NUCLEAR POWER MAY MAKE COMEBACK

Nuclear power may be on the brink of a comeback in the United States—a development driven by concerns about climate change, energy independence and the rising cost of energy. Opinion polling suggests that the combination of these forces may be sufficient to overcome the American public's traditional reluctance to accept nuclear power. In an attempt to resonate with the public's shifting concerns regarding energy, the nuclear industry's talking points highlight the qualities of nuclear power as clean, safe, reliable and affordable.

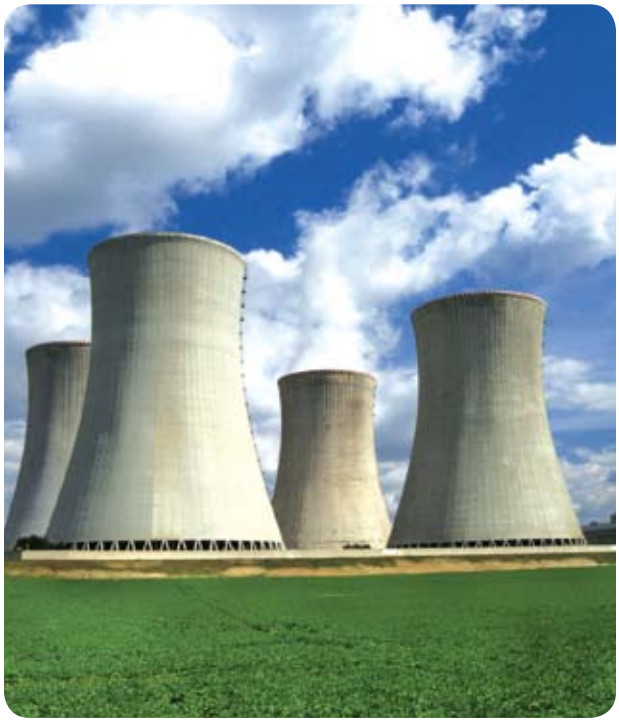
States may play a significant role in bringing about the nuclear renaissance. While regulating nuclear reactor safety is a federal function, states make the final decision on whether new plants can be built and, if so, how the costs will be passed to consumers. Anticipating the coming nuclear renaissance, states such as Florida and South Carolina have positioned themselves to tap the development of new plants by making it easier for utilities to finance new projects.

Not long ago, it appeared nuclear energy would one day be a thing of the past, at least in the U.S. In the decade and a half following the 1979 accident at Pennsylvania's Three Mile Island power plant, utilities canceled plans to build 61 new reactors in 20 states, largely as a result of public concerns over safety and escalating costs to build new plants. But all that may be changing.

The streamlining of the federal licensing process for new plants and federal financial incentives in the 2005 Energy Policy Act are helping to revive the American nuclear industry. In November 2007, the U.S. Nuclear Regulatory Commission received its first application for a new nuclear plant in nearly three decades. As of Dec. 8, 2008, the commission had received 17 applications for new nuclear plants from utility companies and expected to receive three more before the end of 2009 (see map). In all, applicants are requesting permission to add 31 new reactors to the nation's current fleet of 104 reactors. In what could be described as a nuclear gold rush, utilities are scrambling to get a place in line to tap the financial incentives offered by the Energy Policy Act, including loan guarantees, risk insurance and production tax credits.

The nation's nuclear power plants provide approximately 20 percent of the nation's electricity. In 2007, New Jersey, South Carolina and Vermont obtained more than half their electricity from nuclear, with Vermont logging 73.7 percent. As a small state, Vermont's one power plant goes a long way toward meeting the demands of its customers.

But questions remain about the cleanliness, safety, reliability and affordability of nuclear energy.



Is it Clean?

Nuclear energy certainly earns bragging rights for being a clean-air energy source. Compared to carbon-based sources of electricity like coal and natural gas, nuclear does not burn anything therefore it does not emit greenhouse gasses or other airborne pollutants as part of the generation process. Looking at electricity from clean air sources, nuclear has provided well over 60 percent of the total nationwide since 1995, reaching 71 percent in 2006.

In terms of air pollution, therefore, nuclear does deserve the label clean. When it comes to solid waste, however, the situation is somewhat different. The waste produced by nuclear power plants includes highly radioactive spent nuclear fuel for which there is no permanent disposal facility in this country or elsewhere (see sidebar). Although spent fuel can be safely stored for decades at the power plants, the lack of a permanent disposal facility presents what researchers at the Massachusetts Institute of Technology called in a 2003 study "one of the most intractable problems facing the nuclear power industry throughout the world." Some people argue there is ample sound science behind permanent waste disposal—it's the political wherewithal that is lacking. Regardless of the root cause, however, the absence of a permanent disposal facility remains a problem for the industry.

Is it Safe?

Nuclear power plants, in routine operations, can be quite safe. The philosophy behind plant design is "defense in depth," with reactors relying on multiple back-up systems—many of them automatic—to assure safe operation. While no technology is completely risk-free, advances in plant design—such as greater reliance on passive safety systems—should make the next generation of nuclear plants even safer than their counterparts operating today.

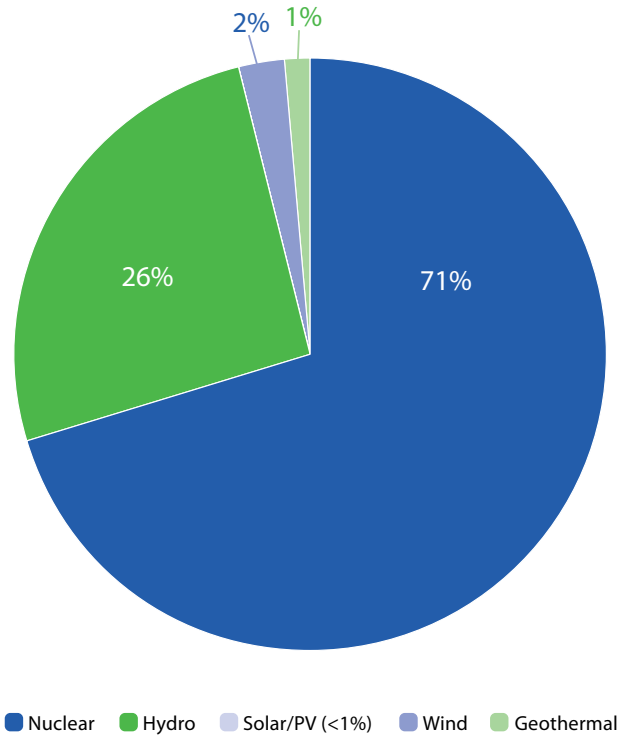
Even if the back-up systems should fail, there are three principal barriers that limit the release of radiation: the sealed fuel rods, the reactor vessel and the reactor containment structure. In addition, nuclear power plants are required to have Nuclear Regulatory Commission-approved emergency preparedness plans to provide protection in the event of an accident. These plans include provisions for training emergency responders and conducting full-scale exercises with officials at the federal, state and local level at least every two years.

The MIT researchers, in the study "The Future of Nuclear Power," observed that safe operation is dependent upon "effective regulation, a management committed to safety, and a skilled work force." In 2001, the Davis-Besse reactor in Ohio was allowed to continue operating despite evidence of a potential problem because of a breakdown in the first two factors. The problem turned out to be significant: Corrosion had eaten a hole almost all the way through the reactor vessel head, which served as a principal barrier to releasing radiation. The remaining protective barrier amounted to less than half an inch of stainless steel. The Nuclear Regulatory Commission fined FirstEnergy, the plant's operator, $5.45 million—the largest single fine ever proposed by the commission—to emphasize "the very high safety and regulatory significance of FirstEnergy's failure to comply with NRC requirements." The incident sent shock waves throughout the industry and within the Nuclear Regulatory Commission, but the positive outcome may be more strict adherence to a culture of "safety first" for the nuclear plants and their regulators.

Power plants are generally safe under normal conditions and vigilant oversight can help prevent accidents. But can reactors and their spent fuel storage facilities be protected from intentional acts of sabotage or terrorism? According to the Nuclear Regulatory Commission, they can. Officials point out the power plants and their on-site storage facilities are not only small targets, they are also robust and highly reinforced. In addition, in the aftermath of the Sept. 11, 2001, terrorist attacks, the Nuclear Regulatory Commission evaluated the potential outcome of a similar attack on a nuclear power plant and found the likelihood of such an attack affecting public health and safety was low. The Nuclear Regulatory Commission also ordered the nuclear industry to augment the already stringent security measures at the power plants, including beefing up the security forces that guard the plants. The result, according to the Nuclear Regulatory Commission, is that nuclear power plants are now "some of the most fortified civilian facilities in the country."

But that doesn't mean there aren't problems. In April 2008, the Nuclear Regulatory Commission fined Florida Power and Light $130,000 after learning security personnel guarding the utility's Turkey Point power plant in Florida were, on multiple occasions, sleeping on the job from 2004 through 2006. The guards were not only sleeping; they also served as lookouts for their fellow guards who slept. A similar situation occurred in 2007 at the Peach Bottom plant in Pennsylvania.

Electricity from Non-Greenhouse Gas Emitting Sources



Source: Energy Information Administration, 2007 and 2008.

Is it Reliable?

As a baseload energy source—a utility's primary and continuous energy source—nuclear power is very reliable. Since 1973, the nuclear industry has logged a steady upward trend in capacity factor, or the amount of energy actually produced compared to the maximum amount capable of being produced. Industry capacity factors have climbed from just 53.5 percent in 1973 to around 90 percent in each of the past four years. This performance compares very favorably with intermittent sources of electricity like wind power, which has an average capacity factor of 20 percent to 40 percent.

Is it Affordable?

Whether nuclear power is affordable is the billion dollar question. The upfront costs of building new nuclear power plants can be staggering. When DTE Energy first announced its plan to build a new 150 megawatt reactor at the Fermi plant in Michigan in February 2007, the company estimated the total project cost at $3 billion. By the time the company filed its license application in September 2008, that estimate had ballooned to $10 billion. The rise in the cost of the new Fermi reactor is not unusual. The length of the review process and construction could run 10 years, making it difficult to reliably estimate total project costs, especially when the cost of materials and fuel are on the rise. Most estimates, however, put the cost of new reactors at $6 billion to $10 billion apiece.

Despite these enormous upfront costs, there is evidence that nuclear power can be competitive with other baseload sources of electricity, even without taxes imposed on carbon emissions (see table). The University of Chicago's 2004 study, "The Economic Future of Nuclear Power," calculated for new nuclear, coal and gas the projected levelized costs of electricity—that is, the present-day cost of producing electricity over the life of the power plant. Put simply: Levelized cost is an economic assessment of the total cost of the power plant. It generally includes costs such as the initial investment, operations and maintenance, cost of fuel and expected returns on investments of capital. The authors in the University of Chicago's study concluded that federal incentives such as those in the Energy Policy Act could reduce the projected levelized cost of new nuclear plants to within reach of coal- or gas-fired plants.

The study by MIT found that, absent carbon taxes, nuclear was the most expensive option for power. Several potential improvements to the licensing and construction process, however, could reduce upfront costs. According to the study, the imposition of carbon taxes could make nuclear highly competitive with coal and gas in terms of the projected levelized cost.

What Are the States Doing?

Nuclear energy does appear to be reliable, generally clean and safe. The affordability question is more difficult to answer because of the rising price of construction costs including materials and labor, uncertainty regarding carbon taxes, the first-of-a-kind nature of building a new fleet of advanced reactors in the U.S. and the instability of credit markets in today's struggling economy. If there will, indeed, be a nuclear renaissance in this country, it will only occur if nuclear power is cost-effective compared to other types of energy, not just in theory but in practice. Federal financial incentives may help the industry over the

Comparison of Costs for Baseload Electricity

Type of plant	Chicago Cost[1] ($/MWh)	MIT Cost[2] (c/kWh)
Pulverized Coal	39-49	5.1
CCGT	42-54	6.83
Nuclear	38-594	8.2

[1]The University of Chicago, The Economic Future of Nuclear Power, 2004. 2003 dollars adjusted for inflation.

[2]Massachusetts Institute of Technology, The Future of Nuclear Power, 2003. 2002 dollars adjusted for inflation.

[3]Estimated cost using the high-end estimate for fuel costs, $6.72 per thousand cubic feet in 2002 dollars.

[4]Estimated cost with federal financial incentives. Without these incentives, the estimated cost is $56-84 per MWh.

MWh = megawatt-hour
kWh = kilowatt-hour

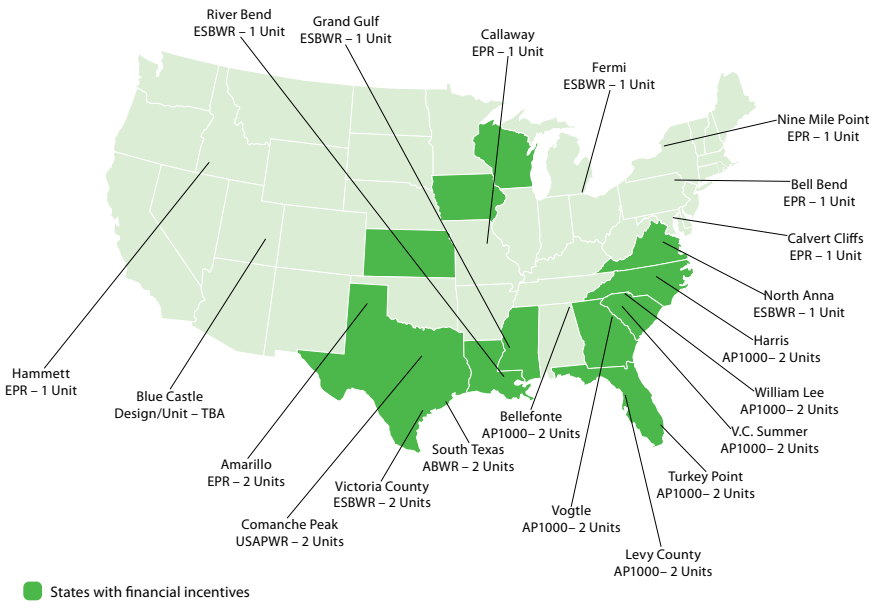
Congress established the national policy on nuclear waste disposal in 1982 when it passed the Nuclear Waste Policy Act. The act gave the federal government the responsibility for developing and operating a permanent repository for spent fuel and high-level radioactive waste. To pay for this service, ratepayers who benefit from nuclear energy contribute to the Nuclear Waste Fund. As of March 31, 2008, ratepayers had contributed nearly $16 billion to the fund.

The repository was originally supposed to begin operating in 1998, but a series of delays has pushed the opening date to 2020 at the earliest. A principal cause for much of the delay is the state of Nevada's strong opposition to the selection of a site within its borders—Yucca Mountain—for development as a national repository.

The Council of State Governments' Midwestern Office and Eastern Regional Conference work cooperatively with the Department of Energy to engage states in decisions regarding the Department's shipments of radioactive waste, including future shipments to a national repository. Through these cooperative agreements, CSG's regional offices in the Midwest and the East organize regional committees of gubernatorial and, in the Midwest, legislative appointees that identify, prioritize and seek to resolve state issues related to the Department of Energy's shipments. High on the list of priorities in both regions is the possible federal pre-emption of state laws, such as those requiring inspections or assessing fees on shipments. In 2006 and 2007, the Department of Energy sought passage of federal legislation that would make it easier for the department to pre-empt state transportation laws. Such pre-emption proposals faced a strong backlash, and no such legislation was introduced in 2008.

For more information on the transportation projects, contact Lisa Janairo (CSG Midwest, *ljanairo@csg.org*) or Cort Richardson (CSG/ERC, *crichardson@csg.org).*

New power plant applications



Source: Nuclear Energy Institute (2008) and Nuclear Regulatory Commission (2008).

initial hurdle of licensing and constructing the first few plants. The imposition of carbon taxes could help.

In addition to federal action to assist the industry, several states enacted legislation and/or rules to help tap nuclear as an energy source for their future. In May 2008, Ohio became the first state to incorporate nuclear energy into its portfolio of clean-energy sources. The standard requires utilities to produce a certain amount of their electricity from alternative energy resources, including nuclear power. By 2025, Ohio utilities must produce 25 percent of the kilowatt-hours sold using these advanced sources. Virginia has a voluntary renewable portfolio standard that defines nuclear energy as a renewable energy source.

States can also augment the federal financial incentives to make it easier for utilities to get financing for these large capital investments. Florida, Georgia, Iowa, Kansas, Louisiana, North Carolina, South Carolina and Wisconsin have all enacted legislation that gives the public utilities commission the authority to certify proposed costs as prudent, thereby ensuring the utilities will be able to recoup these costs under future rate adjustments even if projects are canceled. Four of these states—Florida, Kansas, North Carolina and South Carolina—have joined Mississippi and Virginia to pass laws that allow the cost of construction work in progress to be added to customer rates, thereby making it possible for developers of new nuclear power plants to recover some of their upfront investment during construction rather than having to wait until the plant begins operation.

Such financing can significantly reduce the total cost of a project. For example, Georgia Power estimated in mid-2008 that it would cost $9.6 billion to build two new reactors at its Vogtle plant in Georgia if Georgia Power was allowed by the state to bill the costs of construction work in progress to ratepayers. That's compared to $14 billion if such financing were not available. Allowing utilities to recoup their costs from utility customers during construction does offer the potential benefit of reducing the eventual cost to the consumer; however, the downside to consumers is that they assume the risk today from a utility's investment in a plant that may never operate. For example, a plant could be canceled before construction is complete and therefore may never produce electricity.

States enacted most of these incentives in the past two years, and that impact is already apparent. Of the applications the Nuclear Regulatory Commission has received for power plant licenses since 1979, 75 percent of the new reactors are planned for states, such as Florida and Georgia, that have passed legislation giving some kind of financial incentive to utilities that build new nuclear plants. Focusing on the back end of the nuclear fuel cycle, states can work to bring about a solution to the problem of nuclear waste disposal. Some states ban the construction of new power plants unless a federal disposal facility, or repository, is available (please see sidebar). Legislation to lift these bans has been introduced in some of these states, such as California and Wisconsin, but has not yet been adopted.

Because ratepayers foot the bill for the federal repository program, the National Association of Regulatory Utility Commissioners has advocated for reform of the funding scheme supporting that program. In 2008, the association's board of directors resolved that "a permanent solution for the nuclear waste management and disposal issue should be implemented without delay in order to mitigate the environmental and economic risks and costs associated with investment in new nuclear reactors." The association and other groups advocate on behalf of the states for the federal government to carry out the nation's current policy on disposal as one way to help bring about the rebirth of nuclear power in the U.S.

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