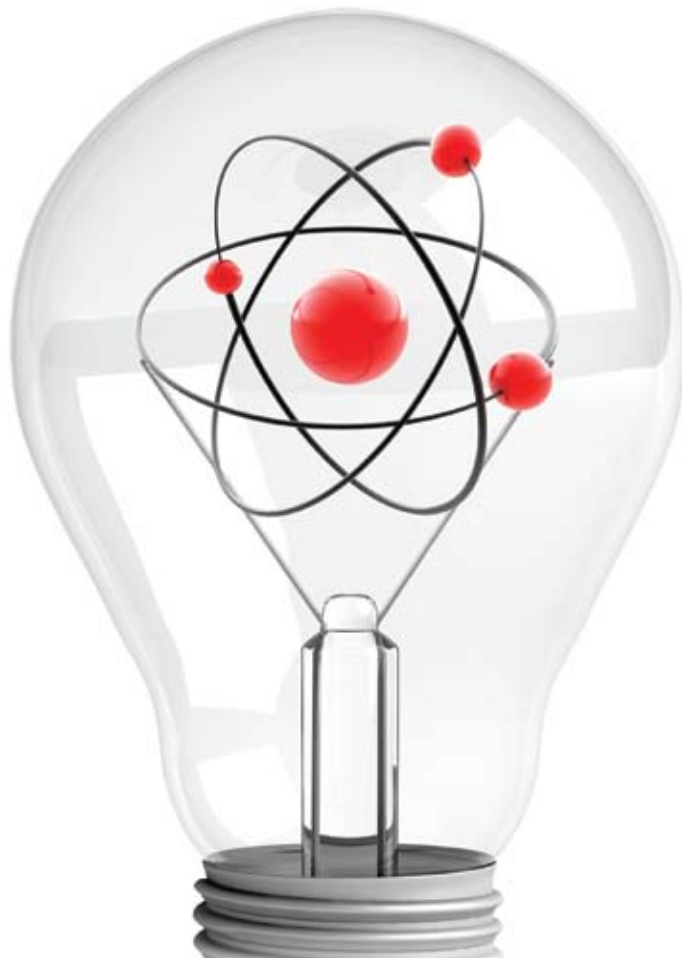


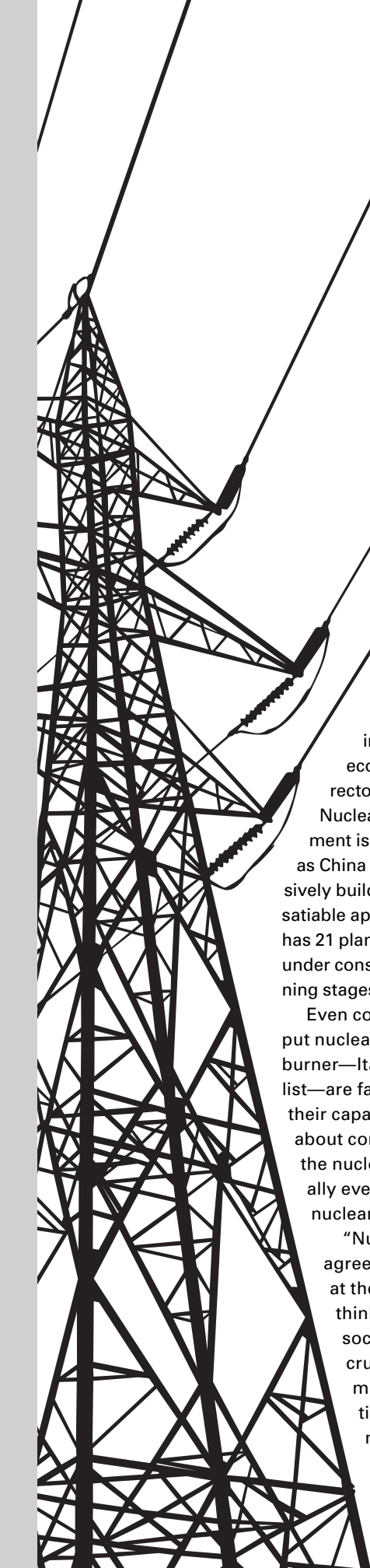
THE NUCLEAR RENAISSANCE

Many countries generate much of their electricity from nuclear power. Soaring energy costs are now prompting the U.S. to put more plants on stream.



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From pariah to prom queen—that's the metaphoric journey of nuclear energy over the past few years.

While long shunned because of widespread concerns about safety, new global realities have sparked substantial new interest in nuclear power. Right now some 30 countries are considering building new nuclear reactors to fuel their economies, according to John Ritch, director general of the London-based World Nuclear Association (WNA). The movement is being led by industrial giants such as China and India, both of which are aggressively building nuclear plants to satisfy their insatiable appetite for energy. China, for instance, has 21 plants under construction. India has six under construction and another eight in planning stages, according to the WNA.

Even countries that once seemed to have put nuclear power development on the back burner—Italy, Britain, and the U.S. head this list—are fast-tracking new projects to expand their capacity. That makes the turnaround just about complete. “Globally we are well into the nuclear renaissance,” says Ritch. “Virtually every serious economy is expanding its nuclear fleet.”

“Nuclear is back on the agenda,” agrees Joel Kurtzman, a senior fellow at the Milken Institute, an independent think tank that studies economic and social challenges, including the energy crunch. “It has a place in the energy mix. Our views of it have been fictitious. Now we are recognizing that nuclear may be the cleanest and safest source of power.”

Some jaws might drop at that sweeping statement. But the reality is that, as ambitious economies wrestle with mounting demand for fossil fuels, government leaders are taking a fresh look at the nuclear sector. The attraction: It offers an alternative to high-priced oil and natural gas, and it does not produce CO₂ emissions to harm the environment.

In the U.S. the paradigm shift is very noticeable, coming after a 30-year lull in the industry. The 1979 Three Mile Island incident effectively fanned public fears about safety and brought construction to a halt. Nevertheless, nuclear power generates about 19% of the nation's electricity (about the same proportion as natural gas), according to Edison Electric, a trade group in Washington, D.C. Although it is way behind coal (50%), nuclear is dramatically ahead of renewables such as hydroelectric (6.5%), and solar and wind power (under 2%).

The hiatus in construction has put the U.S. far behind other industrialized countries in terms of nuclear power capacity. To put it in perspective, France, the world leader, generates 78% of its electricity through nuclear. It is followed by Belgium at 54% and Sweden at 48%, according to the World Nuclear Association.

Jump-starting New Construction

The tide is now poised to turn, fueled in part by the Energy Policy Act of 2005, which provides loan guarantees of up to 80% to build energy plants that revolve around “innovative technologies,” a category into which nuclear falls, say its advocates. The act also provides risk insurance of \$2 billion against licensing delays, as well as tax credits.

The industry, which has not seen a new plant come online since 1996 when the Tennessee Valley Authority opened Watts Bar, says that these inducements are needed to revive interest in building new plants. Particularly crucial are the loan guarantees, say industry experts. "We need the federal government to provide loan guarantees," says Mike Kansler, president and chief nuclear officer of Entergy Nuclear, a Jackson, Miss.-based operator of 12 nuclear reactors in states ranging from Nebraska to Vermont. Guarantees are needed, Kansler elaborates, because Wall Street has indicated it will hang back from funding new reactors—with price tags often upwards of \$5 billion—without them. This debate resides in Congress,

which so far has not provided funding needed to jump-start new construction; but, says Kansler, there are signs that there will soon be a resolution. More momentum comes from the U.S. Department of Energy's Nuclear Power 2010, a program designed to improve the approval process for new reactors, and bring to market advanced reactor technologies from companies such as GE Hitachi and Westinghouse. An upshot is that there are 34 expressions of interest regarding new plant construction now on file with the Nuclear Regulatory Commission (NRC).

This is why Kansler—whose company has filed for a new nuclear reactor license in Mississippi—is convinced that the U.S. nuclear fleet soon will be expanded. "We may see a new plant operational as early as 2015, and we definitely will see many new plants before 2020."

Chicago, Ill.-based Exelon is another case in point of a company that is interested in new nuclear construction in the U.S. Operator of 17 nuclear units—which in 2007 operated at an extraordinary 94.5% of capacity—Exelon is the nation's largest producer of nuclear power. By Exelon's calculation, in 2007 its plants prevented 121 million metric tons of carbon dioxide emissions, eliminating the need for an equivalent amount of coal-based generation. "There is no doubting that nuclear is a very

clean source of electricity, with virtually no greenhouse gas emissions," says Tom O'Neill, vice president of new plant development at Exelon Nuclear.

For its part, Exelon also has announced its intention to file an application for a combined construction and operating license for a possible new plant in southeast Texas. The application is to be filed with the Nuclear Regulatory Commission in September 2008. However, Exelon stresses that although it will file the application, the decision to build the new plant has not been made and depends on positive resolution of the many possible construction roadblocks. "We need to see federal loan guarantees and we also want certainty that the NRC approval policy works as promised," says O'Neill, who adds that even in the best-case scenario Exelon does not envision its possible new Texas plant opening before 2017. Lead times simply are very long in the nuclear industry, O'Neill explains.

Public Reassurances

As significant as financial and regulatory approvals are, one much bigger obstacle

probably has to be cleared before nuclear takes its place in the energy mix: "We as an industry have not done a good job of educating the public about nuclear," says Kansler. "People don't understand it."

Worries about safety that were triggered by Three Mile Island, and the 1986 reactor failure in Chernobyl in the former USSR, have held back new nuclear reactor construction in recent years, despite the fact that safety systems at Three Mile Island prevented any harm to the environment. Today, however the good news is that advances in technology further reduce the potential for catastrophe. As Kansler explains, the new plants on the drawing boards will be safer, simpler, and will have fewer moving parts—for instance, 25% to 30% fewer pumps, valves, motors, and cables. They will be easier to operate than the prior generation of plants, most of which were designed in the 1960s and 1970s. New plants will be much smarter, insists Kansler,

The Energy Policy Act, which guarantees loans to build nuclear power plants, is expected to fuel new construction.

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who says that emergency cooling systems, for example, will be self-actuating, meaning that in the event of an emergency a valve will open automatically and water will flow onto the reactor. No electricity is required, no operator input—nothing more than gravity and physics. “We have learned a lot about plant design and know how to do this much better,” says Kansler.

What about safe disposal of nuclear waste and possible dangers associated with repurposing waste to make weaponry? As large as these concerns loom to nuclear opponents, supporters are increasingly confident that they are in fact non-issues. “We know how to handle these problems,” says the Milken Institute’s Kurtzman. “These are political, not technological, concerns.”

Truths About Nuclear Power

1 Today one-third of the world’s people have no access to electricity. By 2050 demand for electricity will triple. Countries with large populations, like China and India, are turning to nuclear energy.

2 Nuclear reactors emit no greenhouse gases. Today’s plants are preventing emissions of 2.5 billion tons of CO₂ annually.

3 Nuclear is the only energy industry to take full responsibility for all its wastes. In countries using this form of power, radioactive wastes amount to less than 1% of total national wastes.

4 Reactors can now be used for desalination to meet the world’s growing shortage of clean water. New reactors are expected to produce hydrogen and battery power for clean-energy cars.

5 Chernobyl spurred the creation of the World Association of Nuclear Operators. Today’s reactors use a “defense in depth strategy,” comprising multiple layers of backup safety systems, to prevent the release of radioactivity even under a worse-case scenario.

6 U.S. public support for nuclear energy has reached 70%, a record high.

Source: World Nuclear Association

What Lies Ahead

Regardless of what the U.S. does, the rest of the world is marching ahead with new nuclear plants. By the WNA’s tally, 36 reactors are under construction, in countries ranging from Argentina to Pakistan. Another 93 reactors globally are in advanced planning stages. A further 218 are in proposal phases. If, suddenly, the new nuclear plants are approved in the planet’s many energy-hungry countries, will this trigger sharp jumps in the price of uranium, along with fuel shortages? Dan Ervin, director of ShoreENERGY, the Energy, Economic, and Sustainability Program at Salisbury University, in Salisbury, Md., says no: “Uranium is plentiful, particularly in Australia and Canada, but the United States has large reserves, too. Supply won’t be an issue.”

The International Atomic Energy Agency corroborates this view with an estimate that current known reserves are ample for 85 years, but the IAEA cautions that actual reserves are in fact probably much higher—stagnant demand has not stimulated aggressive exploration—and, what’s more, advanced reactor technology (so-called fast reactors) will let plant operators get much more out of less fuel. The bottom line: “When you look at the facts, nuclear has to be part of the energy solution going forward,” says Mike Lawrence, program manager for nuclear energy at the federal Pacific Northwest National Laboratory in Richland, Wash. He adds that in the years ahead, there will be a rush to build many dozens more reactors in the U.S., simply because significant increases in generation capacity will be needed to meet sharp jumps in electrical demand (perhaps a 25% increase by 2030, predicts the WNA).

And that will be welcomed by many who study the globe’s rush to provide adequate energy. “You cannot talk about clean air and not talk about nuclear,” adds Entergy’s Kansler. “This country needs nuclear to meet electricity demand with a clean fuel. It is that simple.”

— Robert McGarvey

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