

case study

# New York City Solar Schools Education Program

## Clean energy investments as a catalyst to advance climate change education

**NYC DCAS**  
Citywide Administrative Services

OFFICE OF  
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Education



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## summary

# Clean tech investments present unique educational opportunities

Cities across the country are meeting the challenge of climate change with significant investments to improve resiliency, reduce emissions and improve health outcomes. Municipalities are retrofitting building HVAC systems, upgrading lighting, installing green infrastructure and transitioning to clean renewable energy sources like solar panels and wind turbines. In addition to the environmental benefits that these projects represent, there is an extraordinary opportunity to link these investments to the educational advancement of students, thereby deepening and extending their understanding of climate change and the central role it is likely to play in the coming decades. Solar installations and other environmentally-focused investments can provide a catalyst for this highly relevant expansion of student education. Projects can be leveraged as an opportunity to engage the educational community, as well as private and nonprofit partners, to drive innovation in learning, increase teacher professional development, and prepare students for careers in the new economy.

The City of New York is a national leader in climate change policy and action. One of the key actions that the City is taking is to install large scale solar panel systems on public school buildings. The agencies engaged in the rollout of these projects seized the opportunity to link these investments to student learning and improve climate education literacy in the largest school system in the country. To build a community of learning around clean energy investments and sustainability the City of New York created the **NYC Solar Schools** program, an integrated partnership of government agencies, environmental nonprofits, and educators. This initiative serves as a valuable case study in how to successfully connect real world energy investments to student curriculum and workforce development in high growth sectors.

This partnership identified the opportunity that solar installations represented, identified and secured funding, and developed a robust educational curriculum that includes teacher training and student vocational training programs. Through these efforts, over 700 teachers have received professional development training, 11 Career and Technical Education (CTE) schools are participating in hands-on solar installation training

and nearly 2,600 students have participated in the **NYC Solar Schools** program in the first few years alone. This case study highlights the components of these programs and distills the lessons learned into a set of best practices that other municipalities can adapt to build a culture of learning and climate literacy around investments in clean energy and climate change mitigation.

**“The (NYC Solar Schools) activities are a very effective way to help students understand the challenging concepts of energy and climate change; but also encourage higher order thinking, cause and effect, vocabulary skills, and cooperative group work.”**

**NYC Middle School Teacher, 2018**



# A collaborative partnership catalyzed the NYC Solar Schools movement

The working group created to develop the **NYC Solar Schools** effort was fundamental to the success of the program. Having identified the unique opportunity available to create an education program that revolved around the City's extensive solar power installation program, this partnership worked together to secure funding and develop the structure and format of the program. The members of this group were careful to work collaboratively while also recognizing and taking advantage of each other's strengths. They included the Division of Energy Management within the New York City Department of Citywide Administrative Services (DCAS), the Office of Sustainability (DOE Sustainability) within the New York City Department of Education (DOE), and Solar One, an environmental non-profit with extensive educational programming.

DCAS procures energy for all City agencies, manages and funds energy retrofits in City buildings, invests in clean energy resources, spearheads energy efficient operations and maintenance programs and tracks the performance of City buildings—all in efforts to advance the City's climate action goal of reducing total greenhouse gas (GHG) emissions 80% by 2050. Installing solar power is a critical initiative to help achieve this overall goal and the City has established solar installation targets for both public and private sector buildings. To advance the public sector goal, DCAS has partnered closely with the DOE on the development and implementation of an ambitious plan to install solar power systems on more than 100 school buildings in the next two years, concurrent with efforts to double the size of the program in the near term. Due to this alignment, DCAS was the primary funder of the **NYC Solar Schools** program.

The NYC Department of Education benefits from a highly active Office of Sustainability whose vision is to transform the NYC public school system by advancing sustainability leadership in each of the 1,859 schools—which account for roughly one-quarter of all City-owned buildings. DOE Sustainability leads the development of robust educational programs around core sustainability policies and goals, with the **NYC Solar Schools** program exemplifying these efforts. DOE Sustainability provides programs and support across the school system, from operations to teaching

and learning, and leverages the synergies across environmental, educational, and civic issues to effect change. To promote sustainability across all NYC schools, DOE Sustainability also partners with a diverse array of organizations, from nonprofits to other government agencies, to provide school resources, curriculum, and programming across diverse topics and units of study.

To take full advantage of the opportunity to link solar investments with educational programming, DCAS and DOE partnered with New York City-based environmental nonprofit Solar One to implement environmental education programming in schools. Solar One had an existing K-12 Education Program – Green Design Lab™ – to promote experiential learning opportunities through science, technology and design, developed with support from the National Science Foundation. DOE and Solar One used this robust program to educate teachers and students about climate and sustainability while exploring STEM disciplines. Additionally, a concept emerged to incorporate technical solar installation training into high school electrical programs at CTE schools. Leveraging the DCAS-driven solar installations tethered to the City's clean energy goals helped to underscore that the field of sustainability is burgeoning and encompasses a host of job opportunities. Many students are interested in technical and trades-related studies or experience. The **NYC Solar Schools** partnership created the solar CTE program to provide relevant context and application of technical skills to green careers. Together, the K-12 and the CTE programs provide unique mechanisms for the advancement of knowledge and skills that will become increasingly critical to stimulate action in response to climate change.

**100 solar PV installations  
planned at NYC schools**

**100 MW of solar PV installed  
across city buildings by 2025**

### A diverse curriculum, careful engagement, and a flexible attitude are key to success

Prior to the development of the **NYC Solar Schools** program DOE and Solar One had worked together on a variety of environmental programming. In addition to professional development and the delivery of K-12 educational curriculum, this collaboration included a variety of school-wide sustainability projects, energy challenges, trainings for a wide spectrum of staff, and other sustainability events. The core **NYC Solar Schools** content developed and delivered by Solar One educators includes individual lessons and activities that are tailored for each teacher's existing curriculum and are based on teachers' input and feedback. The program includes three components: training, curriculum, and toolkits.

**Training:** The **NYC Solar Schools** program follows a “train the trainer” model, with a series of professional development workshops organized to train teachers on the incorporation of new lessons into existing curriculum. Designed to prepare teachers to utilize the lessons on their own across the school year, workshops are an efficient means of knowledge sharing and teacher preparation that reaches hundreds of teachers per year, and, through those teachers, thousands of students. NYC DOE teachers are invited to participate in training workshops that are organized by age group (elementary, middle, high school). Furthermore, the high school series is offered in specific subjects (Chemistry, Biology, Earth Science, Living Environment, Physics and Environmental Science/Engineering) to directly align content with educational standards and test preparation. Participating teachers can also take advantage of co-teaching sessions which further support the integration of content and provides an extended platform for feedback.

**Curriculum:** The full **NYC Solar Schools** curriculum covers a broad range of subjects, including energy, electricity, climate, energy efficiency, and renewable energy—with a specific emphasis on solar photovoltaic (PV) systems. Lessons are predominately used in science classes but have been incorporated in humanities courses as well. All are drawn from Solar One's full Green Design Lab curriculum, which explores environmental sustainability through the lens of energy, air quality, water, food, and materials. The

lessons within the **NYC Solar Schools** program are designed to synchronize with age-appropriate state testing and standards.

**Toolkits:** Participating schools are provided with a toolkit of materials that teachers can use to assist in the delivery of lessons. Toolkits are mainly non-consumables that can be used repeatedly such as watt meters, mini solar panels, alligator clips, motors, and multimeters—providing an important hands-on facet to the educational program.

**Continuous Engagement:** To keep the community of teachers engaged, the program utilizes an online platform to support continued communication, build a broader network, and enable sharing of best practices. As the program continues to grow, DOE Sustainability and Solar One will continue to refine the curriculum and add new lessons, activities and resources informed by teacher feedback and the changing needs of the student body.

### **700+ teachers trained to date 2,500+ students reached directly to date**

**“This program definitely changed our thoughts on future careers in solar because we learned that opportunities in solar are going to continue to grow over the upcoming years and we really enjoyed working with solar and would love to continue to do so as a permanent career.”**

**NYC Solar Schools CTE Student, 2019**

**“Loved all of the activities. It can be difficult to determine where to start teaching students these subjects, so there was a nice flow between lessons. An energy audit is something that I'm excited to try with my students (and family and friends too!)”**

**NYC Elementary School Teacher, 2018**



### Hands-on training can prepare students for jobs in high growth sectors

In addition to the lessons and programming developed for introduction into the general educational curriculum, the **NYC Solar Schools** partnership recognized an opportunity to provide deeper technical expertise for high school students in Career and Technical Education (CTE) programs. The vocational focus of these programs provides a unique opportunity for incorporating solar PV systems in to hands-on, skills-building training. Solar CTE program students gain valuable experience in a growing economic sector and can connect educational goals with workforce development opportunities.

Leveraging funding from DCAS, Solar One piloted the NYC Solar CTE program in collaboration with DOE Sustainability and the DOE Office of Post-Secondary Readiness, which manages DOE's CTE programs. The goal of the NYC Solar CTE program is to implement solar installation knowledge and skills within existing electrical programs at CTE high schools across New York City. Although students enrolled in the NYC Solar CTE program often have a background in electrical installations, they do not always have a firm grasp of how conventional electricity is generated or the associated health and climate implications. This program helps to demystify these concepts and provide technical installation basics. Learning objectives of this program include:

- Increase participants' environmental and climate literacy
- Expose students to careers in the solar industry
- Increase participants' knowledge of solar PV systems and installations
- Train participants on content in preparation for solar industry certification
- Train teachers to implement the program with future cohorts

This hands-on curriculum is focused on i) introducing the benefits of solar energy, ii) the hard skills of solar PV installation, and iii) real world lessons to prepare the students for careers in the field. Electrical, construction, and engineering teachers are trained through a blend of traditional train-the-trainer professional development and on-site support through co-teaching. The co-teaching component is spread out over three years

and is designed so schools are equipped to run the program in future years with limited support. First implemented in 2017 at four high schools, the NYC Solar CTE program has now expanded to 11. A research and evaluation phase is planned to identify opportunities for growth and program improvement.

#### **The NYC Solar CTE Program has four primary components:**

**Professional Development Workshops:** Group workshops are held with all participating CTE electrical teachers to introduce content, curriculum, and materials developed for the solar unit.

**Lesson Planning:** In-depth professional learning sessions at each school, focused on lesson planning and tailoring the solar unit to meet the specific needs of each school.

**Co-teaching:** The program provides 10 days of co-teaching at each school. An experienced Solar One educator partners with the participating teacher to deliver the curriculum in the classroom.

**Career Exposure:** Career activities are planned for each school, including guest speakers from the solar industry and field trips. A targeted number of students at each school are selected for placement in summer internships with solar installation companies.

**Workforce Development Link:** A critical aspect of any training program is connecting trainees to job opportunities. A future goal for the NYC Solar CTE educational training is to link the CTE training programs to Requests for Proposals (RFP) for solar installation services being advanced by the municipality. This could include summarizing the existing training programs and requesting that proposers submit a plan on how they will provide workforce training, internships, job interviews and/or employment opportunities for graduates of City-sponsored training programs. The vendor's response can be included in the RFP scoring process. This type of systematic link between job training programs and career opportunities through City procurement may provide a more direct link to career opportunities.

## **best practices**

Providing communities across the country with a roadmap to achieve educational programs integrated with their clean tech investments

The **NYC Solar Schools** team has compiled this set of best practices to guide other communities in their development of similar programs.

### **Identify**

**Survey environmentally-driven policies and associated investments to identify educational opportunities**

Complete an assessment of city climate and environmental policy priorities and associated investments, such as solar power installations, energy retrofits, or resiliency-focused projects and determine if any initiatives are appropriately suited to catalyze new educational opportunities. Assess existing school programs for ability to incorporate new curriculum or other learning opportunities.

### **Partner**

**Develop a robust partnership including diverse stakeholders**

The development of a robust partnership with critical stakeholders, decision-makers and partners to align resources is critical for all aspects of a program's development and ongoing advancement. Identify environmental and sustainability education innovators, key school decision makers, STEM, career and tech education programs, sustainability champions, and relevant agency partners. Select local industry partners to provide career connections and to help source program materials such as solar panels or products that may be helpful for program development.

### **Align**

**Link programming with current educational standards**

School districts are typically guided by rigorous educational standards. As such, the most effective environmental education programs will be those that will deliver critical content within existing channels, rather than being purely additive. Ensure that new lessons can be easily integrated into existing frameworks, rather than developing a new

area of study. In NYC, for instance, the program was carefully integrated into existing state standards and new curriculum instruction was delivered within existing teacher training programs.

### **Build**

**Develop a community of practice**

The long-term success of a program can be encouraged through the creation of a plan for continuous adaptation and development of a community of practice. This can be further advanced through a knowledge-sharing platform to help connect teachers, allowing them to share lessons and tips to improve student outcomes. Teachers can benefit from a diversity of training models to ensure the program is effective and accessible to the widest range of classrooms. Follow-on training each year helps teachers absorb any curriculum changes and communicate lessons learned by other participants. These might include ongoing group workshops, in-class co-teaching, online modules, and one-to-one training sessions.

### **Link**

**Provide exposure to green careers**

Exposure to green careers is a major component of the **NYC Solar Schools** program. As renewable energy is a fast-growing jobs sector, building a pipeline to these well-paying jobs is helpful to advance student exposure to new career pathways. Best practices include asking students to complete independent research focused on different types of green careers, providing them with content training that will give them a jump-start on industry-recognized certifications and connecting them with mentorships, internships and other industry exposure.

## conclusion

Clean energy investments are both a critical tool in combating the climate crisis and a unique opportunity to deepen and expand educational opportunities for students.



Supporting climate literacy through education that meaningfully communicates the impacts and solutions about climate change is critical for our children and future generations. Advancing green careers through solar education programs leads to positive outcomes that are both specific and general. Students benefit from an increased understanding of immediate career steps they can

take that are aligned with a changing economy while also developing an increased understanding of their ability to make positive environmental change across all aspects of their lives. Introducing students to green jobs and career pathways will help enable the next generation of New Yorkers to contribute to a more just, resilient, and sustainable city in the face of climate change.

## resources

**Solar One website**  
<https://www.solar1.org/>

**DCAS DEM website**  
[nyc.gov/dem](https://nyc.gov/dem)

**NYC DOE website**  
[schools.nyc.gov/sustainability](https://schools.nyc.gov/sustainability)

**BEEEx case study link**  
[https://be-exchange.org/case\\_study/nyc-solar-education-program/](https://be-exchange.org/case_study/nyc-solar-education-program/)



The Department of Citywide Administrative Services' (DCAS) Division of Energy Management (DEM) serves as the hub for energy management for New York City government operations, serving 80 agencies and more than 4,000 buildings. DEM is tasked with leading the City's efforts to reduce greenhouse gas emissions 80% by 2050 from a 2005 baseline, with a near-term goal to reduce emissions from government buildings 35% by 2025.

The NYC DOE Office of Sustainability supports all schools in the largest public school system in the United States to be more sustainable by improving operational and facility efficiencies, implementing systems that support sustainable practices, and engaging students, teachers, and administration in environmental education and stewardship.

Solar One's mission is to provide education and resources that create more sustainable and resilient urban environments. We empower learning that changes the way people think about energy, sustainability, and resilience by engaging and educating a diverse set of stakeholders and beneficiaries. Our programs help individuals and communities explore new ways of living and working that are more adaptive to a changing world.

The mission of the Building Energy Exchange is to accelerate the transition to healthy, comfortable, and energy efficient buildings by serving as a resource and trusted expert to the building industry. This case study was developed by BEEx for NYC DCAS DEM in partnership with NYC DOE and Solar One.



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