

At PPPL  
**THIS WEEK**

**MONDAY, SEPTEMBER 10**

**NSTX Physics Meeting**

1:30 p.m. - 3 p.m. ♦ B-318

**TUESDAY, SEPTEMBER 11**



**WED.-THU, SEPTEMBER 12-13**

**Communications Summit  
for U.S. Magnetic Fusion**

All Day. ♦ Princeton University

Invitation only conference of communications leaders and scientists

**WEDNESDAY, SEPTEMBER 12**

**GFDL Events and Seminars**

12 p.m. - 1 p.m. ♦ GFDL  
Smagorinsky Seminar Room

Regional Patterns of Climate Change  
In Global Warming

Shang-Ping Xie (U. Hawaii/IPRC)

[www.gfdl.noaa.gov/events](http://www.gfdl.noaa.gov/events)

(Gov't, Univ. or 2 other forms of I.D. needed)

**FRIDAY, SEPTEMBER 14**

**DIII-D Science Meeting**

1 p.m. ♦ B-233

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**Scientists Invent Device to End Shortage  
of Material Vital to Medical Exams**

By John Greenwald

**R**esearchers at the Princeton Plasma Physics Laboratory are using their knowledge of fusion to develop a solution to chronic shortages of a radioactive element vital to medical exams.

The researchers are creating a compact device that hospitals could install on their premises to produce the material, called Technitium-99m (Tc-99m), the world's most widely used medical isotope for diagnostic examinations. Tc-99m comes from the radioactive decay of a man-made substance called Molybdenum-99 (Mo-99). The \$5 billion-a-year industry presently producing Mo-99 is plagued by supply delays caused by lengthy supply lines and frequent shutdowns at a handful of aging nuclear reactors.

The refrigerator-size system developed at PPPL would be one that "you turn on over the weekend, and when you come in on Monday you have enough Mo-99 to produce enough Tc-99m to meet your exam schedule for the week," said George Ascione, head of the health physics department at the Laboratory.

The demand for Mo-99 far outstrips the current supply. "The market is well under-saturated," said Adam Cohen, deputy director for operations, who is working with Ascione and lead investigator Charles Gentile on the project. "Hospitals want to use more Technitium than is currently available." A 2011 report from the London-based World Nuclear Association (WNA) concurred with that sentiment. "A need for increased production capacity and more reliable distribution is evi-

*continued on page 4*

**Below, from left, George Ascione, Charles Gentile and Adam Cohen place copper plates and a coupon containing naturally occurring molybdenum beneath a gamma ray detector in the prototype device.**



# PPPL Brings In Gold (& Silver) For Reducing Greenhouse Gases & Green Buying

By Jeanne Jackson DeVoe

The U.S. Department of Energy (DOE) is recognizing PPPL for cutting its carbon footprint nearly in half in a three-year period, nine years ahead of federal deadlines.

PPPL will receive a 2012 Sustainability Award in Washington, D.C., later this month after reducing greenhouse emissions by 48 percent in the last three years, far exceeding the DOE's goals of a 28 percent reduction. The award is one of three PPPL will accept for its environmental programs. "To cut greenhouse emissions by 50 percent over three years is just really exceptional," said Robert Sheneman, the deputy head of PPPL's Environment, Safety, Health and Security (ESH&S) Department.

Staff members cited for the sustainability award are: Matt Lawson, of the Material Services Branch, for his work on acquiring and managing a fleet of vehicles using alternative fuels; Bill Gervasi, manager of facilities maintenance and operations, for his work on energy efficiency and incorporating energy efficient products in Lab facilities; John Lacenere, head of AC Power Engineering, for metering electric systems to make them more efficient; Margaret King, grounds and maintenance supervisor, for managing the recycling program, including composting; and Tim Stevenson, head of project management, for reducing sulfur hexafluoride emissions.

The awards will be given in conjunction with the GreenGov Symposium in Washington the last week of September, with the Electronics Challenge award presentation scheduled on Sept. 26 and the GreenBuy award and Sustainability award ceremonies scheduled Sept. 27.

One of the ways the Lab was able to significantly cut greenhouse emissions was through an aggressive campaign to reduce leaks of sulfur hexafluoride or SF<sub>6</sub>, the gas used to insulate electrical equipment. Although it is not toxic, it has the potential to cause global warming at nearly 24,000 times the rate of carbon dioxide, Sheneman said.

When PPPL staff realized that SF<sub>6</sub> was responsible for a large portion of its greenhouse gases, it was "a wake up call," Sheneman recalled. "They said, 'Uh oh, we have to get on this.'"

Tim Stevenson led the staff members in an effort to cut SF<sub>6</sub> emissions. First, they performed an extensive survey of valves, tubing, gauges and external components that could leak and repaired any necessary. They performed daily rounds and readings to check pressure so as to identify any failures almost immediately. The lab continues to upgrade high-voltage power equipment and the SF<sub>6</sub> handling systems to ensure against leaks.

Laboratory staff also converted many fleet vehicles from conventional to alternative fuels, reducing greenhouse gases by 13 percent. PPPL won a DOE Sustainability Award last year for its fleet management program. They also took steps to reduce electricity in facilities, resulting in a 17 percent cut in electrical use. In addition, they improved boiler operations to

reduce fuel consumption by 23 percent. Those efforts made up for a 29 percent increase in greenhouse gases from business travel, Sheneman said. The uptick was due to more PPPL scientists and engineers traveling abroad for international collaborations, especially for work on ITER, an experimental fusion device being built in Cadarache, France.

Officials at the Department of Energy have established goals to reduce business travel and other indirect causes of greenhouse gases, such as employee commuting, by 13 percent by 2020. The Lab reduced greenhouse gases from employee commuting by 18 percent and reduced waste disposal by 8 percent through its recycling program. It also expanded its food waste composting program over the past year. Those efforts resulted in a 7.7 percent overall reduction in this category by 2011.

Sheneman said the challenge for PPPL in reaching the 2020 goal will be to continue to pursue its research mission, while still finding ways to reduce greenhouse gases by, for example, videoconferencing with overseas research partners whenever possible.

While PPPL will continue efforts to make PPPL more sustainable, Sheneman warns it may be difficult to reach such dramatic reductions in greenhouse gases over the next several years. "I suspect what we'll find is that the first 50 percent is the easy part," he said. "It's going to require us to make some choices."

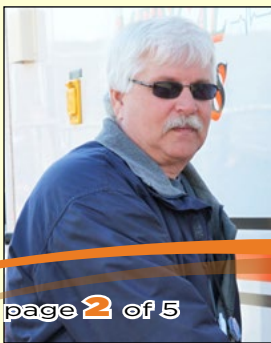
In addition to the sustainability award, PPPL will also receive a gold GreenBuy Award from the DOE for its green purchasing program. The Lab will be one of only three facilities in the country, along with the Lawrence Livermore National Lab and the National Renewable Energy Lab, to receive the gold award. PPPL did not change any policies or institute new programs to win the award, Sheneman said. It simply submitted a list of green products the Laboratory has been purchasing over the past decade.

PPPLers have a history of buying green products for everything from the soap in the restrooms to the cleaning products used on the floors. So when the DOE asked for submissions for its GreenBuy award program, Lab purchasers simply had to demonstrate what they already have been doing. "It's a recognition of what people have been doing for years down in the trenches," Sheneman said.

The custodial staff uses a deodorizer made of thyme oil, for example, and an air freshener/deodorizer made from 100 percent orange oil. The Lab has also increased its use of recycled paper throughout offices and rest rooms and in the cafeteria.

PPPL will also receive a silver award in the EPA's Federal Electronics Challenge 2012 for purchasing, managing and disposing of energy efficient electronics equipment, after winning a bronze award last year. "We like to receive As on our report card," Sheneman joked. ☺

Matt Lawson



John Lacenere



Margaret King



Bill Gervasi



Tim Stevenson



# PPPL Joins Proposed Partnership in China

By John Greenwald

**P**PPPL would join forces with two major Chinese research institutions under a tentative agreement that Laboratory Director Stewart Prager signed Aug. 13 in Hefei, China. The agreement, reached in the form of a nonbinding memorandum of understanding, would make PPPL a partner in a proposed center for fusion and plasma science with the University of Science and Technology of China (USTC) and the Institute for Plasma Physics (IPP). Both are in Hefei.

Participation in the center would enable PPPL scientists to collaborate in fusion and plasma physics research with the two Chinese partners. Funding for the center would come from the Chinese government.

The new center would be among the approximately 100 research enterprises that the Chinese government plans to create at universities across China. USTC, which would house the center, plans to open an office to initiate the organization while the university develops a proposal to submit to the government next year. "There is optimism that the center will get funded," said Prager, "but the competition will be stiff." 📧



Stewart Prager (center) at the signing ceremony for the proposed new center. Flanking him in the front row at the third, fourth and fifth from left are: Prof. Yuanxi Wan, director of the proposed center; Prof. Jianguo Hou, president of USTC; and Prof. Jianguo Li, director of IPP.

Photo credit: USTC Publicity Office

## Welcome to Jeanne Jackson DeVoe!



Jeanne Jackson DeVoe

**J**eanne Jackson DeVoe, a longtime journalist who has written extensively for Princeton University, has joined the PPPL staff in an interim position as a Communications Specialist. In this role, she will be organizing tours for the Laboratory's popular visitors program and serve as editor of the PPPL Weekly, among other duties.

DeVoe has written for the University's Woodrow Wilson School, the School of Engineering, the Keller Center, and the Department of History. She also has written for several institutions within Rutgers University, including its Office of Research and Sponsored Programs, and Rutgers Today. She has taught journalism at Rutgers' School of Communication & Information for more than a decade.

In her lengthy journalism career, she has reported and written for numerous magazines and newspapers, including New Jersey Monthly and Working Mother. She wrote a parenting column, "Family Matters," for nine years for the Times of Trenton.

She began her career at the Asbury Park Press, where she worked for 11 years covering local politics, education and police. She also wrote a singles column for the Press. She is a graduate of Hofstra University and has a master's degree from Columbia University's Graduate School of Journalism. She lives in Princeton with her husband, two teen-age sons, and two dogs. She is an avid reader who enjoys music, gardening and quilting. 📧

# Vital Device

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dent,” said the group, which represents nuclear isotope suppliers and nuclear power providers throughout the world.

Medical workers inject patients with Tc-99m to diagnose conditions ranging from brain tumors and organ ailments to circulatory problems and heart disease. The isotope emits gamma rays that diagnostic equipment can easily trace. Some 80 percent of all nuclear medicine procedures use Tc-99m, according to the WNA—a proportion that works out to some 30 million scans a year.

PPPL formulated its project when the National Research Universal reactor in Chalk River, Canada, which produces some 40 percent of the world’s Mo-99, shut down for 15 months beginning in 2009. The reactor makes the isotope by shooting neutrons at highly enriched uranium. The closure caught the eye of engineer Gene Baker, who sent Director Stewart Prager a note suggesting that the Laboratory use its own knowledge of neutrons to create Mo-99. PPPL has long been familiar with neutrons as the product of fusion reactions that the Laboratory is working to develop as a clean and abundant source of energy.

## Neutron Generator

Baker’s suggestion prompted a series of brainstorming sessions. The process the Laboratory developed employs a device called a neutron generator that energy companies use in searching for oil. PPPL’s generator is a roughly six-foot-long, flagpole-like tube that fires high-energy neutrons at quarter-inch thick metal plates. The contact produces high-energy gamma rays that strike an isotope called Molybdenum 100 (Mo-100), knocking a neutron out of the isotope’s nucleus and turning it into Mo-99.

Since this process takes place without uranium, there’s no radioactive waste or risk of nuclear proliferation. There’s also no supply chain. “The Mo-99 is right there when you need it, and that’s a big difference from what’s happening now,” said lead investigator Gentile.

Prompt access to the medical isotope is vital because the usefulness of both Mo-99 and Tc-99m is limited by their half-lives, which measure the time that it takes for half of a radioactive element to decay away. Mo-99 has a half-life of 66 hours, or less than three days, so any delay in a lengthy supply chain can cause much of the isotope to be lost to decay. The half-life of Tc-99m is only six hours, which means that it must be used quickly once it is made. When dealing with both elements, “you’re always fighting the half-life,” said Gentile.

The ability to produce Mo-99 directly in hospitals could be particularly beneficial to countries with poor transportation systems that hamper the delivery of medical supplies. “There are places on this planet that airplanes don’t fly to on a daily basis, but there are people there who need this kind of technology,” Gentile said.



George Ascione, far right, positions gamma ray detector over copper plate and a coupon of molybdenum.

The PPPL effort is part of a worldwide race to create new sources of Mo-99. In Canada, efforts are under way to use particle accelerators called cyclotrons to produce the isotope in place of the 55-year-old Chalk River reactor, which is scheduled to cease operation in 2016. Other recent endeavors include a Russian venture to expand production of Mo-99 to three nuclear reactors in the town of Dimitrovgrad, a move that began in 2010. In contrast to such efforts, the PPPL process is designed to make Mo-99 without large facilities wherever it is needed, and the device can be plugged into a standard wall outlet.

PPPL has produced test batches of the isotope by using its process, and has filed for a patent to be held by Princeton University. Researchers now plan to seek funds to build a prototype in the fall.

The inventors are currently fine-tuning the process to produce the maximum amount of Mo-99 at a time. This calls for creating the best combination of neutron energy and quarter-inch plates to produce the optimal level of energy for the gamma rays. “We want to optimize the high-energy gammas to get a very high yield of Mo-99 from a small amount of Mo-100,” health physicist Ascione said. Such precise calibration could enable a few grams of Mo-100 to yield a week’s worth of Mo-99 for medical scans.

Once developed, the PPPL process would need to be licensed by the U.S. Nuclear Regulatory Commission for use outside the Laboratory. Approval from the U.S. Food and Drug Administration after clinical trials would be required as well. Gentile estimates that hospitals could then purchase the Mo-99 production systems for a price “on the order of a few hundred thousand dollars a year if you make them in quantity. This is not a multimillion dollar device,” he said.

For PPPL, an added benefit of producing Mo-99 comes from the fact that fusion reactors could also make the isotope once such reactors are built. “Fusion reactors will not only have the ability to make electricity from the neutrons they create, but also medical isotopes,” Gentile said. “That shows another application for fusion energy.”

# Fusion Leaders Gather for Communications Summit

By Jeanne Jackson DeVoe

PPPL will bring together scientific and communications leaders in the fusion energy field, for a Communications Summit on U.S. Magnetic Fusion at Princeton University, Sept. 12 -13, focused on raising national awareness of fusion energy.

The day and a half-long, invitation-only conference, organized by Kitta MacPherson, PPPL's Director of Communications, and John DeLooper, Head of Best Practices and Outreach at the Laboratory, is aimed at discussing best practices to inform the public about the potential of fusion energy to provide an alternative energy source to the United States and the world.

Providing information to the public is particularly important at a time when resources are limited and communications priorities must be set and there appears to be more public awareness of other forms of alternative energy, MacPherson said in a letter to meeting attendees. There is a need to inform the public about the excellent progress being made by fusion scientists and engineers in their goal of developing commercial fusion energy, she said.

Most of the meeting will be devoted to small workshop discussions among participants, with the goal of developing a communications roadmap for the future. ☐

## Prager Interview on YouTube

PPPL Director Stewart Prager's video interview with Plainsboro Mayor Peter Cantu that appeared recently on the "Spotlight Special" on Plainsboro's cable television station is now posted on YouTube. In the 13-minute special, Prager discusses the Lab's history, the scientific challenges ahead for fusion and the strong ties between the Lab and the Plainsboro community. You can view the video at <http://www.youtube.com/watch?v=xEG28RUvI6w&feature=plcp>.



## PPPL Café Menu

BREAKFAST ..... 7 a.m. • 10 a.m.  
CONTINENTAL BREAKFAST ..... 10 a.m. • 11:30 a.m.  
LUNCH ..... 11:30 p.m. • 1:30 p.m.  
SNACK SERVICE ..... until 2:30 p.m.

**MONDAY SEPT. 10**

**TUESDAY SEPT. 11**

**WEDNESDAY SEPT. 12**

**THURSDAY SEPT. 13**

**FRIDAY SEPT. 14**

COMMAND PERFORMANCE  
CHEF'S FEATURE



**FETTUCINI ALFREDO W/ ITALIAN SAUSAGE**



**CURRY BEEF STEW W/ MASHED POTATOES**



**GINGER PORK OVER RICE**



**JAMAICAN STEW PEAS W/ CHICKEN & RICE**



**SAUSAGE AND BEAN RAGOUT**

EARLY RISER

*Blueberry Pancakes with Bacon*

*The XL Turkey & Cheese Egg White Omelet w/Fries*

*Steak, Egg and Cheese Burrito*

*Cinnamon Raisin French Toast with Sausage*

*Sausage, Egg, Cheese, Onion, Pepper Quesadilla*

COUNTRY KETTLE

*Home Style Chicken Noodle*

*Tomato with Spinach and Lentils*

*Mushroom Bisque*

*White Bean Chicken Chili*

*Red Pea Soup*

GRILLE SPECIAL

*Double Cheeseburger Hoagie w/ Onion Rings*

*Chicken Cacciatore Sub with French Fries*

*3 Cheese and Mushroom Quesadilla w/ Salsa*

*Asian Pork Burger with Mushrooms, Onions, Fries*

*Crispy Buffalo Chicken Quesadilla*

DELI SPECIAL

*Grilled Chicken, Ham, Swiss, Sauteed Spinach*

*Open Face Turkey Reuben Melt*

*Curry Shrimp Salad on a Multi Grain Roll*

*Baked Cajun Tilapia, Pepper Jack, Tomato*

*Fresh Jersey Tomato Stuffed w/ Chicken Salad*

PANINI

*Roast Beef, Pepper Jack, Red Pepper, Tomato*

*Chicken, Eggplant, Red Pepper, Fresh Mozzarella*

*Ham, Salami, Provolone, Banana Peppers, Tomato*

*Roasted Vegetables with Provolone Cheese*

*Tuna Panini Melt*

MENU SUBJECT TO CHANGE WITHOUT NOTICE

[CLICK HERE FOR A PRINTABLE WEEKLY MENU](#)

## WEEKLY

Editor: **Jeanne Jackson DeVoe** ♦ Graphic Designer: **Gregory Czechowicz**  
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The **PPPL WEEKLY** is published by the **PPPL Office of Communications** on Mondays throughout the year except for holidays. Deadline for calendar item submissions is noon on Thursday. Other stories should be submitted no later than noon on Wednesday.

Comments: [commteam@pppl.gov](mailto:commteam@pppl.gov) ♦ **PPPL WEEKLY** is archived on the web at: <http://www.pppl.gov/ppplweekly.cfm>