

Insight

NOVEMBER/DECEMBER 2006

Man's Best Friend

Seeing Eye Dog Archer Helps Worker at Pennsylvania Nuclear Power Plant



PHOTOS COURTESY OF PPL SUSQUEHANNA

Archer guides Mickey Franczak through the PPL Susquehanna offices.

One of the plant workers at PPL Susquehanna does not speak, rarely interacts with co-workers and spends most of his day lying down on the job.

Archer, a golden retriever-Labrador mix, is a Seeing Eye dog for Mickey Franczak, a health physics technician at PPL's Susquehanna nuclear plant in northeastern Pennsylvania.

Every workday morning at 6:30, Archer and Franczak arrive at the plant driven by one of several co-workers. Archer then guides his owner through the security equipment at the plant's

entrance and into his office. Archer lies quietly under Franczak's desk for most of the day while Franczak helps coordinate day-to-day activities and keeps logs for the health physics group. He also provides employees with required information about the radiological conditions of their designated work areas.

Archer's favorite time is morning break when, after a brief walk outside, he is let off his harness for about an hour inside the enclosed health physics office. Without the harness, he knows he is not working and may interact with other workers.

"He's just like every other dog—he loves to have his belly scratched, and he's always up for a treat," said Franczak, who gradually lost his eyesight over the past 15 years because of a medical condition.

Archer also enjoys brief walks during lunch and afternoon breaks. At home in rural Shickshinny, Pa., he enjoys playing fetch and long walks in the country and in town that help keep his skills sharp.

"He retrieves toys when he wants to play—at least most of the time. Sometimes he just wants to rough it up," Franczak said.

"When I first got him a couple of years ago, he was only two and much like a little kid—he didn't want to listen. I've had to continue to work on improving his ability to help me, and lately he's been doing his job just perfectly. He even stays by my side now when passing other dogs and people on the street. I'm real proud of him."

Franczak uses other special supports to help him with his job at PPL Susquehanna. A software program enables him to work with Word docu-

ments, e-mail and Web pages by converting the content from written text to spoken words. He also uses a scanner that converts documents to electronic text that the software can read. Last year, Franczak's co-workers pitched in to buy him a home computer with the adaptations he needs.

"I really appreciate the support I've gotten from PPL and my friends here at the plant so I can continue to work and maintain a sense of accomplishment," Franczak said. "I'm not one to sit home and twiddle my thumbs. I know from others like me that many companies would have required me to go on long-term medical leave. Jobs for the legally blind are very limited.

"I never thought I'd be able to have a guide dog at a nuclear power plant, although he was probably one of the easiest workers to process. He didn't have any lengthy employment or criminal history to wade through,"

Franczak said with a laugh.



Archer is a Seeing Eye dog for Mickey Franczak, a health physics technician at PPL's Susquehanna nuclear power plant.

Iowans Believe Clean, Safe Nuclear Energy Is 'Smart Answer'

Iowa is a state of firsts: First in corn and pork production. First in ethanol production. And the first to hear a new grass-roots message about the importance of clean, safe nuclear energy to its 81,000 businesses, 89,700 farms and 2.9 million residents.

This October, the Clean and Safe Energy Coalition (CASEnergy Coalition) and state leaders called on Iowans to support nuclear power's use to balance America's energy demands and protect the environment. The Iowa stop is the first of several planned by the coalition, a group of more than 600 organizations and individuals who support nuclear energy.

"Our country's significant energy needs keep growing," coalition co-chairman Patrick Moore told policymakers and business leaders gathered at FPL Energy's Duane Arnold nuclear plant near Cedar Rapids. "Nuclear energy should be an important part of this diversification plan, especially since its production generates no pollutants or greenhouse gases."

Duane Arnold, Iowa's only nuclear power plant, generates 10 percent of the state's electricity. The Hawkeye State is part of the U.S. West North Central power grid, which forecasters predict will need 21 percent more electricity by 2030 to meet increasing consumer demand, Moore said.

The coalition includes the support of state and



PHOTO COURTESY OF CASENERGY COALITION

CASEnergy Coalition co-chairman Patrick Moore discusses the benefits of nuclear energy in Iowa. Justin Shields of the Hawkeye Labor Council, left, and state Rep. Brian Quirk joined Moore.

local policymakers in Iowa and other states.

"Nuclear energy is a smart answer for many reasons," said Brian Quirk, a Democratic state representative. "An important one to me is that nuclear energy is a clean energy source, one that can preserve the natural beauty we have out here in Iowa."

State Rep. Phil Wise, another Democrat, said 15 members of the Iowa House of Representatives Democratic caucus back the coalition. He told *The (Cedar Rapids) Gazette* that Iowa's first-in-the-

nation presidential caucuses would mean the group could influence national energy policy.

"Adding almost 50 percent more electricity to our country's electricity grid and 20 percent to our grid is not something we can solve in 2029," the Democratic mayor of Cedar Rapids, Kay Halloran, noted. "Solutions need to be put in place now, and nuclear energy is an important part of that solution."

Noting the wave of Democratic support, an Oct. 8 *Gazette* editorial said the policymakers "deserve praise for rejecting decades-old stereotypes about nuclear power and coming out strongly in favor of expansion of nuclear energy."

Local labor and business leaders also backed nuclear energy. "The growth of nuclear energy means jobs," said Justin Shields of the Hawkeye Labor Council. "And that is important to both our union and to this country. . . . Nuclear energy means economic growth and jobs, for our union and for many other workers across the country."

The CASEnergy Coalition brings together diverse organizations and individuals who support an expanded role for nuclear power in America's energy portfolio. For more information on the coalition, visit www.cleansafeenergy.org.

NRC's Merrifield Declines to Seek 3rd Term

Commissioner Jeffrey Merrifield, one of five members of the U.S. Nuclear Regulatory Commission, has decided not to seek a third term.

President Clinton appointed Merrifield, a Republican, to the NRC in 1998. President Bush subsequently reappointed him to a second term in 2002. Merrifield, whose term ends in June 2007, said he would serve the remainder of his term.



"Commissioner Merrifield has made extraordi-

nary contributions to the work of the NRC and rendered exceptional service to the American people," said NRC Chairman Dale Klein.

Merrifield has been with the agency at a time of significant change in the outlook of the nuclear industry. Having served on the commission during and after the events of Sept. 11, 2001, he has been heavily involved in efforts to improve the agency's security and emergency preparedness capabilities.

Merrifield has toured all 103 operating nuclear power plants in the United States.

Reactor Research Gets Funding Boost

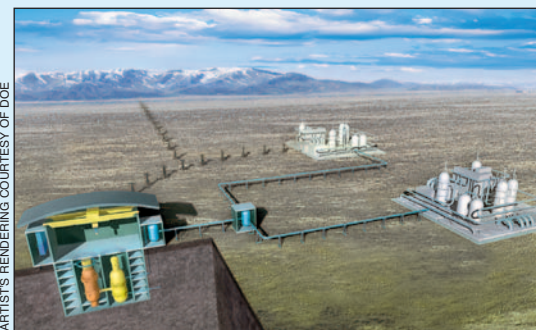
A new generation of even safer, more efficient nuclear power plants is a step closer to reality after the U.S. Department of Energy selected three companies to perform engineering studies and develop an early design to guide research on the next-generation nuclear plant (NGNP).

In September, DOE awarded about \$8 million to Westinghouse Electric Co. for the pre-conceptual design of the NGNP. In the future, the agency will issue contracts to AREVA NP and General Atomics to perform complementary engineering studies in the areas of technology and design tradeoffs, initial cost estimates, and selected plant arrangements.

The NGNP is a very-high-temperature reactor capable of producing heat suitable for the economical production of hydrogen, electricity and other energy sources. The design will incorporate advanced safety features that will allow the reactor to shut down automatically if necessary.

"These three commercial teams, broadly representing nuclear and other energy sectors, bring an important commercial perspective to the NGNP research and development initiative," said Dennis Spurgeon, assistant secretary for nuclear energy. "Their involvement will help us focus our research and development activities as well as establish the functional requirements for the program."

The studies, scheduled for completion in summer 2007, will use DOE funds and industry contributions for pre-conceptual design activities. DOE plans to build a prototype next-generation nuclear plant at its Idaho National Laboratory site by 2021.



DOE plans to build a prototype next-generation nuclear plant at the Idaho National Laboratory.



Staff from TXU's Comanche Peak nuclear plant sample water near the site as part of the facility's environmental monitoring program.

NRC Task Force Finds No Health Impact From Inadvertent Releases

Inadvertent releases of radioactive liquids from the nation's nuclear power plants did not pose any risk to public health and safety, a panel of Nuclear Regulatory Commission and state experts says.

"The most significant conclusion of the task force regarded public health impacts," the NRC report noted. Stuart Richards, the NRC manager who led the task force, said the agency "looked at a wide range of releases that go back to 1996 ... and none of these events led to appreciable radiation doses to people outside the plants. There are, however, areas of our regulations that could better cover these sorts of inadvertent spills and leaks."

The task force issued 26 recommendations for the agency and nuclear plant operators. These include updating NRC regulations on monitoring radioactive releases to take into account state-of-the-art technology and practices. The group also advised that the industry voluntarily inform state and local agencies even in cases where releases are below the limit requiring NRC notification.

In July, the nuclear energy industry implemented voluntary programs at nuclear plant sites across the country to enhance detection and management of inadvertent radiological releases in groundwater. The Groundwater Protection Initiative also provides for improved communication to local stakeholders in the event of a release.

The industry initiative emphasizes the need for

greater openness, a theme explored in the agency's 76-page report. "The task force concluded that the positive benefit to the NRC's goal of openness could be significant. The recommendations contained in the report reflect this judgment."

Ralph Andersen, chief health physicist at the Nuclear Energy Institute, said that the industry's initiative included many of the task force's recommendations for new measures at nuclear facilities.

He also sees changing expectations for the industry. "The expectations are more openness and transparency, a more proactive response to issues, and a more visible demonstration of our commitment to safety and protecting of the environment," Andersen said. "Meeting these expectations could foster greater public confidence in the industry."

The discovery of inadvertent releases of radioactive liquids, containing primarily tritium, in groundwater at or near several nuclear power plants during the past year prompted the NRC and industry responses. Tritium, a radioactive form of hydrogen, forms naturally in the upper atmosphere. It also is produced commercially for various uses and is a byproduct of nuclear power generation.

The full NRC report is available at www.nrc.gov/reactors/operating/ops-experience/grndwtr-contam-tritium.html.

Synthetic Venom and Nuclear Technology: Allies in Cancer Fight

Two unlikely allies have enlisted to battle cancer: synthetic scorpion venom and nuclear technology.

In a clinical trial, physicians paired Iodine 131, a radioactive isotope used in nuclear medicine, and a protein derived from the venom of the giant yellow Israeli scorpion. The resulting compound, 131-I TM-601, unleashed its fury against glioblastoma multiforme, the most common and deadly brain tumor, causing measurable damage to the cancer but little harm to surrounding tissues.

The action stems from the synthetic protein's affinity for cancerous cells. When pumped into the body, it locks onto them like a magnet and delivers the radioactive iodine to counter the cancer.

Researchers believe TM-601 also may boost the radioactive iodine's punch. If so, the finding "could allow us to reduce the dose of chemotherapy to achieve a therapeutic effect," said Adam Mamelak, a neurosurgeon at Cedars-Sinai Medical Center in Los Angeles and leader of the clinical trial.

More than 17,000 of the 36,000 brain tumors diagnosed each year are glioblastomas. The tumors are extremely aggressive and deadly, with only 8 percent of patients surviving two years from time of diagnosis. Surgeons often cut out a central mass of tumor, but residual cells quickly spread, beginning new deadly growths.

"Despite advances in surgical technology, radiation therapy and cancer-killing drugs, length of survival has remained virtually unchanged for patients with gliomas," said Keith Black, interim chairman of Cedars-Sinai's neurosurgery department. Physicians recently learned immunological secrets of the disease, he explained, "and we are developing innovative approaches, such as this one, that capitalize on these revelations."

One of the reasons brain tumors are resistant to traditional chemotherapy is that the molecules are too large to pass through the blood-brain barrier. Not so with TM-601, the peptide synthesized from the venom of the giant yellow Israeli scorpion. It passes through the barrier and attaches itself to the tumor. Moreover, the substance binds readily to Iodine 131, making a potent compound.



PHOTO BY ISRAEL IMAGES

Researchers created a synthetic version of the giant yellow Israeli scorpion's venom to battle cancer.

Researchers at TransMolecular Inc., a biotechnology company in Birmingham, Ala., developed the substance and obtained an expedited review from the U.S. Food and Drug Administration. The review is reserved for new drug applications that show promise against life-threatening diseases for which there is no effective treatment.

Mamelak, along with colleagues at several other hospitals, published the trial's results in the Aug. 1 issue of the *Journal of Clinical Oncology*.

The doctors selected 18 patients for the phase I study. First, doctors excised the solid mass of tumor. Fourteen to 28 days later, they injected a single low dose of the medicine directly into the

cavity left by the tumor.

Although the aggregate length of survival was 27 weeks, two women had a "complete radiographic response," meaning there was no evidence of tumor visible on magnetic resonance imaging scans. The patients remained alive 33 and 35 months after surgery.

The National Cancer Institute plans two additional clinical trials using the medicine. The first, a follow-up, phase II trial using higher doses against glioblastoma and other brain cancers, is already under way. Also under investigation is a phase I trial using the drug in patients with brain, breast, prostate, lung, skin and colon tumors.

16 Million Nuclear Medicine Procedures Each Year

- There are nearly 100 different nuclear medicine imaging procedures available today.
- Unlike other tests and procedures, nuclear medicine provides information about the function of virtually every major organ system within the body.
- Nuclear medicine procedures are among the safest diagnostic imaging tests available.
- The amount of radiation in a nuclear medicine procedure is comparable to that received during a diagnostic X-ray.
- Children undergo nuclear medicine procedures to evaluate bone pain, injuries, infection or kidney and bladder function.
- Nuclear medicine procedures are painless and do not require anesthesia.
- Common nuclear medicine applications include diagnosis and treatment of hyperthyroidism, cardiac stress tests to analyze heart function, bone and lung scans, diagnosis of liver and gall bladder function, and many more.

SOURCE: SOCIETY OF NUCLEAR MEDICINE

Refueling Outages Go Beyond Routine to Boost Plant Performance

Every 18 to 24 months, U.S. nuclear plants power down to replace their oldest uranium fuel with new assemblies. These “outages” serve as ideal times to perform regular maintenance and replace equipment to make today’s reactors more efficient. That is exactly what happened at several nuclear power plants this fall.

Fort Calhoun Station, the Omaha Public Power District’s nuclear power plant, undertook an ambitious refueling and maintenance outage that included replacing the plant’s pressurizer, reactor vessel head, two steam generators and other components. To allow access to the equipment, workers cut a large hole in the side of the plant’s containment building, which has walls nearly 4 feet thick.

Fort Calhoun personnel began preparations for the outage several years ago and more than 2,000 contractor employees assisted plant personnel during the outage. Most companies schedule refueling and maintenance outages for the spring and fall, when electricity demand is typically lower than at other times of the year.

In Kansas, Wolf Creek Generating Station began its fall outage in October. Before the outage started, the plant completed the longest continuous run in its 21-year history—506 days. Besides the refueling, Wolf Creek employees and contract workers installed modifications to several pieces of



PHOTO COURTESY OF OPPD

Fort Calhoun workers cut a large hole in the 4-foot-thick containment building to replace the vessel head.

equipment to comply with new U.S. Nuclear Regulatory Commission requirements.

PSEG Nuclear’s Salem 1 reactor returned to service in early November after completing a refueling outage with reactor head replacement in the world record time of 25 days, six hours and three minutes. During the outage, nearly 1,000 employees and supplemental workers completed 17,000 activities and met all nuclear safety goals.

American Electric Power’s Cook 1 reactor set a fuel-cycle record for electricity generation as the reactor shut down in September for its refueling. Besides refueling the reactor and regular outage work, the company replaced the reactor vessel head, three low-pressure turbine rotors and other major component and system improvements. The project cost more than \$100 million.

The replacement head incorporates corrosion-resistant material that will improve safety and reduce inspection requirements. The turbine rotors will boost reactor output by up to 25 megawatts during summer operation and 40 megawatts in the winter.

More than 1,800 contracted workers supplemented the plant’s 1,400-person work force to complete approximately 14,000 maintenance, inspection and equipment-modification activities.

FirstEnergy Nuclear Operating Co. began outage

work on its Beaver Valley 2 plant in Shippingport, Pa., in October. While the reactor was off line for refueling, the company completed several modifications to prepare the plant for an 8 percent increase in generating capacity.

One company already is working toward its 2008 outage. The Nebraska Public Power District’s Cooper Station took delivery on a used generator stator that will ensure low-cost electricity for Nebraskans, company officials said. A stator is a large, stationary encasement that holds the generator rotor. The rotor, with help from steam turbines, spins to produce electricity.

The massive 525-ton equipment arrived at the plant in Brownsville in eastern Nebraska, after shipment up the Missouri River. The company will refurbish the equipment next summer and install it during Cooper’s spring refueling outage in 2008.

The overall cost of the refurbishment is \$31.5 million. “By refurbishing a replicate of the system Cooper already has, we obtain a quality piece of equipment that NPPD can rebuild while the plant is on line, saving both outage and installation time. These measures equate to lower costs for our customers,” NPPD President and CEO Ron Asche said.



RON ASCHE



PHOTO COURTESY OF NPPD

A barge carrying Cooper Station’s generator stator docks next to a boat ramp on its way to the plant.

Proposals Seek Progress on Yucca Mountain

Two new legislative proposals have a similar goal in mind: clearing away obstacles delaying the federal government's used fuel and high-level defense waste repository in Yucca Mountain, Nev.

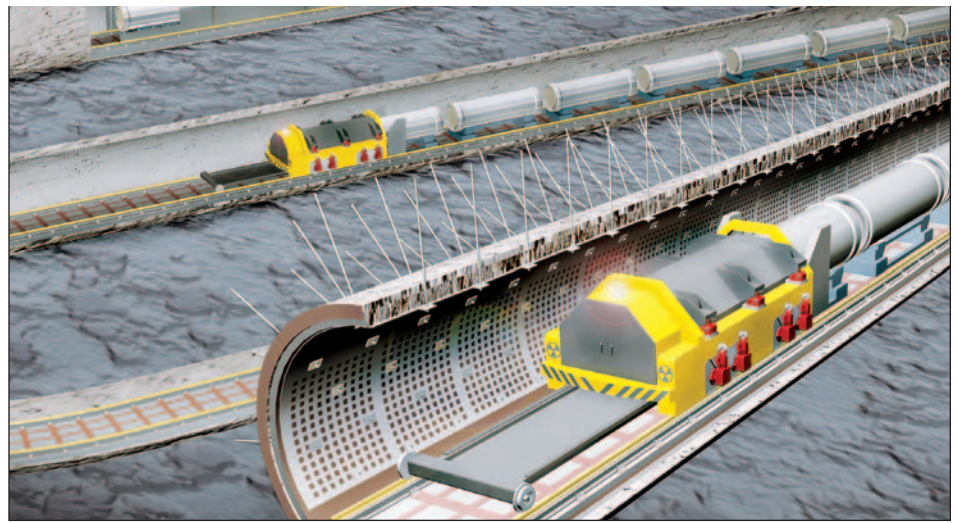
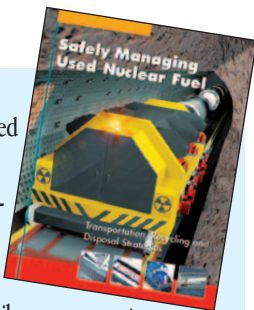
Sen. Pete Domenici (R-N.M.) introduced a bill in September that could accelerate movement of used fuel to Yucca Mountain. The legislation (S. 3962), in conjunction with the Senate 2007 energy appropriations bill's interim storage site provisions and Global Nuclear Energy Partnership's focus on reprocessing, form an overall strategy to address the federal government's short-, medium- and long-term management of used reactor fuel, Domenici said.

The legislation would create licensing procedures that could allow the federal government to move defense waste and commercial used fuel to Yucca Mountain before the repository opens. Domenici's bill requires the U.S. Department of Energy to file for a license with the U.S. Nuclear Regulatory Commission to build a surface storage facility at the Nevada Test Site concurrent with a construction authorization application for the repository, which DOE plans to file in June 2008.

The Nuclear Energy Institute has updated its brochure about the Yucca Mountain repository, "Safely Managing Used Nuclear Fuel."

The brochure describes permanent disposal at the national used nuclear fuel repository and contains illustrations of the facility and its storage containers.

To order copies, call 202.739.8148 or send an e-mail to publications@nei.org. The brochure is available online at www.nei.org



Yucca Mountain's remote-control rail system would carry and emplace sealed containers in the tunnels. No human would handle the containers once they are inside the repository.

"This measure provides DOE with the authorities needed to execute the Yucca Mountain project, and to begin long-term emplacement, while the Global Nuclear Energy Partnership program will reduce the volume of material to be emplaced in the mountain, eliminating the need for a second repository program," Domenici said.

Pennsylvania Gov. Ed Rendell (D) urged Congress in October to "enable full funding and continued development of a permanent repository at Yucca Mountain for the nation's high-level radioactive waste and [used nuclear fuel]."

"Pennsylvania has nine nuclear power plants on five sites. Due to the lack of a permanent SNF [spent nuclear fuel] repository, the commonwealth has now accumulated one of the largest inventories of SNF in the nation," Rendell wrote in an Oct. 16 letter to Sen. Arlen Specter (R-Pa.).

Calling himself a "strong advocate" for Yucca Mountain, Rendell stated his support for S. 3962. "While I believe that S. 3962 moves things in the right direction, I urge the Senate to take whatever action is necessary to ensure that construction of the final repository proceeds," Rendell wrote.

Meanwhile, the Nuclear Energy Institute issued a legislative plan in September that incorporates several measures from the administration's used fuel legislation introduced in April, including Nuclear Waste Fund reform and removal of the statutory 70,000-metric-ton limit for the repository.

The industry's proposal offers a number of additional features, including a temporary used-fuel storage facility at the Yucca Mountain site with a capacity of 40,000 metric tons. It also establishes procedures for alternative interim storage sites, ideally linked to fuel recycling demonstration facilities.

Union Backs Nuclear Energy, Repository

Nuclear energy won support from the International Brotherhood of Electrical Workers (IBEW) this fall when the group adopted a resolution encouraging work on used fuel management initiatives and advanced reactor designs.

The group adopted a resolution at its international convention backing "legislation that creates an integrated, environmentally sound, secure high-level radioactive waste system that ensures timely central storage, safe transportation and permanent disposal of spent nuclear fuels and nuclear byproducts." It also urged the construc-

tion of low-level radioactive waste facilities.

In addition, the IBEW called on the federal government to continue collaborating with private industry on research and development of advanced reactor designs. Government-industry partnerships also should focus on providing the nuclear energy sector with a well-trained work force, the resolution said.

Finally, the IBEW supported regulatory reform to make the permitting process for new nuclear plants "more objective and efficient, while ensuring safety and maintaining production."

Nuclear Power Can Bolster National Security

America must embrace alternative energy sources, including nuclear power, to reduce its dependence on imported oil and gas and the resulting threats to national security, two new studies say.

“The longer the delay, the greater will be the subsequent trauma,” said former Defense Secretary and Energy Secretary James Schlesinger, who chaired an independent panel appointed by the Council on Foreign Relations, a nonpartisan group.



JAMES SCHLESINGER

“National Security Consequences of U.S. Oil Dependency” calls for “greater use of nuclear power today,” saying, “over time, electricity generated by it can replace liquid fuels for transportation.”

The additional electricity, the study found, “will eventually make it easier to achieve greater substitution of electricity for oil, such as through use of plug-in hybrid cars and other cost-effective,

electricity-based transportation technologies.”



PHOTO COURTESY OF TVA

A contractor employee welds pipe at TVA's Browns Ferry 1, which is expected to restart in May 2007.

Nuclear plant construction could be hampered if the government is unsuccessful in making progress on used fuel management, creating an effective regulatory framework for licensing new plants and meeting proliferation concerns, the task force said.

“America faces a dangerous, long-term energy crisis,” says a new study by the Progressive Policy Institute that offers a plan to address America’s two distinct energy needs—fuel for transportation and power to generate electricity. Among the plan’s recommendations is expanding nuclear energy.

“New [nuclear] plant designs can produce power more safely and economically than first-generation facilities,” said the report, titled “A Progressive Energy Platform.”

The plan also proposes using carbon caps, substituting homegrown biofuels for oil in vehicles, increasing natural gas supplies and aggressively expanding the use of renewable energy such as wind, solar power and geothermal heat.

The Council on Foreign Relations report is available at www.cfr.org. The Progressive Policy Institute report is available at www.ppionline.org.

Bill Boosts Science Education to Help U.S. Stay Competitive

Recent reports from organizations as diverse as the National Academy of Sciences and the National Association of Manufacturers have concluded that the United States must bolster science education programs to retain its competitiveness in the global high-tech marketplace.

A bipartisan group of senators introduced a bill this fall to do just that. The legislation includes several initiatives that would aid the nuclear energy industry and other infrastructure sectors in educating their future work forces.

The National Competitiveness Investment Act (S. 3936), introduced in the Senate by Majority Leader Bill Frist (R-Tenn.) and Minority Leader Harry Reid (D-Nev.), contains many provisions of the Protecting America’s Competitive Edge bill

approved earlier this year by the Senate Energy and Natural Resources Committee. The provisions would increase federal support for basic research in the physical sciences, establish partnerships between Department of Energy laboratories and high schools, and invest in cleaner, more reliable and efficient energy technologies.

“This bill will help to preserve America’s competitive edge in the 21st-century global economy and will enhance our economic security,” Frist said.

Sen. Edward Kennedy (D-Mass.), a co-sponsor, agreed. “Study after study tells us that we need major new investments in education and research and development to stay ahead. We cannot just tinker at the margins and expect to master our own destiny in the global economy.”

The bill “strengthens programs at colleges and universities to encourage a renewed interest in



EDWARD KENNEDY

nuclear science,” Kennedy said, noting that three university research reactors are located in Massachusetts.

“These colleges will have a vital role as nuclear science expands, and this bill will help expand their programs and establish new ones to meet growing demand.”

The bill also would create a director of mathematics, science and engineering education programs within DOE, with responsibility for the agency’s nuclear science education program.

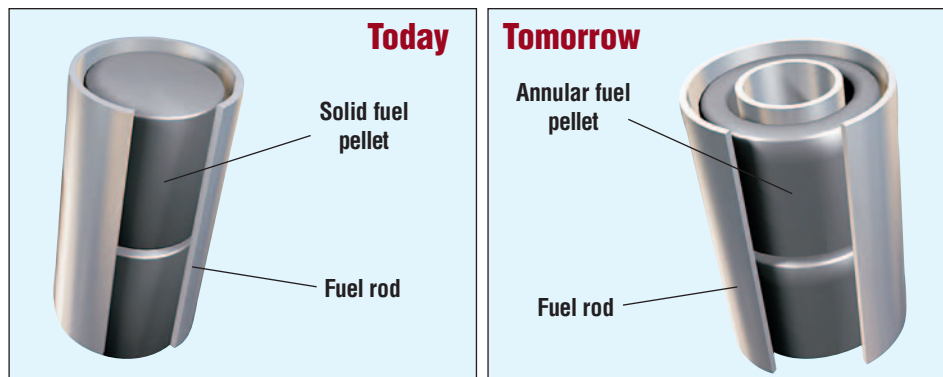
MIT Researchers Develop More Efficient Nuclear Fuel Pellet

Researchers at the Massachusetts Institute of Technology (MIT) have found a way to make uranium fuel—used in nuclear power plants—produce even more energy. The fuel study is part of ongoing work at MIT to make nuclear power plants even safer and more efficient.

Nuclear plants use uranium fuel comprised of ceramic-coated cylindrical pellets, about a half-inch in diameter, encased in steel tubes, or rods. A single uranium fuel pellet provides as much energy as 17,000 cubic feet of natural gas, 149 gallons of oil or nearly a railroad car full of coal.

MIT participated in a three-year project with the Department of Energy, Westinghouse and other companies to research a new fuel for pressurized water reactors, which comprise about two-thirds of America's 103 reactors. The goal: a fuel that is 30 percent more efficient and safer to use.

The new fuel pellets are hollow tubes instead of solid cylinders. MIT says the new configuration increases the surface area of the fuel and allows



Today's nuclear power plants use solid fuel pellets, left. MIT researchers have developed an annular fuel pellet, right, that is more efficient.

water to flow inside and outside the pellets. That facilitates the transfer of heat to the water, which ultimately creates steam to drive a power plant's turbines. Heat is produced when atoms inside the fuel fission, or split apart.

According to MIT, the new fuel is easy to manufacture and increases reactor power output by 50 percent. Researchers say the fuel also is safer

because it reaches an operating temperature of about 700 degrees Celsius, less than half the 1,800 degrees Celsius reached by today's fuel.

Before the new fuel concept can become a commercial product, researchers must test a limited number of fuel rods with hollow pellets in an operating reactor. Researchers say the fuel could be ready for commercial use in about 10 years.

NUCLEAR ENERGY

Insight

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