

The need for nuclear energy— Four years after the Harvard speech

BY SEN. PETE V. DOMENICI

EARLIER THIS YEAR, blackouts in California were front-page news. There was serious discussion about our energy crisis. The situation eased in the last few months thanks to mild weather and increased conservation. The economic slowdown after the September 11 terrorist actions will also depress U.S. energy needs for awhile. But while the urgency of an energy crisis has abated somewhat, the basic facts haven't changed. The United States and the world are facing immense shortfalls in energy, both in the short term and even more so in the long term.

In October 1997, I gave a speech at Harvard University that anticipated the severity of the energy problems for both this nation and the world. In that speech, I called for a national dialogue on nuclear power. I'd like to contrast that with another speech given that same month by President Clinton as he laid out his strategy for negotiations at Kyoto.

He talked about renewables, conservation, and his deep concerns about emission of greenhouse gases—but he never said one word in that speech about nuclear. By ignoring nuclear energy, he dismissed the largest

This article is adapted from a speech prepared by Sen. Pete V. Domenici (R., N.M.) and delivered on November 19 by Pete Lyons, his scientific advisor, at the conference, "America's Energy Challenge—The Nuclear Answer," held at Texas A&M University, in College Station, Tex. Senator Domenici is the ranking Republican member of the Senate Energy and Water Development Appropriations Subcommittee, which provides funding for the U.S. Department of Energy and its programs to advance energy R&D. Currently the most senior member of the Senate Energy and Natural Resources Committee, he has also worked to advocate a new generation of nuclear energy policies.

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source of clean electricity we have today, or will have for a long time.

Today we have a different administration. Thanks to the leadership of President Bush, we also now have a realistic energy policy that recognizes the need to increase all sources of energy. I am very pleased that nuclear energy figures prominently in his plan. I should note in passing, however, that unfortunate choices were made by the Senate majority party to avoid Senate committee debate on a legislative version of the President's energy plan.

The Vice President's National Energy Policy stated that "The Policy Development Group recommends that the President support the expansion of nuclear energy in the United States as a major component of our national energy policy."

President Bush accepted that recommendation without hesitation. In his speech releasing and endorsing the National Energy Policy, he noted that "America should . . . expand a clean and unlimited source of energy—nuclear power," and added, "By renewing and expanding existing nuclear facilities, we can generate tens of thousands of megawatts of electricity, at a reasonable cost, without pumping a gram of greenhouse gas into the atmosphere."

In contrast to President Clinton's speech, my Harvard speech certainly mentioned the "nuclear" word—considerably more than once. I discussed several concerns and challenges, with perhaps the most critical issue being the focus of antinuclear groups only on the risks involved with nuclear. They

simply don't discuss its benefits, or discuss the solid technical solutions for the risks. Unfortunately, their actions do not help the public toward a balanced view of this complex issue.

This issue is hardly unique to nuclear energy. Energy production, by any technology, represents a trade-off between risks and benefits. The public must have information to fairly judge both sides of this equation for each energy source. With that kind of comparison, nuclear energy fares very well. From this debate, and from continued progress on many fronts, I believe that nuclear energy will play an increasing role in future domestic and global electrical supplies.

Benefits of nuclear energy

As you know, there's a long list of real benefits from nuclear energy, fundamental to its superb record in supplying clean, reliable, low-cost electricity. In fact, its operating costs are among the lowest of any source, even 10 percent below coal.

The output of nuclear plants has risen dramatically since the 1980s. In 2000, U.S. plants generated over 91 percent of their maximum output. Since the 1980s, the average unit output has increased by over 20 percent. That's equivalent to gaining more than 20 new nuclear plants without building any.

Safety of nuclear energy

Safety has been a vital focus, as evidenced by a constant decrease in the number of emergency shutdowns, or "scrams," in the U.S. do-

mestic plants. In 2000, for the fourth year in a row, the number of unscheduled reactor shut-downs was zero.

Another example of the exemplary safety of well-run nuclear reactors is the U.S. nuclear navy. It now operates about 90 nuclear-powered ships. Over the years, they've operated about 250 reactors. They've accumulated over twice the number of reactor-years as our civilian sector without any significant incidents. They are welcomed into more than 150 major foreign ports in over 50 countries, excluding only New Zealand.

Some question the safety of nuclear plants in light of the recent terrorist attacks. I concur that it is appropriate that we carefully evaluate the safety of all major nodes of our critical infrastructures—chemical plants, electrical transmission systems, pipelines, oil tank farms, and nuclear plants, to name a few. But we need to remember that nuclear plants are probably the most hardened commercial structures in the world.

In addition, critics of nuclear energy need to remember that we and our allies control the fuel supplies for nuclear energy. That's in stark contrast to petroleum-based fuels, where the fuels are largely controlled by sources outside the United States who will consider their own best interests ahead of ours.

In my view, it just doesn't make sense to conclude that any potential target that cannot be hardened against any and all acts of war should be abandoned, as some of the antinu-

clear groups might suggest for nuclear plants. With that line of reasoning, we should be abandoning airplanes and high buildings.

Instead, I think the President's leadership is taking us on precisely the correct course—to work diligently to root out the causes and sources of terrorism around the world. Only then can we return to enjoying the lifestyle that we value and that we want to preserve for our future generations.

Some have sought to limit nuclear energy by arguing that transportation of spent fuel is too dangerous. These arguments are being raised again in light of the terrorists' actions. Indeed, such transportation must be done with great care, but it's also something that we already do very well. There has never been a breach in a spent nuclear fuel container during almost 3000 American shipments covering 1.6 million miles.

Environmental benefits

The environmental benefits of nuclear energy are immense. It is essentially emission-free. We've avoided the emission of more than 2 billion tons since the 1970s. A recent Japanese study showed that nuclear was the lowest electricity source in overall carbon dioxide emissions except for hydropower. The inescapable fact is that nuclear energy is making a vital contribution to our environmental health and security.

In fact, we could be doing much more with nuclear energy to promote the health of our environment. For example, France generates

76 percent of its electricity from nuclear. That helps France achieve spectacular results for minimal emissions of carbon dioxide. Their emission of CO₂ per dollar of gross domestic product (GDP) is almost three times lower than ours.

Nuclear energy today

Since that speech at Harvard, a national dialogue has followed. From that dialogue and many concrete actions, the nuclear industry of 2001 bears little resemblance to that of 1997.

In 1997, it was a real challenge to find a headline talking about the future of nuclear energy. There was little optimism for relicensing, and any talk about a new plant would have been dismissed as lunacy.

Many factors contributed to this dramatic shift. I think that Harvard speech helped. Congressional initiatives helped and support in Congress is now much stronger. The President's strong support for nuclear energy is a key development. And initiatives, including some that I helped to encourage, to streamline the Nuclear Regulatory Commission also helped. Today, there's real enthusiasm for expanded use of nuclear energy.

Today, six nuclear plants have been relicensed to add up to 20 years to their service. These six studies took between 17 and 23 months. That's in contrast to the old NRC that took eight years studying one application for an enrichment plant.

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There are 14 relicensing applications pending at the NRC now. And there are 26 more renewal applications expected in the next few years.

I've also been approached by several utilities that tell me to expect three applications for operating licenses of new plants by the end of 2002. Around the world, there are 93 new reactors planned by 2016 and 37 are under construction today. Eight are scheduled for operation in 2002.

Nuclear energy in Congress

Earlier this year, when I have introduced extensive legislation to support and encourage future nuclear energy development, I found many Senators eager to help. Eighteen Senators joined me in cosponsoring this bipartisan legislation—a most impressive number. Nuclear energy is included in several other energy bills as well.

For the current fiscal year, nuclear energy is well supported, including:

- \$17.5 million for university support to ensure educational resources needed for nuclear power.
- \$7 million for Nuclear Energy Plant Optimization to improve reliability and productivity of our 103 existing nuclear power plants.
- \$32 million for the Nuclear Energy Research Initiative.
- \$7 million to continue work on advanced reactors including Generation IV.
- \$5 million for cost-shared programs with industry to support new licensing applications at the Nuclear Regulatory Commission.
- \$18 million to continue the research on improved understanding of the health impacts of low doses of radiation.
- \$5 million for continued joint work with Russia on high-temperature, gas-cooled reactors.
- \$10 million for our Nuclear Regulatory Commission to prepare to license new plants.
- \$50 million for research on reprocessing and transmutation to reduce quantities and toxicity of final waste forms.

I'd like to discuss two specific areas. One involves the largest remaining roadblock to rebirth of a new era for nuclear energy. The second involves my vision for the role of nuclear energy around the world.

Dealing with spent fuel

Perhaps the most frustrating area of challenge for future use of nuclear energy involves our lack of credible strategies to deal with spent fuel. The barriers to progress in this area are entirely political, and not technical. This is one area that I fear could doom our nation's prospects for future use of nuclear energy if we don't make faster progress.

We continue to focus on Yucca Mountain as a permanent repository, despite the fact that it is not obvious that permanent disposal of spent fuel is in the best interests of all our citizens. It's even less obvious to me that we should equate the terms "spent fuel" and "waste."

Depending on our future demands and options for electricity, we may need to recover

the tremendous energy that remains in spent fuel. Furthermore, strong public opposition to disposal of spent fuel, with its long-term radiotoxicity, may preclude use of repositories that simply accept and permanently store spent fuel rods.

For these reasons, I favor centralized storage for a period of time in a carefully monitored, highly secure, fully retrievable configuration. At a minimum, this type of storage could allow concentration of the spent fuel from its 70-plus locations around the country into one or more centralized, tightly controlled storage areas.

Such a monitored storage facility can allow future generations to evaluate their own needs for energy and decide on appropriate reuse of spent fuel or final disposition. In a very real sense, this facility would represent a national nuclear fuel reserve for future generations.

Congress has worked very hard to make progress on the spent fuel issues. Last year, a bill that created an "early receipt facility" in Nevada passed both Houses of Congress by large margins; it also created an office within the Department of Energy to seriously evaluate strategies for spent fuel. The vote for passage was 253–167 in the House and 64–34 in the Senate—those are both impressive margins. Unfortunately, President Clinton vetoed this bill, and the veto override vote failed in the Senate by a single vote.

That office would have studied alternative management strategies for spent fuel, including both reprocessing and transmutation. We need to do the research today that can allow tomorrow's leaders to decide whether some forms of reprocessing and transmutation can lead to reduced risks and enhanced benefits from nuclear energy.

Transmutation

Transmutation, as part of an integrated national or international strategy for spent fuel, could dramatically alter the radiotoxicity of final waste products destined for a repository and allow recovery of much of the residual energy in spent fuel. This option might involve systems utilizing both existing or new reactors, plus accelerators, to develop a new fuel cycle. I've successfully championed a major research program for this effort, Advanced Accelerator Applications, or AAA, which is funded at \$50 million this year.

If this program is successful, we can recover the residual energy in spent fuel. We would also produce a final waste form that is no more toxic, after a few hundred years, than the original uranium ore. If we reach that goal, I think public concerns about waste will be dramatically reduced.

I was very pleased that the President endorsed these studies in the National Energy Policy, which:

recommends that, in the context of developing advanced nuclear fuel cycles and next generation technologies for nuclear energy, the United States should reexamine its policies to allow for research, development and deployment of fuel conditioning methods (such as pyroprocessing) that reduce waste streams and enhance proliferation resistance. In doing so, the United States will continue to discourage the accumulation of separated plutonium worldwide.

In addition, the new policy also stated:

The United States should also consider technologies, in collaboration with international partners with highly developed fuel cycles and a record of close cooperation, to develop reprocessing and fuel treatment technologies that are cleaner, more efficient, less waste-intensive, and more proliferation resistant.

Nuclear energy's future

Before closing, I'd like to mention my vision for a major future role for nuclear energy. It involves the increasing globalization of the world's economies. I don't believe that the world can develop in the peace and harmony that we all want unless the large differences

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between the "have" and "have-not" nations are addressed.

The standard of living for billions of people lags behind the Western world by extremely large factors. Reliable sources of electricity underpin the economies of the developed world. They are one of the factors determining each nation's standard of living and are certainly one of the prerequisites for modernization in all developing nations. There is now a vast gulf in energy usage per capita between Western nations—especially the United States—and the developing world.

I firmly believe that globalization offers immense benefits to the American people. We benefit from a network of global trading partners. These partners help create markets for our high-technology products. But this will happen only if the rest of the world increases its standard of living to levels that closely match our own. And that won't happen unless they have access to clean, reliable, low-cost sources of electrical power.

Nuclear energy, appropriately designed to avoid proliferation concerns and operate in absolute safety, can play a major role in energizing the rest of the world. It can be one of the solutions to providing global energy needs and helping to bring many of the poorer economies into the 21st century. **■**