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For Immediate Release
November 8, 2006

Contact: Jason Gorss
Phone: (518) 276-6098
E-mail: gorssi@rpi.edu

Examining the Impact of Renewable Energy on the Electric Power Grid

\$1.23 million from NYSTAR will allow Rensselaer to create renewable energy test-bed

Troy, N.Y. — With a \$1.23 million grant, researchers from Rensselaer Polytechnic Institute will be creating a distributed power “test-bed” to study how the electricity distribution grid might be affected by the widespread adoption of clean, renewable energy sources.

The two-year project, which is funded by the New York State Office of Science, Technology and Academic Research (NYSTAR), is designed to help understand the potential effects of meeting New York state’s key alternative energy goal — by 2012, more than 25 percent of power generation through renewable energy sources such as wind, solar, and fuel cells.

NYSTAR Executive Director Michael J. Relyea today presented Rensselaer President Shirley Ann Jackson and members of the research team with the \$1.23 million award at an energy forum in Colonie, New York, hosted by Rensselaer’s Center for Future Energy Systems (CFES).

“Global energy security is the greatest challenge of our time,” President Jackson said at today’s event. “The solutions rest in redundancy of supply and diversity of source, and will require innovation: innovation in the discovery, extraction, and transportation of fossil fuels; innovation in conservation; and innovation to develop alternative energy sources which are reliable, cost-effective, safe, and environmentally benign. This project — which seeks to enhance our understanding of the effect of adding an increasing number of small-scale renewable electricity generating sources to the utility grid — further demonstrates the leadership role Rensselaer Polytechnic Institute and New York state are taking to secure our global energy future. I applaud NYSTAR for its support of this vital research.”

As people begin adopting small-scale renewable sources to power homes and businesses, problems in the utility grid could arise because these sources are likely to be connected at the local distribution level. “For example, I do not want my photovoltaic system’s inverter to go off when my neighbor’s central air conditioner comes on,” said CFES Director Nag Patibandla. “We want to understand how the distribution grid functions at a high degree of renewable resources penetration.”



(L-R) Dr. Jackson, CFES Director Nag Patibandla, and NYSTAR Executive Director Michael J. Relyea

Photo by Rensselaer/Kris Qua

Patibandla led New York's Distributed Generation program for five years before joining Rensselaer. For the new project, he and his colleagues plan to build a test system on the Rensselaer campus where they can attach a number of simulated renewable energy sources along with equipment that is susceptible to fluctuations in power output.

Examples of sensitive loads include high-power computer systems, light-emitting diodes (LEDs) in traffic lights, and wastewater treatment plants. Renewable energy sources are themselves inherently sensitive because they have inverters that convert direct current to alternating current, Patibandla said.

"The award to Rensselaer will enable it to strengthen its research and development activity in a critically important area of technology," said NYSTAR Executive Director Michael J. Relyea. "It is one of many initiatives reflecting the vision and leadership of Governor Pataki and the Legislature. NYSTAR is thrilled to fund such economically worthwhile scientific endeavors at Rensselaer. The academic and private sector support that backs this important Rensselaer initiative on new energy systems is a testament to the incredible dynamic nature of research, development, and commercialization efforts ongoing at Rensselaer."

Researchers at the CFES will be partnering with Sensitron Semiconductor of Deer Park, N.Y.; Inverters Unlimited Inc. of Albany, N.Y.; and Advanced Energy Conversion of Malta, N.Y. The project also will examine policy aspects of renewable resources penetration in partnership with the Pace Energy Project, part of Pace Law School's Center for Environmental Legal Studies.

"With growing concern over the security of our energy supply and its consequences for the global climate, energy is emerging as one of the defining public policy issue of our generation," said Pace Law School Dean Stephen Friedman. "Pace is pleased to join with Rensselaer on this important initiative to define the technological, economic, and regulatory framework for supporting renewable energy and clean distributed generation as an ever-increasing part of our future energy mix."

The CFES, in partnership with Cornell University, Brookhaven National Laboratory, and Clarkson University, seeks to meet the energy challenges of the 21st century by focusing on innovation in and commercialization of energy conservation and renewable energy systems. The new project will expand the current efforts in technology commercialization at CFES into the area of distributed power generation, or the use of small-scale generators located close to the power load being served. Specifically, the researchers will examine the stability and dynamic behavior of the electricity grid, the feasibility of installing distributed energy to counter-balance natural intermittency, and grid stability and power quality, Patibandla said.

The award is being made through NYSTAR's Centers for Advanced Technology Development Program, which seeks to enhance and expand the capabilities of existing Centers for Advanced Technology that have achieved a record of success.

In addition to Patibandla, two Rensselaer researchers will be co-principal investigators: Jian Sun, associate professor of electrical, computer, and systems engineering; and Nadarajah Narendran, director of research at Rensselaer's Lighting Research Center. The project also will support six Rensselaer graduate students.

About Rensselaer

Rensselaer Polytechnic Institute, founded in 1824, is the nation's oldest technological university. The university offers bachelor's, master's, and doctoral degrees in engineering, the sciences, information technology, architecture, management, and the humanities and social sciences. Institute programs serve undergraduates, graduate students, and working professionals around the world. Rensselaer faculty are known for pre-eminence in research conducted in a wide range of fields, with particular emphasis in biotechnology, nanotechnology, information technology, and the media arts and technology. The Institute is well known for its success in the transfer of technology from the laboratory to the marketplace so that new discoveries and inventions benefit human life, protect the environment, and strengthen economic development.

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Rensselaer Polytechnic Institute (RPI), 110 8th St., Troy, NY 12180. (518) 276-6000



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