U.S. Nuclear Energy Program Review: Too Much Talk, Too Little Mission

by Marjorie Mazel Hecht

A "Review of the Department of Energy's Nuclear Energy Research and Development Program," issued Oct. 29 by a committee of the National Academy of Sciences,[1] criticized the Department of Energy's Global Nuclear Energy Partnership (GNEP) program, but for all the wrong reasons. Instead of critically looking at GNEP's goal of preventing other countries from developing a complete nuclear fuel cycle on their own, the committee focussed on how there is no real need for the United States to develop the reprocessing of spent nuclear fuel, and how it's too expensive anyway.

"All committee members agree that the GNEP program [for fuel recycling] should not go forward and that it should be replaced by a less aggressive research program.... Domestic waste management, security, and fuel supply needs are not adequate to justify early deployment of commercial-scale reprocessing and fast reactor facilities," the report states. "There is no economic justification to go forward with this program at anything approaching commercial scale."

The head of this small-thinking NAS committee, Robert W. Fri, happens to be the same person who headed President Gerald Ford's nuclear group in 1975, which made the decision to stop the reprocessing of spent fuel. (This nuclear group worked with Ford's chief-of-staff, Dick Cheney.) Ford lost the election, but Jimmy Carter, as President, then implemented the same Ford nuclear program and stopped U.S. spent-fuel reprocessing. This decision led to the accumulation of spent fuel in storage at nuclear plants, and thus created a perpetual "cause" for the anti-nuclear movement: "But what about the waste?"

Spent fuel from nuclear plants, it should be emphasized, is not "waste." About 97% of it can be recycled into new fuel, and the remaining 3% of actinides—high level radioactive elements—could also be "mined" to retrieve valuable isotopes for medical and industrial use. Until the decision of the Carter Administration, the United States, like other nuclear nations, routinely reprocessed spent fuel in a large industrial facility (the Savannah River Site in South Carolina), which worked well and did not have a security problem.

The NAS committee's report recommends that the DOE Office of Nuclear Energy put more emphasis on the department's Nuclear Power 2010 program, which is geared to facilitating the siting, design, and licensing of new nuclear power plants. It also supports more funding for the Generation IV program, which aims to put a next-generation nuclear plant in operation by 2017.[2]

These recommendations are good, as far as they go. Both programs need more funding to achieve their limited (compared to the need) goals, and both programs should be accelerated. But the littleness of the DOE's vision is exceeded, not challenged, by the committee's report.

The Real Issue: American System Development

The real issue not addressed by either the DOE or the NAS report is the *mission* of the United States in the economic future of the world. The world needs 6,000 nuclear plants by the year 2050, in order to bring the entire world's population up to a decent standard of living, by ensuring an adequate supply of electricity.[3] To accomplish this requires American System thinking, like that successfully implemented by Alexander Hamilton and, more recently, by Franklin Roosevelt. This means low-interest credit for projects that will build needed infrastructure and benefit the economy. Long-term nuclear development projects, 25-50 years, will *pay for themselves and more,* as the Apollo Program did, which returned $10-14 to the economy for every dollar spent. The spinoffs, in terms of new technologies, an educated and employed workforce, and plentiful electricity, will allow the entire world economy to grow.

Imagine what an industrial boom we would have in this country, if we put our mind and resources to mass-producing nuclear plants (and mass-producing the facilities that could mass-produce reactors) for the world, at the same

1. "Review of DOE's Nuclear Energy Research and Development Program," National Research Council of the National Academy of Sciences, Oct. 29, 2007, 144 pp. Available online at www.nap.edu.

2. For more on the fourth-generation nuclear plants, see: Marsha Freeman, "Time for Next-Generation Nuclear Plants in the USA," and Marjorie Mazel Hecht, "Fourth-Generation Reactors Are Key to World's Nuclear Future," both in *EIR*, Aug. 7, 2007 and available at www.larouchepub.com/eiw.

3. Massachusetts State Nuclear Engineer Jim Muckerheide discusses "How To Build 6,000 Nuclear Plants by 2050," and why we need them, in the Summer 2005 *21st Century Science & Technology,* available at www.21stcentury sciencetech.com/Articles%202005/Nuclear2050.pdf

time training a future workforce in the necessary skills.

But this NAS committee, like most of today's decision-makers in industry, is fatally stuck in the post-Bretton Woods economic mode, even as the world financial system is imploding in front of its eyes. It bows to the market's "bottom-line," with its invisible hand that commands what will turn a "profit" in the shortest possible amount of time. This is *not* how this country was built and became an industrial giant.

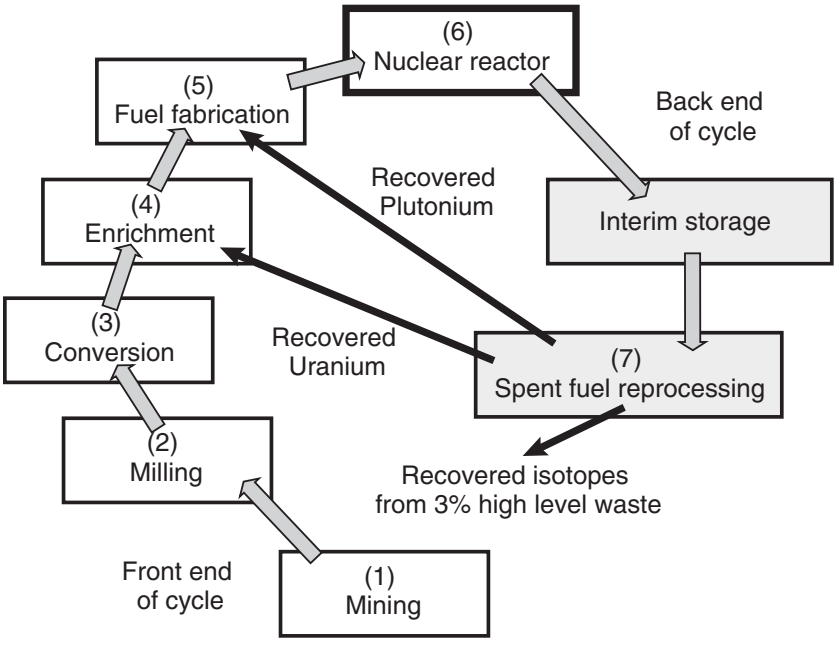
The recommended incremental approach, taking step by tiny baby step, like the Achilles in Zeno's Paradox, never arrives at the destination. This kind of thinking is what killed the U.S. fusion program, and a host of other promising technologies that could have moved civilization forward.

Both the head of the DOE nuclear program (see accompanying interview with Dennis Spurgeon) and most of the members of the NAS committee, are without doubt "pro-nuclear." But some members of the committee, might most charitably be described as "anti-pronuclear," that is, technically qualified nuclear experts who in fact want to curb civilian nuclear energy, especially in the developing sector, and who use their technical expertise to have a seat at the table of policy-making bodies.

This anti-pronuclear view got a real boost in the person of the late Dr. Albert Wohlstetter, the actual model for the fictional nuclear maniac "Dr. Strangelove," and a strategic advisor to several U.S. Presidents.[4] Wohlstetter, a mentor of several of today's neocons (such as Paul Wolfowitz and Richard Perle), put forward his view, in many influential policy papers, that civilian nuclear plants were the equivalent of bombs, and that reprocessing simply made bomb-making even easier, by providing access to plutonium.

This neocon who played with nuclear missile strategy, worked closely with Amory Lovins, the green inventor of "negawatts," the idea that you can increase society's energy budget, by conservation. Wohlstetter and Lovins' economic analyses are nearly identical: Use renewables; nuclear is both undesirable and too expensive. In their view, reprocessing and breeder reactors must be forbidden, because they make it possible to perpetuate and increase nuclear energy.

Completing the Nuclear Fuel Cycle



The full nuclear fuel cycle shows that nuclear is a renewable energy source: The spent fuel can be reprocessed to recover unburned uranium and plutonium that can be fabricated into new reactor fuel. Since 1976, the U.S. nuclear cycle has been "once through," going from spent fuel to interim storage and then longer-term storage.

The spent fuel produced by a single 1,000-megawatt nuclear plant, over its 40-year lifetime, is equal to the energy in 130 million barrels of oil, or 37 million tons of coal, plus strategic metals and other valuable isotopes that could be retrieved from the high-level fission products. Other nuclear nations reprocess this resource.

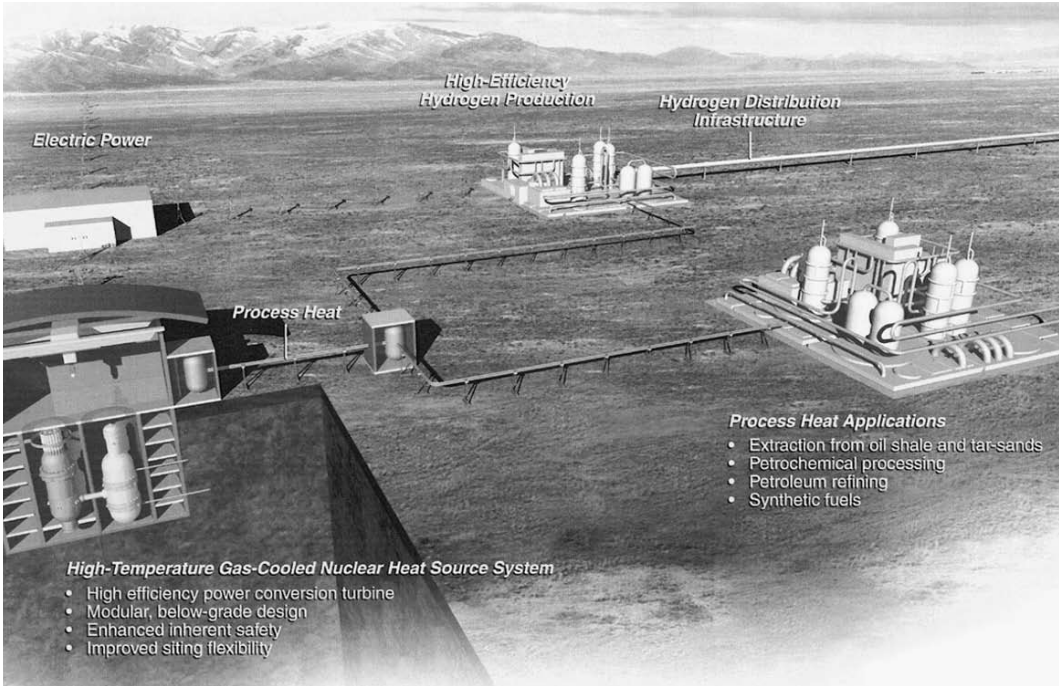
Closing the Nuclear Fuel Cycle

The U.S. civilian nuclear program, like others around the world, was established with the intention of recycling spent nuclear fuel. After all, that is what makes nuclear a truly *renewable* energy: Uranium fuel can be used to produce heat and electricity, and when it is "spent," it can be recycled into new reactor fuel. No other energy source can do that.

But, when reprocessing was stopped under the Carter Administration, in 1975-76, the United States adopted a "once-through" nuclear fuel cycle, with all the attached political baggage. This once-through cycle was touted as being both cheaper, and non-proliferation friendly. If we don't reprocess, the Carter reasoning went, other nations will be encouraged not to reprocess.

Plans were made for a permanent burial place for the U.S. spent fuel that would accumulate, a site that, *billions* of dollars later, is still today in contention. In California, under Wohlstetter's instigation, meanwhile, legislation was adopted that prohibited any new nuclear plant from being built, until there was a national "waste" repository. California is still reaping the disaster of this policy, in brownouts and increased electricity costs.

4. See Marjorie Mazel Hecht, "Albert Wohlstetter's Legacy: The Neo-Cons, Not Carter, Killed Nuclear Energy," *21st Century Science & Technology,* Spring-Summer 2006.



Idaho National Laboratory

This artist's drawing of a high-temperature gas-cooled reactor coupled to a hydrogen production plant and an industrial processing complex is one of the designs for the DOE's Generation IV or Next Generation Nuclear Plant. A next generation reactor is planned to be online by 2017-20, depending on funding. By that time, other nations expect to be exporting high-temperature reactors!

Just before civilian reprocessing was stopped (military spent fuel continued to be reprocessed until the 1990s), the Ford Administration dissolved the Atomic Energy Commission (AEC). The AEC had led the effort to promote nuclear energy, and under President Nixon, had made plans for a breeder reactor program, to ensure the nation a future supply of nuclear fuel. The AEC had been invigorated by the outspokenly pro-nuclear Dr. Dixy Lee Ray, who served on the commission from 1972, and was its chairman in 1973 and 1974.

The Energy Research and Development Administration (ERDA) was set up to replace the Atomic Energy Commission, and to include so-called alternative energies as equals. This agency became the Department of Energy (DOE) in 1977, and for many years, until the 2006 appointment of Dennis Spurgeon, the DOE did not even have an assistant secretary for nuclear.

The GNEP program was announced in February 2006. In addition to its aim of policing the fuel cycles of other nuclear countries, GNEP set out to research and develop the recycling of spent fuel as an alternative to the once-through fuel cycle, but to do this *without* the separation of plutonium.

When spent fuel is reprocessed, the highly radioactive fission products (3%) are removed, and the fissionable uranium-235 (96%) and plutonium (1%) are separated for reuse. This plutonium could be directly used as fuel in breeder reactors, or mixed with uranium to make MOX, mixed oxide fuel for conventional reactors. (MOX, made from surplus weapons plutonium, has been used in 35 European reactors, and MOX is beginning to be used in the United States, with the Savannah River Facility designated as the production site.)

GNEP: It's All About Preventing Proliferation

GNEP, however, has set as a goal the development of a recycling process that will prevent any plutonium from being used. A second goal is to develop a breeder reactor whose fast neutrons would be used, not to make electricity, while at the same time breeding more reactor fuel,[5] but instead to "burn up" the highly radioactive fission products (3% of the spent fuel). Both of these GNEP goals are geared to develop commercial-scale facilities not for advancing nuclear technology in order to produce power more efficiently, but simply for preventing proliferation.

The NAS report does not question the aims of GNEP. It criticizes the timetable, saying that GNEP should not rush into developing a commercial facility for nuclear fuel recycling or an advanced sodium-cooled burner reactor; that it

5. Breeder reactors, also called fast reactors, produce electricity *and* new nuclear fuel, and were considered to be an essential part of the Atoms for Peace nuclear development plans. In a conventional reactor, a moderator such as water, slows down the fast neutrons of the fission reaction to the optimal rate for maintaining a chain reaction. In the breeder reactor, these neutrons are not slowed down, but are caught in a "blanket" of uranium or thorium surrounding the reactor core. There, the neutrons produce new fissile material, such as plutonium-239. At the same time, the heat from the fission reactions in the core is used to produce electricity.

The Russians have operated sodium-cooled fast reactors since 1958, including the prototype BN-350, which produced electricity and desalinated water from 1972 to 1999. They have an ambitious program for developing larger commercial fast reactors.

Bertrand Russell's Malthusian Wedge

The genesis of the double-sided nuclear strategy promoted by Albert Wohlstetter—bombs for us and limits on nuclear technology for the rest of the world—lies with Lord Bertrand Russell and his acolyte and popularizer, H.G. Wells. Russell and Wells promoted a curb on nuclear technologies because they feared that the efficient production of electricity by nuclear energy would allow unlimited population growth.

Russell's aim was to stop the American System of perpetual progress, and replace it with Malthusianism. He particularly desired to cull the brown and black populations of the world, and famine, wars, and disease were the methods he and Wells favored. Today, between the environmental movement and the Cheney/Bush preemptive war faction, the world is well along in carrying out the British oligarchy's Malthusian plan.

From the beginning of the post-war U.S. nuclear program, there was a fight to wrest control of civilian nuclear energy from the military.[1] The civilians won, and the first civilian U.S. nuclear plants were built by private industry and run by public utilities. But, the Russellites continued to organize internationally, through the Pugwash group and the International Atomic Energy Agency, and in the United States, for curbs on nuclear technology development. They succeeded in promoting their Malthusian views via the issue of proliferation, the danger that nuclear knowledge might get into the hands of "bad people" who would misuse it to make bombs or threaten terrorism.

Wielding this Russellite wedge, the Nuclear Non-Proliferation Treaty was introduced in 1968, and passed into law in 1970. In addition to the five publicly acknowledged nuclear weapons states, 182 other nations have signed on. A system of safeguards and inspections by the IAEA was put in place to monitor compliance with the no-nuclear-weapons policy.

The NPT, as the treaty is known, could not have gotten nations to sign on if it did not acknowledge and foster the positive uses of nuclear energy as the "inalienable right" of member-states. And so, the treaty "promotes co-operation in the field of peaceful nuclear technology and equal access to this technology for all States parties. . . ." States have the right to "research, production, and use of nuclear technology for peaceful purposes without discrimination."

The NPT, however, has been applied with discrimination by the United States, which used political pressure selectively to stop the growth and development of civilian nuclear energy. Brazil and Argentina were victims of this pressure in the 1970s.[2] Israel's non-publicly acknowledged nuclear weapons program has not come under U.S. pressure.

Along with the NPT came the robust bureaucracy of the proliferation "industry," with legions of anti-nuclear and anti-pronuclear "experts," whose press releases and talking heads proliferate in the media. Instead of directly stating the Malthusian aim of killing off "excess" population, they work to "kill" the energy technology which has the highest energy flux density, and hence power, to efficiently produce enough electricity to light the world.

1. Nuclear engineer Theodore Rockwell describes this fight in an article in the Summer 2004 *21st Century Science & Technology,* "The Two-Edged Atomic Sword: Getting the Atom Away from the Army." The article is adapted from Rockwell's book *Creating the New World: Stories and Images from the Dawn of the Atomic Age.*

2. Marsha Freeman discusses the U.S. role in the sabotage of the Brazilian and Argentine nuclear programs under the guise of non-proliferation, in "Ibero-America Needs a Space Agency!" *21st Century Science & Technology,* Spring 2002. For a comprehensive review of the situation, see "How Nuclear Energy's Promise Was Nearly Destroyed," *EIR*, Jan. 14, 2005; also available at www.larouchepub.com/other/2005/3202_nuclear_promise.html.

should instead continue research, and not select a particular technology yet. In particular, the NAS report states that GNEP should not skip the step of building an engineering-scale facility by moving directly into the commercial facility stage.

The NAS report outlines all the technical and political problems that remain for GNEP to solve, and concludes that delay is inevitable, so why not delay: "If and when technical progress justifies construction of a major facility, it is the very strong view of this committee that an engineering-scale facility is by far the safest, most effective, and least risky course. . . . [The committee believes that DOE should] commit to the construction of a major demonstration or facility only when there is a clear economic, national security, or environmental policy reason for doing so. . . . The committee is concerned that the plan to move rapidly to recycling and fast reactors has no economic basis."

What's missing here is any sense of mission or reality: What role will the United States play, as the rest of the world, led by Russia, India, and China, intends to move forward—

The Fast Flux Test Facilty at Hanford, Washington, is a 400-megawatt sodium-cooled fast reactor of the type GNEP proposes to develop. It was designed to test new reactor fuels and materials, but it was shut down by the DOE just months before GNEP was announced. Now, it could be restarted.

fast—with nuclear? Will we bury our heads in the sands of bureaucracy and continue to "study" and talk about the issue, as the NAS committee recommends? Will we inch along, inventing a new recycling process, and building a new facility based solely on an unproven and misguided goal of preventing proliferation? Neither GNEP nor the NAS has a solution befitting the nation that pioneered civilian nuclear technologies and, under the Atoms for Peace program, trained hundreds of nuclear engineers and scientists from around the world.

Meanwhile, India announced on Nov. 13 that it was building four new fast breeder reactors based on the thorium fuel cycle, that would both produce power and breed new fuel. These are 500-megawatt reactors, costing about $800 million each, which are part of the nation's three-stage program to meet its tremendous need for electricity. Japan, which has extremely limited indigenous energy resources, has selected the fast reactor as its standard reactor for the century ahead, as it fulfills its goal of increasing the percentage of electricity supplied by nuclear. Russia is gearing up for an ambitious nuclear construction program for domestic use and export, including floating reactors and sodium-cooled fast reactors. And China has an operating demonstration high-temperature gas-cooled reactor on the pebble bed model, and a demonstration fast reactor scheduled to open next year.

In short, if the United States doesn't wake up and make nuclear power the centerpiece of a domestic reindustrialization program, with a renewed mission to help the world industrialize, someday soon we will have to import both nuclear electricity and nuclear engineers, scientists, and technicians from other countries.

Interview: Dennis Spurgeon

Cost of Not Recycling May Be 'Staggering'

Dennis Spurgeon is the Assistant Secretary for Nuclear Energy at the U.S. Department of Energy (DOE), and in this capacity, is the senior nuclear technology official in the U.S. Government. He is responsible for the DOE's nuclear technology research and development, its nuclear technology infrastructure, and its support to nuclear education in the United States. He also leads the DOE's Global Nuclear Energy Partnership (GNEP).

Spurgeon graduated with distinction from the U.S. Naval Academy, and holds a Masters of Science in nuclear engineering and the degree of Nuclear Engineer from the Massachusetts Institute of Technology. In addition to government posts in the Ford Administration, he has worked in the nuclear industry.

Spurgeon was interviewed Nov. 13, via e-mail, by Marjorie Mazel Hecht, for 21st Century Science & Technology *magazine.*

Q: The National Academy of Sciences committee [see accompanying article] is headed by the same man—Robert Fri—who was responsible in the Ford Administration for the policy that stopped reprocessing in 1975. This present committee was unanimously opposed to going forward with reprocessing, saying that it wasn't needed now, and it cost too much. But what about the cost of not reprocessing? Not to reprocess means that the anti-nukes have a perpetual political rallying point: nuclear "waste."

Spurgeon: The cost of not reprocessing may be staggering. Since only about 5% of the uranium in nuclear fuel is consumed, we are currently disposing of a tremendous amount of a remaining energy. And, perhaps worse, by not developing and utilizing recycling technology, the United States will not be able to compete in this market segment against other countries such as France or Japan, that have made the national commitment to recycle their spent nuclear fuel. Moreover, closing the nuclear fuel cycle in the United States is essential to ensuring a vibrant nuclear industry in the future.

Additionally, the United States needs to develop its recycling capability in order to provide the full scope of assured fuel supply services to countries interested in obtaining nuclear power plants to meet their domestic energy needs, thereby reducing the risk of proliferation of sensitive technologies that could be misused.

Q: Some of the GNEP goals—fuel testing and experience with a sodium-cooled fast reactor—could be achieved using a restarted Fast Fuel Test Facility.[1] Is this being considered, now that a study has shown restart to be possible?

Spurgeon: The Department has not yet made a decision regarding the final technology choice or location for the fast reactor component of the Global Nuclear Energy Partnership (http://www.energy.gov/news/5287.htm). The Fast Flux Test Facility (FFTF) in the state of Washington continues to be a potential option. The ultimate decision to use FFTF or a different solution will depend upon many factors, including cost, acceptance by the state and local populations, FFTF's ranking against other technologies, operating and maintenance costs, amongst other considerations.

Q: Why is there so little mention of new technologies for isotope separation? E.g., if we develop the fusion torch, we could transmute spent fuel and make use of valuable isotopes for medical and industrial purposes.

Spurgeon: While many technologies have been evaluated for use as part of the GNEP concept, those that are extremely nascent have not been included. The fusion torch, while potentially applicable, has a very low technology readiness level, and is decades away from commercial manifestation, and wouldn't meet the Department's near-term objective to begin spent nuclear fuel recycling.

Q: What will be the effect of the NAS report on the program and on the funding? What's next at NE [DOE Office of Nuclear Energy], after this report?

Spurgeon: The Department agrees with some of the report's recommendations, namely that the Nuclear Power 2010 program should be fully funded. However, we believe that there are significant discrepancies between the report's conclusions and their applicability to the current GNEP program. The Department is hopeful that Congress will read the report and consider its recommendations in context with information provided by DOE and other sources.

Q: The NAS report is a policy disaster. We need a return to the American System of industrial development—which looks 25-50 years into the future to plan needed infrastructure, instead of an inch-by-inch, bottom-line approach (like that of the NAS committee) that gets you nowhere. This country was built into an industrial giant by a dirigist approach, carrying out great infrastructure projects. What would you (NE) do, if you could define your mission as reindustrializing the U.S.A. and going nuclear to become energy independent?

Spurgeon: One of the Department of Energy's strategic goals is to promote America's energy security through reliable, clean, and affordable energy. To realize this goal, DOE is working to create a more flexible, more reliable, and higher capacity U.S. energy infrastructure. NE contributes to this effort through the Nuclear Power 2010 program and GNEP, to name a few vehicles.

Q: How do you see the United States helping to build the 6,000 new nuclear plants the world needs by 2050?

Spurgeon: Through our leadership role in GNEP, the United States is fostering the expansion of safe and secure nuclear power worldwide. Specifically, GNEP seeks to provide infrastructure support and knowledge to developing countries, including the development of smaller reactors more appropriate for the infrastructure of developing countries. Additionally, a robust expansion of nuclear power is predicated on a viable answer to waste disposition. Developing a sound and viable waste disposition strategy is a fundamental goal of GNEP.

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1. The FFTF, a sodium-cooled fast flux reactor, was shut down by the DOE in 2005, allegedly for budgetary reasons, although the reactor operated well and was in good working order. FFTF supporters campaigned to keep it open as a facility that could test reactor fuel and produce isotopes for medical and industrial use. After the final DOE decision to shut it down, engineers drained the sodium by drilling a hole in a plate inside the reactor vessel, which, it was thought, would prevent the reactor from being started up again.

However, after the hole was drilled, engineers looked at the hole, reassessed the situation, and determined that the FFTF could, indeed, be started again.

For more background on the FFTF, see "Save the Fast Flux Test Reactor," *EIR*, Feb. 25, 2005.