

POWERING A BRIGHTER FUTURE IN PENNSYLVANIA

A Report on Solar at Pennsylvania K-12 Schools





About Generation180

Generation180 inspires and equips individuals to take action on clean energy.

We envision a 180-degree shift in our energy sources – from fossil fuels to clean energy – driven by a 180-degree shift in people’s perception of their role in making it happen – from apathy to agency, from despondency to determination, from hopeless to hopeful.



Generation180 is working toward a future in which all of our K-12 schools are completely powered by clean energy. We are leading a nationwide movement that will reduce energy costs, enhance student learning, and foster healthier communities for all. The campaign leverages the integral role that schools can play in encouraging clean energy action throughout their communities.

Our campaign works to advance the transition to clean energy in the following ways:

Mapping the Solar Schools Movement / Generation180 is tracking the fast-growing number of K-12 schools nationwide that tap into the power of the sun. Our national report, *Brighter Future: A Study on Solar in U.S. Schools*, analyzes trends and ranks states for solar adoption by schools. Our interactive online map helps you identify solar schools near you and learn more about their systems, including the installer, system size, and funding mechanism.

Building a Toolbox for Going Solar / Generation180 has developed a library of free resources to help schools flip the switch to solar energy. The *How-To Guide for Schools Going Solar* offers step-by-step advice for going solar and includes an introduction to solar finance. The *Solar Schools Campaign Toolkit* is an organizing guide for students, parents, teachers, and community members who want to catalyze change at their schools. The virtual *Help Desk* collects and organizes relevant resources, answers questions, and offers personalized support.

Empowering and Connecting Educational Leaders / To scale the clean energy movement nationwide, Generation180 is leveraging the knowledge and experience of schools that have led the way. Our *Clean Energy School Leaders Network* is a group of superintendents, school board members, operations and facilities directors, and others who want to advance clean energy adoption at schools and will share their knowledge and experience with peers.

Inspiring a Brighter Future / Generation180 shares success stories and best practices from school districts around the country that are using clean energy. Through reports, blogs, videos, presentations, and digital content, we help schools recognize the benefits of going solar, identify the opportunities, and share solutions and success stories.

Expanding Equitable Access to Solar / Generation180 focuses on identifying and expanding opportunities for all schools to benefit from clean energy, regardless of their size, geography, or resources. Through our state campaigns, we advocate for policies that remove financial barriers, and we target resources and assistance to the most disadvantaged, underserved, and diverse communities.

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COVER PHOTO: STEELTON-HIGHSPIRE ELEMENTARY SCHOOL IN STEELTON, PA. CREDIT: MCCLURE COMPANY

Collaboration with FedEx

Generation180 and FedEx have teamed up to launch a new collaboration that will enable more U.S. schools to obtain solar power and benefit from cost savings, educational opportunities, and climate protection. We share a vision for inspiring others to act more sustainably and for increasing momentum toward a renewable and regenerative future for schools across the country. Through this collaboration, Generation180 is expanding its Solar for All Schools program into Pennsylvania, where FedEx Ground is headquartered.



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Introduction

Pennsylvania has one of the largest public education systems in the United States,¹ serving more than 1.7 million students. Accelerating and normalizing clean energy production at Pennsylvania schools and teaching about it in classrooms would have a positive impact on a generation of young people and future leaders. However, **currently only 5% of Pennsylvania students attend a school with a solar energy system.**

Pennsylvania is also a nationwide leader in the energy sector and is surpassed only by Texas for total energy production and electricity generation,² but it has not been at the forefront of the clean energy movement at schools. In Generation180's 2020 report, *Brighter Future: A Study on Solar in U.S. Schools*, Pennsylvania was identified as lagging behind its neighbors, instead of leading. In 2020, Pennsylvania ranked 25th in the nation for the number of K-12 schools with solar and ranked 13th for installed solar capacity at schools. New York schools had more than double the solar capacity of Pennsylvania schools, and Maryland had more than triple the number of schools with solar.

Pennsylvania has tremendous untapped potential to power its K-12 schools with locally sourced clean energy, and momentum is building. **From 2020–2022, the amount of solar installed at Pennsylvania schools doubled.** Most of those solar projects were funded in a way that removes the barrier of upfront costs and makes solar accessible for school districts, regardless of the size of the budget. There is an opportunity to scale the adoption of solar at schools across the state, including in the western half of the state and counties along the northern border – where there is currently almost no solar on schools.

This report lays out the current state of solar adoption by Pennsylvania schools, identifies the benefits of solar adoption for schools, and lays out the opportunities for expanding solar across the Commonwealth. This research is part of Generation180's *Solar for All Schools* campaign to provide the resources and support needed for schools across Pennsylvania to access the numerous benefits of clean energy.

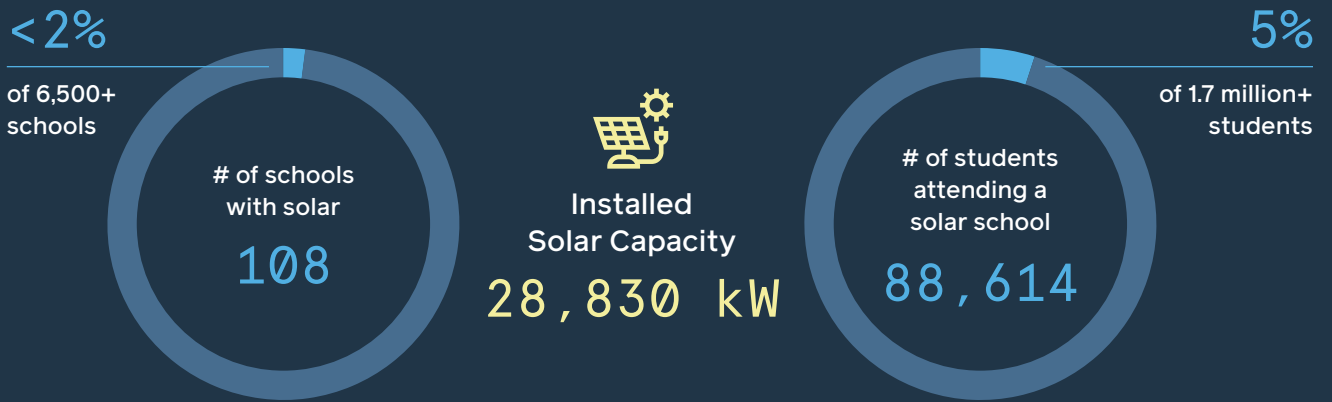
↓ ROLLING HILLS ELEMENTARY SCHOOL. CREDIT: CONSOLIDATED ENGINEERS



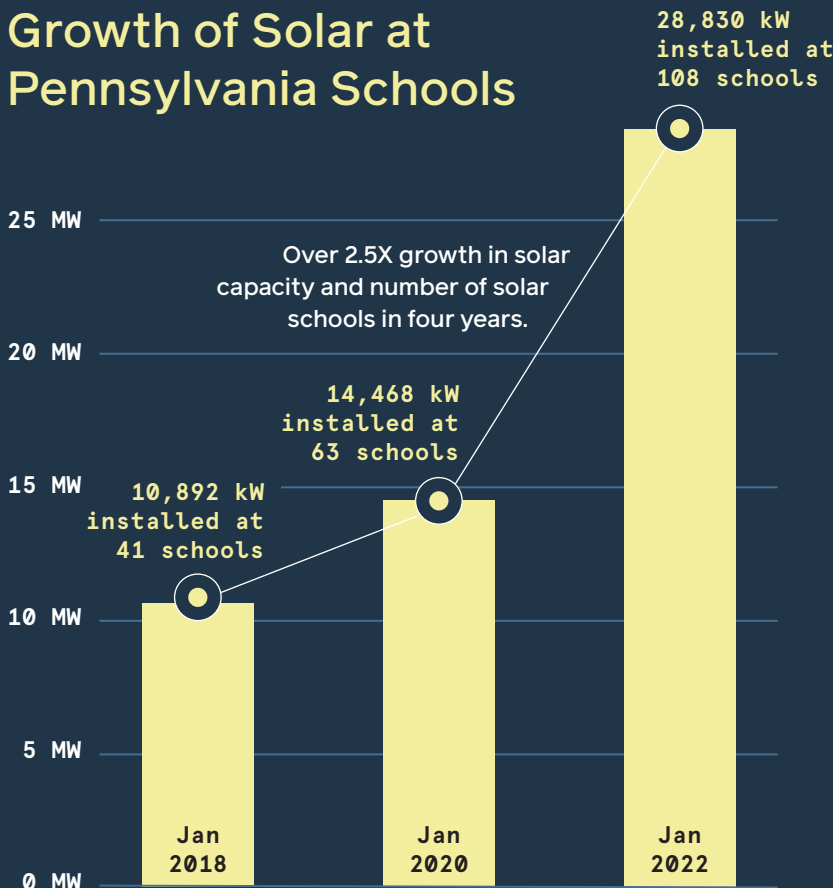
State of Solar at Pennsylvania Schools

Key Findings

Data are cumulative through 2021 and include Pennsylvania's K-12 public, charter, and private schools.



Growth of Solar at Pennsylvania Schools

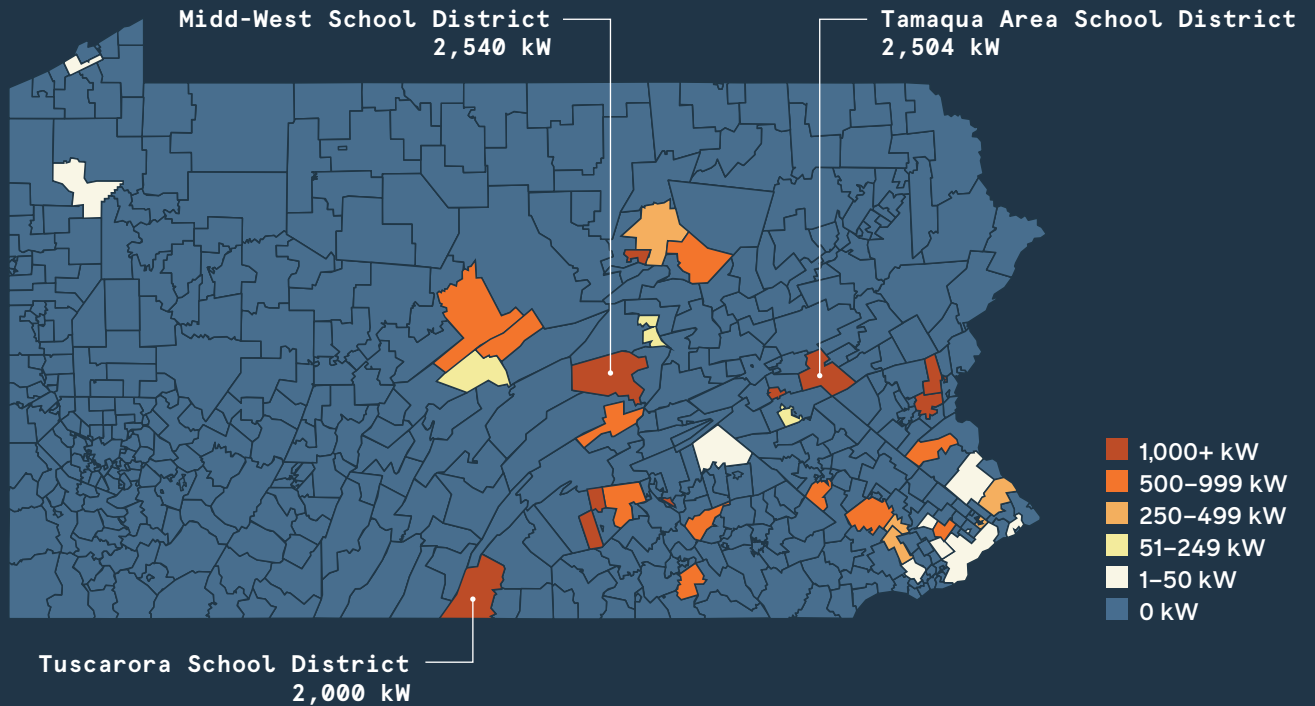


The 28.8 MW of installed solar capacity at Pennsylvania schools generates enough clean electricity each year to offset the greenhouse gas emissions equal to **taking 5,000 gas-powered vehicles off the road.**



The amount of solar installed at PA schools **doubled from 2020-2022** during the COVID-19 pandemic.

Solar Adoption by Public School Districts

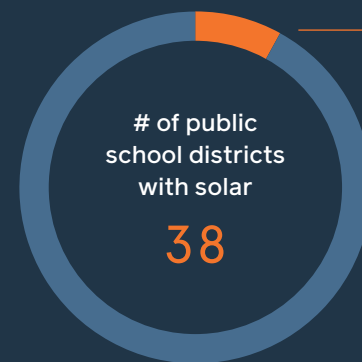


Top 10 Public School Districts in Pennsylvania Ranked by Installed Solar Capacity

- 01 / Midd-West School District – 2,540 kW
- 02 / Tamaqua Area School District – 2,504 kW
- 03 / Tuscarora School District – 2,000 kW
- 04 / Nazareth Area School District – 1,748 kW
- 05 / Bethlehem Area School District – 1,625 kW
- 06 / Steelton-Highspire School District – 1,600 kW
- 07 / Pottsville Area School District – 1,475 kW
- 08 / Loyalsock Township School District – 1,105 kW
- 09 / Carlisle Area School District – 1,000 kW
- 10 / Cumberland Valley School District – 1,000 kW

8%

of 500 public school districts



From 2020-2022, the average solar capacity per public school district doubled from 378 kW to 759 kW.

How Schools Are Funding the Switch to Solar

Trend toward third-party ownership

Access to funding is likely to be the biggest concern for school districts interested in making the switch to solar. However, schools do not necessarily need to find the funds for solar in their capital budgets. According to the available data on solar financing in Generation180’s 2020 national study on solar in U.S. schools,³ 79% of the cumulative solar capacity installed by U.S. schools was funded through third-party ownership.

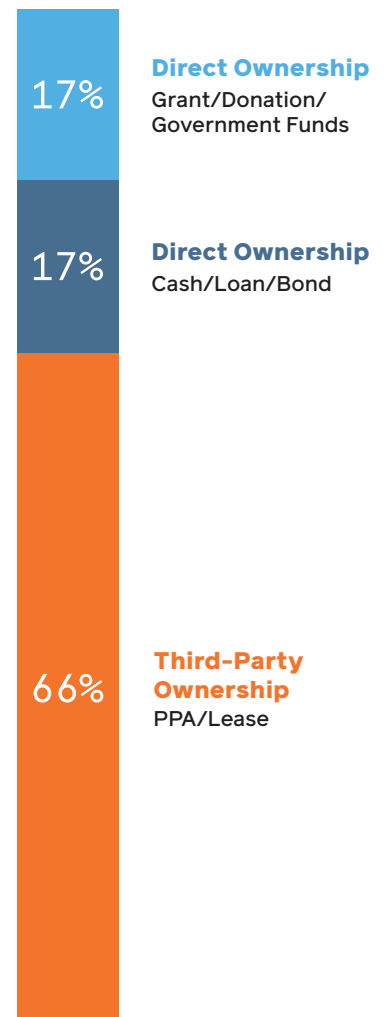
Pennsylvania schools are also relying on third-party ownership as a model to fund solar projects. This report found that for the projects with available funding data, **third-party ownership accounted for two-thirds (66%) of the cumulative solar capacity installed on Pennsylvania schools.** Only one-third (33%) of the cumulative solar capacity was directly owned by the school districts, with about half of the funding coming from grants and half from school district funding (such as cash, loans, or bonds).

A power purchase agreement (PPA) is the typical third-party ownership arrangement in which a solar developer funds, owns, and maintains the solar energy system for a set period, ranging from 5 to 25+ years. During the PPA term, the school pays the system owner for the solar energy produced, but usually at a lower rate than what it would have paid the utility. In this arrangement, schools would expect to receive immediate energy savings that typically increase over time as the utility’s electricity rates rise. The benefits of a PPA include receiving stable and low-cost solar-powered electricity with little-to-no upfront capital costs or ongoing maintenance costs.

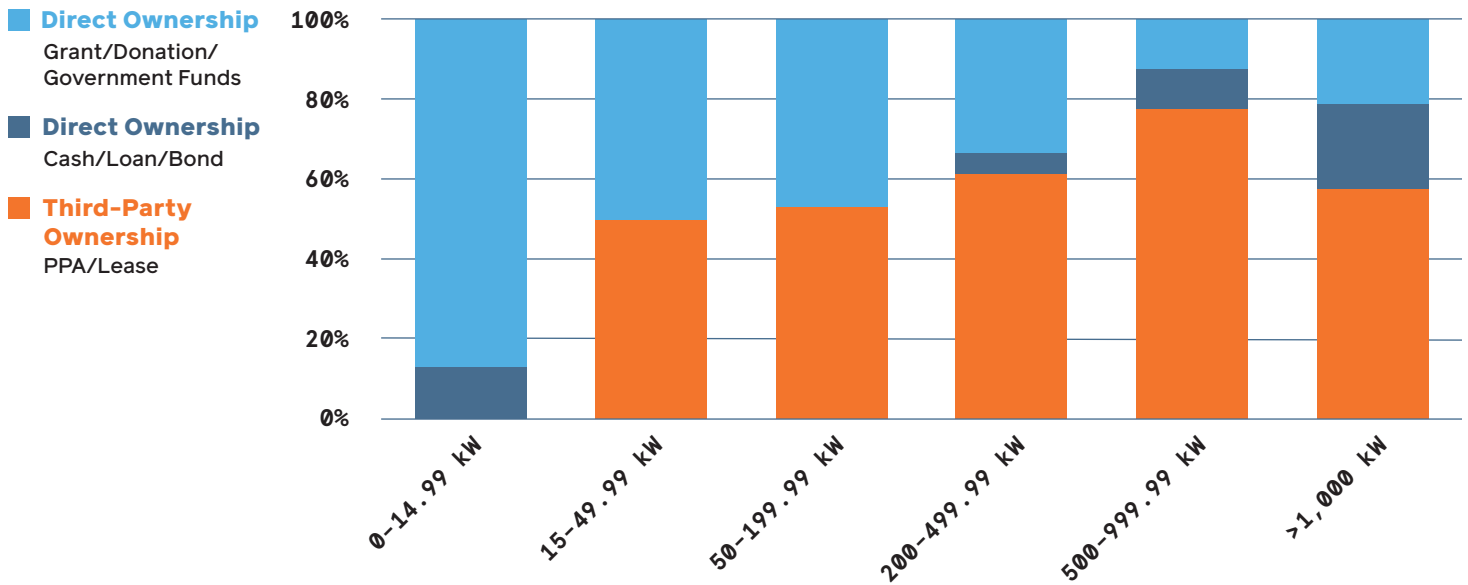
74% of the solar capacity installed between 2020–2022 was financed through third-party ownership

Between 2020–2022, not only did the amount of solar installed on schools double, but the prevalence of third-party ownership to finance solar projects grew as well. **Nearly three-fourths (74%) of the solar capacity growth during this period was financed through third-party ownership.** The increased use of third-party ownership to finance solar projects at schools has enabled schools and school districts to enlarge their solar projects and reap more cost savings without having to make an upfront capital investment. Almost all of the solar projects installed in 2020 and 2021 were over 1,000 kW (1 MW) in solar capacity, which placed those public school districts onto the ‘Top Ten List’ for solar capacity in Pennsylvania (see the full list on page 3).

Cumulative Solar Capacity Installed at Pennsylvania Schools, by Financing Type



School System Size Distribution by Financing Type



In Pennsylvania, scaling up the capacity of solar projects is critical for bringing down the solar electricity rate in the power purchase agreement to make it cost-competitive with the low electricity rates that school districts are already paying. That is why **third-party ownership is the primary financing mechanism used for at least half of the projects over 50 kW in solar capacity**. In contrast, direct ownership is the primary type of financing used for all of the projects under 15 kW and half of the projects up to 50 kW. For the solar installations that are directly owned by the school districts, grants have played an important part in funding these projects.

Read more below about the availability of state and federal grants for solar.

Government Grants for Solar at Schools

State Grants

Over the past decade, state grants have been available for developing solar projects at Pennsylvania schools through the state Department of Environmental Protection (DEP) Energy Harvest program, the Pennsylvania Energy Development Authority (PEDA), and the Department of Community and Economic Development (DCED). As of this writing, there are no state grants available to fund clean energy projects at schools, but schools should check these state agencies for future renewals of grant funds.

Federal Grants

The American Recovery and Reinvestment Act of 2009 provided funding opportunities to state and local governments for clean energy, and many schools nationwide were able to utilize these federal funds for solar installations. In April 2022, the Biden-Harris Action Plan for Building Better School Infrastructure was announced, and the administration launched the \$500 million grant program created by the Bipartisan Infrastructure Law. The funding will be distributed through competitive grants offered by the U.S. Department of Energy over a five-year period until funds are expended. Eligible projects include energy efficiency improvements, renewable energy improvements, and the installation of alternative-fueled vehicle infrastructure at public school facilities.⁴

Equitable access to solar

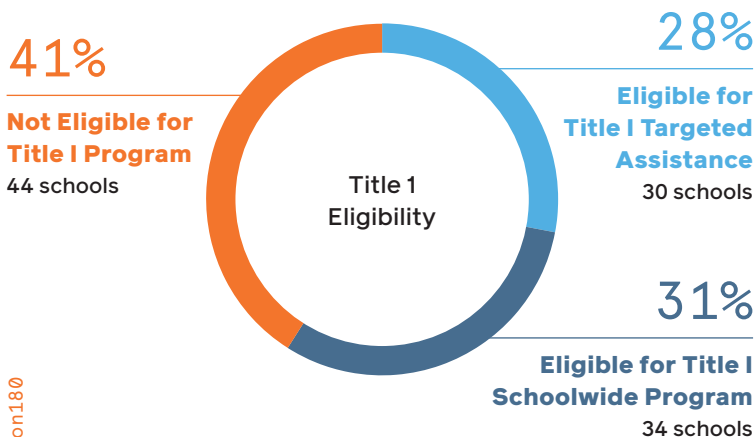
Pennsylvania is one of 29 states that allow third-party power purchase agreements to fund solar projects.⁵ This policy is critical for schools, particularly those in under-resourced communities, to have access to solar financing options that eliminate the barrier of upfront costs. Going solar can be an equitable solution for disadvantaged school districts to simultaneously address their financial, educational, and community health challenges.

This study found that under-resourced school districts in Pennsylvania have been able to overcome funding barriers and gain access to solar technology. **Schools that are eligible for the Title I program, which is primarily based on percentages of students from low-income families, make up 61% of all the solar schools in the state.**

Schools that are eligible for the Title I schoolwide program, with at least 40% of students from low-income families, comprise nearly one-third (31%) of Pennsylvania’s solar schools. Tamaqua School District, Steelton-Highspire School District, and Midd-West School District are meeting all (or nearly all) of their electricity needs with solar arrays installed at schools that meet the low-income threshold for the Title 1 Schoolwide Program. Pottsville Area School District is cutting its electricity consumption in half with solar arrays installed at schools that have a Title I schoolwide program. These districts serving low-income communities are benefiting from reduced operational costs that can be redirected into services for students in need.

In Pennsylvania, there are currently 1,240 schools that have at least a 40% poverty rate and have been approved by the state for a Title I schoolwide program.⁶ Only 64 (5%) of those schools have taken advantage of the opportunity to generate energy savings by going solar. With the option available to go solar without having to find the funds in the capital budget, there is untapped potential for these under-resourced school districts to reap all of the financial, educational, and community health benefits of going solar.

Distribution of Solar Schools by Title 1 Eligibility



What is a Title I School?

Title I, Part A of the Elementary and Secondary Education Act (ESEA) provides financial assistance to schools and local education agencies that serve a population with high percentages of students from low-income families. The National Council of Education Statistics categorize all public schools based on their eligibility for two types of Title I program:

- **Title I Targeted Assistance Program:** Eligible schools must have at least 5% of the school-age population come from low-income families. The financial assistance is used to directly support the lowest-achieving students.
- **Title I Schoolwide Program:** Eligible schools must have at least 40% of the school-age population come from low-income families. The financial assistance is used to help ensure that all children meet challenging state academic standards.⁷

Benefits of Solar for Pennsylvania Schools

Increasing numbers of schools across Pennsylvania are discovering the multitude of ways that solar energy can benefit school operations, student learning, and the surrounding communities.

Energy cost savings

Energy is typically the second largest expense for schools after staffing.⁸ By switching to solar, schools can reduce their burdensome operational expenses and stabilize long-term energy costs. Those savings can be reinvested back into student learning. Middle-West School District in Middleburg, Pennsylvania currently generates more solar power than any other school district in the state. Through a power service agreement, the district installed 2.56 MW of solar capacity at two school sites without paying any upfront capital costs. The solar system offsets 95% of the district's electricity consumption and is projected to save the district more than \$9 million over the 40-year life expectancy of the solar panels. Middle-West is planning to expand its solar array to produce more onsite clean energy than the district consumes and to generate additional revenue by selling the excess energy back to the grid. (See cost saving success story on page 11.)

Energy independence and resilience

Two Pennsylvania school districts are generating all the electricity their school buildings consume with large ground-mounted solar arrays. Steelton-Highspire School District redeveloped a closed landfill to generate enough onsite clean electricity to meet its needs. Tamaqua Area School District (TASD) reclaimed land once used for coal production by installing a 2.5 MW solar array that would provide all of its electricity needs for decades to come.



← TAMAQUA AREA SCHOOL DISTRICT. CREDIT: GREENWORKS DEVELOPMENT

These school districts are providing their own clean power onsite, reducing their dependence on utilities, and enjoying resilience to energy price fluctuations. When Tamaqua Area School District completed its solar installation in Fall 2020, the district had projected it would save \$8.5 million in avoided electricity costs over the 40-year life expectancy of the solar panels. The school district avoided the 70% increase in utility rates that occurred the subsequent year, and it now projects a 40-year savings of \$10 million.

Training for energy careers

Jobs in solar photovoltaic (PV) installation nationwide are projected to grow by more than 50% over the coming decade.⁹ In Pennsylvania, more than half of clean energy employers report not having enough trained applicants for open jobs.¹⁰ Schools can help prepare high school students to secure in-demand, living-wage jobs by expanding Career and Technical Education (CTE) courses to include energy training. Schools with onsite solar arrays can provide real-time data that can be used in both CTE and science classrooms. In Philadelphia, the Bright Solar Futures Academy provides a three-year solar energy training program during which students learn the entire process of going solar, from procurement and design to installation and maintenance. (See job training success story on page 13.)

Training for agriculture careers

In Pennsylvania, 1 in 15 jobs is related to the agriculture and food industry.¹¹ Students who attend a school with a ground-mounted solar array can cultivate new skills in the growing field of agrivoltaics, an agricultural practice that enables farmers to generate additional revenue from leasing land to solar developers while gaining additional benefits from the solar panels. The solar panels provide needed shade for livestock, while the animals provide lawn maintenance. Growing food around the solar panels increases crop yield by reducing soil temperatures and water loss.

Raising sheep and alpacas in a solar field provides an additional benefit for students who want to learn about agribusiness, veterinary science, or soil science. A solar array located on campus can provide the opportunity to gain new skills. In Cumberland Valley School District in central Pennsylvania, students in the local FFA club (formerly Future Farmers of America) were raising sheep and alpacas in their high school's solar field. With the increasing numbers of school districts installing large solar fields, there is a tremendous potential for more Pennsylvania students to benefit from agrivoltaics.



↑ CUMBERLAND VALLEY SCHOOL DISTRICT IN MECHANICSBURG, PA
CREDIT: CHRIS KNIGHT, PATRIOT NEWS

Student leadership and civic engagement

Students who are learning about climate change in science class are turning to civic engagement for climate solutions. Young people are organizing and urging their schools to make meaningful climate commitments and to transition to clean energy. Eighth grade students in the Woodland Hills School District near Pittsburgh led the charge to convince the school board to adopt a climate change resolution, the first of its kind in Pennsylvania. The students participate in the Climate Action Committee, which drafted the new Climate Action Plan with an ambitious target to achieve net zero carbon emissions by 2050. Students are involved in the process of assessing the buildings and evaluating options for solar. The district is also taking a holistic approach through its curriculum, aiming for 100% of educators to be teaching climate action units and 80% of students to be engaged in climate advocacy by 2050. (See student advocacy success story on page 15.)

Hands-on STEM learning

Solar provides a unique opportunity for schools to integrate clean energy into their curriculum and to enrich STEM (science, technology, engineering, and math) instruction with real-world data and onsite clean energy technology. Students can utilize the real-time monitoring dashboards to analyze the solar system's output and learn about the relationship between their energy consumption and energy generation.

Commonwealth Charter Academy (CCA), a public charter school in Harrisburg, makes solar energy an integral part of its hands-on learning experience. The 500 kW rooftop solar system supplies one-third of the building's total energy consumption and 100% of the energy needed for its state-of-the-art controlled environment agriculture center. AgWorks at CCA, the largest public educational aquaponics facility, contains a sustainable, zero-waste ecosystem with nearly 3,000 plants and approximately 400 fish and three labs to conduct scientific experiments and research.¹²

↓ COMMONWEALTH CHARTER ACADEMY IN HARRISBURG, PA. CREDIT: SOLAR RENEWABLE ENERGY, LLC





↑ PHILADELPHIA SOLAR SPRINT
CREDIT: PHILADELPHIA SOLAR ENERGY ASSOCIATION

The Philadelphia Solar Energy Association (PSEA) has been supporting STEM education in the Philadelphia region through the Solar Sprint program since the 1970s. Students design, build, and race solar cars, learning fundamental skills in solar technology. PSEA has also developed a 5th grade solar curriculum that teaches students how solar energy is related to climate change and recently began holding solar energy camps for high school students. PSEA and the School District of Philadelphia have plans to release new curricula for students in grades 6-9 that will lay a foundation for the 3-year Bright Solar Futures solar job training program for 10th-12th graders. (See job training success story on page 13.)

Healthier people and planet

One in eight children in Pennsylvania has had lifetime asthma, a condition that is exacerbated by air pollution and disproportionately affects people of color.¹³ In Philadelphia, more than one in five children have asthma, which is more than double the national rate.¹⁴ Switching to solar reduces the harmful air pollution emitted by the burning of fossil fuels and protects the health of people and the planet. If all K-12 schools in Pennsylvania installed an average-sized solar energy system of 267 kW, this would eliminate carbon dioxide emissions each year equivalent to closing 3.8 gas-fired power plants in one year.



While we are extremely proud to be reducing our carbon footprint through this comprehensive approach to energy, our investment is more than just harvesting the sun for solar power or switching out various mechanisms. Equally as important are the tens of thousands of dollars in energy cost savings a year that will allow us to continue preserving the programs and services that are most important to us.”

Dr. Michele Balliet, Superintendent, Elizabethtown Area School District

↓ ELIZABETHTOWN AREA SCHOOL DISTRICT
CREDIT: MCCLURE COMPANY



COST SAVINGS SUCCESS STORY: Mid-West School District

School district aims to produce more clean energy than it consumes

↓ MIDD-WEST SCHOOL DISTRICT IN MIDDLEBURG, PA. CREDIT: GREENWORKS DEVELOPMENT



Solar Project Highlights

LOCATION

Middleburg, PA

DISTRICT SIZE

2,100 students at 4 schools

INSTALLED CAPACITY

2.56 MW – currently the largest solar installation at a K-12 school in PA

STRUCTURE

6,268 bifacial solar panels across two ground-mounted arrays of 2.1 MW and 460 kW

ENERGY OFFSET

Currently 95% of the district's annual energy use and moving toward 110% energy offset

COST SAVINGS

\$9 million estimated over 40 years

FINANCING

28-year third-party power service agreement (PSA) with GreenWorks Development, with option for system buyout after 5 years



COST SAVINGS SUCCESS STORY: **Mid-West School District**

Midd-West School District, a small district serving 2,100 students at four schools in the Middleburg Borough in rural, central Pennsylvania, currently holds the title for the largest school district solar array in the state. But it's not stopping there. Solar installations offset 95% of the districtwide electricity costs. Midd-West is planning to add more solar panels to offset 110% of its electricity use with solar and to generate additional revenue by selling the excess energy back to the grid.

Midd-West saw the value of energy savings in 2013 when it implemented a comprehensive energy efficiency strategy at West Snyder Elementary School, such as swapping all the lighting to LEDs and switching from coal-powered heating to a geothermal energy system. The success of those cost-saving upgrades prompted the district to consider the potential opportunity to go solar and find more operational savings.

A school board member, who was pursuing a solar energy system at home, helped initiate the process of bringing a solar array to the district to save on operating expenses. Midd-West issued a bid for the district's solar project in 2019, and the two solar arrays (totaling 2.56 MW) were installed and operational by November 2020. The main array (2.1 MW) at Middleburg Elementary School covers 6 acres behind the main school complex and athletic fields. The 1.25 acre array (460 kW) installed at West Snyder Elementary brings the district closer to its goal of having a zero energy building. If the district expands its solar installation to offset 100% of its electricity consumption with onsite clean energy, then the elementary school's only remaining fossil fuel sources would be the propane it uses to fuel kitchen appliances and backup generators.

Midd-West was able to go solar with no upfront capital investment by utilizing a 28-year power service agreement (PSA) designed for the project by GreenWorks Development. In this third-party ownership arrangement, the customer makes monthly contract service payments for the use of the solar system. The district pays an average estimated solar-generated electricity cost of \$0.037 per kilowatt-hour over the project term, and it receives 100% of the electricity cost savings and the value of the Solar Renewable Energy Credits (SRECs) generated by the system.

The district's solar project provides predictable low-cost energy that reduces operational costs now and protects against rising electricity costs in the future. The energy savings enables the district to stretch its budget further and invest more into critical resources and services for students. To date, Midd-West has been saving \$145,000 on its annual electric bill, and the annual savings will increase as the utility rates rise. After the fifth year of operation, the district will have the option to purchase the system using 100% financing, which is expected to further increase the cash flow to the district.

The current 2.6 MW solar installation is estimated to save the district more than \$9 million over the 40-year life expectancy of the solar panels. Midd-West is planning to add 437 kW of solar, at no upfront cost to the district, in order to reach 110% electricity offset. That addition would increase the estimated 40-year project savings by another \$2.3 million.

↓ MIDD-WEST SCHOOL DISTRICT IN MIDDLEBURG, PA. CREDIT: THE DAILY ITEM



Going solar was a huge advantage for the district in that it made 95% of our energy costs a known fixed cost that won't fluctuate based upon the market. The savings, previously budgeted for energy expenses, can be diverted to things directly related to meeting student needs."

Joe Stroup, Midd-West School District, Superintendent

JOB TRAINING SUCCESS STORY: School District of Philadelphia

Philadelphia students prepare for their *Bright Solar Futures*

↓ RIBBON CUTTING AT FRANKFORD HIGH SCHOOL IN PHILADELPHIA, PA. CREDIT: JORDAN BAUMGARTEN



Through the Bright Solar Futures program, we are building a diversified clean energy workforce – one that provides an on-ramp to meaningful careers for populations that are traditionally excluded from the clean, green economy and yet most burdened by the high cost of energy inefficiencies. These...learning opportunities are about bringing new communities into the work of addressing climate change.”

**Shonique Banks, Pennsylvania Energy Authority,
Director of Development and Workforce Initiatives**



← SOLAR TRAINING LAB AT FRANKFORD HIGH SCHOOL. CREDIT: GENERATION180

JOB TRAINING SUCCESS STORY: School District of Philadelphia

Pennsylvania has been ranked as a top state for solar employment growth since 2015,¹⁵ and the state has a need to develop a stream of trained solar workers to fill these positions. Philadelphia Energy Authority (PEA), an independent body established in 2010 to leverage clean energy as a tool for economic development, stepped up to the challenge of developing a new generation of diverse solar workers in the area. In 2019, PEA provided introductory solar trainings to two cohorts of high school students to pilot elements of a new solar curriculum. This laid the groundwork to establish a first-of-its-kind Solar Career and Technical Education (CTE) program to help meet Philadelphia's demand for a trained solar workforce.

In Fall 2020, the Bright Solar Futures program was launched to provide young people in Philadelphia with the skills they need to fill solar jobs. The three-year CTE program, spanning 10th to 12th grade, engages students in 1,080 hours of class time to prepare them to earn the credentials required to become a solar installer, one of the fastest-growing jobs in the nation. The development of the Bright Solar Futures program was funded by a \$1.25 million grant from the U.S. Department of Energy and is implemented in collaboration with a network of partners, including Solar States and YouthBuild Philly.

The program introduces students to all aspects of work in the solar industry: sales, design, and the technical components of installation. Instruction takes place at Frankford High School, where the recent opening of a state-of-the-art solar training lab represents a milestone in Pennsylvania's equitable transition to clean energy. In addition to hands-on training in the lab, the students go on field trips to multiple solar sites and participate in paid summer internships.

The Bright Solar Futures program equips students with a marketable vocational skills, along with the confidence to pursue future clean energy careers. Upon graduation, students are prepared to earn three key industry credentials: OSHA10, which is required for any construction work; the North American Board of Certified Energy Practitioners (NABCEP®) Associate Credential, essential for applying to entry-level solar jobs; and the Construction and Skilled Trades Selection System (CAST) credential, required for some utility jobs.

Twenty students were actively enrolled in the program during the 2021-22 school year, and ten more 9th graders signed up for 2022-23, with the first graduating class expected in 2023. By connecting clean energy to the classroom, the Bright Solar Futures program jumpstarts careers for those who are positioned to benefit the most and grows the clean energy workforce of tomorrow. PEA has plans to scale the Bright Solar Futures program statewide and is packaging the curriculum so that it is easy for other school districts to replicate.

Pennsylvania Energy Authority has also worked with the School District of Philadelphia to bring solar energy systems to its campuses and reduce the hefty \$45 million electricity bill that it pays each year. In 2019, a PEA study analyzed the solar potential of four schools in the district and found that the district could install 1.1 MW of solar on four buildings that would offset around 45% of the total electricity consumption at those schools. This has the potential to save the district over \$1.8 million year-by-year for electricity.



↑ SOLAR TRAINING LAB AT FRANKFORD HIGH SCHOOL. CREDIT: GENERATION180



This program has enabled [students] to take control of their future in a way that will have a positive impact on their community and their environment... Having a meaningful career path to work toward that pays well has given many of the solar energy technology students a sense of direction and a reason to try in school."

Jordan Crolly, School District of Philadelphia, Solar Energy Technology Teacher

STUDENT ADVOCACY SUCCESS STORY: Woodland Hills School District

Youth activists in Pittsburgh call for groundbreaking climate action

Youth climate activists across Pittsburgh are speaking up and asking their school districts to take a stand in the fight against climate change. While this region has a long history of coal and natural gas production, these young people are making a new name for Pittsburgh as a hub for youth climate action. In 2019, Woodland Hills School District became the first in Pennsylvania to pass a school board resolution on climate change. In 2021, the district received a national award from the Green Schools National Network and the Center for Green Schools for its successful climate initiatives.

The growing student-led climate movement has been supported by the Pittsburgh-based nonprofit Communitopia, whose mission is to provide transformative climate change education that develops youth leaders and advances equitable solutions in environmental justice communities. Margeaux Everhart, an eighth-grade teacher at Woodland Hills Junior High School, was inspired to help start a youth climate action team during a workshop hosted by Communitopia. Her class organized a campaign calling on the Woodland Hills School Board to pass a climate change resolution. These eighth graders sent 27 personalized letters and spoke at school board meetings to encourage their leaders to take climate action.

The school board unanimously adopted a resolution that acknowledges climate change as a serious concern for this generation and commits to the formation of a new multistakeholder Climate Action Committee to guide the district in moving forward on climate protection efforts and engage every part of the school community. In September 2021, Woodland Hills School District released its action plan, which includes ambitious goals to have zero carbon emissions, to have all educators teaching a climate action unit, and to have 80% of the student population engaged in climate advocacy by the year 2050. The Climate Action Committee is working on its next steps to go solar on its school buildings and make progress in meeting its emission reduction goals.



We believe supporting the teaching of climate change in schools and facilitating youth activism are important ways to combat climate change on a community level, especially since policies put in place today will impact us the most in the future.”

Katie Green, Student at Woodland Hills Jr./Sr. High School and Member of Woodland Hills Climate Action Team

Opportunities for Pennsylvania Schools



↑ CARLISLE SCHOOL DISTRICT. CREDIT: CARLISLE SCHOOL DISTRICT

Solar has gained tremendous momentum across Pennsylvania schools in the last few years, as school districts are learning more about the benefits of switching to clean energy. As of the end of 2017, 41 schools in Pennsylvania had installed 11 MW of solar. **By 2021, in just four years, the number of solar schools in Pennsylvania and the amount of solar installed at those schools had grown by more than 2.5X to nearly 29 MW of solar on 108 schools statewide.**

This forward progress can continue as more students and school leaders speak up, more resources become available, and more districts understand how to access the benefits of clean energy. Listed below are some key opportunities that Pennsylvania schools can take advantage of in order to access these benefits.

Scaling up project size

In Pennsylvania, school districts can take advantage of a statewide virtual net metering law that allows buildings located within two miles of one another and that are owned by the same customer to share the energy generated by a solar array. This means that a school district can increase the size of the project at one school site with available roof space or land in order to offset the electricity at a nearby school site that is not solar-ready. These larger, district-wide projects can capitalize on economies of scale and make solar projects more cost effective than tackling one school facility at a time.

School districts can also take advantage of Pennsylvania's net metering policy that allows a customer to oversize a solar energy system to 110% of its previous annual electricity consumption. Mid-West School District is planning to expand its solar installation to reach that 110% threshold, so that it can earn revenue by selling the excess solar energy to the grid.

Avoiding rising utility rates

Electricity rates have held steady in Pennsylvania in recent years due to an abundance of natural gas, but this is beginning to change. At the end of 2021, utilities across the state increased electricity rates with price spikes of 26% for PPL customers and over 50% for Pike County Light & Power customers, and rates are expected to climb further.¹⁶ Switching to solar power decreases dependence on a volatile energy market and enables schools to stabilize long-term energy costs. Districts using third-party ownership to go solar can negotiate fixed low rates or rates with low and predictable increases over time. Tamaqua Area School District avoided an unexpected rise in its utility rates by going solar with a power service agreement. Its expected 40-year savings from solar went from \$8.5 million to \$10 million after the utility rate increased.



↑ ELIZABETHTOWN AREA SCHOOL DISTRICT, CREDIT: MCCLURE COMPANY

Utilizing school district land

The school districts in Pennsylvania with the largest solar installations have all utilized available land to install sizable ground solar arrays, instead of relying on rooftop space alone. Using land for solar makes more school sites immediately solar-ready and bypasses the challenge of replacing or repairing aging roofs. Rural school districts represent one-quarter of all districts in the state, and these districts have the ability to install ground-mounted solar arrays large enough to offset all of their electricity needs, as proven by Tamaqua Area School District and Steelton-Highspire School District.

Using a solar field for both energy production and agriculture, known as agrivoltaics, creates new opportunities for hands-on learning, agricultural education, and preparation for careers in both clean energy and agriculture. Cumberland Valley School District was the first public school district in the state to explore agrivoltaics with high school students. Other educational institutions in the state are modeling what is possible. Susquehanna University in Selinsgrove, PA has the largest university-sponsored solar array in the state, and it uses a flock of sheep from a nearby farm to sustainably maintain the land around its solar array.¹⁷ There is great potential for more schools state-wide to benefit by combining these complementary land uses.

Leveraging new buildings and new roofs

Fast-growing communities in metro Philadelphia are investing in new school buildings and major renovations to accommodate increasing school enrollment. As these projects are being planned, school districts should be specifying that the roofs be solar-ready and explore adding the cost of installing solar into the project budget. Adding a solar array to a new building will lower the operations cost for the new building for decades to come. Additionally, adding solar panels to the roof can extend the lifetime of the roof portion that it covers because solar panels are more durable than roofing materials and shield the roof surface from weather. Coupling the costs with a larger project, like a roof replacement or new building, allows a school district to float a low-interest bond that is already budgeted for capital expenses.

Conclusion

Pennsylvania is poised to leap forward in its transition to clean energy, and schools can be at the forefront of that movement. Schools across the Commonwealth are rapidly adopting solar as a budget solution that reduces burdensome energy costs, as a tool for enhancing STEM learning and vocational training, and as a climate solution that protects the health of its communities. The growth of solar on schools is helping to normalize clean energy in communities and educate the future leaders who will have to confront the climate crisis.

If schools across the state continue at the rate of solar adoption experienced over the last four years, Pennsylvania schools could reach a milestone of having 50 MW of cumulative installed solar capacity within the next five years. Once this benchmark is achieved, **Pennsylvania's schools would be sequestering carbon dioxide from the atmosphere at a rate equal to covering the cities of Pittsburgh and Scranton with forests.**¹⁸

We can envision a future in which Pennsylvania moves ahead as a leader in generating clean energy, starting with its schools. Schools powered by solar energy are minimizing taxpayer dollars spent on electric bills and increasing resiliency to fluctuations in funding and energy prices. Once a school goes solar, it has onsite technology and data that can be used for hands-on, real-world lessons and for career and technical education. Schools with clean energy technology become learning labs that model for students how to move toward a brighter future that does not rely on polluting fossil fuels. The benefits of solar at schools reach beyond the campus boundaries by showing the benefits of using locally sourced clean energy and inspiring community members to take advantage of those benefits in their homes and businesses.

Generation180 has a vision for all schools to have access to the benefits of solar and clean energy. We are providing additional resources, support, and technical assistance to help Pennsylvania's K-12 schools make the switch to clean energy. Learn more at SolarForAllSchools-PA.org.

↓ SHADY SIDE ACADEMY IN PITTSBURGH, PA. CREDIT: SCALO SOLAR SOLUTIONS

If all K-12 schools in Pennsylvania installed an average-size solar energy system of 267 kW, this would eliminate carbon dioxide emissions each year equivalent to closing 3.8 natural gas-fired power plants.



Methodology

The methodology for collecting and analyzing data for this report was developed by Generation180 for its national census and report *Brighter Future: A Study on Solar in U.S. Schools, Third Edition*. The process outlined below builds upon the methodology developed by Solar Energy Industries Association and The Solar Foundation for the first two editions of the *Brighter Future* report.

Schools Data Collection

The census includes all public, private, and independent K-12 schools in Pennsylvania. The National Center for Education Statistics (NCES), the primary federal entity for collecting and analyzing data related to education, was the primary source of information on schools used in the report. NCES databases provided comprehensive lists of all U.S. public and private K-12 schools, with corresponding geographic and demographic information. The NCES list of U.S. public schools with corresponding data was sourced from the Common Core of Data (CCD) from the 2020-2021 school year. The list of U.S. private schools was obtained through the Elementary/Secondary Information System (ELSi) and sourced from the Private School Survey (PSS) data, which was available through the 2019-2020 school year. Information, maps, and statistics on Pennsylvania's schools and school districts were also obtained from the Pennsylvania Department of Education website.

Solar Data Collection & Analysis

The census of Pennsylvania schools with solar includes data on operational solar energy systems that are above 1 kW in installed capacity and were installed prior to the year 2022. To be included, the solar installation must either be installed on the property of or be providing electricity to a public school, private school, or educational center that services students in grades pre-K through 12. In cases where a school district installs a solar array that is intended to power multiple buildings or the energy is used to offset the district's total electricity consumption, then all of the applicable schools in the district are included in the census data.

The data for this report were collected primarily between the fall 2021 and spring 2022 from a variety of online sources, including solar developer websites, press releases, school websites, and newspaper articles. Much of the data came from publicly available sources provided by state incentive and net metering programs, such as the Pennsylvania Alternative Energy Credit Program and PJM's Environmental Information Services. Schools and solar installers across Pennsylvania were contacted for data collection and verification.

All new data were integrated into Generation180's existing national database for solar schools. Data were cross-checked across sources and database editions to prevent double-counting and to verify new information. The statistics in the State of Solar section of the report utilize the published data about solar schools in Pennsylvania from the second edition published in 2017 (which includes projects installed through the Third Quarter of 2017) and from the third edition published in 2020 (which includes projects installed through the end of 2019). The growth statistics over time use these datapoints as benchmarks for comparison.

Generation180 accepts and verifies solar data that it receives from the public on an ongoing basis through its website. Readers are encouraged to submit any new information on solar installations by U.S. K-12 schools at SolarforAllSchools.org. Individuals and organizations that supported this data collection process are noted in the Acknowledgments.

Appendix: List of Pennsylvania Schools with Solar

Public School Districts

	Solar Capacity (kW)	Year Installed
Bald Eagle Area School District		
Bald Eagle High School	510	2011
Wingate Elementary School	257	2011
Bellefonte Area School District		
Bellefonte Area High School	541	2011
Marion-Walker Elementary School	122	2011
Pleasant Gap Elementary School	40	2011
Bethlehem Area School District		
East Hills Middle School	295	2011
Farmersville Elementary School	400	2011
Freedom High School	380	2011
James Buchanan Elementary School	280	2011
Spring Garden Elementary School	270	2011
Bristol Township School District		
Harry S. Truman High School	5	2019
Bucks County Technical High School^	8	2019
Carlisle Area School District*		
Bellaire Elementary School, Carlisle Area High School, Crestview Elementary School, Hamilton Elementary School, Lambertson Middle School, Letort Elementary School, Mooreland Elementary School, Mt. Holly Springs Elementary School, North Dickinson Elementary School, Wilson Middle School	1,000	2010
Central Bucks School District		
Central Bucks East High School	22	2012
Central Bucks South High School	5	2012
Central Bucks West High School	5	2009
Lenape Middle School	3	2011
Tamanend Middle School	3	2011
Colonial School District		
Colonial Elementary School, Plymouth Whitemarsh High School	352	2011
Colonial Middle School	352	2011
Council Rock School District		
Holland Middle School	112	2018
Newtown Middle School	40	2018
Rolling Hills Elementary School	128	2021
Crawford Central School District		
Meadville Area Senior High School	1	2008

Appendix: List of Pennsylvania Schools with Solar

	Solar Capacity (kW)	Year Installed
Cumberland Valley School District*		
Cumberland Valley High School, Eagle View Middle School, Silver Spring Elementary School	1,000	2012
Dallastown Area School District		
Dallastown Area High School	506	2011
East Lycoming School District		
Hughesville High School	600	2011
Elizabethtown Area School District*		
Bear Creek Elementary School, Bainbridge Elementary School, East High Street Elementary School, Elizabethtown Area Middle School, Elizabethtown Area High School, Mill Road Elementary School, Rheems Elementary School	500	2019
Governor Mifflin School District		
Governor Mifflin High School	195	2011
Governor Mifflin Intermediate School	195	2011
Governor Mifflin Middle School	195	2011
Great Valley School District		
Great Valley Middle School	131	2011
Greenwood School District		
Greenwood Elementary School	389	2021
Greenwood High School	564	2021
Jenkintown School District		
Jenkintown Elementary School	5	2009
Jenkintown Middle/High School	5	2009
Lewisburg Area School District		
Lewisburg High School	150	2016
Lower Merion School District		
Penn Valley School	6	2011
Lower Moreland Township School District		
Lower Moreland High School	81	2011
Murray Avenue School	175	2012
Pine Road Elementary School	328	2012
Loyalsock Township School District		
Loyalsock Township High School	1,101	2021
Midd-West School District*		
Middleburg Elementary School, Midd-West High School, Midd-West Middle School	2,100	2021
West Snyder Elementary School	461	2021
Millcreek Township School District		
James S. Wilson Middle School	24	2011
Montoursville Area School District		
Loyalsock Valley Elementary School	497	2021

Appendix: List of Pennsylvania Schools with Solar

	Solar Capacity (kW)	Year Installed
Nazareth Area School District		
Lower Nazareth Elementary School	574	2011
Nazareth Area Intermediate School	600	2013
Nazareth Area Middle School	574	2011
Norristown Area School District		
Norristown Area High School	5	2012
Northern Lebanon School District		
Northern Lebanon High School	5	2010
Owen J. Roberts School District		
Owen J. Roberts High School	214	2012
Owen J. Roberts Middle School	312	2012
Phoenixville Area School District		
Phoenixville Area High School	252	2012
Pottsville Area School District		
John S. Clarke Elementary School	1,011	2020
Lengel Middle School	464	2020
Quakertown Community School District		
Quakertown Community High School	500	2015
Rose Tree Media School District		
Media Elementary School	5	2005
School District of Philadelphia		
Greenfield Albert Middle School	5	2010
A. Philip Randolph Technical High School	3	1985
Green Woods Charter School	4	2014
Wissahickon Charter School	5	2009
Schuylkill Haven Area School District		
Schuylkill Haven Elementary	52	2011
State College Area School District		
Corl Street Elementary School	69	2019
Radio Park Elementary School	70	2019
Spring Creek Elementary School	64	2019
Steelton-Highspire School District		
Steelton-Highspire Elementary School, Steelton-Highspire Junior/ Senior High School	1,600	2021
Tamaqua Area School District*		
Tamaqua Elementary School, Tamaqua Area Middle School, Tamaqua Area High School	2,200	2020
West Penn Township Elementary School	304	2020
Tuscarora School District		
Mountain View Elementary School	2,000	2017

* These school districts installed an array that offsets electricity for the district or for multiple school sites. The first school listed is the one that has the array installed on its campus.

^ Bucks County Technical High School receives students from six school districts. Its solar array was added to the Bristol Township School District, where it is physically located.

Appendix: List of Pennsylvania Schools with Solar

Independent Schools

	Solar Capacity (kW)	Year Installed
Independent Private School in Wyncote		
Ancillae-Assumpta Academy	97	2012
Independent Private School in Exton		
Church Farm School	1,100	2013
Independent Public Charter School in Harrisburg		
Commonwealth Charter Academy	389	2019
Independent Private School in Paoli		
Delaware Valley Friends School	86	2012
Independent Private School in Newtown		
Episcopal Academy	5	2010
Independent Private School in Barett Township		
Evergreen Community Charter School	10	2019
Independent Private School in Mount Joy		
Lancaster Mennonite Kraybill Campus	106	2011
Independent Private School in WatsonTown		
Maranatha Mennonite Christian School	61	2017
Independent Private School in Hershey		
Milton Hershey School	10	2010
Independent Private School in Bethlehem		
Moravian Academy Middle School	1,290	2010
Independent Private School in Pittsburgh		
Shadyside Academy	35	2018
Independent Private School in Philadelphia		
Springside Chestnut Hill Academy	232	2009
Independent Private School in Philadelphia		
Springside School Cherokee Campus	144	2012
Independent Private School in State College		
State College Friends School	4	2007
Independent Private School in West Chester		
Westtown School	35	2008

Endnotes

- 1 U.S. Energy Information Administration. *State Profile and Energy Estimates: Pennsylvania*. Updated October 21, 2021. <https://www.eia.gov/state/?sid=PA>.
- 2 Greenhouse gas (GHG) and CO2 emission equivalencies were generated by converting kW to kWh using Pennsylvania's average of 1,214 kWh/kW/year for commercial systems, which is obtained from the U.S. Solar Market Insight (<https://www.woodmac.com/industry/power-and-renewables/us-solar-market-insight>). The resulting kWh value was then converted to metric tons of CO2 in order to find GHG and CO2 equivalencies using the EPA Greenhouse Gas equivalencies calculator at <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.
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