

DOE Program from page 1

Congress must ensure that funding for the repository program—more than \$16 billion from electricity consumers—is provided for the Department of Energy to complete scientific studies under the current schedule,” said Joe Colvin, NEI president and CEO.

The absence of S. 1287—which among other things would have established early receipt of fuel after repository construction was authorized—won’t affect the program, Ivan Itkin, the head of DOE’s Office of Civilian Radioactive Waste Management, told *Insight*.

The agency is still “on track”—based on its internal schedule—to issue the site recommendation consideration report late this year, with a formal recommendation to the president in 2001 by the energy secretary on whether Yucca Mountain is a suitable site, said Itkin.

There’s only one issue that worries Itkin: money. The Clinton administration has requested \$437.5 million in fiscal 2001 for DOE’s waste management program. If Congress approves the request, “we’ll be able to produce a site recommendation [in 2001] and submit a license application [to the Nuclear Regulatory Commission] in 2002,” he said.

Electricity consumers pay about \$650 million each year to the Nuclear Waste Fund solely to fund this program.

But if the funding level were “eroded,” the agency’s schedule would start to slip. Itkin said with \$413 million in funding for fiscal 2001, DOE could still produce a site recommendation in 2001, but the license application would slip to 2003. At the so-called stable funding level of

roughly \$350 million that the agency has received in recent years, the license application would slide three to five years, Itkin said.

A one-year slippage in the schedule could lead to \$400 million in added costs. A three-year delay could cost more than \$1 billion. “Penny-wise could end up being pound-foolish,” he said. “If Congress gives us sufficient funding, we’ll do the job.”

NRC Study from page 1

in one study, for instance, resulted in estimates of the fraction of accidents releasing radioactive materials that are “much too large.”

The conservative studies were driven by an industry and an NRC culture that erred on the side of safety by analyzing worst-case scenarios. Now, thanks to years of experience and advanced analytical techniques, engineers and scientists have new tools for such studies.

One reason for the new study—*Reexamination of Spent Fuel Shipment Risk Estimates*—was to prepare for the many shipments of used

fuel expected during the next few decades.

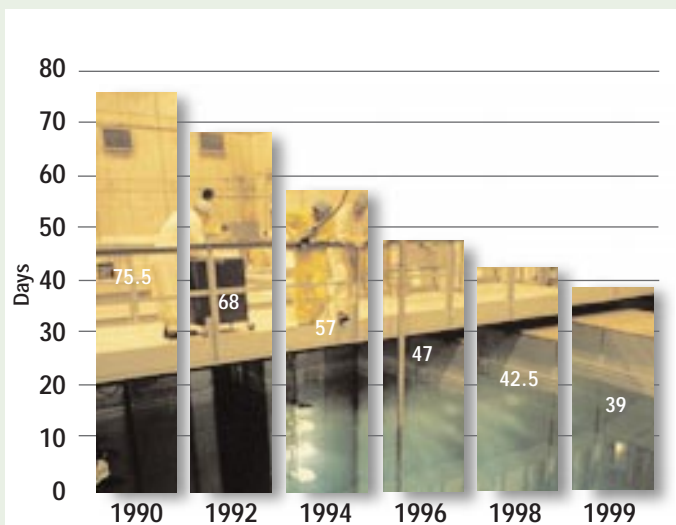
“The publication of this new body of knowledge is very much needed at a time when our nation is on the verge of a decision—expected in 2001—on whether to proceed with the Yucca Mountain repository,” says Steven Kraft, director of spent nuclear fuel management at NEI. “This study should provide the public and decision-makers with a much more accurate understanding of the safety of shipping used fuel to Yucca Mountain.”

‘Time Equals Money’

When a nuclear power plant shuts down to refuel, every day out of service can cost its owners up to \$500,000 in replacement power and additional labor. That’s why the steady decline in the median refueling outage during the 1990s—from about 10½ weeks to about 5½ weeks last year—is good news to plant owners. It’s also good news to consumers, who benefit from lower fuel costs on their electric bills.

One reason for shorter outages is the trend toward on-line maintenance. Not only does it save money, but it cuts the time that certain safety systems are out of service.

A second reason outages are getting shorter is smarter management. Increasingly, companies plan outages not by the day, but by the hour and even the minute.



SOURCE: INSTITUTE OF NUCLEAR POWER OPERATIONS (INPO)

University Researchers Find No Link Between TMI Accident, Cancer Deaths

The most extensive study yet of the population living near the Three Mile Island nuclear power plant has found no apparent increase in cancer deaths as a result of the 1979 accident.

For a 13-year period, researchers from the University of Pittsburgh's Graduate School of Public Health collected and analyzed information on



Evelyn Talbott
Associate professor
Epidemiology Department
University of Pittsburgh

"This study helps put to rest the lingering question of whether residents of Three Mile Island are experiencing an increase in cancer deaths as a result of the nuclear accident."

32,135 people living within a five-mile radius of the Pennsylvania plant.

The study—which covered the period from 1979, when the accident occurred, to 1992—considered such information as education, occupation, smoking habits, residence, medical history, previous radiation exposure, and travel in the area of the plant within 10 days of the accident. Researchers determined the individuals' maximum and likely radiation exposure during those 10 days. Causes of death examined by the researchers included all heart disease and all malignancies, as well as specific cancers known to be sensitive to radiation.

"This study helps put to rest the lingering question of whether residents of Three Mile Island are experiencing an increase in cancer deaths as a result of the nuclear accident," said Evelyn Talbott, associate professor in the Department of Epidemiology and the study's principal investigator.

What the researchers did find was a "significantly higher mortality from all causes among the TMI population as compared with residents of the surrounding three-county area," according to the university's public health graduate school. The largest contributor to that mortality was heart disease. "The effects of smoking and education levels on the incidence of heart disease are well-known," said Talbott. "When we controlled for these risk factors, along with background radiation factors, we found that the elevations in mortality were not noteworthy."

Although they found no consistent evidence suggesting that the small amount of radiation released during the accident had a measurable impact on the mortality of those living in the area for 13 years after the event, the investigators say that further study is warranted.

"Because the latency period for many cancers is 20 years or more, continued follow-up on the TMI residents will provide a more comprehensive look at their mortality, as well as morbidity, from various cancers," said Talbott. In fact, the university's research team is now analyzing data on the same population collected through 1999.

The study is the latest of at least a dozen epidemiological studies conducted since 1981 that

have found no discernible direct health effects to the population in the vicinity of the TMI plant.

Information on the study is available at http://www.upmc.edu/NewsBureau/kathryn/three_mile_island.htm and <http://ehis.niehs.nih.gov/docs/admin/newest.html>.

UNSOUND STUDY

Critics of the nuclear energy industry claimed last month that infant mortality rates around five nuclear power plants dropped after the plants were closed—an allegation disputed by John Boice, former head of the National Cancer Institute's radiation epidemiology branch.

Boice cited a 1991 study by the institute that surveyed 900,000 deaths in counties around 65 nuclear power plants. The study—the largest and most comprehensive study of cancer mortality near nuclear plants—found no evidence of increased risk of death from a wide range of cancers.

Joseph Mangano—who raised the allegation in an article in *Environmental Epidemiology and Toxicology*—acknowledged that "radiation exposure is just one of many potential factors affecting infant health."

Now Hear This

"I used to oppose nuclear plants. ...I don't oppose nuclear anymore."

—Rep. James Moran (D-Va.), explaining that he changed his mind after attending a conference on nuclear energy sponsored by the Aspen Institute, a nonpartisan organization. Reported in *Nucleonics Week*, April 6, 2000.

Review Finds Fuel Plants Operate Safely

Senate Urges Continued Improvement in Regulatory Efficiency

Ten U.S. facilities that process uranium for nuclear power plant fuel are "operating safely," an independent assessment team has concluded.

The review was conducted in response to a September 1999 accident at a fuel processing facility in Tokaimura, Japan, in which workers used improper procedures for mixing solutions containing radioactive materials, resulting in an accidental "criticality," or nuclear chain reaction.

The 10 facilities asked the Nuclear Energy Institute to manage a review of their plants to see if they were susceptible to the factors in the Japanese accident.

The review, concluded last month, "did not find any conditions of safety urgency requiring immediate attention."

While the team observed some instances where actual performance fell short of management expectations, it also found "best practices" when it visited each site.

The most uniform best practice was criticality safety. Employees at all levels at every facility had a healthy respect for the materials they worked with and for the potential for a criticality to occur. In addition, the facilities had aggressively pursued more engineered controls, eliminating the need for human intervention to achieve safety. Several of them had set operating limits well below the safety threshold, so if something went wrong, they would not be anywhere near regulatory limits.

American facilities adhere to a principle called "double contingency," says team member Jack Brons, which means that "a criticality accident can occur only if two unlikely, independent events occur." Some facilities use triple contingency controls so that the least severe or most likely problem is internally reportable, and the second requires notification of the Nuclear Regulatory Commission.

All U.S. facilities conduct formal reviews before performing very infrequent operations, even though they are not required to. If any operation is

performed less than once a year, a review seeks to learn if anything has changed and ensures that every employee is properly trained. At the Japanese plant, the operation had not been performed for two years, there was no review, and the employees were not trained.

Before the team began visiting fuel facilities, the NRC and the administration both agreed that the review was an appropriate response to the Tokaimura event.

Team members were: Robert Bernero, a consultant to the Department of Energy and to commercial nuclear facilities; Jack Brons, special assistant to the president of NEI; and James Clark, vice president and senior consultant of JAI Corp., part of the management and operating contractor team for DOE's Office of Civilian Radioactive Waste Management. All have management-level experience in operations, regulation and assessments.

To access the report, see <<http://www.nei.org>>.

Senate Passes Bill to Reduce NRC User Fees

Measure Would Save Nuclear Facilities More Than \$50 Million a Year

Congress and the nuclear energy industry support the improvements that the Nuclear Regulatory Commission is making to its oversight process. Now they would like to see the same kind of reform brought to the fees the agency assesses its licensees, known as user fees.

To that end, the Senate adopted an authorization bill last month that would gradually reduce the annual fees that the NRC collects from the owners of nuclear power plant owners and other facilities licensed by the agency.

By law, the NRC collects nearly 100 percent of its budget from fees charged to licensed facilities. The facilities are charged for all agency services, including those that do not directly benefit them—a system that the industry opposes. By the industry's reckoning, plant owners and others pay a total of \$50 million a year for unrelated programs.

The Senate measure would save licensed facilities more than \$50 million in annual fees by reducing their assessments. Under the measure, assessments would be decreased by 2 per-

cent each year from 2001 through 2004. In 2005, the fee would be reduced by 4 percent, for an overall reduction of 12 percent.

In parallel with the Senate legislation, the NRC has submitted a \$488 million budget proposal that would reduce its reliance on user fees by 2 percent in fiscal 2001. The agency intends to ask congressional appropriators to fund the difference. The NRC said it intends to continue reducing the user fee 2 percent annually during the five-year appropriation period for a total reduction of 10 percent.

The Changing Face of Nuclear Engineering

Profile of a 21st Century Nuclear Professional

Meet Gabriela Lugo—tomorrow's nuclear engineer. She's a scholarship student at Texas A&M University. She talks up the study of science and engineering to Texas high school students. And she's excited about her many career choices.

"Until I began studying nuclear engineering, I didn't know about all the things you can do with nuclear technology—in the medical field, food irradiation, space exploration, electricity production," says Lugo.

Is the field of nuclear engineering boring? "Certainly not," she says. "It's intriguing. You get down to the basics of matter, of life."

As today's nuclear energy work force begins retiring, Lugo sees opportunities galore for students like herself. "They'll need to be replaced, their work continued," she says. In fact, there's already a shortage of nuclear engineers, and a 1999 study projects that it's going to grow. A survey by the American Society for Engineering Education of college nuclear engineering programs and companies that hire nuclear engineers revealed that companies now need 422 more nuclear engineers than are on the market. They'll be 468 short by 2002.

Lugo, when she isn't studying, is visiting mainly Hispanic high schools to talk about the world of nuclear energy, including radiation. "Their initial reaction is fear. It helps when we tell them that radiation comes from everywhere—the sun, a banana, our bodies."

In one of her favorite classroom demonstrations, Lugo passed around cookies on an old red Fiesta ware plate. The original red Fiesta ware glaze contained uranium oxide and was very slightly radioactive. "We got out a Geiger counter and began checking everything in the room, including the cookies," says Lugo. "When we got a reading, some of the students figured out it was from the plate, not the cookies. We confirmed that—and everyone felt more comfortable!"

Lugo also dispenses practical advice to high school students: how to get into college, how to

Nuclear engineering is "in." Just ask Texas A&M sophomore Gaby Lugo

obtain a scholarship, why it's important to take honors courses, and why volunteer work matters. "Through volunteering, I learned how to coordinate events and how to speak in front of people," she says.

"Most important, volunteering has bettered me as a person."

Last October, Lugo helped pull together a presentation on

Texas A&M's Women in Discovery project—aimed at celebrating the achievements of women scientists and engineers and promoting science literacy in Texas. She used the presentation to encourage high school students to study engineering and science in college. Besides her outreach work with the Society of Mexican-American Engineers and Scientists, Lugo is active in the local student chapter of the American Nuclear Society and in a multi-

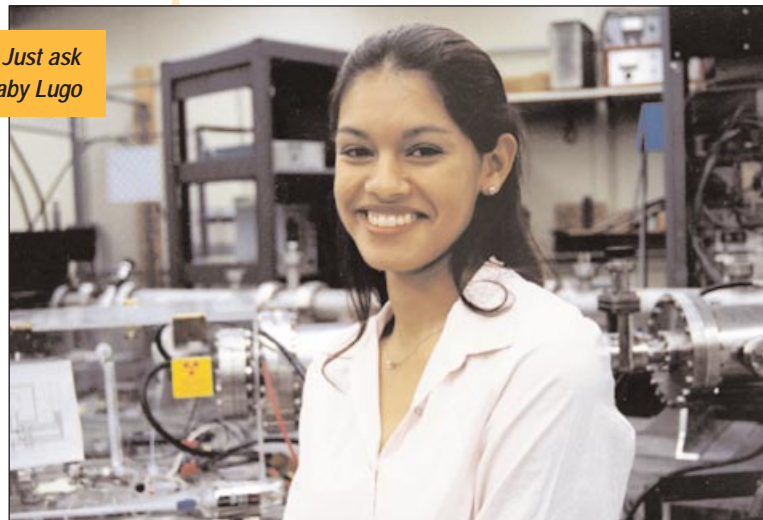


PHOTO COURTESY OF TEXAS A&M UNIVERSITY

cultural sorority. If she had time for a hobby, Lugo says it would be photography. While in high school, she won several awards, including a National Art Award, for her photographs.

Lugo's next goal is a master's degree in nuclear engineering. And after that? "I'd like to be a spokesperson for the nuclear industry," she says. "I like letting people know the truth—and telling them about the myths—of nuclear energy."

Helping Teachers Make the Grade

America needs more science and math geeks! The nation's schools aren't producing tomorrow's scientists, mathematicians and engineers, says Rep. Vernon Ehlers. That's why the Michigan Republican is backing legislation that will help prepare U.S. students for a science- and technology-based society.

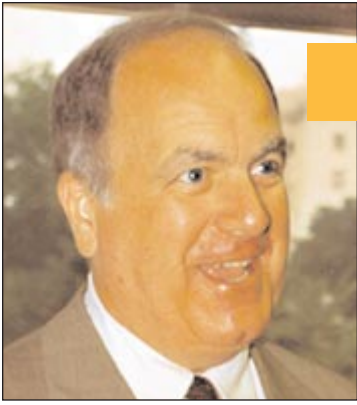
The country needs to reform its science, math, engineering and technology education from kindergarten through 12th grade, says Ehlers.

To initiate that reform, he has introduced three bills that are "a first step in a long

process" toward ensuring that teachers have the necessary training and skills to teach these subjects and students have the best possible curricula and environment for learning.

Ehlers believes in a hands-on approach. "Students should learn science primarily by doing science." By pursuing this approach, teachers can "tap into children's curious and inquisitive nature and develop an excitement for these subjects," he says.

For information on the bills, which have 16 co-sponsors, including Ehlers, see <<http://www.house.gov/ehlers/issues/science>>.



Q&A With Rep. John Spratt

Building Greater Awareness of Nuclear Energy's Value

Rep. John Spratt (D-S.C.), together with Rep. Joe Knollenberg (R-Mich.), head up the new "congressional member organization," the House Nuclear Issues Working Group. Spratt is a ranking member on the House Budget Committee and a member of the Armed Services Committee. He shared with Nuclear Energy Insight his thoughts about the working group and congressional interest in nuclear and nonproliferation issues.

Insight: You and Rep. Knollenberg took the lead in creating the Nuclear Issues Working Group. What do you see as the group's role in the House?

Spratt: Our mission is to build a greater awareness of the role of nuclear power. For example, in my state, South Carolina, nuclear power supplies almost 60 percent of the electricity we use. More broadly, we also want to make known what nuclear technology is making possible in other fields, such as medicine. This is the sort of information our group wants to get out to other members of Congress and their staffs.

Insight: The Senate has its nuclear caucus, the House has its nuclear clean-up committee and the nuclear issues working group. Do you think there's a growing interest in nuclear issues in Congress?

Spratt: Marginally, maybe. Many nuclear power facilities are nearing the end of their original license periods, and members with reactors in their districts will be concerned about relicensing. Yucca Mountain is also nearing the end of engineering development, and spent fuel disposal will

remain an issue with members until there is a final solution. Of course, members in states left with the environmental legacy of nuclear weapons production have a continuing interest.

Over the last year, allegations of security lapses at the Department of Energy have led to a complete overhaul of the department and have resulted in the re-creation of a DOE oversight panel of the Armed Services Committee, similar to a panel created and chaired for four years when Les Aspin was chairman. Mac Thornberry is chairman of the new panel and is working actively to make the panel knowledgeable and authoritative.

Nuclear arms control, proliferation and testing are still divisive issues in defense and foreign policy. And among members of the Armed Services Committee, there is concern about stockpile stewardship and the maintenance of nuclear weapons without testing. There is also concern about the emergence of rogue nations with ballistic missiles and nuclear warheads, dominated by irrational leaders who are not deterred by the threat of a devastating counterattack. We are concerned about

the continuing course that Russia may take, and cooperative threat reduction, and about the course China may follow.

Insight: Is there a role for the U.S. commercial nuclear energy industry in promoting the nation's nonproliferation efforts?

Spratt: Utilities like Duke Power, which serves my constituency, have worked in Ukraine to help them manage their nuclear reactors. And Duke has come forward with an offer to burn plutonium mixed-oxide fuel in its reactors, if the MOX fuel is ever made. It will only be made if there is a deal with Russia to reduce its stockpile of weapons-grade materials.

Insight: Your state is host to seven nuclear power plants that supply almost 60 percent of South Carolina's electricity. As a result, South Carolina has relatively few air quality issues—a fact that makes more emission tons available for other industrial activities and additional electricity generation. Do you think there's an awareness in Congress of the role nuclear energy can play in positioning states for economic growth?

Spratt: Well, nuclear power has been important to South Carolina. There's no question about that, and our state does have relatively cheap power.

Clearly, nuclear generation is a clean-air alternative to fossil fuel generation, and as clean-air standards get stricter and stricter, and as we struggle to reduce carbon dioxide as well as NOx emissions, this characteristic of nuclear power ought to be valued more and more.

South Carolina: A National Leader in Nuclear Power Production

- ▶ **Number of nuclear generating units:**
Seven
- ▶ **Electricity from nuclear energy:**
58 percent
- ▶ **Emissions avoided annually by nuclear energy:**
260,735 tons of sulfur dioxide
168,946 tons of nitrogen oxide
- ▶ **Consumer funds committed to federal nuclear waste management:**
\$1.03 billion

DOE Grants Critical to University Research

Basic research “should be a spark,” says Michael Corradini. The University of Wisconsin nuclear engineering professor believes that spark can ignite “new ideas that really benefit people in the long term.”

Corradini is one of 13 nuclear engineering faculty members across the country who have received Department of Energy grants this year to carry out innovative research. He and a colleague, T.R. “Rock” Mackie—together with two students—are building an industrial radiation detector that will be “cheaper, better and faster” than anything in use today. It’s a project that wouldn’t be possible without the DOE grant, says Corradini.

“DOE’s program is the equivalent of a National Science Foundation-based program,” he says. The difference is that the foundation has no fundamental research program for nuclear engineering or nuclear medical physics.

Kuruville Verghese says his project “would not have happened” without a DOE grant. He heads a team at North Carolina State University that is identifying design changes to mammography systems

under development. The goal is to improve the image, which will allow the earlier detection of breast cancer.

“There are indications that microcalcifications [tiny calcified formations] are present—generally in clusters—in 70 percent of breast tumors,” says Verghese. “We’re trying to find technology improvements that will lead to better definition of these clusters. This is part of earlier detection.”

At the University of Missouri, nuclear engineering professor Mark Prelas is using a DOE grant to develop a radioisotope battery for powering future unmanned spacecraft. Today’s craft rely on RTGs—radioisotope thermal generators—that produce electricity from the heat given off by plutonium 238, an isotope that isn’t used in weapons.

RTGs are safe, but they’ve generated a lot of protests from anti-nuclear groups, says Prelas. “The isotope we’re using is krypton 85. It’s an inert gas that doesn’t react with the human body, and because it’s gaseous, it disperses quickly.” Krypton 85—one of the safest of all known radioactive isotopes—is produced during the operation of a

nuclear power plant and released into the atmosphere. “If a krypton 85 battery is feasible, we could argue that nuclear plants should capture krypton 85 because there’s a market for it,” says Prelas.

A krypton 85 battery also could be used in communication satellites and in remote locations on Earth, such as Arctic stations, says Prelas.

Joining Prelas in the project are three other faculty members and four students. He says the DOE Nuclear Engineering Education Research grant provided a unique advantage. “It’s the only way we could have done the work.”

There’s only one problem with DOE’s university research program, says Wisconsin University’s Corradini. It only allows for a few new grants every year. “I’m a proponent of doubling, tripling or quadrupling the funds.”

The program—launched in 1998 with support from the House and Senate Appropriations Energy and Water Development subcommittees—supports basic research in nuclear engineering. It uses a competitive process to award about \$5 million in grants annually.

Putting a Face on Support for Nuclear Energy’s Clean Air Benefits

For small business owner Patty O’Donnell, clean air is a priority.

“Nuclear energy is one of the cleanest, safest sources of electricity. It keeps the lights on and the air clean,” says O’Donnell, a resi-

dent of Vernon, Vt. and mother of four.

O’Donnell represents two out of every three Americans who support nuclear energy, according to a recent industry survey.

O’Donnell’s image and message reached hundreds of Washington, D.C., policymakers, government workers and business people in April during the first leg of a new advertising campaign featuring the benefits of nuclear energy. They will appear for a second run this year.

O’Donnell’s message is echoed in a separate advertisement featuring a Phoenix, Ariz., science teacher, Craig Rowe.

“I see nuclear energy as one of the ways to help clean up our air,” Rowe tells readers of the *New Republic*, *National Journal*, *CQ Monitor*,



The Washington Post, *The Washington Times* and *Roll Call*.

Turtle Island—Under St. Lucie's Protection

If you want to see a living fossil, visit the Sunshine State. Florida's Atlantic coastal waters are home to five species of sea turtle—which have changed little since they first appeared about 200 million years ago. Once numbering in the millions, the sea turtle population has dwindled to the point where four of the species are endangered and one is threatened.

That trend may be reversing now, according to nesting survey results in Florida, including a 22-mile stretch of beach on Hutchinson Island—2½ miles of which belong to Florida Power & Light's St. Lucie Nuclear Power Plant. There, female turtles—which can range in weight from 200 pounds to 1,000 pounds, depending on the species—drag themselves ashore to lay their eggs.

Biologists from FPL conduct a nesting survey along 11 miles of the 22 miles of beach from mid-April to mid-September. "We count every nest every day," says Stacy Foster, FPL senior environmental specialist.

Leatherback, loggerhead and green turtles all nest on the beach, and surveyors identify every nest by species. The information is fed into the Florida Fish and Wildlife Conservation Commission's database.

"The loggerhead is the most common, with about 7,000 nests," Foster says.

While the information on female turtles is extensive, less is known about the males because they rarely leave the water. But they do come into St. Lucie's intake canal, where biologists

capture, tag and release them. "We've accumulated more information on male turtles than was available in the past," says Foster.

It's too soon to know whether the turtles can be removed from the endangered and threatened lists, she says, but "there appears to be a steady increase in their numbers." At least, the turtles will be safe on the St. Lucie site. Florida Power & Light has committed never to develop the beach.



PHOTO COURTESY OF FLORIDA POWER & LIGHT

NUCLEAR ENERGY insight

Nuclear Energy Insight is published monthly by the Nuclear Energy Institute for policymakers and others interested in nuclear issues. NEI is the Washington-based policy organization of the nuclear energy industry.

For more information call 202.739.8000 or visit NEI's Web site at www.nei.org.

Editor
Leslie Lamkin

Managing Editor
Alice Clamp

Contributing Editors
Jennifer Cetta
Lynne Neal
William Skaff
Richard N. Smith

Graphic Design
Rafy Levy



IN THIS ISSUE

- ▶ Study finds no link between TMI accident, cancer deaths. **3**
- ▶ Rep. Spratt advocates broader awareness of nuclear technologies. **6**
- ▶ Without DOE grants, some university research wouldn't be possible. **7**



NUCLEAR
ENERGY
INSTITUTE

1776 I Street, N.W., Suite 400
Washington, D.C. 20006-3708

Return Service Requested

PRESORT FIRST CLASS
U.S. POSTAGE
PAID
WASHINGTON, DC
PERMIT 827