ADVANCED ENERGY RESEARCH AND TECHNOLOGY CENTER™

WELCOME GUIDE

ADVANCED ENERGY™
Research and Technology Center
AT STONY BROOK UNIVERSITY

www.aertc.org

U.S. GREEN BUILDING COUNCIL
LEED PLATINUM
USGBC

Stony Brook University

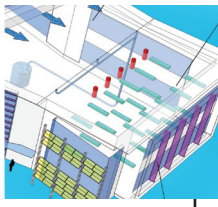
ADVANCED ENERGY™
Research and Technology Center
AT STONY BROOK UNIVERSITY

WELCOME

The Advanced Energy Research and Technology Center™ (www.aertc.org), a New York State Center of Excellence, located at Stony Brook University, is at the forefront of energy research and technology. The Center partners with other universities and research institutions, energy providers, private industry, and State and Federal energy institutions to develop advanced, cutting-edge technologies that explore ways of producing and promoting clean energy. Consistent with that mission, the focus and construction of the facility is to incorporate multiple energy-sustainable design principles.

This LEED® Platinum-designed building is organized around core and flexible laboratories which support the main energy research thrusts known today. Flexible labs allow a diversity of research and are easy to convert for the future. Specifically designed to meet ever-changing research needs and agendas, the Center will provide space for the university and its research partners far into the future.

The Center's traditional labs, the high-bay lab, and the outdoor spaces support research at different stages from nano-scale to pilot plant to real-life simulation; all in an energy-forward building. From site selection and stormwater runoff control, building construction management and the materials used, to water usage reduction and energy efficient lighting, the Center promotes energy efficiency at its maximum. This guide is developed to highlight those innovative energy-sustainable technologies incorporated in the building's design.



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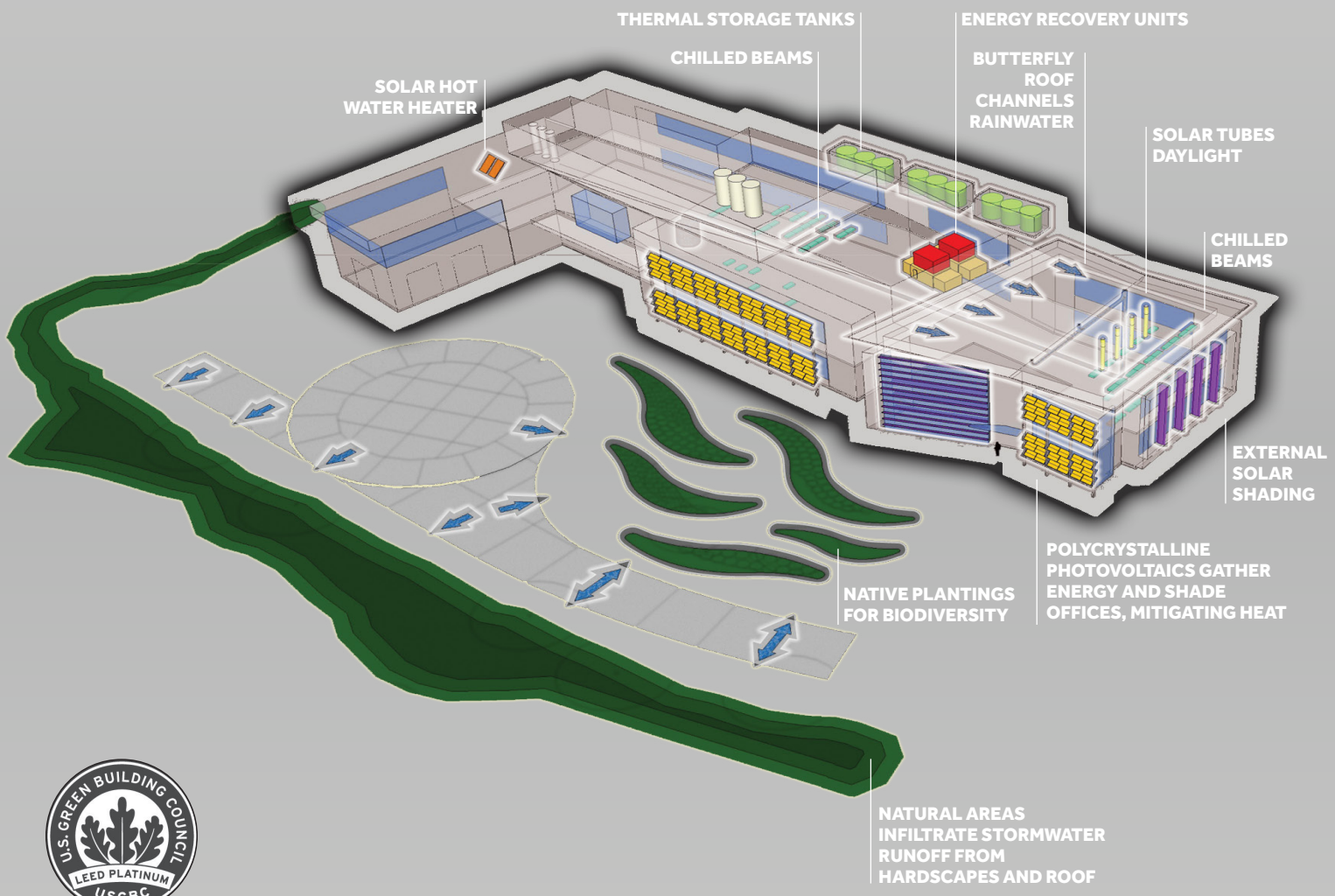
SUSTAINABILITY PLAN

GOALS

- Site planning to minimize heat gain and glare
- Cooling through hydronic distribution
- Recover energy from exhaust streams
- The use of thermal energy storage
- Roof design to collect rainwater
- Water efficient landscaping
- 'Cool' roof design

4552
GROSS SQUARE METERS IN THE CENTER (49,000 SQ. FT.)

650
SQUARE METERS ALLOCATED INCUBATOR / INDUSTRIAL PARTNER SPACE (7,000 SQ. FT.)



BUILDING GREEN AND WHAT LEED® MEANS

Leadership in Energy and Efficient Design (LEED) certification is the recognized standard for measuring building sustainability. Achieving LEED certification is the best way for you to demonstrate that your building project is truly "green." The LEED green building rating system program—developed and administered by the United States Green Building Council, a nonprofit coalition of building industry leaders—is designed to promote design and construction practices that increase profitability while reducing the negative environmental impacts of buildings and improving occupant health and well-being.

GREEN FEATURES

NATIVE AND ADAPTIVE PLANTINGS

The native and adaptive plantings used at the Advanced Energy Center™ not only enhance the site but also promote biodiversity and do not require irrigation. Much of the disturbed site is envisioned to return to its once native state through the application of seed mixes with native grasses and forbs. There are only small areas of manicured lawn on the entire project site.

91%
OF CONSTRUCTION WASTE WAS RECYCLED

541
TONS OF CONSTRUCTION WASTE WAS DIVERTED FROM LANDFILLS

0%
POTABLE WATER USED FOR LANDSCAPE IRRIGATION

RAIN GARDEN

Rain Garden areas were designed to accept stormwater run off from adjacent hardscape surfaces. Contaminants are picked up from these hard surfaces and are cleansed by hearty vegetation and soil allowing storm water run-off to percolate back to the ground water table.

COOL ROOF DESIGN

A cool roof is one that reflects the sun's heat and emits absorbed radiation back into the atmosphere. The roof's temperature may stay around 38°C (100°F) which reduces the amount of heat transferred to the building below, keeping the building at a cooler and more constant temperature.

GREEN FEATURES

POLYCRYSTALLINE PHOTOVOLTAICS

Supported by **PSEG-LI**, the 10kW array of polycrystalline photovoltaic panels gather energy while shading the south-facing windows. This mitigates heat gain while diffusing harsh southern daylight within the directly adjacent spaces.

EXTERNAL PASSIVE SOLAR SHADING

External passive solar shading was employed to block glare and heat gain while diffusing daylight. Vertical shading is effective for east-facing windows, and horizontal shading was utilized for southern exposures. The building's orientation uses daylighting to reduce artificial lighting loads and shading devices to minimize heat gain. Shading devices are composed of photovoltaic cells that capture the sun's energy to produce electritiy.

10kW
OUTPUT POWER FROM POLYCRYSTALLINE PHOTOVOLTAIC PANELS

>20%
OF CONSTRUCTION MATERIALS CONTAIN RECYCLED CONTENT

GREEN FEATURES

ELECTRIC VEHICLE CHARGING STATIONS

Four ChargePoint electric vehicle charging stations are located in the parking lot. ChargePoint also reports on electricity consumption for accounting purposes and green-house gas emission reductions for each user. Charging stations courtesy of the Department of Energy (DOE).

12
CURRENT NUMBER OF HYBRID VEHICLES ON CAMPUS

17
CURRENT NUMBER OF ELECTRIC VEHICLE CHARGING STATIONS ON CAMPUS

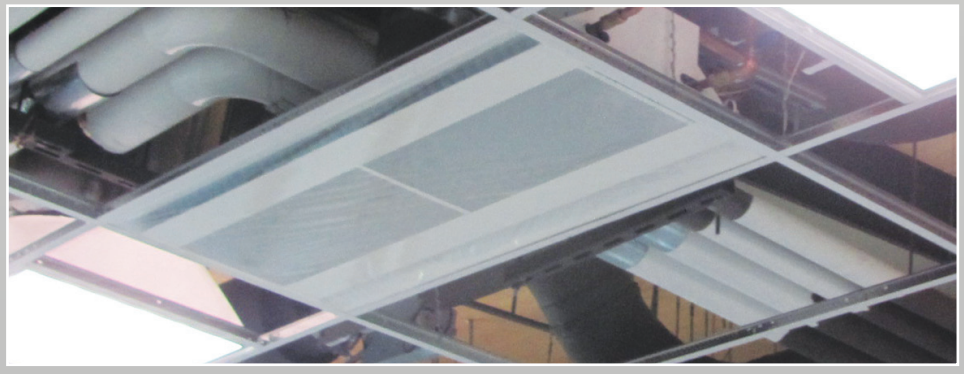
ALTERNATE-FUELED VEHICLES

Hybrid electric buses are used to connect both the main campus and the Advanced Energy Center (located at Stony Brook University Research and Development Park). The University operates 30 alternate fueled vehicles, and the entire bus fleet has been operating on a BioDiesel blend since April of 2005.

MINIMIZING LIGHT POLLUTION

With LED lighting in parking areas, walkways and common spaces, lighting at night is minimized outside the building. Light pollution into the night sky is prevented by full outdoor cutoff fixtures and by preventing light from exiting the building directly at night (light trespassing). By using light fixtures that are shielded to reflect light down, and that are of low wattage, lighting was designed within parameters outlined by the International Dark Sky Association's Dark Sky Initiative.

GREEN FEATURES



CHILLED BEAMS

Chilled beams are an efficient European technology that has caught on in recent years here in the U.S. Incorporating a water cooling coil with an air diffuser, chilled beams induce room air across the cooling coil thus reducing the amount of air from the central air system. This project has 74 linear meters (244 linear feet) of chilled beams in offices and labs reducing the primary air flow by 30%. This saves 48,000kWh per year or about $11,700.

THERMAL ENERGY STORAGE TANKS

Thermal Energy Storage tanks are used to store cooling energy in the form of ice. Ice is generated at night and weekends when electric rates are much lower. This cooling energy is then used during the weekdays when electrical rates are higher. Ice was selected as the energy storage medium because 0.45 kilograms (1 pound) of ice can store 14.4 times more than liquid H_2O. Thus the first cost and area required is greatly reduced compared to water storage tanks. The extra energy used to make ice is offset by cooler night-time temperatures. Estimated cooling dollars saved is $37,400 annually.

SOLAR TUBE DAYLIGHTING

Solar tube skylights pull a dramatic amount of "ducted daylight" into the second floor open office space producing up to 20,500 lumens each. In this regularly occupied space, the solar tubes minimize the need for artificial lighting during normal daytime occupancy.

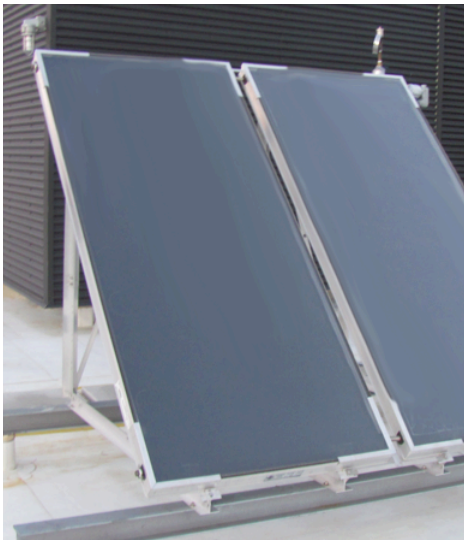
74
LINEAR METERS OF CHILLED BEAMS REDUCE AIR FLOW BY 30% (244 Linear Feet)

UP TO **80%**
REDUCTION IN ENERGY USAGE WITH SOLAR TUBE DAYLIGHTING

$11,700
ESTIMATED ANNUAL SAVINGS USING CHILLED BEAMS

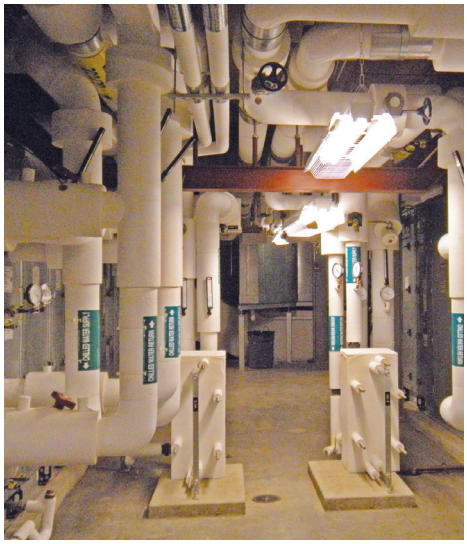
$37,400
ESTIMATED ANNUAL SAVINGS USING OFF-PEAK THERMAL ENERGY STORAGE

GREEN FEATURES



SOLAR HOT WATER HEATER

The solar hot water heater located above the High Bay Lab is used to offset natural gas use for heating and hot water. Although it might seem small, this is intended as a demonstration; the hot water that visitors come in direct contact with is primarily heated by the sun.



ENERGY RECOVERY UNITS (ERU)

The Energy Recovery Unit (ERU) is a wheel that passes between the exhaust air and outside airstreams to transfer heat and moisture without transferring harmful chemicals. Its molecular sieve technology selectively transfers only water vapor and heat. Heat is recovered from exhaust air and is used to precondition (heat, cool, humidify, dehumidify) outside air that is drawn in to replace the exhaust air.

KIOSK

On the right as you enter the lobby, the Kiosk is your link to live data that show in real-time how much water, electrical, natural gas and photovoltaic is currently being used throughout the building. The green conversion center and historical data charts can put energy usage and savings into perspective.

STORMWATER REUSE

All storm water that hits the roof is collected in large storage tanks in the basement. This non-potable 'grey' water is filtered and dyed blue, then used to flush plumbing fixtures. The "butterfly roof" aids in the collection of stormwater. The collection tanks hold an estimated 10 days worth of water usage which guarantees significant reserves.

10
DAYS WORTH OF GREY WATER IS HELD IN THE STORMWATER REUSE TANKS

870 MILLION
BTUs OF POWER ARE SAVED EACH YEAR BY THE ENERGY RECOVERY UNITS (ERU)

GREEN CONSTRUCTION

REDUCING EMBODIED AND OPERATIONAL CO_2

The embodied CO_2 of a building (the CO_2 released during the manufacture of the building materials, their transport to the site and the actual building process) can be equivalent to thirty years of operational CO_2! This means that even for most environmentally sound and sustainable buildings, it takes 30 years to offset the CO_2 released during their construction. The Advanced Energy Center used more than 1,300 pages of complex building design and construction specifications to reduce both embodied and operational carbon. CO_2 occupancy sensors in laboratories and offices control the use of lighting, ventilation and exhaust systems. When occupancy is low lighting, ventilation and exhaust levels are automatically reduced to the minimum allowed by environmental and health and safety standards.

RENEWABLE AND RECYCLED MATERIALS

Significant portions of the office spaces, hallways, gallery and lobby use rapidly renewable materials like bamboo and wood from certified and sustainable forests. More than 20% of the construction materials contain recycled content, and more than 20% originated locally (<500 miles), reducing embodied CO_2. Of the 2,642 tons (5,284,000 pounds) of concrete used in construction with 476 tons (952,000 pounds) of embodied CO_2, 53 tons (106,000 pounds) were abated using concrete with high-fly ash content. Center construction utilized 533 tons (1,066,000 pounds) of steel, which embodied 480 tons (960,000 pounds) of CO_2. Operational energy savings of the Center are estimated at 2,000 tons (4,000,000 pounds) of CO_2 per year.

4,000
METRIC TONS
(8,000,000 POUNDS)
TOTAL BUILDING MASS

2,000
METRIC TONS (4,000,000 POUNDS)
CO_2 EMISSIONS REDUCED
PER YEAR

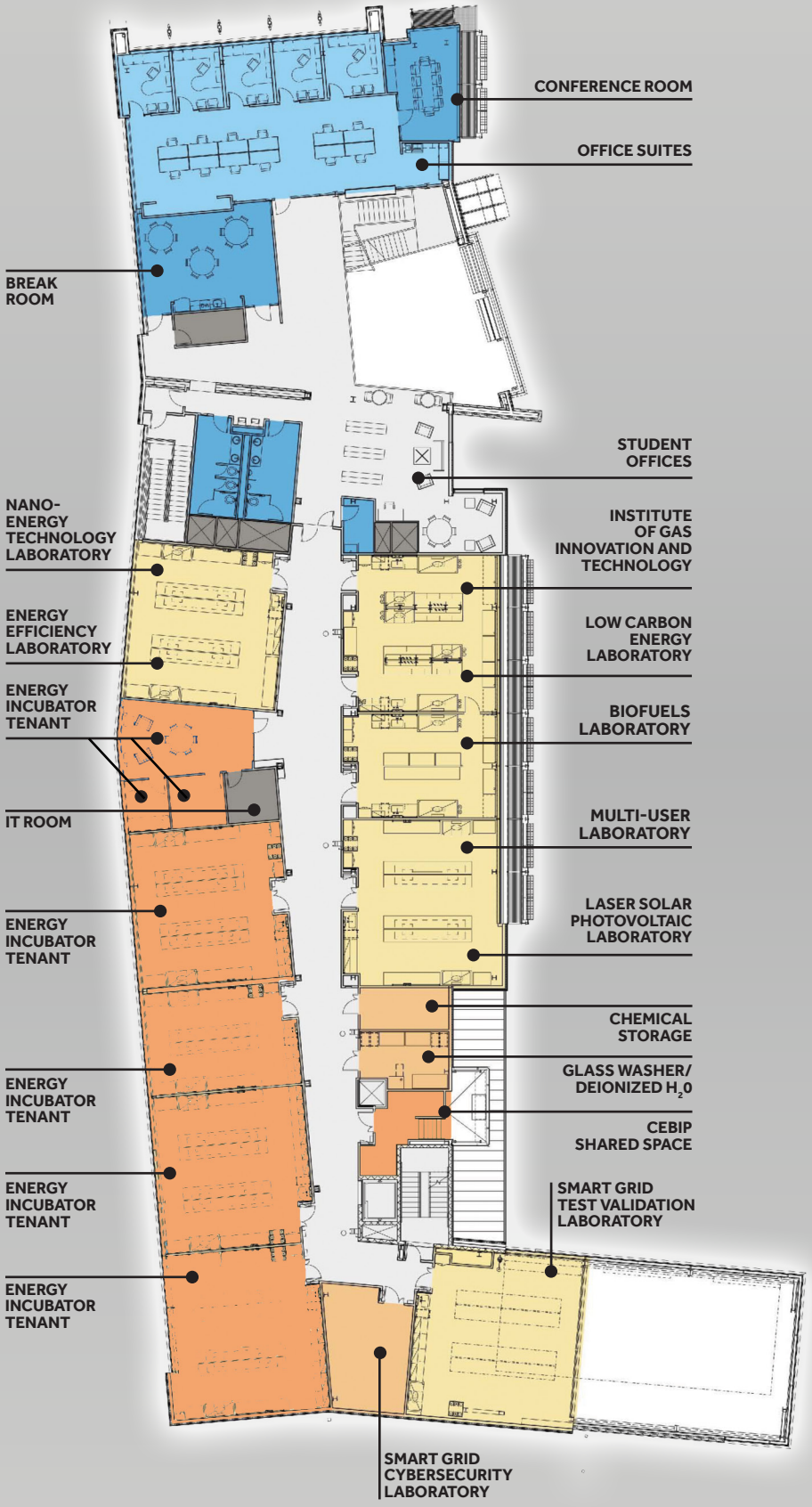
40%
REDUCED ENERGY CONSUMPTION
COMPARED TO CODE

FIRST FLOOR

RESEARCH AREAS

- Batteries
- Smart Grid
- Microgrid
- Biotechnology
- Conventional fuels
- Advanced combustion
- Energy conservation
- Energy policy
- Fuel cells
- Hydrogen energy
- Modeling & Simulation
- Photovoltaics
- Power management
- Renewable energy
- Thermal transfer optimization

SECOND FLOOR



CORE SPACES

Analytical chemistry

Biofuels

Chemical synthesis

Microscopy

Nanotechnology

CENTERS

Advanced Energy Training Institute (AETI)

Center for Integrated Electrical Energy Storage (CIEES)

Center for Mesoscale Transport Properties (m2m)

Institute for Gas Innovation and Technology

New York Energy Policy Institute (NYEPI)

New York State Center for Clean Water Technology (CCWT)

New York State Smart Grid Consortium (NYSSGC)

NYSERDA Clean Energy Business Incubation Program (CEBIP)

National Offshore Wind Research and Development Consortium

Thermomechanical & Imaging Nanoscale Characterization (ThINC)

SUPPORTERS

U.S. DEPARTMENT OF ENERGY

NEW YORK STATE OF OPPORTUNITY. Division of Science, Technology & Innovation

Stony Brook University

nationalgrid

NEW YORK STATE OF OPPORTUNITY. NYSERDA Supported

BROOKHAVEN NATIONAL LABORATORY

PSEG LONG ISLAND
We make things work for you.

NEW YORK STATE OF OPPORTUNITY. NY Power Authority

NYU·poly

LIPA Long Island Power Authority

NYIT

NYS SmartGrid Consortium

Farmingdale State College
State University of New York

CUNY THE CITY UNIVERSITY OF NEW YORK

The City College of New York

CACT
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Clean Energy Business Incubator Program
AT STONY BROOK UNIVERSITY

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ADVANCED ENERGY™
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