

At PPPL  
**THIS WEEK**

MONDAY, DECEMBER 10

**Andlinger Center Highlight Seminar Series** (Click [here](#) for link)

4:30 p.m. ♦ Princeton University, Computer Science 104 Auditorium

*"Enhancing Electrochemical Energy Storage on the Macroscale via Architecture Design on the Nanoscale"*

Debra Rolison, U.S. Naval Research Laboratory  
Refreshments at 4 p.m. in the LSB Lobby

WEDNESDAY, DECEMBER 12  
- THURSDAY, DECEMBER 13

**Lehman Review**

WEDNESDAY, DECEMBER 12

**PPPL Colloquium** (Click [here](#) for link.)

4:15 p.m. ♦ MBG Auditorium

*"Small Modular Reactors, National Security and Clean Energy: A U.S. National Strategy"*

Dr. Victor H. Reis, U.S. Department of Energy  
Refreshments at 4 p.m. in the LSB Lobby

THROUGH THURSDAY, DECEMBER 14

**Donate to United Way**

THROUGH DECEMBER 19

**Princeton University/PPPL Food Drive**  
Donation Box in LSB Lobby

**UPCOMING EVENTS**

December 19

**PPPL Colloquium** (Click [here](#) for link)

4:15 p.m. ♦ MBG Auditorium

*"Progress and Challenges in Cosmology"*

Jeremiah Ostriker, Princeton University  
Refreshments at 4 p.m. in the LSB Lobby

**Save the Date:**  
Dec. 21 at noon  
PPPL Holiday Party!



**Dec. 22 to Jan. 2 Lab Closed**

\*The next issues of the PPPL Weekly will be on Dec. 10, Dec. 17 and Jan. 7. The deadline for the Dec. 17 issue will be Dec. 12.

**INSIDE ...**

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environmental management

o Beautiful Ugly Show *page 4*

**How cool are cool roofs? PPPL serves as the laboratory to find the answer**

By Jeanne Jackson DeVoe



Keith Rule and a team of interns felt the heat when they installed a weather station on top of the LSB roof last summer as part of the cool roofs project. From left to right: Keith Rule; Jessica Sponaugle, a summer intern from Monmouth University in West Long Branch; and Hannah Capponi, a summer intern from Council Rock High School North in Newtown, Pa.

When Keith Rule and a team of interns walked onto the black and white roof of the LSB Building at PPPL one sweltering day last summer, they could feel the temperature difference between the two different colored areas in the soles of their feet.

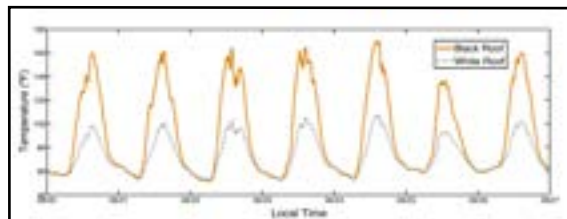
The white roof was tolerable but the black roof was too hot to stand on. "You could feel it coming through your shoes," recalls Rule, a senior project engineer in the Environment, Safety, Health & Security Department, who is heading the project at PPPL.

Rule and his team installed equipment for a study that will give researchers a precise picture of what kinds of roofs work best in what kinds of weather and examine how so-called "cool roofs" can affect energy use and energy costs. "The question is: What gives you the most savings for the buck?" said Elie Bou-Zeid, a professor of civil and environmental engineering at Princeton University who is the lead researcher on the project.

Researchers aim to find out whether cool roofs – white roofs that reflect the sun – are the best way to save energy and money in areas like New Jersey, where it's icy cold in winter and steaming hot in summer.

**Early data shows dramatic temperature difference between black and white roofs**

Early data from the project supports what Rule and his team's feet were telling them back in the summer: White roofs are much cooler than black roofs. When temperatures were in the 90s during the third week of Au-



This chart shows the temperature fluctuations on a white roof compared to a black roof at PPPL during the last week of August. The black roof reached 170 degrees Fahrenheit, while the top temperature of the white roof was just over 100 degrees. (Chart courtesy of Prathap Ramamurthy).

# How cool are cool roofs? PPPL serves as the laboratory to find the answer

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gust, for example, sensors measured the temperature on the black roofs at 130 degrees to 170 degrees Fahrenheit – hot enough to fry an egg. Rule’s team needed sunglasses to work on the highly reflective white roofs but they were much cooler – ranging from 90 to 100 degrees.

However, the data also indicate that the thickness of the roof’s insulation, called the R-value, could be the most crucial factor in determining whether the building will absorb the heat. A thicker roof seems to eliminate the differences between the black and white roofs and it works in all seasons, Bou-Zeid said. But more insulation costs more money than painting a roof white and the difference in cost will be another factor the study will consider.

Adam Cohen, PPPL’s deputy director for operations, said the study has also demonstrated the value of PPPL’s infrastructure for sustainability research. There are a large number of buildings at the site that can be used in a study and the Lab staff has shown itself to be an enthusiastic participant in sustainability research studies. “We showed that we could use this facility as a test bed to evaluate sustainability projects in a real working environment,” Cohen said.

## A constant stream of information

PPPL timed the project to take advantage of the fact that the Laboratory was replacing roofs and agreed to make PPPL a live laboratory for the cool roofs project. The team installed not just black and white colored roofs but also roofs of different thicknesses between March and early September.

The group installed four weather stations on five PPPL roofs that resemble wire tripods fitted with oddly-shaped contraptions. They measure all kinds of weather from solar radiation, better known as sunshine, during the sweltering days of the summer to the 85-mile-an-hour winds during Hurricane Sandy in October. The team also installed 25 sensors at five locations inside the roofs to measure heat absorption.

Every 15 minutes a data logger above the ceiling in each of the five buildings sends this information to Bou-Zeid, who is five miles away at Princeton’s School of Engineering and Applied Science. Meanwhile, PPPL’s automatic building systems feed Bou-Zeid data on how much electricity and fuel is being used for heating and air conditioning. He and Prathap Ramurthy, a postdoctoral research associate, plug the data into a computer model that will accurately predict the cheapest and most-energy efficient roof for every temperature and weather condition.

The cool roofs study at PPPL and Princeton stands out from previous studies, Bou-Zeid explained, because it is based on extremely detailed, minute-to-minute information on weather and heat absorption, and will therefore result in more accurate predictions.

Another significant difference, he said, is that this study is the only one to compare how the thickness of a roof affects heat absorption compared with cool roofs. “Our data will be much more exact,” Bou-Zeid said.

## Preventing pollution and saving energy

Many researchers believe that reflective white roofs earn the “cool roofs” title by reflecting the sun’s rays to keep buildings’ interiors cooler and reducing the need for air conditioning. Black roofs, on the other hand, absorb heat – making buildings warmer year-round and potentially reducing heating costs in the winter.

The main effect cool roofs could have on the environment is to reduce greenhouse gas emissions by reducing the amount of energy used to cool buildings. A 2010 study by the Lawrence Berkeley National Laboratory in Berkeley, Calif. predicted that making roofs and pavements more reflective in all cities with populations of more than 1 million people in the northern hemisphere would offset 57 billion tons of CO2 emissions –far more than the 36.4 billion tons of carbon dioxide released worldwide in one year in 2010.

Black roofs absorb solar radiation from the sun and when that heat escapes, the building emits heat or long-wave radiation some of which may be trapped by the greenhouse gases in the atmosphere that cause the greenhouse effect, which is linked to global warming. By contrast, white roofs reflect solar radiation. The short waves of solar radiation or sunlight are not trapped by greenhouse gases and therefore do not contribute to global warming, Bou-Zeid said.



A revised overhead photo of the black and white roofs installed on PPPL buildings as part of the cool roofs project. (Photo courtesy of Mark Hughes).

Continued on page 3 ►

# PPPL gets high marks in environmental management audit

By Jeanne Jackson DeVoe



Rob Sheneman

An audit of PPPL's environmental management systems found that PPPL continues to do a great job managing its environmental and sustainability projects but there is still room for improvement.

The independent evaluation from Nov. 12 to 16 found that PPPL has made several improvements over the last year. The Laboratory had more "commendable practices" this year than last year and fewer "findings," – areas that need improvement.

"If I were to compare our progress from last year I would say it's fairly substantial," said Robert Sheneman, deputy head of Environment, Safety, Health and Security, who also serves as PPPL's Environmental Management Systems program manager.

The audit by consultants from UL-DQS Inc. is part of a voluntary process that PPPL pursued as part of Princeton University's agreement with the Department of Energy and is also a response to a Presidential Executive Order for federal agencies and contractors. Last year, PPPL registered to be certified as meeting the international management system standard known as ISO-14001. After an extensive audit in December 2011, PPPL was certified in February. The certification process includes annual audits and the Laboratory will have another audit next year and a re-registration audit in 2014.

## Numerous positive comments

The auditors spent much of the week reviewing documents and interviewing department heads, supervisors and employees. They had several positive comments in their final report – noting that PPPL received many awards for its environmental programs in 2012. The report said there were "great improvements realized at this facility related to its sustainability goals" by reducing sulfur hexafluoride, or SF<sub>6</sub>, emissions and reducing energy use and non-hazardous waste.

The report also praised PPPL's chemical review process, which "captures nearly any chemical entering the site." It noted that PPPL uses

double-sided copies throughout the Laboratory and that PPPL hosted America Recycles Day during the audit.

One area the auditors said could be improved is how well PPPL communicates its environmental policies and programs to everyone at the Lab, Sheneman said.

Not everyone is aware of the role PPPL's environmental policies play in their everyday work life. Some employees might not consider the LED lights that shut off when they leave the room as being part of environmental management, for example, or they might not know that the carpeting or furniture in their offices is made of recycled materials that can easily be recycled when they outlive their usefulness.

In a sense, PPPL is a victim of its own success because everything from recycling to organic cleaning materials may just seem like everyday business, Sheneman said. "This laboratory has had such good environmental practices for a long time that the environmental management system is transparent," Sheneman explained. "If employees follow the existing rules and processes they're 99 percent of the way there." 📌



PPPL won praise for reducing non-hazardous waste. One way it has done that is through its active recycling program, which reduced waste by 8 percent.

## How cool are cool roofs? PPPL serves as the laboratory to find the answer

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Walking on the black side of the roof. From left to right: Capponi, Sponaugle, and Rule.

However, the main impact of white roofs on the environment would be to reduce energy consumption. Another 2010 Berkeley study on the potential benefits of cool roofs for commercial buildings in 236 U.S. cities estimated that commercial building owners who installed cool roofs in warm areas could reduce the amount of energy used for air conditioning by 10 to 30 percent. The study concluded that commercial building owners in cooler areas would pay more for heating in winter but would still realize a net decrease in energy costs.

The Cool Roofs project was funded by \$193,250 from the DOE's Energy Efficient Buildings Hub. It is one of several EEB energy projects at PPPL that are concluding in January. 📌

## Michael Gonzalez's photo in PU "Beautiful Ugly" Show



PPPL'er Michael Gonzalez's photo will be displayed in a Princeton University exhibit at Murray Dodge Hall opening Dec. 10 entitled "Beautiful Ugly." about the beauty in mundane or ugly things.



Gonzalez, a training specialist who has worked at PPPL for five years, snapped a photo of a mass of seemingly abandoned bicycles on the Princeton campus after a meeting on campus last spring. "Because I'm always in this mindset of always looking for things to photograph, I thought this was a pretty unique image," he said.

He later learned the bikes are donated by students graduating from Princeton and then fixed up by an organization called U-Bikes, and rented out to students. Gonzalez named his photo "Saṃsāra" the Sanskrit word meaning circle that refers to the belief in the cycle of rebirth. "They're getting to have a second or third life," Gonzalez said.

A dedicated amateur photographer, Gonzalez has taken a photo a day for the past year or so and posted the photos on his facebook page. Although he owns a good digital camera, he took the photo for the exhibit and snaps most of his photos on his iPhone. You can see several of his prints at [Instaprints.com](http://Instaprints.com).

(Photo above right by Shannon Gonzalez)

## Last Chance to Contribute to the United Way

PPPL'ers have just four more days to contribute to the PPPL & Princeton University United Way Campaign, which continues through Dec. 14. As of Nov. 30, PPPL employees had contributed \$6,069.

Employees can contribute by cash or check or through payroll deductions. Princeton University will contribute an additional 10 percent for every gift by cash or check and 15 percent for every gift through payroll deduction.

United Way of Mercer County donated more than \$1.5 million to non-profit organizations last year, including contributions to a 2-1-1 Hotline, a prescription program for low-income people in Mercer County and a group that provides emergency food and shelter to county residents. It is also involved in numerous community efforts including:

- United Housing First: Provides homes to homeless people
- United Financial Empowerment: Prepares tax returns for free.
- United Aging and Disability Partnership: Helps dozens of seniors and people with disabilities at risk for being placed in nursing homes to stay in their homes.
- United Youth Mentor Link: A mentoring program that helps high school students at risk of dropping out of school.



## Register Your Future Scientist for Young Women's Conference

Young women with a passion for science are welcome to register for the Young Women's Conference in Science, Mathematics, Technology and Engineering, hosted by PPPL, on March 22 at Princeton University.

The all-day conference for seventh through tenth-graders will include lectures, hands-on activities and tours of Princeton University's laboratories. Registration is open to the daughters of PPPL staff and to school groups on a first-come, first-served basis through Feb. 15. For more information and to register, visit the Young Women's Conference website at <http://science-education.pppl.gov/YWC>.



## Help feed the hungry by contributing to food bank

More than 10 percent of Mercer County residents and about 24 percent of Trenton residents are living below the poverty line, according to the U.S. Census Bureau.

The Mercer Street Friends Food Bank helps by providing food to more than 25,000 people through 50 pantries, shelters and soup kitchens.

You can do your part to help feed community members in need by contributing to the Princeton University Food Drive and bringing your canned goods and nonperishable food to the donation box in the LSB Lobby from now through Dec. 19.

Needed items include canned protein such as tuna fish or chicken, Parmalat, cereals, and peanut butter and jelly. The Food Bank also needs personal care products such as soap, shampoo, deodorizer, feminine products and laundry soap. No glass please!

Items needed for the Send Hunger Packing Program, which provides food to school-aged children to get them through the weekend, include: single servings of Parmalat, individual servings of cereal and individual servings of microwaveable food, granola bars and pudding cups.



## New station added to TigerTransit bus line

The TigerTransit Forrester/PPPL bus line between the Princeton Borough train station, Princeton University and PPPL, now stops at the University Medical Center of Princeton in Plainsboro.

The bus line operates Monday to Friday, 8 a.m. to 7 p.m. Click [here](#) to view a map of bus routes and [here](#) to access TigerTracker, which tracks buses in real time.



# PPPL Café Menu

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

**MONDAY - DEC. 10**

**TUESDAY - DEC. 11**

**WEDNESDAY - DEC. 12**

**THURSDAY - DEC. 13**

**FRIDAY - DEC. 14**

**COMMAND PERFORMANCE  
CHEF'S FEATURE**



Ravioli Marinara served w/ Breadstick



Buffalo Chicken Wrap Served w/ Veggie Sticks



Chicken Marsala Served w/ Mashed Potatoes & Vegetable



Pizza Casserole



Blackened Salmon w/Mango Salsa & Caribbean Rice

<b>Early Riser</b>	Western Omelet	Chocolate Chip Pancakes	Steak, Mushroom & Cheddar Omelet	Southern Style Biscuits w/ Sausage Gravy	Italian Sausage, Peppers & Provolone Omelet
<b>Country Kettle</b>	Split Pea w/ Ham	Vegetable Vegetarian Soup 🍎	Cream of Potato w/ Bacon	Smoked Turkey Corn Chowder	Chicken Rice
<b>Grille Special</b>	Chicken Po' Boy w/ Cajun Mayonnaise & Hush Puppies	Bacon Blue Cheeseburger served w/ Fries	BBQ Pulled Pork Sandwich w/ Onion Rings	Grilled Cheese w/ Bacon & Tomato on Texas Toast w/ Fries	Pizza Steak w/ Pepperoni & Mozzarella Torpedo w/ Fries
<b>Deli Special</b>	Chicken Salad w/ Apples & Walnuts Wrap	Smoked Turkey & Muenster Cheese on a Kaiser Roll	Classic Tuna Hoagie	Seafood Salad Croissant	Corned Beef, Swiss, Coleslaw & Russian Dressing on Rye
<b>Panini</b>	Corned Beef & Cheddar on Rye Bread	Pressed Italian Panini	Italian Sausage, Roasted Peppers & Provolone Ciabatta	BBQ Pulled Chicken & Provolone Ciabatta	Roast Beef, Provolone, Red Onion, Tomato & Chipotle Mayo

MENU SUBJECT TO CHANGE WITHOUT NOTICE

# WEEKLY

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