

**TASK 3: NEW YORK STATE COLLEGES AND  
UNIVERSITIES-A SUMMARY OF PROGRAMS  
IN WIND AND SOLAR GENERATION  
AND RENEWABLE ENERGY TECHNOLOGY**

**FINAL REPORT 10-13  
NOVEMBER 2009**

NEW YORK STATE  
ENERGY RESEARCH AND  
DEVELOPMENT AUTHORITY

**nyserda**  
Energy. Innovation. Solutions.



The New York State Energy Research and Development Authority (NYSEERDA) is a public benefit corporation created in 1975 by the New York State Legislature.

NYSEERDA derives its revenues from an annual assessment levied against sales by New York's electric and gas utilities, from public benefit charges paid by New York rate payers, from voluntary annual contributions by the New York Power Authority and the Long Island Power Authority, and from limited corporate funds.

NYSEERDA works with businesses, schools, and municipalities to identify existing technologies and equipment to reduce their energy costs. Its responsibilities include:

- Conducting a multifaceted energy and environmental research and development program to meet New York State's diverse economic needs.
- The **New York Energy Smart<sup>SM</sup>** program provides energy efficiency services, including those directed at the low-income sector, research and development, and environmental protection activities.
- Making energy more affordable for residential and low-income households.
- Helping industries, schools, hospitals, municipalities, not-for-profits, and the residential sector, implement energy-efficiency measures. NYSEERDA research projects help the State's businesses and municipalities with their energy and environmental problems.
- Providing objective, credible, and useful energy analysis and planning to guide decisions made by major energy stakeholders in the private and public sectors.
- Since 1990, NYSEERDA has developed and brought into use successful innovative, energy-efficient, and environmentally beneficial products, processes, and services.
- Managing the Western New York Nuclear Service Center at West Valley, including: overseeing the State's interests and share of costs at the West Valley Demonstration Project, a federal/State radioactive waste clean-up effort, and managing wastes and maintaining facilities at the shut-down State-Licensed Disposal Area.
- Coordinating the State's activities on energy emergencies and nuclear regulatory matters, and monitoring low-level radioactive waste generation and management in the State.
- Financing energy-related projects, reducing costs for ratepayers.

For more information, contact the Communications unit, NYSEERDA, 17 Columbia Circle, Albany, New York 12203-6399; toll-free 1-866-NYSEERDA, locally (518) 862-1090, ext. 3250; or on the web at [www.nyserda.org](http://www.nyserda.org)

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**ENERGY RESEARCH AND DEVELOPMENT AUTHORITY**  
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**TASK 3: NEW YORK STATE COLLEGES AND UNIVERSITIES  
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RENEWABLE ENERGY TECHNOLOGY**

Final Report

Prepared for the  
**NEW YORK STATE  
ENERGY RESEARCH AND  
DEVELOPMENT AUTHORITY**

Albany, NY  
[www.nyserdera.org](http://www.nyserdera.org)

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Project Manager

Prepared by:  
**AWS TRUEWIND, LLC**

## Foreword

The report was developed for the New York State Energy Research and Development Authority (NYSERDA) under the PON 995, Agreement 9998. NYSEDA is a public benefit corporation created in 1975 under Article 8, Title 9 of the State Public Authorities Law.

This publication was written by AWS Truwind, LLC. The intent of this report is to provide a summary of NYS College and University programs for solar and wind generation and renewable technology. This is an assembly of publicly available data through an internet search of websites and may not represent the complete portfolio of the individual institution.

The principal authors were Marie Schnitzer, Dan Ryan and Staci Clark of AWS Truwind, LLC.

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\*Advanced research

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### Alfred State College, SUNY\*

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#### **General**

- The School of Applied Technology
  - Electrical Construction & Maintenance Electrician program has embedded both wind turbine electrical generation and photovoltaic electrical systems into its course and lab work.
  - The Robotic & Computerized Control technician program allowed the students to design and build a biodiesel reactor that uses the used grease products to produce biodiesel fuel for campus buses.
- Air Conditioning and Heating Technology instructs students on installing energy-efficient heating systems, including geothermal and solar options. The New York State Energy Research and Development Authority (NYSERDA) provided \$25,000 in funding through its PV incentive program.
- Through the Continuing Education program, students such as local homeowners and contractors were able to learn about the basics of PV systems in theory classes and put the theory into practice by installing the panels and major components of the system.
- A 750W wind turbine is currently in the process of being installed by students under the direction of Glenn Brubaker, assistant professor in the Electrician, Computer, and Robotics Technician Department. Future renewable energy projects, such as wind turbine, geothermal, and Leadership in Energy and Environmental Design (LEED) will be developed.
- The Center for Organic and Sustainable Agripreneurship helps farmers produce home-grown energy such as ethanol plants, biodiesel facilities, photovoltaic, and wind generation.
- Jeffrey Stevens, assistant professor of the Electrical Service Department is developing a certification program working for the New York Solar Energy Research and NYSEERDA. He will be installing a new solar energy system on campus.
- Center for Renewable Energy
  - Educate students to design, implement, and operate green building and renewable energy technologies.
  - Work with businesses including farms to implement technologies that reduce production costs, and to sustain the environment.
- The school has many renewable energy projects that allow students to work on the latest renewable energy equipment and gain hands-on experience. Academic programs such as Architectural Technology, Construction Management, Building Trades, and Electrician Trades involve the integration of energy conservation, alternative energy use and sustainable building design education.

## *NYS Colleges and Universities*

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- The SUNY Energy Research Brochure indicates research in hydrogen economy, hydrogen from water, fuel cells, and recycled solar power tubes  
(<http://www.suny.edu/GovtRelations/federal/pdf/Energy%20Brochure%20combined.pdf>).

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### **References**

- SUNY Alfred – Going Green:  
<http://www.alfredstate.edu/about-us/going-green>
- SUNY Alfred - \$20,000 from BP America:  
<http://www.alfredstate.edu/news/2007-05-29/20000-from-bp-america>
- SUNY Alfred – Center for Renewable Energy:  
<http://www.alfredstate.edu/cosa/center-for-renewable-energy>

## **Alfred University\***

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### **General**

- Center for Environmental and Energy Research (CEER)
  - Mission to use expertise and facilities in ceramic engineering, materials science/engineering and related programs to develop materials and processes for environmental sustainability.
  - A 10 kW Bergey Excel-S is installed on campus and is used to power the milking barn and as a laboratory for students to learn about turbine performance. The installation of the tower in 2003 served as a training workshop for NYSERDA installers. Data collected every 10 min (<http://ceer.alfred.edu/Research/windturbine/windturbine.html>).
  - Research on various renewable energy sources including hydrogen generation, fuel cells, wind-based hybrid power systems, solar (water heaters and photovoltaic (PV)-powered water pumps), manure-fueled gas, and other biomass ([http://ceer.alfred.edu/Research/research\\_energy.html](http://ceer.alfred.edu/Research/research_energy.html)).
    - Fuel cell and hydrogen research (<http://ceer.alfred.edu/hydrogeninstitute/research.html>)

- Gasification of willow and agriculture residues to energy (<http://ceer.alfred.edu/research/hybridwillow.html>)
- Research completed by the Kzauo Inamori School of Engineering and NYS College of Ceramics at Alfred and in conjunction with the New York State Foundation for Science, Technology and Innovation (NYSTAR) funded Center for Advanced Ceramic Technology (CAMP) on energy efficient and economical processing of silicon nitride ball bearings for wind turbine applications ([http://cact.alfred.edu/docs/SiliconnitrideballsareusedinWindTurbineapplications toimprove BearingPerformance\\_2 .pdf](http://cact.alfred.edu/docs/SiliconnitrideballsareusedinWindTurbineapplications toimprove BearingPerformance_2 .pdf)).
- Research completed by the Division of Electrical Engineering on small wind power systems, mainly hybrid systems with wind as the primary source and PV or fossil fuel generators as the alternate source, for use in residential and agriculture areas of NY (<http://ceer.alfred.edu/Research/baghdadchipres.pdf>).
- Research on glass microspheres for hydrogen storage (<http://ceer.alfred.edu/Abstracts/AbstrShelbyRecov.htm>)
- Research on ceramic/glass coatings for recycled concentrating solar power collector tubes (<http://ceer.alfred.edu/Research/Summer/summer%202005/NaylorEdwardsSum0905.pdf>)
- In 2002, a solar water heater was installed in the Environmental House (<http://ceer.alfred.edu/research/solarwater.html>)
- Center for Advanced Ceramic Technology
  - Research on polymers/composites, ceramic processing, corrosion/oxidation prevention, electronic/mechanical engineering, and metals/metal-ceramic interfaces
- Academic program in Environmental Studies although no specific courses related to renewable energy (<http://ens.alfred.edu/AcadCoursesFall%202002.htm>)
- Short courses and workshops offered to professionals by the Inamori School of Engineering. Current classes are mainly in ceramics and glass (<http://engineering.alfred.edu/shortcourses/>)
- Spectroscopy facilities for examining materials with electromagnetic radiation
  - Researching techniques to develop new types of solar absorbing ceramic materials
  - Computer modeling lab and materials testing lab for fatigue testing capabilities under ambient and controlled-environmental conditions and polymer characterization

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## *NYS Colleges and Universities*

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## Bard College

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### General

- NYSERDA provided a study to determine the feasibility of installing geothermal systems at the college. Based upon the results of that initial feasibility study, the college enrolled in NYSERDA's New Construction Program (NCP), which provided nearly \$25,000 to complete technical assistance evaluations. In addition, the New Construction Program will be providing over \$400,000 in incentives to help the college install the recommended equipment.  
<http://www.achrnews.com/Articles/East/f444a3ed8e95a010VgnVCM100000f932a8c0>
- Bard College has signed on to be a Campus Partner through the New York State Department of Transportation's Clean Air NY initiative. On Earth Day (April 22), 2009, Bard College established an electric bike-sharing program in order to reduce vehicle miles traveled on and around campus. The program includes four electric bikes.
- Science courses offered but no indication of renewable energy related course work/research (<http://science.bard.edu/>).

## *NYS Colleges and Universities*

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### Binghamton University, SUNY\*

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#### General

- Center for Autonomous Solar Power (CASP)-
  - Developing third generation large area, flexible, light weight solar cells
  - Researchers are working to develop devices that generate far more energy in one year than is consumed in their manufacture.  
[http://www.suny.edu/research/research\\_quarterly/SolarEnergy.cfm](http://www.suny.edu/research/research_quarterly/SolarEnergy.cfm)
  - The latest addition to the University's New York State Center of Excellence in Small Scale Systems Integration and Packaging (S3IP), CASP will develop thin film solar modules.
  - Focus on tapping into the sun's immense supply of renewable energy and make it easily accessible as a flexible and low cost power source.
  - Solar conversion efficiency, storage capabilities, solar module stability and power system cost reduction.
  - Center for Advanced Microelectronics Manufacturing (CAMM)
  - Map emerging flexible electronic technologies
  - Validate the design of flexible electronic manufacturing capabilities
  - Granted \$4 million in federal funding for research
- The Integrated Electronics Engineering Center (IEEC)
  - Perform leading edge research in electronics packaging
  - Strengthen the electronics packaging industry (bringing a semiconductor chip into a form that can be integrated into larger assemblies) and systems reliability and modeling
  - Reliability lab for fatigue and fracture testing
  - works in concert with the Center of Excellence
- The Center for Advanced Sensor System (CASE)
  - Develop sensors for biomedical, security and environmental applications  
[http://research.binghamton.edu/discover/archives/New\\_center\\_to\\_focus\\_on\\_solar\\_energy.shtml](http://research.binghamton.edu/discover/archives/New_center_to_focus_on_solar_energy.shtml)
- Institute for Materials Research (IMR)
  - Research on fuel cells, solar and thermoelectric power, and energy storage through batteries and capacitors
  - Researches new materials for energy applications, electronics and packaging including corrosion protection and adhesion, high-temp resistance, photopolymers for resists and materials compatibility
  - ([http://research.binghamton.edu/discover/2008/Green\\_research\\_at\\_Binghamton.shtml](http://research.binghamton.edu/discover/2008/Green_research_at_Binghamton.shtml),  
<http://materials.binghamton.edu/>)
- Awarded \$5 M by the federal government to develop super capacitors for storing solar energy

## *NYS Colleges and Universities*

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- The SUNY Energy Research brochure indicates research on hydrogen from water as well (<http://www.suny.edu/GovtRelations/federal/pdf/Energy%20Brochure%20combined.pdf>).
- School of Engineering and Applied Science
  - Research on distributed and intelligent systems, electrical and computer engineering, and mechanical engineering including advanced materials
- Center of Excellence in Small Scale Systems Integration and Packaging - center for microelectronics established in 2005 (<http://s3ip.binghamton.edu/>)
  - Creation of test-bed projects and pilot manufacturing to validate design and develop production techniques

### **Contacts**

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- (607) 777-4030

## **Buffalo State College, SUNY**

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- Degree programs in Electrical Engineering Technology: Electronics, Electrical Engineering Technology: Power and Machines, Industrial Technology (B.S. and M.S.) (<http://www.buffalostate.edu/technology/x461.xml>)
- Students in the Technology Education program built their own wind turbines from recyclable materials (<http://www.buffalostate.edu/bulletin/research.xml?aid=1587>).

Michael C. Trunzo

- Vice Chancellor for Government Relations
- (716) 878-4000

## **Canisius College**

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- No course work/research mentioned. General commitment to the environment and conservation with mention of renewable energy and smart energy ([http://www.canisius.edu/images/userImages/rlsweb/Page\\_12346/CanisiusEnergy.pdf](http://www.canisius.edu/images/userImages/rlsweb/Page_12346/CanisiusEnergy.pdf))

## *NYS Colleges and Universities*

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### City University of New York

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#### General

- Advanced Science Research Center
  - Building construction that will support research in photonics, nanotechnology, water and environmental sensing (<http://web.cuny.edu/research/Advanced-Science-Research-Center.html>)
- Composition of various courses in physics, calculus, environmental policy, chemistry and environmental chemistry and solar-based courses led to 1<sup>st</sup> CUNY diploma in renewable energy for a student (<http://web.cuny.edu/news/cm-archive/feb-08/cuny-grows-greener.html>)
- Research on creating power from sludge being conducted by Chemistry Professor Teresa Bandosz (<http://web.cuny.edu/news/cm-archive/feb-08/cuny-grows-greener.html>)
- Collaboration with Binghamton University, Clarkson University, Rensselaer Polytechnic Institute, SUNY New Paltz and Cornell University to provide support for the Solar Energy Consortium in NY
- Center for Engineered Polymeric Materials at College of Staten Island
  - Research in photosensitive polymers
  - Organic electron-accepting materials for organic PV cells
- Center for Sustainable Energy at Bronx Community College
  - Funded by U.S. DOE
  - Mission to promote the use of renewable and efficient energy technologies in urban communities through education, training, workforce development and research
  - Clearinghouse for info on energy conservation, policy, and renewable clean energy
  - Workshops for middle and high school science teachers
- Center for Advanced Technology in Photonics Applications
  - Development and dissemination of knowledge in photonics technology to promote NYS economic development
  - Work in fiber optic sensors, quantum cryptography, high performance imaging arrays, CO<sub>2</sub> conversion to methane, terahertz technology, carbon nanotubes/quantum dots and battery/fuel cell technology

### Clarkson University\*

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#### General

- Clarkson Center for the Environment
  - Research, degree programs and outreach programs related to the environment, including renewable energy

## *NYS Colleges and Universities*

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- Center for Sustainable Energy Systems Research (<http://www.clarkson.edu/cses/research/index.html>):

### Solar Energy

- Silicon-based photovoltaic (PV) devices
- Current work is centered on creating potential low-cost and large-area PV devices through the use of well-ordered polymer nanocomposites
- Collaborations with RPI and Corning Inc and support from NYSERDA
- Contact: Dr. Devon Shipp ([dshipp@clarkson.edu](mailto:dshipp@clarkson.edu)) Department of Chemistry and Biomolecular Science

### Wind Energy

- Current research is on small turbines in the 1-100kW range, suitable for rural, residential and commercial applications
- Use novel blade concepts to improve efficiency, reduce noise and enhance the low wind speed performance
- Tests small turbine prototypes at the Wind Turbine Test site
- Several publications on wind turbines
- Collaboration with Future Energy Solution Inc., Optiwind, VentoTek
- Contact: Dr. Ken Visser ([visser@clarkson.edu](mailto:visser@clarkson.edu)) Department of Mechanical and Aeronautical Engineering

### Geothermal

- Focus on the characterization of porous media, fractures, and the simulation of multiphase flow in fractured porous media
- Partnership with Haley & Aldrich Inc.
- Contact: Dr. Tong Qiu ([tqiu@clarkson.edu](mailto:tqiu@clarkson.edu)) Department of Civil and Environmental Engineering

### Biomass

- Research on the conversion of biomass to fuels using thermo-chemical and biological means
- Investigate the cause of farmers' reluctance to adopt new energy technologies
- Collaborations with area farmers and CoolBrands Inc.
- Contact: Dr. Stefan Grimberg ([sgrimber@clarkson.edu](mailto:sgrimber@clarkson.edu)) Department of Civil and Environmental Engineering

### Power Systems

- Identify the benefits that distributed energy resources provide to grid operation, such as loss reduction and capacity deferment
- High Voltage Lab is used to improve grid reliability
- Contact: Dr. Thomas Ortmeyer ([ortmeyer@clarkson.edu](mailto:ortmeyer@clarkson.edu)) Department of Electrical and Computer Engineering

### Energy Harvesting & Storage

- Dr. Cetin Cetinkaya, Department of Mechanical and Aeronautical Engineering

## *NYS Colleges and Universities*

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### Fuel Cell & Hydrogen Technologies

- Dr. Ian Suni, Department of Chemical and Biomolecular Engineering
- Minor in Sustainable Energy Systems Engineering
- Center of Excellence in Environmental and Energy Systems (CoE)
  - Members of CoE are pursuing multiple opportunities including new biofuels, improved technologies to produce power from the sun and wind, processes to reduce emissions from traditional fuels, and innovations to increase energy efficiency.
  - Projects being conducted by Clarkson CoE include:
    - Dairy waste-to-energy research activities
    - Research on advances in fuel cell design
    - Wind energy – blade and turbine technological advances
    - Energy efficiency research
    - Areas of advanced motor design & improved truck efficiency
    - Advanced biofuels conversion technologies and impacts on environment and human health
    - Numerous other proposals:
      - NSF IGERT / industrial partners affiliated with CoE
      - Energy outreach and education through K-12 outreach
      - New construction for sustainable energy research labs
- Center for Advanced Materials Processing (CAMP)
  - Research on the production, modification and conversion of matter in which small particles, colloidal media and surface play an important role
  - Creating and characterizing low-cost, large area PV devices and batteries
    - Combine expertise in soft materials, semiconductors and (photo)electrochemistry with materials and manufacturing expertise at Binghamton and Cornell Universities
  - Consider collaborative with other academic or industrial partners to build and test PV devices and/or explore manufacturing processes
  - Research on high-efficiency PV and energy conserving products/processes for PV with RPI Center for Future Energy Systems
- Proposed Center for Sustainable Energy Systems on campus
- Office of Educational Partnerships, Energy Systems and Solutions project-based curricula to educate eighth-grade students on renewable energy  
(<http://www.clarkson.edu/highschool/k12/project/energysystems.html>)
- Computational fluid dynamics research through the Aeronautical Engineering program  
([http://www.clarkson.edu/programs\\_of\\_study/programs/aeronautical%20engineering\\_research.html](http://www.clarkson.edu/programs_of_study/programs/aeronautical%20engineering_research.html))

## *NYS Colleges and Universities*

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- Related undergraduate courses (<http://www.clarkson.edu/sas/master/documents/Courses09-10.pdf> for fall 2009/Spring 2010)
  - ES 238 Introduction to Energy Systems
  - EM 361 Supply Chain Environmental Management
  - MA 739 Seminar in Nonlinear Processes (discusses CFD models)
- Wind Research Project to Construct a Wind Turbine on Campus
  - Install a commercial size, 1.5MW wind turbine
  - Establish Clarkson as a leader in renewable energy innovation and research
  - The turbine could be used to power about 10% of the campus and used as a lab
  - Create invaluable learning and research opportunities for students

### **Contacts**

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- Phone: 315-268-7687

Others: See above

### **References**

- Clarkson University - Clarkson should construct a wind turbine:  
<http://media.www.clarksonintegrator.com/media/storage/paper280/news/2008/11/03/Opinion/Clarkson.Should.Construct.A.Wind.Turbine-3521984.shtml>
- Clarkson University - Center for Sustainable Energy Systems:  
<http://clarkson.edu/CSES/>
- Clarkson University - Lab puts turbines to the test:  
[http://blog.syracuse.com/green/2008/11/outdoors\\_and\\_in\\_clarkson\\_unive.html](http://blog.syracuse.com/green/2008/11/outdoors_and_in_clarkson_unive.html)

## **Colgate University\***

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### **General**

- ENST 480 Interdisciplinary Investigations of Environmental Issues
  - During the spring semester of 2008, 15 students in Environment Studies investigated several alternative energy (wind and biomass) options for Colgate and local community.
  - Colgate has various sustainability efforts on campus, (<http://www.colgate.edu/desktopdefault1.aspx?tabID=3447>) including a wood-fired boiler for supplying the campus' heat. Colgate also planted willow shoots in May 2009 that will be used as biomass fuel for the wood-chip burning facility (<http://www.colgate.edu/DesktopDefault1.aspx?tabid=4354>).

## *NYS Colleges and Universities*

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- Colgate's wood-fired boiler satisfies more than 75 percent of the campus's heat and domestic hot water needs. Installed in the early 1980s, the boiler processes approximately 20,000 tons of locally and uses sustainably harvested wood chips. Last year, this renewable, carbon neutral resource helped Colgate avoid consuming the equivalent of 1.17 million gallons of fuel oil and saved the university over \$1.8 million in heating costs.
- In May 2009, Colgate planted 60,000 8-inch willow shoots on a 7 1/2 acre plot only one mile from the main campus. If all goes right, the plot will yield about 900 dry tons of biomass over a 20-year period. This fuel source can be used as a supplement to the wood-chip burning facility and provide a lot of information for possible expansion. <http://blogs.colgate.edu/2009/05/willow-experiment-aims-to-gene.html>
- Colgate's architectural consultants are required to be LEED-accredited, and building projects routinely follow LEED Silver standards. The new Ho Science Center has been built with heat-recovery technology and the latest energy-efficient lighting systems.

### **References**

<http://www.colgate.edu/DesktopDefault1.aspx?tabid=3869>

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## **College of Mount Saint Vincent**

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- No indication of any renewable energy research or related course work (<http://www.mountsaintvincent.edu/index.php>).

## **Cornell University\***

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### **General**

- Renewable Bioenergy initiative is a planned College of Agriculture and Life Sciences project to use on-hand resources from farms, forests and other operations to generate energy that is economically and environmentally sustainable.
- Cornell operates a 1,100 KW hydroelectric plant to supply about 2% of Cornell's energy.
- Cornell has two solar PV systems on campus. The Day Hall system is 15 kW and The Cornell Store is 2.2 kW ([http://www.utilities.cornell.edu/utl\\_photovoltaiacs.html](http://www.utilities.cornell.edu/utl_photovoltaiacs.html)).

## *NYS Colleges and Universities*

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- Collaboration with Binghamton University, Clarkson University, Rensselaer Polytechnic Institute, SUNY New Paltz and the City University of New York to provide support for the Solar Energy Consortium (SEC) in NY
  - Mission to double the efficiency of PV systems, halve the installed cost, simplify installation, and develop unique PV forms for use in urban environments (<http://thesolarec.org>)
- Cornell conducted a feasibility study in the spring of 2005 for a utility scale wind energy facility on Mount Pleasant. Due to many technical challenges associated with the proposed location, the feasibility was stopped.
- The Cornell Cooperative Extension hosts a wind energy resources informational website for the state of NY, including papers and reports, and government related sites. The website is intended to help inform decision making relative to wind development (<http://blogs.cce.cornell.edu/windenergy/>).
- Five scientists from the Cornell Lab of Ornithology are participating in a collaborative with 25 other top wildlife scientists to address the priorities regarding wind energy development and its impact on migrating birds and bats (<http://www.news.cornell.edu/stories/July09/windpowerBirds.html>)
- In June 2009, Cornell researchers hosted a workshop on large-scale wind generated power for U.S. and international experts in June 2009 to address issues relative to wind energy development, including bird migratory patterns ([http://cfp.mae.cornell.edu/~caughey/WindPower\\_09](http://cfp.mae.cornell.edu/~caughey/WindPower_09)).
- Energy Studies in the College of Engineering
  - Research in the areas of solar cells, wind, water, biofuels, geothermal, fuel cells, computation and modeling, climate change, combustion engineering, power systems, and fusion (<http://www.geo.cornell.edu/eas/energy/>).
- The Center for a Sustainable Future is purposed with advancing multidisciplinary research and innovative collaborations within Cornell and beyond. It focuses on the areas of energy, the environment, and economic development. The key partners are the Engineering Energy Studies, Cornell Center for Materials Research, Cornell Fuel Cell Institute, KAUST Cornell Center for Energy and Sustainability, and the Northeast Sun Grant Initiative (<http://www.sustainablefuture.cornell.edu/index.php>).
  - The Northeast Sun Grant Initiative was formed to support research, education and outreach projects in the areas of biologically-based power, fuels and non-food products (<http://nesungrant.cornell.edu/>).
  - The KAUST Center for Energy and Sustainability is responsible for investigating organic-inorganic hybrid nanomaterials for application in water desalination, carbon capture and sequestration, oil and gas production, and solar energy (<http://kaust-cu.cornell.edu/>).
- College of Agriculture and Life Sciences researches renewable, clean energy, and economically sustainable systems that reduce reliance on fossil fuels.
  - Research focuses on areas such as Industrial Biotechnology, Biogas Processing, Wind Energy, Sustainable Land Use for Bioenergy, Biofuels and Renewable Energy Projects Contact: Mike Hoffmann, Director; Email: [mph3@cornell.edu](mailto:mph3@cornell.edu); Phone: 607-255-2552

## *NYS Colleges and Universities*

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- Center of Excellence in Environmental and Energy Systems (CoE)
  - Members of CoE are pursuing multiple opportunities including new biofuels, improved technologies to produce power from the sun and wind, processes to reduce emissions from traditional fuels, and innovations to increase energy efficiency.
  - Projects being conducted by Cornell CoE include:
    - Cornell Fuel Cell Institute supported by DOE
    - Major DOE program, Cornell Beam Research Accelerator(COBRA)on plasma fusion in Lab of Plasma Studies
    - Electrical and Computer Engineering
    - NSF Center focused on electric power grid (consortium of 13 universities)
    - Investigation of methane hydrates
    - Earth & Atmospheric Sciences / Chemical & Biomolecular Engineering
    - Student project to convert waste vegetable oil to biodiesel
    - Lignocellulosic materials to ethanol
    - Center for Northeast Sun Grant Initiative
    - Anaerobic co-digestion of manure and food waste
    - Conversion of dairy manure-derived biogas to hydrogen
    - Conversion of biogas to liquid fuels such as Dimethyl Ether (DME)
    - Transfer of manure management solutions to farmers
- Use of GIS to co-locate manure and food waste
- Research in developing new organic semiconductor devices that show electroluminescence and act as a PV cell
  - Use of ionic junctions to improve semiconductor performance
  - Could be fabricated in thin, flexible sheets to create new types of flexible PVs at lower cost
- Center for Materials Research
  - Research on materials structured at the nanoscale
  - Supported by the National Science Foundation, DOE, Department of Education and NYS
  - Facilities for materials synthesis and preparation, analysis, testing, and characterization
  - Cornell Nanofabrication Facility has an electron beam lithography and photolithography capabilities as well as thin film deposition and processing
- Global research partnership award with King Abdullah University of Science and Technology in Thuwal, Saudi Arabia
  - Support research in organic-inorganic hybrid nanomaterials for carbon dioxide capture and sequestration, desalination of water, production of gas and oil, and solar energy conversion
- Courses Offered:
  - BEE 4010 – Renewable Energy Systems

## *NYS Colleges and Universities*

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- Introduces energy systems with emphasis on quantifying costs and designing renewable energy systems to convert environmental input into useful forms of energy
- BEE 4870 – Sustainable Energy Systems
  - Offers a system approach to understanding renewable energy systems and their conversion processes
- BEE 6870 – The Science and Engineering Challenges to the Development of Sustainable Bio-Based Industries
  - Explores challenges facing the development of industries that use biologically derived materials to produce useful chemicals and energy for society
- BEE 7880 – Biomass Conversion of Energy and Chemicals
  - Biological and physical conversion of biomass to bioenergy and bioproducts
- MAE 4020 – Wind Power
  - Main features of energy conversion by wind turbines, structural effects, and wind farm planning
- MAE 5010 – Future Energy Systems
  - The focus is on renewable energy sources (wind, solar, biomass)

### **NYS College of Agriculture & Life Sciences at Cornell University, SUNY (<http://www.cals.cornell.edu/>)**

- In November 2007, the Community and Rural Development Institute (CaRDI) published a report on Municipal Approaches to Energy Conservation and Renewable Energy Production: A Resource for Community Energy Initiatives (<http://www.cals.cornell.edu/cals/devsoc/outreach/cardi/publications/upload/11-2007-Reports.pdf>).

### **References**

- Cornell University – Biofuels and Renewable Energy Systems: <http://www.cals.cornell.edu/cals/public/impact/biofuels.cfm>
- Cornell University – Cornell partners with other schools to promote New York’s solar energy industry: <http://www.news.cornell.edu/stories/Jan08/TSEC.ws.html>
- Cornell University – Courses of Study: <http://www.cornell.edu/academics/docs/courses-of-study-2008-09.pdf>
- Cornell University – In the Wind: <http://www.engineering.cornell.edu/news/engineering-magazine/archives/cem-spring-2005/In-the-Wind.cfm>

### **D’Youville College**

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- No indication of any renewable energy research or related course work (<http://www.dyc.edu/>).

## *NYS Colleges and Universities*

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### Daemen College

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#### General

- The Daemen College Alternative Energy Geothermal Demonstration Program is an applied research and development project to evaluate the use of geothermal technology as a model for energy and environmental efficiency in heating and cooling (<http://www.daemen.edu/news/Newsreleases/Pages/DaemenCollegeLaunchesAlternativeEnergyGeothermalProject.aspx>).
- Center for Sustainable Communities and Civic Engagement (<http://www.daemen.edu/academics/centersinitiatives/CSCCE/Pages/default.aspx>)
  - Hosted a business to business, green jobs workshop in June on local western NY companies involved in the green economy. It included speakers from the Wind Action Group and various topics related to renewable energy (<http://www.daemen.edu/news/Newsreleases/Pages/DaemenCollegeCenterforSustainableCommunitiesandCivicEngagementSponsors%E2%80%9CBusinesstoBusinessAGreenJobsWorkshop%E2%80%9DonJune20.aspx>).
- The newly built Research & Information Commons building is LEED certified and uses geothermal energy as a heat source for heating and cooling (<http://www.daemen.edu/about/front/Pages/TheResearchandInformationCommonsisournewestbuilding.aspx>).

### Dominican College

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- No indication of any renewable energy research or related course work (<http://www.dc.edu/default.aspx>).

### Elmira College

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- No indication of any renewable energy research or related course work (<http://www.elmira.edu/>).

### Empire State College, SUNY

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- No indication of any renewable energy research or related course work (<http://www.esc.edu/esonline/online2.nsf/ESHome.html>).

## *NYS Colleges and Universities*

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### Excelsior College

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- Affiliation with Energy Providers Coalition for Education but academic program offered in Nuclear Engineering Technology (<https://www.excelsior.edu/>).

### Farmingdale State College, SUNY\*

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#### **General**

- Plan to build an alternative fuel area on campus
- Expand its solar panel array that reduces the campus power consumption
- Test and evaluate various grades of bio-fuels used for powering small and large vehicles, lead to renewable, energy-efficient fuels
- A partner in the Advanced Energy Research and Technology Center at Stony Brook, which develops alternative and renewable sources of energy
- Solar Energy Center
  - First utility scale photovoltaic demonstration project in the northeast
  - Operate and maintain the existing PV systems
  - Hold the potential as a sustainable clean energy source with competitive rates
  - Plan to provide training in installation and maintenance of PV panels
  - Contact: Prof. Yelleshpur Dathatri, Director Email: [dathatyn@farmingdale.edu](mailto:dathatyn@farmingdale.edu)  
Phone: 631-420-2450
  - Under partnership with the Long Island Power Authority (LIPA), the college is working to expand the center to become a Renewable and Sustainable Resource Center to demonstrate customer-owned renewable energy sources ([http://www.farmingdale.edu/quicklinks/IFS\\_SEARCH.HTML](http://www.farmingdale.edu/quicklinks/IFS_SEARCH.HTML)).
  - Also teaming with LIPA to create Long Island's first "Smart Energy Campus". The two organizations, along with Stony Brook University, are proposing to create Long Island's first Smart Energy Corridor under funding from the American Recover and Reinvestment Act ([http://www.farmingdale.edu/quicklinks/IFS\\_SEARCH.HTML](http://www.farmingdale.edu/quicklinks/IFS_SEARCH.HTML))
- Small Business Development Center receiving a Small business Sustainability Initiative Grant to assist small business owners by conducting training and educational activities related to energy efficiency
- Institute for Research and Technology Transfer (IRTT)
  - Build a small-scale hydrogen-solar powered model home. Model is two 17x17 inch solar panels that produce a maximum combined power of 50 watts.
  - Projects currently under development at IRTT: Protons Exchange Membrane Fuel Cell, Membraneless Fuel Cell, and Wind Energy.
  - Contact: Dr. Hazem Tawfik, Director e-mail: [hazem.tawfik@farmingdale.edu](mailto:hazem.tawfik@farmingdale.edu)  
Phone: 631-420-2307
- Courses Offered

## *NYS Colleges and Universities*

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- Industrial Technology – IND406 – Energy Management
- Environmental Studies – ENV101 - Energy Sustainability and Environment

### **References**

SUNY Farmingdale – Institute for Research and Technology Transfer:

<http://info.lu.farmingdale.edu/~irtt/research.html>

SUNY Farmingdale - Green Then, Green Now:

[http://www.farmingdale.edu/quicklinks/IFS\\_About\\_Farmingdale.html](http://www.farmingdale.edu/quicklinks/IFS_About_Farmingdale.html) (Click Go Green on the left menu)

SUNY Farmingdale - Solar Energy Center:

<http://info.lu.farmingdale.edu/depts/met/solar/index.html>

## Hobart and William Smith Colleges

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### **General**

- One student completed an independent study on viability of wind power as a renewable source of energy for the region (<http://web.hws.edu/news/update/showwebclip.asp?webclipid=2858>).
- The Finger Lakes Institute installed a panel of twelve 165 W solar PV modules in 2004. The temperature of the building is regulated by a geothermal heating and cooling system (<http://fli.hws.edu/greenbuilding.asp>).

## Hofstra University

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### **General**

- The Center for Suburban Studies presented a symposium in April 2004 on facing energy issues related to alternative energy sources such as wind ([http://www.hofstra.edu/Academics/CSS/css\\_conf\\_042204.html](http://www.hofstra.edu/Academics/CSS/css_conf_042204.html)).
- Hofstra Law hosted a conference in March 2009 on Energy and the Environment: Empowering Consumers included various discussions on, for example, NIMBY issues and Alternative Energy (<http://law.hofstra.edu/NewsAndEvents/Conferences/EnergyAndTheEnvironment/schedule.html>)

## Houghton College

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### **General**

- Research completed by one physics student on designing and building a 1-5 kW wind power system and using fundamental principles and equations to estimate power output (<http://www.houghton.edu/academics/programs/physics/Student%20research/Posters/2002%20Sonya%20Marthai/poster.htm>).

## *NYS Colleges and Universities*

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### Iona College

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#### General

- Hosts an annual national conference sponsored by Terex Corporation for business and political leaders on Infrastructure: Pathway to Prosperity (<http://www.iona.edu/news/releases/0708/0708terex.cfm>).

### Ithaca College

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- No indication of any renewable energy research or related course work (<http://www.ithaca.edu/>).

### Keuka College

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- No indication of any renewable energy research or related course work (<http://keuka.edu/>).

### Le Moyne College

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- No indication of any renewable energy research or related course work (<http://lemoyne.edu/>).

### Manhattanville College

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#### General

- New student center built in 2008 is LEED Gold Rating certified and includes solar collectors that generate over 10% of the building's electricity (<http://www.mville.edu/NewsandEvents/News/StudentCenterRecognizedforGreenDesign.aspx>).

### Marist College

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- No indication of any renewable energy research or related course work (<http://www.marist.edu/>).

### Maritime College, SUNY

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- No indication of any renewable energy research or related course work (<http://www.sunymaritime.edu/>).
- Automated and solar powered NOAA weather station on campus ([http://www.sunymaritime.edu/documents/2009/1/26/mes\\_brochure\\_2.pdf](http://www.sunymaritime.edu/documents/2009/1/26/mes_brochure_2.pdf)).

## *NYS Colleges and Universities*

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### Medaille College

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- No indication of any renewable energy research or related course work (<http://www.medaille.edu/>)

### Mercy College

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- No indication of any renewable energy research or related course work (<https://www.mercy.edu/pages/1.asp>).

### Morrisville State College, SUNY

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#### General

- Renewable Energy Training Center (RETC)
  - \$2 M grant funded by the U.S. Department of Labor. Employment and Training Administration to create an alliance of employers, training providers, economic development partners, and K-12 schools to address long-term and short-term needs of NYS renewable energy sector (<http://retc.morrisville.edu/>).
  - The RETC hosted a free solar energy workshop for homeowners, small businesses, and farmers on November 1, 2008 (<http://newscenter.morrisville.edu/article.aspx?ID=5295>). SUNY Solar Power as Renewable Energy (SPARE) Photovoltaic Courses are offered by the RETC in collaboration with SUNY-ESF and SUNY Onondaga Community College. Other professional seminars in renewable energy technology are offered by the college as well (<http://retc.morrisville.edu/events.aspx>).
- School of Agriculture and Natural Resources
  - A.A.S. degree program in Renewable Energy Technology (<http://www.morrisville.edu/programsofstudy/schoolofagandnr/renewableenergy/>). Some of the courses include:
    - RENG 102 – Renewable Energy Resources  
A scientific examination of the energy field with emphasis on alternate energy sources, their technology, and application; present needs and future demands; conventional sources, biomass conversions; wind power; geothermal; solar and nuclear energy. Conservation methods stressed three credits (3 lecture hours), spring semester. These credits count towards the Math and/or Science (List B) requirements for graduation.
    - RENG 220 – Wind/Hydro Systems
    - RENG 305 – Renewable Energy Systems:  
This course provides the student with the basic understanding of renewable energy systems and their potential use for power generation, including electricity. The course focuses on providing the student with an introduction to typical energy consumption patterns along

## *NYS Colleges and Universities*

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with key concepts, terminology, and nomenclature common to all energy systems. The focus will then shift to using solar, wind, hydro, biomass, geothermal, and hydrogen fuel cells as renewable energy systems for a sustainable future.

- In 2003, the college installed a 10 kW wind turbine at its dairy complex. The turbine serves as a real-world laboratory for students in agricultural and renewable resource studies in addition to reducing energy costs for the complex (<http://www.morrisville.edu/alternativeenergy/windturbine.aspx>).
  - Other facilities that exist for the Renewable Energy Technology program include: anaerobic methane digester, algae greenhouse heated by biogas, indoor wind turbine tower safety training facility, biodiesel batch processor, wood gasification heating system, micro turbines for heat generation from biogas, 1-2 kW PV array, and a solar hot water system (<http://www.morrisville.edu/programsofstudy/schoolofagandnr/renewableenergy/facilities.aspx>).
- The SUNY Energy Research brochure indicates research in biodiesel, anaerobic methane digesters, and wind turbines (<http://www.suny.edu/GovtRelations/federal/pdf/Energy%20Brochure%20combined.pdf>).

### **Contacts**

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- Assistant Professor, Renewable Energy
- Phone: 315.684.6780
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Philip V. Hofmeyer, Ph.D.

- Assistant Professor, Renewable Energy
- Phone: 315.684.6515
- E-mail: [hofmeypv@morrisville.edu](mailto:hofmeypv@morrisville.edu)

## Mount Saint Mary College

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### **General**

- In the summer of 2008, NYS Excelsior Scholars Program offered two, two-week sessions for grade school students on mathematics and science, including a renewable energy course ([http://www.msmc.edu/home/Excelsior\\_Program.html](http://www.msmc.edu/home/Excelsior_Program.html)).

## Nazareth College

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### **General**

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- Professors at Nazareth attended a faculty seminar on Germany's Environmental and Energy Strategy to learn about alternative energy sources and how they can be implemented in the U.S. (<http://www.naz.edu/news/dailyupdate.cfm?showDetails=1&detailsType=news&detailsID=667>).

## New York University

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- No indication of any renewable energy research or related course work (<http://www.medaille.edu/>). Website discusses the purchase of Renewable Energy Credits, making it the largest purchaser by any university in 2006 (<http://www.nyu.edu/publicaffairs/releases/detail/1235>).

## Niagara University

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- No indication of any renewable energy research or related course work (<http://www.niagara.edu/>).

## Nyack College

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- No indication of any renewable energy research or related course work (<http://www.nyackcollege.edu/>).

## Pace University

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### General

- The Energy and Climate Center at Pace Law School is working to reduce the environmental, social, and human health burdens of today's more prevalent forms of electricity production and consumption, and to promote the transition to cleaner, more efficient, renewable energy alternatives ([http://www.pace.edu/page.cfm?doc\\_id=23241](http://www.pace.edu/page.cfm?doc_id=23241))
  - Received a \$137,000 federal grant in 2005 from the State Technologies Advancement Collaborative (STAC) and \$50,000 from NYSERDA for joint energy research, development, demonstration, and deployment of technologies were common federal and state objectives exist (<http://www.law.pace.edu/news/2005/grant.html>). Pace will focus specifically on small-scale-on-site power.
- The Dean for the Center for Environmental Legal Studies is involved with research on utility investment in conservation and renewable energy resources ([http://www.pace.edu/page.cfm?doc\\_id=23187](http://www.pace.edu/page.cfm?doc_id=23187)). The Pace Law School hosted a conference in September 2009 on Illuminating Solar Finance; Shedding Light on the Essential Elements of Financing Solar Projects ([http://www.pace.edu/page.cfm?doc\\_id=34187](http://www.pace.edu/page.cfm?doc_id=34187)).

## *NYS Colleges and Universities*

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### Polytechnic Institute of NYU

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#### General

- The New York City Accelerator for a Clean & Renewable Economy (NYC ACRE) program was developed to help promote clean energy technology and companies in New York City grow, and to advance the city as a role model for environmental sustainability and smart growth (<http://www.nycacre.com/about/index.php>).
  - Four-year, \$1.6M grant from NYSERDA to aid in this program

### Purchase College, SUNY

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- No indication of any renewable energy research or related course work on its website, however, it was indicated on the SUNY Research Brochure that some work is being done on wind turbine technology advancement by an Assistant Professor in the New Media School of Natural and Social Sciences, Dr. Brooke Singer (<http://www.nyackcollege.edu/>).

### Rensselaer Polytechnic Institute\*

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#### General

- The institute has completed an energy audit. Energy-efficient lighting and an aggressive conservation policy has reduced consumption by three percent, despite campus growth. Rensselaer has allotted \$50,000 of its energy budget to purchase five million kilowatt-hours from wind sources. There is a 10-kilowatt wind turbine on campus, and a solar array will be installed atop the new Houston Field House. <http://www.greenreportcard.org/report-card-2009/schools/rensselaer-polytechnic-institute>
- LEED standards are incorporated into new building projects, and all renovation projects at the institute are designed with energy efficiency measures. The institute plans to achieve LEED Silver certification for the East Village Athletic Center, and the Media and Performing Arts Center is LEED Silver-certified. The institute recycles construction waste.
- Renowned physicist named Kodosky Constellation Chair at RPI; Research will focus on renewable energy, future electronics, and nano science. <http://news.rpi.edu/update.do?artcenterkey=2396>
- Researchers develop darkest manmade material; carbon nanotube array absorbs light, could boost solar energy conversion. <http://news.rpi.edu/update.do?artcenterkey=2393>
- In a two-year project funded by the New York State Office of Science, Technology and Academic Research (NYSTAR), researchers from Rensselaer Polytechnic Institute (RPI) will undertake a study on how the widespread adoption of clean, renewable energy sources will affect the electricity distribution grid. <http://www.renewableenergyworld.com/rea/news/article/2006/11/renewable-energys-impact-on-the-electric-power-grid-46573>

## *NYS Colleges and Universities*

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- Part of the Center for Future Energy Systems (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 Center for Power Electronic Systems (CPES) at Rensselaer Polytechnic Institute has summer opportunities available to a limited number of high school students to become familiar with renewable energy sources and systems. <http://www.rpi.edu/dept/outreach/docs/2009RenewableEnergyFlyer.pdf>
- Center for Future Energy Systems (<http://www.rpi.edu/cfes/>)
  - Focus on research in low cost high efficiency photovoltaic technologies, compound semiconductor materials, advanced lighting sources, wind, bioenergy, and fuel cell
  - Make New York State the world leader in the new industrial revolution based on renewable energy and energy conversion systems
  - Working to develop new energy technologies and improve existing renewable energy systems
  - Solar Research:
    - Low cost-high efficiency, full spectrum PV technologies
    - Group III-V solar cell material growth on silicon wafer and recyclable substrate
    - Study of MOVPE and ELO processes for Cd based thin layer silicon wafer coating
    - Integration process for multi-wavelength stacked PV
    - Tracking free solar concentrators
    - Solar cell material selection and device fabrication
    - Paintable/printable solar materials
    - Development of nano-architected PV devices for high efficiency
    - Development of high efficiency solar cells comprised of OPV and HPV inorganics
  - Wind Research
    - Adaptive wind turbine design for performance enhancement
    - Blade design and wind tunnel testing
    - Wind power system modeling and analysis
  - Biomass Research
    - Cellulosic ethanol process design and study
    - Enzyme improvement studies, including ligno-cellulose degradability
    - Ionic liquid-based ligno-cellulose pretreatment
    - Algae derived biodiesel
    - Artificial photosynthesis to electricity
    - Synthetic biology to convert cellulose to hydrocarbons
    - Algae research utilizing biomaterials systems incorporating photosynthetic processes

- Fuel Cell Research
  - Materials research for improved SOFC/PEM cells and stacks
  - Full fabrication, testing, and characterization for SOFC/PEM
  - Transport modeling in electrochemical devices
  - Primary research focus on degradation and life improvement
  - Study of fuel cell structural and chemical interconnect coating interfaces
  - Synthesis of cathode materials via glycine-nitrate processing (GNP)
  - Development of novel alkaline exchange membranes
  - NSF Education grant - Integrative Graduate Education and Research Traineeship Program (IGERT)
- Hydrogen Research
  - Study of the operational characterizations of Distributed Generation under a high degree of penetration
  - Study stability and dynamic behavior of utility distribution grid with small inertia
  - Investigate power quality interactions in inverter based DG
  - Develop and test new DG control features that meet IEEE 1741
- Distributed Generation Research
  - Study of the operational characterizations of DG under a high degree of penetration
  - Study stability and dynamic behavior of utility distribution grid with small inertia
  - Investigate power quality interactions in inverter based DG
- Develop and test new DG control features that meet IEEE 1741 Renewable Energy and Sustainability Course (ECSE 4967/6962 and EPOW 4960/6960)
  - Discuss the fundamentals of renewable energy sources and storage systems
  - Focus on converting the energy from wind, solar, ocean, hydrogen, and biomass to usable electrical energy
- The New York State Foundation for Science, Technology and Innovation (NYSTAR) is supporting RPI to study the ability of the electricity distribution grid to efficiently make use of energy from alternative sources such as solar panels, wind turbines, and fuel cells. A \$1.23M grant was awarded for this two-year project (<http://news.rpi.edu/update.do?artcenterkey=1829>).
  - The work is crucial to New York's quest to have 25% of its energy come from renewable energy sources by 2012.
- Center for Automation Technologies and Systems
  - Research on automation applications that include motion control and assembly, and industrial automation from robotic mechanisms to algorithms

## *NYS Colleges and Universities*

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- Developed patented Active Building Envelope which consists of solar panels to collect and convert solar energy into electricity for buildings through the use of thermoelectric heat pumps
  - Prototype allows for monitoring and further research on-site
- Research on developing a photovoltaic façade composed of integrated concentrator solar modules with pivoting lenses that track the movement of the sun and focus its rays on the solar cells
- Lighting Research Center
  - Devoted to research, analysis and training on new technologies and applications, including the evaluation of PV system efficiencies and the potential for LEDs to be used in PV-powered lighting applications
- Department of Electrical, Computer and Systems Engineering
  - Research on power electronics including design, simulations, fabrication, and characterization of silicon power switching devices
- Department of Materials Science and Engineering
  - Research on applications for nanomaterials, electronics, metals, polymers, and nanocomposites with focus on materials that exhibit stiffness and strength-to-weight ratios
- Nanoscale Science and Engineering Center
  - Focus on developing the means to assemble nanoscale building blocks with unique properties for functional structures

### References

<http://www.greenreportcard.org/report-card-2009/schools/rensselaer-polytechnic-institute>  
[http://www.rpi.edu/cfes/res\\_research.html](http://www.rpi.edu/cfes/res_research.html)

### Contacts

**Need to find contacts**

## Roberts Wesleyan College

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- No indication of any renewable energy research or related course work (<http://www.roberts.edu/>).

## Rochester Institute of Technology (RIT)\*

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### General

- Center for Integrated Manufacturing Studies
  - Increase the competitiveness of manufacturers through applied technology and training
  - Houses three centers, four major programs, and a training program
  - Facility for sustainable systems research, including technology bays, specialized laboratories, and a state-of-the-art training center

- Capability of studying tensile, fatigue, and hardness testing, heat treating, failure analysis, metallography, material restoration, life-cycle/durability testing, failure mode evaluation, prognostics development, and qualification/performance testing
- Master of Science in Manufacturing Leadership
  - An 18-month program, designed for experienced professionals in manufacturing and service organization, that integrates business and engineering courses
- Master of Science in Microelectronics Manufacturing Engineering
  - A two-year research oriented program to prepare students for a career in the semiconductor industry and provide background in optics, chemistry, device physics, electrical engineering, and statistics
- BS in Mechanical Engineering with Energy & Environment Option
  - Energy and Environment Option Technical Electives
    - Renewable Energy Systems
    - Sustainable Energy Management
    - Alternative Fuels and Energy Efficiency
- ME and MS in Sustainability Engineering Courses
  - Fundamentals of Sustainable Engineering
  - Renewable Energy Systems
- Delphi Corporation, a supplier of mobile electronics and transportation systems, and the Rochester Institute of Technology have been awarded \$2.4m in federal funds for fuel cell development. Delphi and RIT previously secured \$2.75m in federal funding for the project.
  - [http://www.newenergyworldnetwork.com/renewable-energy-news/by\\_technology/energy\\_efficiency/delphi-corporation-and-the-rochester-institute-of-technology-receive-24m-for-fuel-cell-development.html](http://www.newenergyworldnetwork.com/renewable-energy-news/by_technology/energy_efficiency/delphi-corporation-and-the-rochester-institute-of-technology-receive-24m-for-fuel-cell-development.html)
- RIT's NanoPower Research Labs received two awards, out of 25 given nationally, from the Department of Energy's Future Generation Photovoltaic Devices and Processes Program. The first project is a three-year, \$1.1 million dollar effort aimed at providing higher efficiency solar cells for the growing concentrator photovoltaic market. The second effort is a university-industry collaboration with Wakonda Technologies designed to enhance the integration of III-V materials onto thin films used in solar cell production. The project, which received an award of \$2.1 million over a three-year period, was also selected for a matching grant from the New York State Energy Research and Development Authority (NYSERDA). The work will build on Wakonda's efforts to produce more energy efficient and cost-effective solar cells for commercial use. <http://www.nanowerk.com/news/newsid=3510.php>
- In addition to the Department of Energy announcement, the NanoPower Labs, in collaboration with Nantero Inc., was also recently named the recipient of a \$750,000 grant to conduct research related to the development of the next generation of rechargeable, lithium ion batteries. The work, funded by the U.S. Department of Defense (DOD), is intended to improve the capacity and cyclability of rechargeable batteries, while also expanding their use in a number of military applications

## *NYS Colleges and Universities*

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- The institute has initiated a \$38 million project to completely overhaul its heating and cooling plant for greater efficiency. In construction and renovation, facilities management services implements energy efficiency technology such as occupancy sensors, building automation systems, and temperature control.
- RIT has made a commitment to ensure that new construction will be LEED-certified. Existing buildings are upgraded with efficiency measures such as the replacement of incandescent light bulbs with fluorescent bulbs, metering of thermal profiles, variable speed drives to reduce electrical consumption, water conserving devices, and temperature controls.
- James J. Winebrake, associate Professor and Chair of RIT's Science, Technology and Society/Public Policy Department in the College of Liberal Arts, recently won a \$532,567 grant from the National Park Service to stimulate energy efficiency and renewable energy use at the 375 national parks across the country. He and public policy graduate student Erin Green will focus on three objectives:
  - Analyze renewable-energy opportunities at parks by matching them with available renewable energy resources, such as wind or solar power
  - Analyze a park's utility bills to uncover cost-saving measures
  - Initiate energy efficiency and renewable energy projects in parks to reduce the National Park Service's dependence on fossil fuels <http://www.rit.edu/news/?r=44263>
- RIT and NYSERDA Partner to Advance Clean Energy Research and Education (\$1.5 million to establish clean energy business incubator, \$1 million for hydrogen fueling station demonstration project). The multi-million dollar effort includes expanded research initiatives in hydrogen fuel technology, the development of a clean energy incubator and the creation of a clean energy research and training center.
  - Announced 5/26/2009; <http://www.rit.edu/fa/ritgreen/news.html>
  - [http://www.nyserda.org/Press\\_Releases/2009/PressRelease20092605.asp](http://www.nyserda.org/Press_Releases/2009/PressRelease20092605.asp)
- Science, Technology, Society/Public Policy
  - James J. Winebrake, Ph.D., Professor and Chair, Dept. of STS/Public Policy
    - Sustainable Intermodal Freight Transportation Systems
    - Analysis of carbon reduction policies on automobile design and market development
    - Sustainable transportation technologies and policies for China
    - Total fuel life cycle analysis for transportation technologies in New York
    - Renewable energy and energy conservation project implementation at national parks
    - Emissions control technology optimization modeling under various policy frameworks
    - <http://people.rit.edu/jjwgpt/>
- Involvement with microsystems engineering and sustainable systems development

### **Contacts**

**Need to find contacts**

## *NYS Colleges and Universities*

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### Skidmore College

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- No indication of any renewable energy research or related course work (<http://cms.skidmore.edu/index.cfm>).

### St. Bonaventure University

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#### General

- One biochemistry student was awarded a summer research scholarship to study renewable energy possibilities in a species of green algae ([http://www.sbu.edu/About\\_SBU.aspx?id=24672&terms=renewable+energy](http://www.sbu.edu/About_SBU.aspx?id=24672&terms=renewable+energy)).

### St. John Fisher College

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- No indication of any renewable energy research or related course work (<http://www.sjfc.edu/>).

### St. Lawrence University

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#### General

- The University is considering the construction of a biomass boiler (<http://www.stlawu.edu/green/community>).
- One student in the Department of Physics studied the Evaluation of InP Quantum Dots as Sensitizers for Solar Cells in 2008 ([http://it.stlawu.edu/~physics/stuff/student\\_projects/2008/shehata\\_spring.shtml](http://it.stlawu.edu/~physics/stuff/student_projects/2008/shehata_spring.shtml)).

### Stony Brook University, SUNY

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#### General

- Managed by Stony Brook University and funded by the Office of Science of the U.S. Department of Energy
- Long-term research for high-risk programs in science including the development of advanced technologies that address national energy needs (e.g. computational techniques to optimize power grids)
- National Photovoltaic Environmental Research Assistance Center
  - Assists DOE and photovoltaic industry in the development of energy systems that are technologically feasible and environmentally acceptable
  - Identifies and examines potential health/safety barriers for new PV materials
  - Safety Assistance Center
- Center for Functional Nanomaterials

## *NYS Colleges and Universities*

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- Fabrication and study of nanoscale materials with emphasis on atomic-level tailoring
- Developed the Markal-Macro energy and economic modeling/analysis tool to support strategic energy planning. Integrates energy, environmental and economic factors for energy solutions
- Stony Brook University Hospital in Stony Brook, N.Y. is the first hospital in the nation to pledge to reduce its environmental impact through a comprehensive agreement with the U.S. Environmental Protection Agency (EPA). The hospital and EPA today signed an agreement that outlines goals and strategies for energy and water conservation, solid waste management, green design and the use of environmentally-friendly products.  
<http://yosemite.epa.gov/opa/admpress.nsf/0/DDD1BF3656D217158525761E00561195>
- The Small Business Development Center at Stony Brook University has successfully competed in a NYSERDA Program Opportunity Notice (PON) and was awarded \$247,000 for its proposal entitled the “Stony Brook Energy Company Initiative”. The goal of the initiative is to facilitate the entry of new and existing companies into the renewable and clean energy business in New York State.  
[http://commcgi.cc.stonybrook.edu/am2/publish/General\\_University\\_News\\_2/Small\\_Business\\_Development\\_Center\\_At\\_Stony\\_Brook\\_University\\_Receives\\_NYSERDA\\_Grant\\_For\\_Energy\\_Company\\_Initiative\\_Proposal.shtml](http://commcgi.cc.stonybrook.edu/am2/publish/General_University_News_2/Small_Business_Development_Center_At_Stony_Brook_University_Receives_NYSERDA_Grant_For_Energy_Company_Initiative_Proposal.shtml)
- Stony Brook University will be home to the new Northeastern Chemical Energy Storage Center (NOCESC). The team will attack a series of key fundamental research issues that directly impact the ability to use lithium ion batteries in a wider range of applications - particularly in combination with new renewable energy sources and in the field of transportation.  
[http://commcgi.cc.stonybrook.edu/am2/publish/Research\\_20/DOE\\_to\\_Establish\\_Energy\\_Frontier\\_Research\\_Center\\_at\\_Stony\\_Brook\\_University.shtml](http://commcgi.cc.stonybrook.edu/am2/publish/Research_20/DOE_to_Establish_Energy_Frontier_Research_Center_at_Stony_Brook_University.shtml)
- The Advanced Energy Research and Technology Center will develop advanced cutting edge technologies to explore new ways for production of clean energy, enhance production from renewable sources, and find efficient methods for distribution and storage of energy with minimal impact on the local ecosystems. <http://www.aertc.org/>
- Brookhaven National Laboratory, which is managed by Stony Brook University for the Department of Energy, has a well established reputation for energy related research. Several large companies, that provide energy to New York State, such as National Grid USA, LIPA, and British Petroleum have invested over \$500M in contracts with the laboratory for energy related research, which includes construction of complete experimental test stations and fundamental research at the National Synchrotron Light Source, the Center for Functional Nanomaterials, and the Department of Applied Science.  
<http://www.aertc.org/>
- Research Projects:
  - Photovoltaic Cells for Electric Power Generation
    - This project is based on a lower cost alternative to photovoltaic power, using amorphous silicon, in place of the pure crystalline silicon used in most photonic cells.

## *NYS Colleges and Universities*

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The study led to some improved designs and patents, but more work is needed to achieve widespread and practical photovoltaic power generation.

- Thermal Spray Center for Fuel Cells and Engines
- Solid Oxide Fuel Cells: Studies of Ionic Conductivity
- Environmental Nanotechnologies for Clean Energy Applications
- Novel Sensors for Harsh-Environment Energy Generation
- Fuel Cells
- Carbon Sequestration by Catalytic CO<sub>2</sub> Conversion
- Biological Hydrogen Production and Green Processes
- Thin-Film Photovoltaic Reliability and Lifetime Assessment
- Oxide Nanomaterials for Energy Applications
- Measurement of Carrier Recombination Parameters in III-V Compounds for Photovoltaic Cell Design Optimization
- Nanofibrous Membranes for Energy Applications
- Harvesting Wave and Tidal Energy
- Surface Metrology for PV Wafers
- Wafering and Manufacturing of Photovoltaic Solar and Thermal PV Cells
- <http://www.cewit.org/docs/energyprojects.pdf>

### **Contacts**

#### **Need to find contacts**

## SUNY Brockport

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### **General**

- No major renewable energy initiatives or programs ([www.brockport.edu](http://www.brockport.edu)).
- In 2007, SUNY Brockport hosted a speaker on clean renewable energy and “Re-Energizing America: Curing America’s Addiction to Oil” (<http://www.brockport.edu/newsbureau/854.html>).
- SUNY Brockport did an environmental assessment in 2007 that indicates that the college will use alternative energy sources such as solar and wind in maintenance and construction projects whenever possible (<http://www.brockport.edu/gci/GreenAssessment.pdf>).

## SUNY Canton\*

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### **General**

- Degree Program - Alternative and Renewable Energy Systems (Bachelor of Technology)

## *NYS Colleges and Universities*

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- Research and learn alternative and renewable energy technologies focusing on practical energy conversion to meet the demand for sustainable development
- Examples of alternative energy systems include wind power, hydro-electric, fuel cell, geothermal power, solar power, and biofuel applications including anaerobic digesters
- Students who graduate from this program will work with architects and engineers to create viable renewable energy solutions for commercial and residential facilities
- Alternative and Renewable Energy Systems - B. Tech
  - Courses Offered [http://www.canton.edu/course\\_descriptions/alt\\_energy.html](http://www.canton.edu/course_descriptions/alt_energy.html)
    - AREA – Alternative and Renewable Energy Systems
    - AREA 110 – Introduction to Alternative Energy
    - AREA 300 – Fuel Cells
    - AREA 303 – Wind Turbines
    - AREA 310 – Biofuels
    - AREA 320 – Experimentation & Measurement I
    - AREA 321 – Solar Energy Utilization
    - AREA 322 – Passive Solar Building
    - AREA 323 – Photovoltaic Systems
    - AREA 370 – Experimentation & Measurement II
    - AREA 400 – Automotive Applications For Fuel Cells
    - AREA 420 – Alternative Energy Design I
    - AREA 470 - Alternative Energy Design II
- Formed an Energy Center for training in PV and geothermal, and Building Performance Institute (BPI) certification for students and contractors. Small wind training will follow
- Looking to build test bed with 8 100-kW turbines for training on turbine maintenance, wind site assessment, and design, as well as wind integration, into the electrical grid. Possible collaboration with Clarkson University for this effort.
- The Small Business Development Center (SBDC) is working to help business owners address energy challenges and solutions and outlines adoptable renewable energy systems and energy efficiency. The New York State SBDC, in partnership with NYSERDA and the New York Business Development Corporation (NYBDC), has formulated an Energy Savings Program that will encourage business owners to implement energy efficiencies that will allow their firms to compete on a favorable basis in a global economy.
- Canino School of Engineering Technology, Department of Science and Engineering Technology offers a course on power transmission and distribution including hydropower, thermal, nuclear, and wind power generating stations.

### **References**

## *NYS Colleges and Universities*

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SUNY Canton – Degree in Alternative and Renewable Energy Systems:

[http://www.canton.edu/csoet/alt\\_energy/](http://www.canton.edu/csoet/alt_energy/)

SUNY Canton – Four-Year Degree in Alternative and Renewable Energy:

[http://www.canton.edu/public\\_relations/news/alt\\_renew\\_energy\\_degree.html](http://www.canton.edu/public_relations/news/alt_renew_energy_degree.html)

### **Contacts**

**Need to find contacts**

## SUNY Cobleskill

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### **General**

- The college is building a \$41.7M Center for Agriculture and Natural Resources. The building will be LEED certified and will serve as the center for focus on agriculture technologies and renewable energy resources (<http://news.cobleskill.edu/chancellorvisit09.php#>).
- It was indicated in the SUNY Energy Research brochure that Douglas Hammond of the Department of Agricultural Engineering is involved with research on biodiesel (<http://www.suny.edu/GovtRelations/federal/pdf/Energy%20Brochure%20combined.pdf>).
- Related Physical Science course: PSCI 104- Energy and the Environment
  - This course will aim to present the concept of sustainability in terms of physical principles and the concept of energy. The central idea running through the course will be energy: its physical definition, its various forms (thermal, nuclear, chemical, solar, electrical, etc.) and processes involved in the production, extraction, distribution, and use of energy. We will examine traditional and non-traditional modes of energy production including the technologies of those modes of production and the associated advantages and disadvantages of each mode. The goal is to provide the student with a broad-based physical and technical understanding of energy and to provide him/her with a basis for evaluating, understanding, and deciding upon the complex energy issues of the 21st century (<http://www.cobleskill.edu/catalog/viewcourse.asp?dept=PSCI&num=104>).

## SUNY Cortland

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### **General**

- No major renewable energy initiatives or programs ([www.cortland.edu](http://www.cortland.edu)).
- Assistant Professor and Chairman of the Physics Department, Brice C. Smith, is focusing some of his research on issues related to the U.S. and global energy systems, particularly as they relate to nuclear power, renewable energy, and the threat of global warming (<http://www.cortland.edu/physics/FacultyStaff/Smith.htm>).

## *NYS Colleges and Universities*

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- The Cortland Students Advocating for a Valuable Environment group posted an Earth Week conference in 2008 that included a workshop for the community on how to get renewable energy systems into people's homes (<http://www2.cortland.edu/dotAsset/85728.pdf>).

### SUNY Delhi

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#### **General**

- Center for Excellence in Watershed Applications and Technology is a partnership with SUNY and is committed to stimulating economic development in upstate New York by addressing objectives for renewable energy. It is involved with projects related to biomass gasification and willow and forest biomass (<http://www.delhi.edu/community/coe/>).
- Photovoltaic Design and Installation training is being offered through the Business and Community Service Department in cooperation with NYSERDA and IREC ([http://www.delhi.edu/academics/academic\\_divisions/technologies/photovoltaics.php](http://www.delhi.edu/academics/academic_divisions/technologies/photovoltaics.php), <http://www.delhi.edu/bcs/Photovoltaics%20Brochure%20Sept-Oct%2009.pdf>).

### SUNY Environmental Science and Forestry\*

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#### **General**

- The SUNY College of Environmental Science and Forestry (ESF) has developed a Climate Action Plan that will use a combination of renewable energy projects, sustainable construction, energy conservation and managed forestland to make the college carbon neutral by 2015.
  - The report spells out a five-fold path toward driving the college's net CO<sub>2</sub> emissions to zero by 2015. Some 40 individual initiatives are included in those five major areas:
    - energy conservation measures, including energy audits, renovations, technology and facility upgrades;
    - alternative energy projects on the main campus and regional campuses designed to deliver clean and renewable energy to existing structures, including biomass heat, photovoltaic arrays, wind turbines, and the production of biodiesel from waste cooking oil to help fuel the college fleet;
    - new construction that will focus on energy-efficient design and systems that produce heat and power from sustainable sources for new and existing buildings;
    - campus action to engage the campus community to increase awareness and reduce waste in all aspects of college operation, including travel efficiency and standardized temperature settings;

- forest carbon sequestration, centering on proper designation and management of ESF's forested properties, in keeping with Chicago Climate Exchange and Greenhouse Gas Protocol standards.
- The combination of systems will help the campus flip its fuel usage from less than five percent renewable energy sources to more than 65 percent by 2014.
- <http://www.esf.edu/communications/view.asp?newsID=263>
- [http://www.syracuse.com/news/index.ssf/2009/09/suny\\_esf\\_president\\_outlines\\_pl.html](http://www.syracuse.com/news/index.ssf/2009/09/suny_esf_president_outlines_pl.html)
- The Sustainable Use of Renewable Energy (SURE) is a two-day program that provides an opportunity to learn about renewable energy and ideas that are being developed. Examples energy systems include solar, wind, power, biomass and conversion to biofuels.
- SUNY ESF is offering photovoltaic installation and maintenance training through the SUNY SPARE (State University of New York Solar Power as Renewable Energy) project (<http://www.esf.edu/outreach/pd/spare/>).
  - SUNY-ESF plans to be carbon-neutral by 2015 (<http://www.esf.edu/communications/view.asp?newsID=263>).
- Partner with SUNY Onondaga Community College to offer Photovoltaic Installer Courses. The courses meet a requirement for certification through NABCEP as a PV installer.
- A five-kilowatt small wind turbine was installed to power a remote classroom at Heiburg Forest (<http://www.esf.edu/communications/view.asp?newsID=238>).
- Solar PV arrays are installed on the roof of Walters Hall and the Baker Laboratory (<http://www.esf.edu/ecenter/goinggreen/solarpanels.htm>).
- SUNY Center for Sustainable and Renewable Energy
  - A 64-campus research and development clearinghouse in the critical area of energy sufficiency and sustainability located at SUNY ESF.
  - Current research includes renewable carbonate fuel cell operations, photovoltaic power generation, solar fueled hydrogen generation, biomass gasification for synthetic gas, and biotechnical hydrogen production from biomass.
  - Current sponsored projects include SUNY Solar Energy As Renewable Energy (SPARE), Fuel Cells, Biomass Fuelled Combined Heat and Power, and Hydrogen Generation and Storage using Renewable Resource Systems.
  - Training courses for PV installers in partnership with Onondaga Community College
- Center of Excellence in Environmental and Energy Systems (CoE)
  - Members of CoE are pursuing multiple opportunities including new biofuels, improved technologies to produce power from the sun and wind, processes to reduce emissions from traditional fuels, and innovations to increase energy efficiency.
  - Projects being conducted by ESF CoE include:
    - Biohydrogen Antek Corporation

## *NYS Colleges and Universities*

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- 250 KW Molten Carbonate Fuel Cell
- Naturally-Chilled H<sub>2</sub>O
- Salix Consortium
- Wood Gasification/Syngas
- Bioplastics
- Wood-based Biorefinery in New York
- Combined Heat and Power (CHP) (Syracuse Green Power Plant)
- Degreed Program - Renewable Energy and Biomass Engineering (M.S., Ph.D.)
  - Focus on the use of renewable and sustainable resources for the production of chemicals, advanced materials, fuel, and energy.

### Course Offered

- Forest Engineering – FEG454 Power Systems
  - Focus on the application of alternative technologies to the matching of power needs and resource constraints. Topics include tractive power, wind power, alternative fuels and photovoltaic.
- Bioprocess Engineering – BPE441 – Biomass Energy
  - Historical, current and future uses of biomass as a source of renewable energy for the production of bioenergy, biofuels and bioproducts
- Environmental Science – ESC325 – Energy System
  - Topics include traditional extractive approaches, sustainable energy systems, energy return on investment, and resource supply.
- Environmental Science – ESC335 - Renewable Energy
  - An overview of the role of renewable energy in the context of energy supply

### References

SUNY ESF – Sustainable Use of Renewable Energy (SURE):

<http://www.esf.edu/certificates/sure/>

SUNY ESF – Kelleher Joins ESF to Increase Focus on Renewable Energy:

<http://www.esf.edu/communications/news/2008/01.23.kelleher.htm>

SUNY ESF – SUNY Center for Sustainable and Renewable Energy:

<http://www.esf.edu/energycenter/about.htm>

### SUNY Fredonia

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- No indication of any renewable energy research or related course work (<http://www.fredonia.edu/>).

## *NYS Colleges and Universities*

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### SUNY Geneseo

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#### General

- A GREEN-UP (Geneseo Recycling Energy & the Environment Neighborhood-University Partnership) summer camp was offered for youth ages 11-14 this past July. Geneseo faculty and students taught classes on science, technology, environmental engineering and mathematics related to renewable energy, reducing waste, and building green (<http://rysag.geneseo.edu/GREENUP.htm>).
- Solar research initiatives by two professors in the Department of Chemistry, David Geiger and James McGarrah, include molecular machines for solar energy conversion, solar energy capture, and electroluminescence (<http://www.geneseo.edu/CMS/display.php?page=2536&dpt=chem>).

### SUNY Institute of Technology

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- No indication of any renewable energy research or related course work (<http://www.sunyit.edu/>).

### SUNY New Paltz\*

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#### General

- No major renewable energy initiatives or programs
- EGG250 Renewable Energy – Discuss energy supply from alternative resources as a result of solar power such as solar radiation, bioenergy and wind power
- SUNY New Paltz ECE faculty member, Michael Otis secured equipment grant from California-based Company, Opto-22. This “OptoGreen” grant is part of the company’s initiative focused on environmental responsibility by providing solutions for automation, control, and data acquisition of renewable energy, energy consumption optimization, and sustainability. Professor Otis and several of his students are working with The Solar Energy Consortium (TSEC) on “The Greening of New York State Farms”.  
<http://www.newpaltz.edu/engineering/news.cfm?id=3819>
- School is part of the coalition between the solar energy consortium & five research universities in New York, including Cornell University, Rensselaer Polytechnic Institute, Clarkson University, SUNY New Paltz and TSEC.
- In 1998, the college installed a 7.7kw photovoltaic array on the roof of Elting Gym to help to offset power usage in the building.

#### Contacts

Michael Otis

- Professor of EGG250
- Office: Resnick Engineering Hall room 210

## *NYS Colleges and Universities*

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- Phone: 845-257-3827
- Email: otism@engr.newpaltz.edu

### Gerald Kitzmann

- University Faculty Senator, Physics Associate Professor (Specialty: Geothermal energy)
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- E-mail Address: kitzmang@lan.newpaltz.edu
- Public Affairs: 845-257-3245

## SUNY Oneonta

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### General

- No indication of any renewable energy research or related course work (<http://www.oneonta.edu/home/default.asp>)
- In September 2009, SUNY Oneonta hosted a speaker on Migrating Eagles and Wind Farms (<http://www.oneonta.edu/general/whatsnew/news/eagle09.asp>).

## SUNY Oswego\*

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- No major renewable energy initiatives or programs (<http://www.oswego.edu/>). One of 35 colleges and universities in New York's Creative Core, which is emerging as a national leader in new and green economy.
- SUNY Oswego is a partner with the Syracuse Center of Excellence in Environmental and Energy Systems.
- SUNY Oswego senior meteorology major Frankie Carlevatti worked with Al Stamm, professor and chair of earth sciences, to explore such campus renewable energy options as small-scale wind, solar and lake-related technologies. The project was supported by one of the college's Student-Faculty Collaborative Challenge Grants.
- Center for Energy Education and Economic Solutions
  - A collaboration of Oswego, Morrisville State, Cayuga Community College, the Institute for the Application of Geospatial Technology and other development groups.
  - With the increased interest in alternative energy, the partnership will support economic development as well as promote energy independence.
  - An educational emphasis will focus on creating training modules on topics that could range from employing global-positioning technology for alternative energy site selection to using biofuels for economic progress to mapping regional energy options.
- Course Offered

## *NYS Colleges and Universities*

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- Energy Technology - TEL 355A laboratory study of energy technology as a resource of society, includes overview of renewable and non-renewable energy sources.

### **Contacts**

Alok Kumar

- Environmental Science Teacher
- PHY 305 "Energy and the Environment"
- Office: 227 Snygg Hall
- Phone: (315) 312-2695
- E-Mail: kumar@oswego.edu

### **References**

- SUNY Oswego – Powerful Partnership:  
[http://www.oswego.edu/news/index.php/site/news\\_story/powerful\\_partnership](http://www.oswego.edu/news/index.php/site/news_story/powerful_partnership)
- SUNY Oswego – Energy Technology Course:  
<http://www.oswego.edu/nova/energycourseoutline.html>
- SUNY Oswego – Wind Power Research:  
[http://www.oswego.edu/news/index.php/site/news\\_story/collaborative\\_research](http://www.oswego.edu/news/index.php/site/news_story/collaborative_research)
- SUNY Oswego – Green Oswego:  
<http://natasha.oswego.edu/administration/ORSP/proceedings%2008%2010.pdf>

## SUNY Plattsburgh\*

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### **General**

- No major renewable energy initiatives or programs
- SCI188 Renewable Energy Fundamentals – An introduction to the use of renewable energy processes and devices for everyday living. Practical evaluations of passive and active solar thermal and electrical systems, biomass conversion, wind power, heat pumps, fuel cells and energy conservation for residential and transportation use.
  - SCI188L – Solar Home Design Lab

## SUNY Potsdam

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- No indication of any renewable energy related research or course work (<http://www.potsdam.edu/>).

## Syracuse University\*

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### **General**

## *NYS Colleges and Universities*

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- Syracuse University has released its Climate Action Plan (CAP), an institutional blueprint and timeline for becoming climate neutral.
  - As part of the CAP, SU has committed to becoming climate neutral by 2040. This commitment will be fulfilled through an action plan of five overlapping sustainable components focused on energy conservation through existing technologies; energy efficiency through emerging technologies; creation of energy from renewable sources; changes in the behavior of students, faculty, and staff; and limited use of energy offsets, as needed, that benefit local residents and businesses.
  - Each component will include one or more flagship projects, selected and designed for maximum public engagement and scholarly research potential while consistently demonstrating the University's commitment to fiscal responsibility.
  - <http://www.syr.edu/news/articles/climate-neutrality-09-09.html>
- The U.S. Environmental Protection Agency (EPA) has recognized Syracuse University as its fourth leading partner on the EPA list of Top 10 College and University Green Power Partners.
- A grant from NYSERDA enabled Syracuse University to become the first energy consumer in central New York to install technology that allows minute-to-minute monitoring of the university's power usage.
  - The technology parallels the energy monitoring capabilities of the Niagara Mohawk Power Corp. (Syracuse) and allows the university to manage energy consumption to save energy and reduce costs.
  - [http://tdworld.com/mag/power\\_syracuse\\_university\\_installs\\_2/](http://tdworld.com/mag/power_syracuse_university_installs_2/)
- Twenty percent of the university's energy is purchased from renewable sources, including wind and low-impact hydro.
- The university has a policy that all new buildings, additions, or renovations over \$10 million must pursue LEED certification. Four projects currently under construction are intended to achieve LEED Silver and Platinum ratings. The university is also working toward achieving LEED-EB certification on 16 buildings.
- Center of Excellence in Environmental and Energy Systems (CoE)
  - Members of CoE are pursuing multiple opportunities including new biofuels, improved technologies to produce power from the sun and wind, processes to reduce emissions from traditional fuels, and innovations to increase energy efficiency.
  - Designated by NYS to conduct research in clean and renewable energy
  - Development of low-defect, high quality silicon carbide epitaxial wafers to enhance power management in PV
  - Role of deposition parameters on PV quality of amorphous silicon germanium alloys
  - Thermal and air quality facility with chambers for testing composition and simulation of materials and systems
  - Projects being conducted by Syracuse CoE federation include:
    - Project to develop supercritical diesel fuel combustion systems

## *NYS Colleges and Universities*

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- Develop compact CHP unit using Biodiesel from soybean oil via supercritical oxidation
- Advisory project to NRC on re-use of spent fuel and waste minimization
- i-BES Control for the personal environment
- US DOE Industrial Assessment Center (IAC)
- Industrial and Residential Cogeneration
- Research on compact biodiesel CHP units
- <http://www.syracusecoe.org/main/energy.aspx>
- Courses Offered
  - ECS 300 – Green Technology and Sustainability
    - Current and alternative energy sources, Sustainable development
  - GEL 305 – Energy and Mineral Resources
    - Solar, geothermal, nuclear (fission and fusion)
  - PHY 300 – Solar Energy Science & Architectures
- College of Engineering and Computer Science
  - Environment and energy components such as energy systems, turbulence, composite materials and fracture mechanics
  - Development of low-cost thin-film building-integrated PV systems
- Center for Advanced Systems and Engineering
  - Predictable analysis of complex information intensive systems
  - Networked and Distributed Computing Laboratory

### **Contacts**

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- PHY 300 – Solar Energy Science & Architectures
- (315) 443-3901
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### **References**

- Syracuse University – Clean and Renewable Energy:  
<http://www.syracusecoe.org/main/energy.aspx>
- Syracuse University – Green Energy:  
<http://greenuniversecity.syr.edu/Energy.html>

## The College of New Rochelle

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- No indication of any renewable energy research or related course work  
(<http://www.cnr.edu/Home/Home>).

## *NYS Colleges and Universities*

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### The College of Saint Rose

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- No indication of any renewable energy research or related course work (<http://www.strose.edu/>).

### Union College

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#### General

- Energy Studies minor program offered for students in non-science, science and engineering fields (<http://www.union.edu/applications/catalog/deptView.php?code=ENS>). Some of the classes offered are:
  - Electrical Engineering program includes classes on Renewable Energy Systems (ENS 209) and Energy Conservation (ECE341)
  - Mechanical Engineering program has a class on Solar Energy Analysis and Design (MER471): Analysis and design techniques applicable to the use of solar energy for heating, cooling, and electric power generation ([http://www.union.edu/academic\\_depts/mechanical\\_eng/curriculum/ABET/MER471\\_ABET\\_F08.htm](http://www.union.edu/academic_depts/mechanical_eng/curriculum/ABET/MER471_ABET_F08.htm)).

### University at Albany, SUNY\*

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#### General

- Center for Sustainable Ecosystem Nanotechnologies – provides critical design and analysis and proof of concept to enable advanced systems and structures for integration within a host of renewable energy technologies.
- National Institute for Sustainable Energy – serves as both a catalyst for energy technology innovations and as a magnet for the attraction of clean energy business.
- Courses offered:
  - Atm 300Z Solar Energy Course – Discussion of solar energy technology including solar energy measurement and distribution, direct use of the sun’s energy, and solar architecture.
  - Geo 250 Energy and Resources – Examination of energy production using non-renewable versus renewable resources relative to present and future environmental and societal impacts.
- The Energy and Environmental Technology Applications Center (E2TAC) was created in 1998 to support energy and environmental technology deployment through accelerated commercialization by leveraging partnerships between industry, government and university. It serves as an active expansion of the University at Albany’s College of Nanoscale Science and Engineering (CNSE) to work with companies in the rapidly emerging energy and environmental industries. E2TAC provides a critical platform for CNSE to leverage its intellectual power base and state-of-the-art infrastructure to provide applications-

targeted, resource supported technology development leading to the integration of microelectronics and nanotechnology in advanced energy and environmental applications. E2TAC's plan is to focus on "Alternative Energy and Environmental Technologies" with the overarching goal of:

- technology development
- education & training
- accelerating commercialization

### **Energy Research**

- College of Nanoscale Science and Engineering
  - Developing better performing distribution, storage and safety systems to accelerate the use of renewable hydrogen.
  - Improving durability, cost effectiveness, performance and commercial viability of fuel cells.
  - Using thin film multilayer structures to fabricate quantum well materials to recover waste heat from automobiles, furnaces, etc.
  - Developing cryo-cooled power amplifiers that are more efficient than current technologies.
  - Developing high temperature superconductors that can save up to 20 percent of electrical output and has applications in motors, generators, transformers and fault current limiters.
  - Energy and Environmental Applications Technology Center
  - Integration of nanotechnology and microelectronics into new energy technology to increase efficiency and reduce cost of PV systems
  - Home of the National Institute of Sustainable Energy which oversees research and development, workforce training and commercialization programs in sustainability and zero net energy use technologies
    - On-site PV systems testing and prototype development
- Atmospheric Sciences Research Center (ASRC)
  - The field of research covers issues where a better knowledge and characterization of the solar resource may influence the performance of solar energy applications (i.e., technical feasibility, technological design, socio-economics). Currently, two parallel tracks are pursued:
    - [Solar resource characterization using remote sensing by satellites](#)
    - [Electrical peak demand mitigation using photovoltaics](#)
  - Solar energy can be converted into electricity using several technologies: the two leading technologies include photovoltaics and solar thermal. Because of its modularity the former is well suited for dispersed production (e.g., using available roofs), while the second is more appropriately suited for centralized production in sunny climates.
  - Solar radiation research at the ASRC is focused on the accurate measurement and interpretation of measurements of solar and infrared radiation. The data collected include broadband and

## *NYS Colleges and Universities*

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spectrally resolved ultraviolet, visible, and near-infrared radiation measurements and broadband terrestrial infrared radiation measurements. (<http://www.asrc.albany.edu/>).

### **Contacts**

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Richard R. Perez

- Senior Research Associate, Atmospheric Sciences Research Center
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- (518) 437-8751

## University at Buffalo, SUNY\*

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### **General**

- UB has a solar panel system on Norton Hall that produces about six percent of the building's electrical power consumption.
- UB chemists are developing novel self-assembly techniques for fabricating inorganic nonmaterial that may play a role in creating more efficient solar cells (Integrated Nanostructured Systems) – Funding opportunities, faculty research, summer internships.
- EE 455 Photonic Devices – Discusses solar cell fundamentals, semiconductor devices and design.
- NYSERDA Awards US \$1.5M to UB for Renewable Energy Incubator
  - In May 2009 at Solar 2009 in Buffalo, NYSERDA announced an award of US \$1.5 million to the University at Buffalo Office of Science, Technology Transfer and Economic Outreach to establish a renewable energy business incubator program that will provide business support to accelerate the successful development of early-stage, clean energy technology companies in Western New York. <http://www.renewableenergyworld.com/rea/news/article/2009/05/nyserda-awards-us-1-5m-to-ub-for-renewable-energy-incubator>
- New York Power Authority and UB to Partner in Major Solar Energy Project to Power Student Apartments (1.1 MW)

<http://www.nypa.gov/press/2009/090507a.htm>

- Energy Systems Institute
  - Funded by U.S. Army, Sandia National Labs and the Office of Naval Research and industry
  - Development of dielectric materials for higher energy, dense, pulse power capacitors
  - Development of thin film PV with high energy density
  - Evaluation of technology for high energy density capacitors, for commercial and military use
  - Development of semiconductor quantum dots for PV devices

## NYS Colleges and Universities

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- Electronic Packaging Lab
  - Microelectronics packaging and reliability testing of nanoscale electronics and operating power electronics in harsh environments
  - Developed method to safely deposit metal oxide thin films on substrates as well a method to grow chemically pure zinc oxide thin films
- Office of Science, Technology Transfer and Economic Outreach (STOR), Office of the Vice President for Research
  - Research on electrical energy generators with integrated thermoelectric, solar and battery capabilities as well as pentacene derivatives as organic semiconductors for replacement of silicon-based materials (<http://www.research.buffalo.edu/stor/>)
- Center for Undergraduate Research & Creative Activities (CURCA)
  - Engineering materials development and testing
- School of Engineering and Applied Sciences
  - Research on developing batteries for electric vehicles and energy storage devices which can be used for solar and wind (<http://www.buffalo.edu/news/10113>)
- Department of Electrical Engineering
  - Research on solar cells using nanowires and nanocrystal quantum dots
- Department of Mechanical and Aerospace Engineering
  - Research on energy conservation and systems including computational fluid dynamics (CFD), boundary layer separation, modeling of turbulent flows and direct numerical simulation (<http://www.mae.buffalo.edu/research/fluids.php>)
  - Research on electronic packaging and thermal management materials for electrical interconnection, heat transfer, etc. (<http://www.mae.buffalo.edu/research/materials.php>)
- Mechanical and Aerospace Engineering Research Grants (<http://www.mae.buffalo.edu/research/grants.php>)
- A Greener Shade of Blue – UB’s commitment to climate neutrality by taking various measures to offset greenhouse emissions

### Contacts

#### Need to find contacts

## University of Rochester

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### General

- Platinum Nanowires for Fuel Cells
  - The creation of long platinum nanowires at the University of Rochester in upstate New York could lead to the development of nanowire-enhanced fuel cells to power vehicles, for example.

## *NYS Colleges and Universities*

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The nanowires should provide significant increases in both longevity and efficiency of fuel cells.

<http://www.renewableenergyfocus.com/view/2957/university-of-rochester-engineers-develop-platinum-nanowires-for-fuel-cells/>

- The US Department of Energy (DOE) has awarded a \$1.75m grant to Professor David Wu of the University of Rochester, to investigate a way to turn waste biomass, such as grass clippings, cornstalks, and wood chips, into usable hydrogen or ethanol.  
<http://www.newenergyworldnetwork.com/renewable-energy-news/by-technology/biofuel-biomass/doe-awards-175m-grant-to-university-of-rochester-for-biomass-rd.html>
- Laboratory for Laser Energetics (LLE)
  - LLE is a unique setting where scientists study laser fusion, where atoms of hydrogen are heated so fast by a giant laser that they fuse, creating bursts of energy - the same process that powers the sun and other stars. LLE is the largest unclassified laboratory of its kind in the nation.
- [Fusion Science Center for Extreme States of Matter and Fast Ignition Physics](#)
- The Institute of Optics
  - The Robert E. Hopkins Center for Optical Design and Engineering exists to provide students at the Institute of Optics the finest opportunities to learn optical design, engineering, fabrication, and testing. (Could apply to concentrating solar)
  - Research on plasmonic materials for light localization and guiding
- Department of Electrical and Computer Engineering
  - Research on nanometer-size silicon objects that can be used for PV (crystallized Si-SiO<sub>2</sub> superlattices and porous silicon)
  - Research in organic light emitting diodes, which may lead to improvements in the ability of solar cells to capture energy
- Center for Advanced Technology in Imaging and Microelectronics Design Center
  - Development of concentrating solar cells using spectral splitting to make silicon more efficient at absorbing longer wavelengths
  - Research to make lower-grade silicon useful and in smaller quantities to save on cost

### **Contacts**

Robert L. Clark

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- Chair, Mechanical Engineering Director, Materials Science Program
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## *NYS Colleges and Universities*

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### Utica College

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#### General

- Utica College began using cleaner energy as the newly completed co-generation plant on the Faxton-St. Luke's campus went online and started delivering energy to the two campuses. The plant was a cooperative effort of UC, Faxton-St. Luke's and Burrstone Energy Center and was made possible by \$1 million co-funding contract with the New York State Energy Research and Development Authority (NYSERDA).

The new plant will produce enough electricity to meet 80 percent of UC's total energy needs with added benefit of reducing UC's energy costs by as much as \$300,000 per year. In addition, the plant, which uses cleaner burning technologies to produce its energy, will reduce the carbon footprint of both campuses.

<http://www.utica.edu/instadvance/marketingcomm/news/index.cfm?featureaction=detail&id=2916>

#### Contacts

Robert Cross

- Director of Environmental Health and Conservation
- (315) 792- 3743

### Vassar College

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#### General

- Vassar College's sustainability committee is comprised of faculty, staff, students, and administrators who work on several fronts to address campus sustainability issues. Vassar adopted an energy conservation policy in spring 2007. A comprehensive draft sustainability plan for the campus was presented to the president in May 2008.
- The sustainability committee employs six student interns who focus on sustainability issues, and the energy intern hosted the first dorm energy challenge in spring 2008. The committee has worked with the Vassar Greens on a number of issues, including encouraging energy conservation and waste reduction.
- The college has performed several energy audits to find ways to reduce energy use. In 2008, the buildings and grounds department began implementing measures to make the college's heating system more efficient, including improvements to steam traps, leak-monitoring systems, and installation of carbon filters. No formal commitments to carbon emissions reduction have been made.
- The college's Farm-to-Vassar program works to purchase food from approximately 20 local producers and supports three local dairies, allowing for 30 percent of food purchases to be sourced locally. Hormone-free milk, strictly cage-free eggs, and fair trade coffee are served. All food waste from the dining halls is composted at the Vassar Farm, and used fryer oil is donated to be made into biodiesel.

## *NYS Colleges and Universities*

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- New construction and renovation projects are subject to a review for green building standards, which are included in the campus master plan. Some construction and renovation projects guided by these standards are underway, including installation of geothermal heating, and energy-saving improvements on a water-chilling system.

### **Contacts**

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Jeff Kosmacher

- Director of Media Relations
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Susan DeKrey

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- 845-437-7404

### **References**

<http://www.greenreportcard.org/report-card-2009/schools/vassar-college>

<http://www.willamette.edu/~nboyce/assessment/Vassar.pdf>

## NYS Community Colleges

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### Bronx Community College

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#### General

- *The Center for Sustainable Energy*, established in 2003 at [Bronx Community College](#), City University of New York, is funded with a Congressional appropriation sponsored by [Representative José Serrano](#), and administered through the [U.S. Department of Energy](#).
- The mission of the Center for Sustainable Energy at Bronx Community College is to promote the use of renewable and efficient energy technologies in urban communities through education, training, workforce development, research, and project facilitation. The Center supports clean energy development and energy conservation as the means to protect the environment, enhance public health, and position New York City to capture emerging economic development opportunities in the energy sector. (<http://www.csebcc.org/>)

#### Contacts

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### Hudson Valley Community College

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#### General

- Training and Education Center for Semiconductor Manufacturing and Alternative and Renewable Technologies (TEC SMART) will be a state-of-the-art education facility in Malta that will allow Hudson Valley Community College to train the 500 to 600 technicians the Capital Region's growing Tech Valley is expected to need over the next five to 10 years. (<https://www.hvcc.edu/tecsmart/>)
- Hudson Valley Community College has received a \$1,979,590 federal grant to expand the college's green jobs and energy efficiency training program to meet the demands of the rapidly growing industry in New York State. The grant is managed by the Center for Energy Efficiency and Building Science (CEEBS), which

## *NYS Community Colleges*

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is part of the college's Workforce Development Institute (WDI).  
([https://www.hvcc.edu/news\\_events/newsstory.php?id=6092](https://www.hvcc.edu/news_events/newsstory.php?id=6092))

### **Contacts**

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- Director of Communications and Marketing
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## **Onondaga Community College**

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### **General**

- OCC has started researching biofuels and have launched a project to research algae to biofuels conversion. No other research was found besides the information outlined below.
- Other interesting information
  - A \$700,000 grant to the College, which will be administered by the New York State Foundation for Science, Technology and Innovation (NYSTAR), will be used to help fund the Sustainability Institute at Onondaga Community College. The College was one of only three community colleges in New York State to receive the grant, which was secured by State Senator John DeFrancisco.
  - "Central New York is on the cusp of becoming a leader in several cutting-edge industries, including renewable energy and environmental systems," said New York State Senator John A. DeFrancisco (R-I-C-WF, Syracuse). "This initiative will help to keep our talented young people in Central New York by preparing them for the rapidly growing opportunities in these high technology fields. It will also propel our economy forward and reinforce our efforts to develop a high-tech, cutting-edge cluster upstate."
  - Earlier this year, OCC President Debbie L. Sydow, Ph.D., joined with leaders from nearly 300 other public and private colleges and universities across the country in signing the American College and University Presidents' Climate Commitment. Through this commitment, Onondaga will work to reduce and eventually eliminate emissions, and to accelerate the educational efforts to equip society to re-stabilize the earth's climate. These goals will be accomplished through a comprehensive institutional action plan to begin to move the campus toward climate neutrality in part through the efforts of the Sustainability Institute. The Institute will be led by David Wall, director of Corporate and Public Partnerships at OCC.

## *NYS Community Colleges*

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- One key focus of the Institute involves designing an interdisciplinary curriculum that will include the following proposed programs: 1) Energy and Environmental Systems A.A.S. degree (with concentration options in Architectural/ Construction, Renewable Energy Technology, and Geoscience/Environmental Technology) and 2) Energy and Environmental Systems A.S. degree (designed for students planning to transfer to four-year institutions.) Plans also include a new Automotive Technology: Emissions Monitoring and Testing A.A.S degree. As the auto industry converts vehicles to alternative forms of fuel, there will be an increased demand for highly trained technicians skilled in the diagnostics and repair of those vehicles.
- A second focus is the review of campus operations in support of a sustainable environment. These efforts build on Onondaga's ongoing commitment to sustainability and renewable energy as outlined in the 2008-13 Facilities Master Plan.
- The third goal is to review such items as: physical plant operations, conservation of natural resources, energy usage, consumption of water resources, food service operations, recycling initiatives, and transportation systems. Recently, a Transportation Task Force, made up of faculty, staff and student representatives provided recommendations to improve public transportation services for students and to encourage the campus community to be more energy conscious in considering its commuting options.

### **Contacts**

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- Manages the Office of Public Affairs and serves as a direct report to the President and member of the President's Executive Council. Responsible for the development and implementation of comprehensive communications, marketing, public relations and government affairs programs.

### **References**

<http://www.sunyocc.edu/>

## **Other Private Renewable Energy Programs**

### Infotonics Technology Center

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- State-designated Center of Excellence with clean room facilities and MEMS-related services (microelectromechanical systems)
- Used to develop a microenergy harvester that works in a manner similar to PV cells

#### **Contacts**

Mary Winters

MEMS Fabrication Director

#### **References**

<http://www.itcmems.com/>

## *Appendix*

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### Acronyms

**ASRC**- Atmospheric Sciences Research Center

**BPI**- Building Performance Institute

**CAMM**- Center for Advanced Microelectronics Manufacturing

**CAP**- Climate Action Plan

**CaRDI**- Community and Rural Development Institute

**CASE**- Center for Advanced Sensor System

**CASP**- Center for Autonomous Solar Power

**CEER**- Center for Environmental and Energy Research

**CEEBS**- Center for Energy Efficiency and Building Science

**CFD**- Computational Fluid Dynamics

**CHP**- Combined Heat and Power

**CNSE**- College of Nanoscale Science and Engineering

**COBRA**- Cornell Beam Research Accelerator

**CoE**- Center of Excellence in Environmental and Energy Systems

**CPES**- Center for Power Electronic Systems

**CSE**- Center for Sustainable Energy

**CURCA**- Center for Undergraduate Research and Creative Activities

**DG**- Distributed Generation

**DME**- Dimethyl Ether

**DOD**- Department of Defense

**CFES**- Center for Future Energy Systems

**E2TAC**- Energy and Environmental Technology Applications Center

**EPA**- Environmental Protection Agency

## *Appendix*

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### Acronyms (continued)

**ESF-** Environmental Science and Forestry

**IAC-** Industrial Assessment Center

**IEEC-** The Integrated Electronics Engineering Center

**IMR-** Institute for Materials Research

**IRTT-** Institute for Research and Technology Transfer

**KAUST-** King Abdullah University of Science and Technology

**kW-** kilowatt

**LED-** Light Emitting Diode

**LEED-** Leadership in Energy and Environmental Design

**LIPA-** Long Island Power Authority

**LLE-** Laboratory for Laser Energetics

**MW-** Megawatt

**NCP-** New Construction Program

**NIMBY-** Not in My Back Yard

**NOAA-** National Oceanic and Atmospheric Administration

**NOCESC-** Northeastern Chemical Energy Storage Center

**NSF IGERT-** National Science Foundation Integrative Graduate Education and Research Traineeship

**NYBDC-** New York Business Development Corporation

**NYC ACRE-** New York City Accelerator for a Clean and Renewable Economy

**NYSERDA-** New York State Energy Research and Development Authority

**NYSTAR-** New York State Foundation for Science, Technology, and Innovation

**OPV-** Organic Photovoltaic

**PON-** Program Opportunity Notice

## *Appendix*

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### Acronyms (continued)

**PV-** Photovoltaic

**RETC-** Renewable Energy Training Center

**RIT-** Rochester Institute of Technology

**RPI-** Rensselaer Polytechnic Institute

**S3IP-** Small Scale Systems Integration and Packaging

**SBDC-** Small Business Development Center

**SEC-** Solar Energy Consortium

**SPARE-** Solar Power as Renewable Energy

**SURE-** Sustainable Use of Renewable Energy

**TEC-SMART-** Training and Education Center for Semiconductor Manufacturing and Alternative and Renewable Technologies

**TSEC-** The Solar Energy Consortium

**U.S. DOE-** United States Department of Energy

**WDI-** Workforce Development Institute

## *Appendix*

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### Further Reading

Some material in this report was obtained from these sources.

- Energy Research at the State University of New York available here:  
<http://www.suny.edu/communications/pdf/EnergyResearch.pdf>
- NYS Foundation for Science, Technology and Innovation (NYSTAR) Research Experience Inventories available at <http://www.nystar.state.ny.us/inventories.htm>

**TASK 3: NEW YORK STATE COLLEGES AND UNIVERSITIES-A SUMMARY OF  
PROGRAMS IN WIND AND SOLAR GENERATION AND RENEWABLE ENERGY  
TECHNOLOGY**

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**FINAL REPORT 10-13**

**STATE OF NEW YORK**

**DAVID A. PATERSON, GOVERNOR**

**NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY**

**VINCENT A. DEIORIO, ESQ., CHAIRMAN**

**FRANCIS J. MURRAY, JR., PRESIDENT AND CHIEF EXECUTIVE OFFICER**

