in Effectively Carrying Out its Mission*, 26 May 2005.

56 See note 1.

57 David Lochbaum, Union of Concerned Scientists, *Nuclear Plant Risk Studies: Failing the Grade*, August 2000.

58 Nuclear Regulatory Commission, *Memorandum and Order CLI-02-24: In the Matter of Duke Cogema Stone & Webster, Docket No. 70-3098-ML*, 18 December 2002.

59 Arjun Makhijani and Scott Saleska, Institute for Energy and Environmental Research, *The Nuclear Power Deception*, April 1996.

60 Arjun Makhijani, Institute for Energy and Environmental Research, *The Pebble Bed Modular Reactor*, downloaded from [www.ieer.org/comments/energy/chny-pbr.html](http://www.ieer.org/comments/energy/chny-pbr.html), 24 January 2006.

61 U.S. Nuclear Regulatory Commission, *Design Certification Pre-Application Review – PBMR*, downloaded from [www.nrc.gov/reactors/new-licensing/design-cert/pbmr.html](http://www.nrc.gov/reactors/new-licensing/design-cert/pbmr.html), 24 January 2006.

62 Atomic Energy Act of 1954, P.L. 83-703, as cited in U.S. Nuclear Regulatory Commission, Office of General Counsel, *Nuclear Regulatory Legislation: 107th Congress, 1st Session*, June 2002.

63 CA Pub Res Code § 25524, ME Rev Stat §4374; KY Rev Stat § 278.610, WI Stat Ann § 196.493.

64 MT Code § 75-20-1203; 35-A ME Rev Stat §4374; KY Rev Stat § 278.610, OR Rev Stat 469.597.

65 U.S. Supreme Court, *Pacific Gas & Electric Co. et al v. State Energy Resources Conservation and Development Commission et al*, 461 U.S. 190 (1983).

66 U.S. Environmental Protection Agency, *State Program Status*, downloaded from [cfpub.epa.gov/npdes/statestats.cfm](http://cfpub.epa.gov/npdes/statestats.cfm), 23 January 2006. The states without Clean Water Act permitting authority are Alaska, Idaho, Massachusetts, New Hampshire and New Mexico.

67 Federal Water Pollution Control Act, Sec. 316(a).

68 Federal Water Pollution Control Act, Sec. 316(b).

69 See note 51.

70 Ibid.

71 Riverkeeper, *Seeking Federal Regulations for Cooling Water Intakes, Phase I Lawsuit*, downloaded from [riverkeeper.org/campaign.php/biodiversity/we\\_are\\_doing/100](http://riverkeeper.org/campaign.php/biodiversity/we_are_doing/100), 24 January 2006.

72 Rhode Island Department of the Attorney General, *Rhode Island, Connecticut, Delaware,*

*Massachusetts, New Jersey and New York Sue Over EPA's Failure to Protect the Nation's Waters*, press release, 26 July 2004.

73 David Schlissel, Geoff Keith, et al., Synapse Energy Economics, *Comments on EPA's Proposed Clean Water Act Section 316(b) Regulations for Cooling Water Intake Structures at Phase II Existing Facilities*, 7 August 2002. Estimate is based on an EPA estimate for replacing all current once-through systems with cooling towers.

74 Dick Munson, Northeast-Midwest Institute, *Water Use by Electric Utilities in the Great Lakes*, January 2005.

75 See note 51.

76 U.S. Supreme Court, *Village of Euclid, Ohio v. Ambler Realty Co.*, 272 U.S. 365 (1926).

77 Kevin E. McCarthy, Connecticut Office of Legislative Research, *Siting Agencies in Other States*, 13 August 2002.

78 16 USC 1455 (d)(8).

79 Tony Dutzik, Jasmine Vasavada, Travis Madsen, National Association of State PIRGs, *Toward a Consumer-Oriented Electric System*, June 2004.

80 See 77.

81 Energy and Environmental Analysis, Inc., *Regulatory Requirements Database for Small Electric Generators*, downloaded from [www.eea-inc.com/rrdb/DGRegProject/index.html](http://www.eea-inc.com/rrdb/DGRegProject/index.html), 26 January 2006.

82 William G. Rosenberg, Dwight C. Alpern and Michael R. Walker, *Deploying IGCC in this Decade with 3Party Covenant Financing: Volume II*, May 2005, Chapter 7.

83 Figures from Edison Electric Institute Rate Regulation Department cited in National Academy of Sciences, Commission on Engineering and Technical Systems, *Nuclear Power: Technical and Institutional Options for the Future*, National Academies Press, 1992.

84 Harriet Burt, California Public Utilities Commission, *Bibliography of CPUC Intervener Compensation Decisions from 2002*, downloaded from [www.cpuc.ca.gov/word\\_pdf/report/34768.pdf](http://www.cpuc.ca.gov/word_pdf/report/34768.pdf), 4 April 2004.

85 Citizens' Utility Board of Oregon, *CUB Membership*, downloaded from [www.oregoncub.org/membership.html](http://www.oregoncub.org/membership.html), 24 March 2004.

86 Based on the Regulatory Assistance Project's state IRP surveys, downloaded from

www.raponline.org /Feature.asp?select=14#IRP%20Survey, 5 May 2006.

87 The California ISO, whose board is appointed by the governor, is an exception.

88 Appliance Standards Awareness Project, *Savings from Recent State and National Standards*, Excel spreadsheet, 12 January 2006. Nuclear reactors based on 1,000 MW reactor operating at a 90 percent capacity factor.

89 Steven Nadel, Andrew deLaski, Maggie Eldridge and Jim Kleisch, American Council for an Energy-Efficient Economy and Appliance Standards Awareness Project, *Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards*, March 2006.

90 Dan York and Marty Kushler, American Council for an Energy-Efficient Economy, *ACEEE's Third National Scorecard on Utility and Public Benefits Energy Efficiency Programs: A National Review and Update of State-Level Activity*, October 2005.

91 Ibid.

92 Ibid.

93 Ibid.

94 Assuming that the bulk of renewable energy installations are wind power, operating at a 33 percent capacity factor.

95 Environment California, "It's Official!" *CPUC Approves \$3.2 Billion Solar Program*, press release, 12 January 2006.

96 Randall S. Swisher, "Bringing Wind Energy Up to 'Code,'" *Public Utilities Fortnightly*, June 2004.

97 Public Citizen, *The Big Blackout and Amnesia in Congress*, undated.

98 U.S.-Canada Power System Outage Task Force, *Final Report on the August 14th Blackout in the United States and Canada: Causes and Recommendations*, April 2004.

99 See Amory B. Lovins, E. Kyle Datta, et al., Rocky Mountain Institute, *Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size*, 2002.

100 U.S. Congressional Budget Office, *Prospects for Distributed Electricity Generation*, September 2003.

101 California Public Utilities Commission, *PUC Adopts Long-Term Power Purchase Plans for Utilities to Ensure Adequate Energy Supply for State*, press release, 16 December 2004.

102 Ibid.

103 See, for example, Joseph V. Spadaro, Lucille Langlois and Bruce Hamilton, "Greenhouse Gas Emissions of Electricity Generation Chains: Assessing the Difference," *IAEA Bulletin*, 42:2, 2000. Some researchers, however, suggest that the life-cycle energy use of nuclear power is commonly underestimated and that, should the world's supply of high-grade uranium be exhausted and lower-grade ores be required, the life-cycle carbon dioxide emissions from nuclear power would exceed those of gas-fired power plants. See Jan Willem Storm van Leeuwen and Philip Smith, *Nuclear Power: The Energy Balance*, downloaded from [www.stormsmith.nl/](http://www.stormsmith.nl/), 17 January 2006.

104 United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties in its Seventh Session, Held at Marrakech from 29 October to 10 November 2001, Addendum, Part Two: Action Taken by the Conference of the Parties*, 21 January 2002.

105 Scott Peterson, Nuclear Energy Institute, *Nuclear Energy as an Environmental Answer* [PowerPoint presentation], downloaded from [www.nei.org/documents/Speech\\_Peterson\\_9-19-03\\_EA-slides.ppt](http://www.nei.org/documents/Speech_Peterson_9-19-03_EA-slides.ppt), 24 July 2004.

106 See Riverkeeper, *Mobilizing Support from Municipalities, NYC Community Boards, Labor Groups, School Boards and Civic Groups*, downloaded from [riverkeeper.org/campaign.php/indian\\_point/we\\_are\\_doing/26](http://riverkeeper.org/campaign.php/indian_point/we_are_doing/26), 26 January 2006.

107 Riverkeeper, *Three Out of Four Counties Reject Indian Point Emergency Plans for Fourth Consecutive Year*, press release, 11 January 2006.