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Nuclear Energy Initiative Holds Uncertainties

Bush Plan Could Cut Dependence on Oil but Relies on Unproven Technologies

By Guy GugliottaWashington Post Staff WriterSunday, February 19, 2006; A09

President Bush's new nuclear energy initiative is supposed to help cure America's "addiction to oil" by redesigning a taboo technology, originally used to obtain plutonium for bombs, to reuse spent nuclear fuel.

Unlike past reprocessing methods, the administration says, the new technique would make it prohibitively difficult for would-be proliferators to extract weapons-grade plutonium from spent fuel, and it would drastically reduce the volume of radioactive waste to be stored at repositories such as Nevada's Yucca Mountain.

The result, Energy Secretary Samuel W. Bodman said early this month, would be increased use of nuclear power, reduced oil consumption and fewer hydrocarbon emissions, "making the world a better, cleaner and safer place to live."

If it works. Both supporters and opponents of the Global Nuclear Energy Partnership agreed that although it marks a radical change in U.S. nuclear energy policy, it also relies on unproven technologies that will take decades to mature, and it does not guarantee success.

Bodman, in congressional testimony last week, acknowledged that the $250 million requested for the program this year will be used to design a test reprocessing plant so that Bush over "the next two or three years" can make "a go or no-go decision as to whether this is something that makes sense."

But one problem with this calculation, opponents say, is that even a toe-wetting start-up requires that the United States reverse nearly 30 years of opposition to reprocessing at a time of increasing concern about weapons programs in North Korea, Iran and other nations. That "is the wrong signal to send," said Edwin Lyman of the Union of Concerned Scientists, which opposes reprocessing.

Also, Lyman and others challenged the administration's view that the new technology does not produce "proliferation proof" plutonium, and suggested that would-be proliferators would almost certainly find new ways to handle the spent fuel by the time the new system is ready.

Deputy Energy Secretary Clay Sell acknowledged these concerns but noted that the U.S. refusal to reprocess spent fuel has been a stance "that virtually no one [else] followed." The world "has moved on without us," he added, and a new technology that makes it harder to obtain plutonium "will make the United States a leader rather than a spectator."

Still, there are other misgivings. Experts in both science and industry doubt that the plan could meet what Sell called an "admittedly aggressive time schedule" to have commercial reprocessing up and running by 2025.

If development drags on, these experts say, reprocessing would have little immediate effect on nuclear waste storage. Meanwhile, the government will be spending billions of dollars developing a fuel that probably will be too expensive to buy in the foreseeable future, except with a government subsidy.

"I'm not dogmatic -- the claims may not ultimately be wrong," said Richard K. Lester, a nuclear scientist at the Massachusetts Institute of Technology. "But on the time scale that's going to matter, it's very difficult to come close to achieving the objectives that have been set."

Reprocessing technology was first developed by the United States in the 1950s as a way to obtain plutonium for nuclear warheads, but President Jimmy Carter banned it in 1977 because of proliferation concerns. President Ronald Reagan rescinded the ban in 1981, but even then, reprocessing was so expensive and technologically daunting that no U.S. power company ever sought to develop it.

France, Japan, Russia, India and the United Kingdom do reprocess commercially, and all use the old U.S. technology, called purex, which derives plutonium oxide from spent fuel and then combines it with uranium to create a mixed-oxide fuel, called MOX, that can be used in some power plants. MOX is much more expensive than the uranium fuel in conventional reactors.

The conventional plants, which include all 103 nuclear generators currently operating in the United States, use "once through" fuel rods in a controlled reaction to produce steam that drives turbine generators. The rods are replaced every 18 to 24 months, and the spent fuel -- about 2,000 metric tons annually -- is put into temporary storage on the reactor sites.

Eventually, the spent fuel is supposed to go to Yucca Mountain, which will open, at the earliest, in 2012. By that time, the industry will have 70,000 metric tons of spent fuel waiting to ship to it.

"We need to solve a couple of big problems," said Phillip J. Finck, deputy associate director for applied science technology and national security at Argonne National Laboratory. "We have to deal with the waste and destroy plutonium."

The new technology, as described by Finck in a telephone interview, begins with a new reprocessing technique called urex-plus, which, like purex, dissolves spent fuel rods in a bath of nitric acid. The used fuel rods are composed of uranium, plutonium, heavy radioactive metals called "transuranics" and lighter radioactive elements known as "fission products."

Unlike purex, which separates out the plutonium, urex-plus leaves the plutonium and transuranics mixed together, making the resulting product unsuitable for weapons and much more difficult to handle for

anyone trying to build a bomb.

The new fuel would be used in a "fast reactor," where neutrons move about much more energetically than in conventional reactors, breaking down the long-lived transuranics into lighter fission products with shorter half-lives.

The spent fuel from the fast reactor would then be reprocessed using another new technology known as "pyroprocessing," which separates the fuel by dissolving it in molten salt and running an electric current through it. The fuel could be recycled several times until the long-lived transuranics all but disappear.

If successful, the new reprocessing method would replace purex, the stockpile of civilian plutonium would stop growing, and the whole cycle would become much more proliferation resistant, Finck said. Also, he added, Yucca Mountain's storage capacity "would increase by a factor of 100." Instead of filling up by 2030, or earlier, the repository would last beyond the end of the century.

That is if the new reprocessing system is ready by 2025. Steven Kraft, senior director of used fuel management for the Nuclear Energy Institute, an industry policy group, voiced doubts: "This is a matter of developing future technologies, and those technologies are 50 to 60 years away."

Kraft endorsed Bush's plan as a worthy long-range goal, but nonproliferation advocates said impurities in reprocessed plutonium are not likely to dissuade would-be proliferators from stealing it.

Arjun Makhijani, president of the Institute for Energy and Environmental Research, an energy think tank, said: "You can get a one-kiloton explosion with impure plutonium, and if you're a terrorist the most important thing is to have the capability. Such a blast would be the equivalent of 1,000 tons of dynamite. "You don't care whether you destroy the tip of Manhattan or the whole island," he said.