

insight

JULY 2000

Rising Nuclear Output = 19 'New' Plants

As U.S. nuclear power plants continue to achieve record performance levels, their output has soared. The effect? The increased output from the nation's current nuclear fleet since 1990 has been the equivalent of bringing 19 new 1,000-megawatt nuclear plants on line.

Powering that rise have been two factors: improved performance (a 17-plant equivalent) and uprates—engineering changes that boost a plant's megawatt output (a two-plant equivalent).

To uprate, some plants have installed new, more efficient turbines. Others have increased the capacity or efficiency of plant cooling systems. And still others have installed more accurate digital controls and instrumentation. As a result, the electricity supply system gets an additional 2,200 megawatts of capacity—the equivalent of two large nuclear power plants. The uprates were possible because of the extremely large safety margins in reactor designs and the advent of sophisticated engineering tools and industry databases in the 1980s.

During the 1990s, several new plants went on line and several were retired. The net result was a similar amount of generating capacity at the end of the decade.

Nuclear plant performance, which rose

through the 1990s, achieved a record last year.

The plants produced 728 billion kilowatt-hours of electricity—enough power to meet the needs of 67.5 million U.S. households. Plant capacity factor—a measure of efficiency that expresses the amount of electricity produced as a percentage of the maximum output achievable—also set a record: 86.8 percent average for all units.

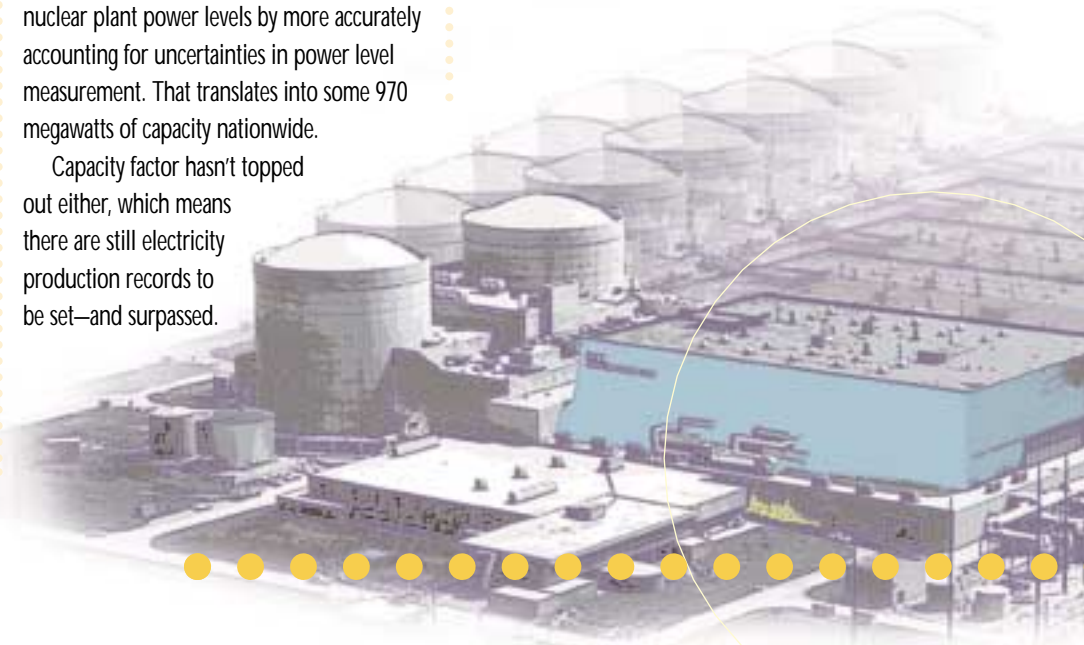
And even more nuclear plant output is on the horizon.

Another 842 megawatts in capacity uprates are planned, according to a survey this year by the Nuclear Energy Institute. And a recent revision in a Nuclear Regulatory Commission rule could allow utilities to request authorization for small increases—about 1 percent—in nuclear plant power levels by more accurately accounting for uncertainties in power level measurement. That translates into some 970 megawatts of capacity nationwide.

Capacity factor hasn't topped out either, which means there are still electricity production records to be set—and surpassed.

The Energy Department's Energy Information Administration projects nuclear output for this year at 735 billion kilowatt-hours—a 1 percent increase over 1999's record level. For the first quarter of the year, nuclear output ran 4.9 percent ahead of the first quarter last year.

A 2 percentage point rise in capacity factor would push nuclear output to about 758 billion kWh a year. With a rise of 4 percentage points—to 92 percent—output would soar to 775 billion kWh a year. Five years from now, U.S. nuclear plants could conceivably be producing 790 billion kWh—the equivalent of about eight new 1,000-megawatt plants coming on line.



Chalk Up a Win for WIN

“I want my workforce to reflect the people we serve,” the president and CEO of Southern Nuclear Operating Co. told 216 people attending the first annual meeting of U.S. Women in Nuclear. “We need total diversity, horizontally and vertically—especially in line management,” George Hairston added. “Not only is this good business sense, it’s also the right thing to do.”

Indeed, women can be anything they want to be, even in the male-dominated nuclear industry, Indira Kochery, health physics chemistry manager at Southern Nuclear, told attendees.

U.S. WIN was formed as a professional network for women who work in nuclear energy, and it encourages women to work in the field.

Last month’s Las Vegas meeting provided attendees—representing a cross-section of the technical professional disciplines in nuclear energy—updates on key industry issues, counsel on professional communications and career development, and an opportunity to network.

The two-day workshop attracted a handful of men, too. “Although the organization is made up



WIN meeting participants went underground to get the facts about Yucca Mountain.

primarily of women, we encourage men to join as well,” said Patricia Bryant, U.S. WIN coordinator and NEI’s director of member communications.

In addition to the discussions, the workshop included a tour of Yucca Mountain, site of a proposed repository for used nuclear fuel.

Cook Unit 2 Back in Full Operation

After nearly three years off line, the D.C. Cook Nuclear Plant Unit 2 reached 100 percent power on July 5, adding 1,090 megawatts to the electrical grid during the peak summer months.

The American Electric Power unit received approval for restart from the Nuclear Regulatory Commission last month.

The two-unit Michigan plant had been idle since September 1997 because of concerns about system reliability and operability.

In a letter to American Electric Power, NRC regional administrator James Dyer said the agency’s oversight panel had concluded that the plant staff’s performance improvement initiatives “have been sufficiently effective to support restart.”

Unit 1 is expected on line in September.

World Using More Nuclear Energy

The global use of nuclear energy increased by 3.8 percent last year, compared with 1998—well above the trend over the past 10 years, according to the annual energy review by BP Amoco.

The rise was powered by an 8 percent jump

in the United States and a 16.3 percent “rebound” in Russia.

It also was the largest percentage increase of any energy source. In fact, the boost in nuclear energy consumption took place against a backdrop of declining global energy consumption, especially in those nations with emerging and developing economies.

A copy of the report is available at <http://www.bpamoco.com/worldenergy>.

The world’s 432 nuclear power plants produced 2.4 trillion kilowatt-hours of electricity in 1999. Of the 31 countries with nuclear plants, 18 generated at least one-quarter of their electricity with the atom.



Nuclear energy supplied a record amount of electricity in 1999 to technologically developed countries like Canada. (Toronto, shown above.)

Energy Forum Held in Cyberspace

The World Wide Web is an increasingly important venue for commerce, but it's also a real-time mechanism for sharing ideas on issues ranging from the frivolous to the extraordinarily important—such as America's energy future. The nuclear energy industry now is moving energy policy dialogue to cyberspace, where more and more people turn to get up-to-date information.

On June 27, SwitchonAmerica.com—NEI's energy forum Web site—sponsored the first in a series of online discussions with energy experts. The forum was held through Speakout.com, a non-partisan Internet-based activism network.

Members of the public logged on to their computers for the chance to question Michehl Gent, president of the North American Electric Reliability Council, and Bill Martin, former deputy secretary of energy and chairman of Washington Policy and Analysis Inc.

Most of the questions were thoughtful and reasonably well-informed. One participant asked if deregulation presents reliability challenges for the future of the electricity sector.

"Challenges, yes. Roadblocks, no," said Gent.



If you have questions about nuclear energy, SwitchonAmerica.com has answers.

In the digital age, we're going to need even more nuclear energy than we've used in the past. Find out why. Respond to one of several

quick polls. Speak your mind about the electricity debate.

You'll find everything you want to know about the benefits of nuclear energy at <http://www.switchonamerica.com>.

"We feel if this is dealt with up front, then we will have sufficient capacity for the near future. Most of this capacity will be dealt with by merchant plants." He noted that most buyers of merchant plants are choosing natural gas as a fuel. "Nobody is sure how long the supply of natural gas will last."

Another participant asked how much electricity the United States will need in 2005, given population growth. While the speakers were not able to provide specific numbers, Martin noted the strong connection between electricity and economic growth. "I would say that electricity grows a little

bit slower than economic growth. So if we are to have a strong economic future, we need a strong electric future to power that economy."

Not surprisingly, the subject of clean energy came up. Asked one participant, "What is the outlook for clean energy sources in the U.S. electricity sector?" Martin said coal meets about half our electricity demand—but it's also the dirtiest fossil fuel. "Clean coal technology is essential," he said. And while natural gas is cleaner than coal, "the cleanest source is nuclear power, which produces no emissions."

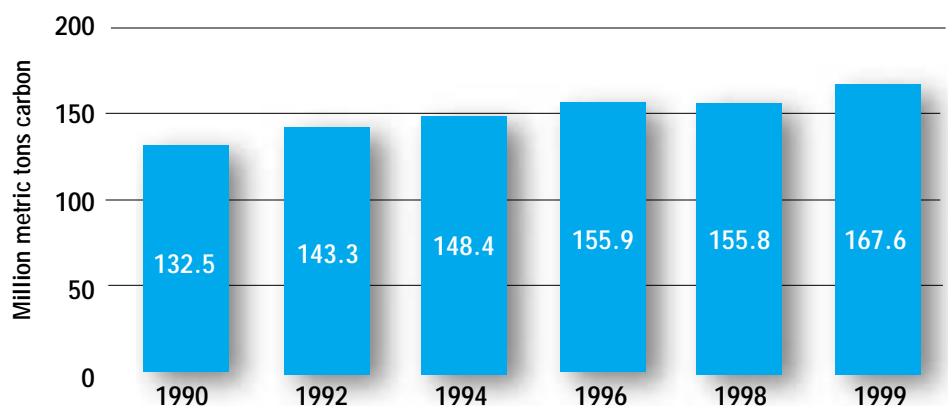
Rising Nuclear Output Slows Carbon Emissions

Record electricity production at the nation's nuclear power plants last year helped reduce U.S. carbon dioxide emissions.

Nationwide, CO₂ emissions from all sources—including industry and transportation—increased 16 million metric tons in 1999—from 1.495 billion metric tons of carbon to 1.511 billion metric tons of carbon, according to preliminary figures from the Energy Department's Energy Information Administration.

Production at America's nuclear power plants was 7 percent above its three-year average. Had production remained at the average level, emissions could have been 11.7 million metric tons of carbon higher, said EIA.

How To Avoid Carbon Emissions: Generate More Nuclear Electricity



Will Congress Intervene?

GAO Seeks Resolution of NRC/EPA Radiation Standards Dispute

Congress may need to reconcile an ongoing disagreement between the Nuclear Regulatory Commission and the Environmental Protection Agency, says the General Accounting Office. The issue is radiation standards for a proposed used fuel repository at Yucca Mountain in Nevada and for nuclear facilities cleanup.

The NRC's proposed public radiation protection limit at Yucca Mountain is 25 millirem a year from all sources—land, air and groundwater—which conforms to internationally accepted standards. The EPA recommends a 15 millirem a year limit, plus a separate standard for groundwater that would make it safe enough to drink before treatment. While the limits would vary, the EPA groundwater limit could be a fraction of a millirem a year, or up to a thousand times lower than average U.S. natural background radiation, GAO says.

The average annual radiation dose for U.S. residents from all sources is 360 millirem per year.

In releasing the GAO report at a July 14 news conference, Sen. Pete Domenici (R-N.M.) said that

"Congress should evaluate legislative approaches to either force EPA and NRC to define one standard or give responsibility to one agency." Speaking of the EPA's proposed requirement, he said, "The more we look at it, the more we're going to conclude that it's irrational. It's so low that I don't think [Yucca] mountain can meet it."

Domenici had asked the GAO to examine the scientific basis for the agencies' radiation standards and the costs of implementing them.

On behalf of the nuclear industry, NEI President and CEO Joe Colvin renewed the call "for Congress to resolve the regulatory stalemate by establishing a science-based radiation protection standard consistent with international levels."

The GAO report noted that the National Academy of Sciences has questioned the technical basis for EPA's groundwater protection approach.

"EPA recognizes that the drinking water contamination limits that are to be applied at the repository are not scientifically up to date," says the report. "They are based on 1970s-era methods of radiation

dose estimation, which have been superseded."

The radiation standards administered by the EPA and the NRC to protect the public from low-level radiation exposure "do not have a conclusive scientific basis, despite decades of research," says the report. "According to a consensus of scientists, there is a lack of conclusive evidence of low-level radiation effects below total exposures of about 5,000 to 10,000 millirem."

As for comparable costs, DOE officials told the GAO that some of the projected increases in the repository's costs could be associated with design changes resulting from EPA's proposed groundwater standards.

For soil cleanup at other NRC-licensed sites, the report showed that cleanup to a standard of less than 10 millirem a year at a nuclear power plant would be quadruple the cost of cleaning up the site to 25 millirem a year.

The report, "Radiation Standards: Scientific Basis Inconclusive, and EPA and NRC Disagreement Continues," is available at www.gao.gov.

Yucca Mountain on Schedule, EPA Off Base

The Energy Department is on track to meet a major milestone in its Yucca Mountain repository program, a DOE official told a House panel last month.

"We are on schedule to make a decision in 2001 on whether or not to recommend the Yucca Mountain site as a repository" for used fuel, said Ivan Itkin, director of the Office of Civilian Radioactive Waste Management.

Testifying before the House Commerce Energy and Power Subcommittee, Itkin said DOE's schedule calls for submitting a license application for repository construction to the Nuclear Regulatory Commission in 2002. But the House's approval of \$413 million in funding for the program in fiscal

year 2001—\$24.5 million less than DOE requested—would probably delay submission for up to a year, he told the subcommittee.

"Now, when we are so close to significant milestones, we should not allow insufficient resources to be a cause for delay," said Itkin.

Old Science. At the same hearing, the U.S. Environmental Protection Agency acknowledged that it used old science as a basis for its proposal to establish a separate groundwater radiation standard for the proposed repository (see story above).

Under pointed questioning from the subcommittee, Steve Page, the director of EPA's Office of Radiation, said the agency made a "policy call" in proposing the 4-millirem groundwater protection

standard in addition to its 15-millirem public radiation protection standard. He also acknowledged that EPA didn't base the groundwater standard on the latest scientific modeling.

Kevin Crowley, staff director of the National Research Council's Board on Radioactive Waste Management, stated unequivocally that the EPA's proposal to include separate groundwater limits in the repository standard is inconsistent with the recommendations made by the board at the request of Congress.

"You do not need a separate groundwater standard. ... It really doesn't make sense to provide more protection to groundwater than to the people who consume that groundwater," Crowley said.

Managing a Precious Resource in Ethiopia

Hydrologists Use Isotope Techniques To Map Groundwater

If all the Earth's water were compared to a gallon, then fresh water—including snow and ice—would constitute less than half a cup. Readily accessible fresh water would be about two drops.

Nowhere is this limited resource more precious than in Africa, where many nations suffer from recurring drought. The Moyale region in southern Ethiopia, for example—home to three million people—has a chronic shortage of water for drinking and crop irrigation.

To manage the region's meager water resources, Ethiopian hydrologists need to know the rate at which groundwater is replenished. Conventional methods can't easily give them that information, especially in arid zones like Moyale. But the use of isotopes—some radioactive—can.

"Groundwater contains rare isotopes of hydrogen and oxygen as well as trace amounts of radioactive isotopes, such as tritium and radiocarbon, washed out of the atmosphere by rain," says Pradeep Aggarwal, who heads the Isotope Hydrology Section at the International Atomic Energy Agency (IAEA). "By measuring the concentrations of these isotopes, we can determine the replenishment, or recharge, rate. We also can distinguish between groundwater that is being renewed through rainfall and very old groundwater that isn't renewable," he says.

For the past two years, two Ethiopian hydrologists—Zenaw Tessema and Johannes Belete—have studied Moyale's soil and rocks and taken water samples to build a picture of the region's water supplies.

"Both the climate and the geology are working against a good water supply for the Moyale region," says Tessema, who works for the Ethiopian

Isotope hydrology helps countries like Ethiopia manage their water resources.

Institute for Geological Surveys. Semi-desert Moyale has only two short rainy periods a year and very few deep-water aquifers. "We're trying to make the best of the worst kind of conditions."

Tessema and Belete, who also works for the institute, are using isotopic methods for the first time to map the region's underground reserves. Referring to a well that local herders use to water their cattle, Belete says: "We know from isotopic analysis that the well water they are consuming is nonrenewable. Unfortunately, this well could soon go dry."

Offsetting the herders' well is an area identified by the two hydrologists as having the greatest groundwater potential in the Moyale region. Knowing which water sources are not likely to be replenished—and which are—is essential to their development and use.

"IAEA has provided us with the basis for managing our water resources in a rational and comprehensive way," says Ketema Tadesse, general manager of the institute. The agency provides equipment for field investigations, trains local and regional

specialists in field measurements, sampling techniques, and data handling and interpretation. The IAEA also offers member countries the use of its special isotope hydrology laboratory.

With the help of these tools, Ethiopian groundwater specialists mapped the Moyale region's aquifer systems. And on the basis of this map, some 80 wells were drilled. They were the only water supply source during this year's peak drought, says the IAEA's Aggarwal.

PHOTO COURTESY OF IAEA



Put Nuclear Energy's Role in Perspective, Congress Told

Together, nuclear energy and coal provide more than 70 percent of America's electricity. Little wonder, then, that the House Commerce Committee's energy and power sub-

"Federal policy-makers completely disregard the role of nuclear energy in meeting the nation's energy needs."



Corbin McNeill
Chairman, president
and CEO
PECO Energy

committee held a hearing last month on the future of these two energy sources.

The United States needs nuclear and coal technologies for electricity production, said subcommittee Chairman Joe Barton. But the nation doesn't know where these technologies are heading, given federal inaction on used nuclear fuel and federal action on limiting pollutants from coal smokestacks, said the Texas Republican.

Robert Ebel put this question to the panel: "...[D]oes the United States have a forward-looking plan for nuclear power?" Not waiting for an answer, he said: "No, it does not." The nation has two choices, said the director of energy and national security at the Center for Strategic and International Studies, a Washington, D.C.-based think tank. "Exercise the nuclear option, through government support... or accept that pollution will worsen."

Speaking for the nuclear energy industry, Corbin McNeill said that "with few exceptions, federal policymakers completely disregard the role of nuclear energy in meeting the nation's energy needs. This is distressing, given that nuclear energy is our largest source of emission-free electricity and second largest generator of electricity overall," said the PECO Energy chairman, president and CEO.

"To put the role of nuclear power in perspective, if the U.S. closed all 103 nuclear plants and replaced them with fossil-fired plants, we would have to remove 90 million cars from America's highways just to maintain air quality at its current level," said McNeill.

Britain's BNFL Invests in New Nuclear Plant

The small, economical and safe nuclear power plant being developed by South Africa's utility, Eskom, has snared an admirer.

BNFL, the British international nuclear company, made a substantial investment last month in what it called "a very exciting and pioneering concept"—the pebble bed reactor.

When Eskom decided to explore the future use of nuclear energy, it knew what it wanted: a nuclear power plant that would be competitive with its large coal-fired generating units, could be sited anywhere—and would be accepted by the public. These criteria led Eskom to the small, modular pebble bed reactor—so named because the fuel consists of "pebbles" the size of baseballs, each containing more than 10,000 uranium oxide microspheres coated with layers of carbon and graphite.

Capable of producing about 110 megawatts of electricity, the reactor's modular design and small size help reduce construction costs and add flexibility by allowing additional generating units to be added to plant sites as needed. The safety systems rely on natural forces and require no human intervention to operate.

The South African government approved a plan for developing a feasibility study, an environmental impact assessment and a public participation process. Construction of a demonstration plant is scheduled for mid-2001.

"We look forward to working with our partners"—Eskom and the state-owned Industrial Development Corp.—"to develop the [pebble bed reactor] further right through to commercial operation," said Sue Ion, BNFL's director of technology and operations. "This investment complements BNFL's ownership of the Westinghouse AP600 reactor—an advanced passive nuclear design."

Now Hear This



"...I have said clearly that Europe cannot renounce nuclear energy, not only for strategic reasons but also because of our commitments at Kyoto [to reduce carbon dioxide emissions]."

— Loyola de Palacio, vice president of the European Commission, in an interview with Barry James, *International Herald Tribune*, June 15, 2000.

Utah Fuel Storage Facility: A Temporary Solution

NRC Public Meeting Elicits Comments on Private Project

Supporters and opponents of a temporary storage facility for used nuclear fuel had an opportunity to speak out at a public hearing in Salt Lake City last month.

Harvard University Professor Richard Wilson of the Scientists for Secure Waste Storage said, "The risks attributable to a waste storage facility are very small and much less than many societal risks. In particular, they are smaller than the risks of living in Salt Lake City with its particulate air pollution."

The temporary storage facility—proposed by a group of eight utilities—would be built on land held by the Skull Valley Band of Goshute Indians in Tooele County, Utah.

The Nuclear Regulatory Commission's Atomic Safety and Licensing Board held closed hearings on financial assurance and decommissioning issues—two of about a dozen contentions raised by the state of Utah and other opponents of the facility. The three-member panel also held a public hearing on emergency planning issues, at which it heard statements from about 60 citizens or representatives of interested organizations.

Transportation consultant Robert Jones told attendees that "the transportation of used fuel has an enviable record of safety—one that is unmatched in the transportation business. Used fuel shipping containers are designed to withstand federally mandated accident conditions."

Safe Storage



If all goes well, the private used fuel facility could open in Utah in 2003.

Scott Peterson, NEI's senior director for external communications, said that although Utah has no commercial nuclear power plants, many Western states benefit from nuclear energy at a time when electricity reserve margins are low.

Nuclear power plants in California, Washington and Arizona have helped improve air quality in cities such as Phoenix and Los Angeles.

Peterson added that because of the Department of Energy's delay in meeting the 1998 commitment to manage fuel at a federal repository, some nuclear plants are running out of storage capacity. "Some of these plants are unable to expand their capacity to store fuel on site and must move used nuclear fuel to a regional storage facility, like that envisioned by Private Fuel Storage," he said. "This storage technology has been demonstrated to be safe at 21 nuclear plant sites that have been operating similar facilities since the late 1980s."

Utah Republican Reps. James Hansen and Merrill Cook submitted statements opposing the Private Fuel Storage project, as did Bob Loux of the Nevada Nuclear Project Office, representatives of a Utah "downwinders" group, the Sierra Club and other local organizations. Hansen has said he will hold congressional hearings on the Goshute Tribe's approval of the land lease for the project.

Please Do Not Disturb

Beware the female alligator defending her nest! Employees at the Waterford 3 nuclear power plant in Taft, La., got too close to a nest while inspecting an old pond on the plant site earlier this month. Mama charged, and the workers fled.

What the alligator didn't know was this: She and her yet-to-hatch babies were perfectly safe on the plant site—where fish and other aquatic animals enjoy a protected habitat.

But there was no way of telling her that. So Mickey Schmill, a parish alligator control officer, and Kip Benoit, a Waterford 3 employee—both

experienced alligator hunters—found and captured the female. They then retrieved and carefully marked the eggs. According to Benoit, a drought has reduced the number of waterside nesting sites, prompting alligators to look for new places to nest.

Meanwhile, the eggs from the Waterford 3 nest

are being placed in a hatchery at the state-run Rockefeller Wildlife Refuge, and the baby alligators will be released into the refuge's 84,000 acres. Their mother is being moved to swamps near Luling, La.

Nuclear Employees Replenish Blood Supply

It started with an idea by Charlie Sauer, an electrical maintenance supervisor at the South Texas Project nuclear power plant—a blood drive supported by the nuclear industry.

Sauer sold the Nuclear Energy Institute on the idea, and during the week of June 26, blood donors from NEI and 10 of its member companies, including STP Nuclear Operating Co., participated in the industry's first Energy for Life blood drive.

The drive, sponsored by NEI, America's Blood Centers and the American Red Cross, was held the week before the Fourth of July weekend, typically a critical period of low blood supplies nationwide.

"We appreciate the continued support of the nuclear industry and are thrilled that it has embarked on this special collaborative effort to help us collect much-needed blood as we enter the summer months," said Celso Bianco, president of

America's Blood Centers. "Because we are all so very busy this time of year, the industry's willingness to conduct additional blood drives and promote the program to its employees will help keep the thought of donating blood—giving 'the gift of life'—at the top of everyone's mind."

Participating companies were:

- Arizona Public Service
- Carolina Power & Light
- Duke Power
- Entergy Operations
- New York Power Authority
- Northern States Power
- South Carolina Electric & Gas
- STP Nuclear Operating Co.
- TXU Electric & Gas
- Vermont Yankee Nuclear Power.



Joe Sheppard, vice president of engineering and technical services at the STP Nuclear Operating Co., donates blood. Collecting the donation is Donald McKinnon, a Gulf Coast Regional Blood Center supervisor.

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insight

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