

Pennsylvania Climate Action Plan



Strategies for government, business, agriculture, and community leaders—and all Pennsylvanians



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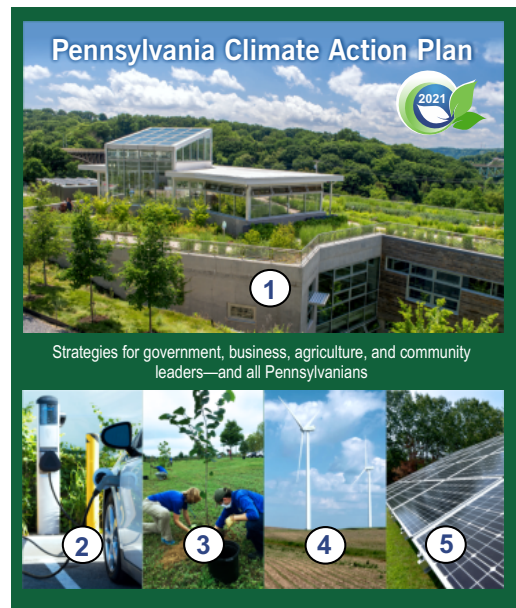
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Read the complete plan:

<https://www.dep.pa.gov/citizens/climate/Pages/PA-Climate-Action-Plan.aspx>

Cover photos:



1. Center for Sustainable Landscapes at Phipps Conservancy and Botanical Gardens, Pittsburgh (*photo: Denmarsh Photography, Inc.*)
2. Electric car charging
3. Benjamin Rush State Park tree planting, Philadelphia
4. Wind farm in central Pennsylvania (*photo: Andy Fogelsonger*)
5. Solar panels at Tom Ridge Environmental Center, Presque Isle, Erie

Message from Governor Wolf

The Climate Imperative

As I've seen firsthand in communities statewide, Pennsylvania is undergoing more extreme weather events, from flooding and tornadoes this month in Philadelphia and across southeast and southcentral counties, to record water levels in Lake Erie in 2019, to flooding that led to U.S. Department of Agriculture disaster declarations in 33 counties in 2018.

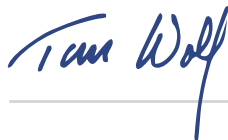
Increasingly frequent, these events are buffeting Pennsylvania with deep recurring socioeconomic costs: public health stresses; evacuations and closings; flooded, buckled, and washed-out roads and bridges; downed trees and power outages; large-scale cleanups; and destroyed homes, businesses, and harvests.

We must move *now* out of a reactive mode on climate change. Leadership across sectors requires knowledge, tools, and proactive approaches to climate change to protect Pennsylvanians' health and safety, economy, infrastructure, farms, businesses, recreation, and environmental resources. In addition to preparing for and adapting to the level of impacts we're already experiencing, we must significantly lower greenhouse gas emissions to prevent worsening impacts.

In 2019, I set the first ever statewide goals to reduce greenhouse gas emissions: 26 percent lower by 2025 and 80 percent lower by 2050, compared to 2005. I've charted a course for Pennsylvania to join 11 Northeast states in the Regional Greenhouse Gas Initiative, the cap-and-invest program that reduces carbon dioxide emissions from electric power plants. Revenue from carbon allowance auctions will be targeted to traditional energy-based communities and Environmental Justice areas across Pennsylvania and to further reduce carbon emissions statewide.

I also mandated that state agencies lead by example, increasing sustainability while saving taxpayers money and creating jobs in Pennsylvania's clean energy economy. In addition to aggressively stepping up energy efficiency measures, we launched an initiative in 2021 to get nearly 50 percent of state agencies' electricity from seven new solar energy arrays to be built around the state by January 2023.

I urge leaders across government, business, agriculture, academia, and community organizations—and all Pennsylvanians—to join in making climate change a top priority. It is only with your commitment, collaboration, and action, large scale or small, that Pennsylvania will meet the climate imperative. Throughout history, Pennsylvania has led the nation in every era of energy innovation. We can and must lead now. Pennsylvania Climate Action Plan 2021 tells us how.



September 22, 2021





Message from Secretary Patrick McDonnell

Tools to Lead on Climate Action

Slowing down future climate change and adapting to changes that are already happening present a challenge that can seem overwhelming. Where to start?

Pennsylvania Climate Action Plan 2021 is where to start. Here you'll find statewide data on and trends in greenhouse gas emissions from every sector: electricity generation, transportation, industry, agriculture, residential and commercial buildings, and more.

A suite of 18 strategies is recommended that—if started now—will meet our statewide greenhouse gas emissions goals for 2025 and 2050. For each strategy, the emission reductions, costs, and benefits in jobs and economic growth are quantified, and health and social benefits are analyzed. Supplemental strategies are also recommended to bolster efforts toward greenhouse gas reductions.

In addition, *Pennsylvania Climate Action Plan 2021* identifies priority areas to focus our preparation and adaptation: public health, overburdened and vulnerable populations, agriculture, recreation and tourism, infrastructure, and forests, ecosystems, and wildlife.

Pathways to adaptation are mapped out that will enable us to lessen negative impacts and capitalize on any potential opportunities created by climate change.

After getting an overview from this booklet, head to www.dep.pa.gov/climate. There you can review the complete *Pennsylvania Climate Action Plan 2021* in depth to inform your policy, planning, and program decision making. You'll also find helpful related resources, including *Pennsylvania Climate Impacts Assessment 2021*, the Local Climate Action Program, statewide data on greenhouse gas emissions, as well as on job growth and workforce development needs in clean energy industries, and many more tools to lead on climate action in Pennsylvania.

September 22, 2021



Pennsylvania Is Getting Hotter

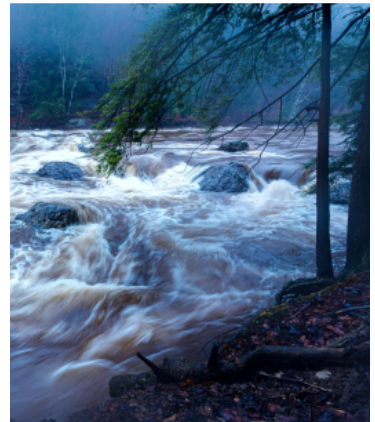
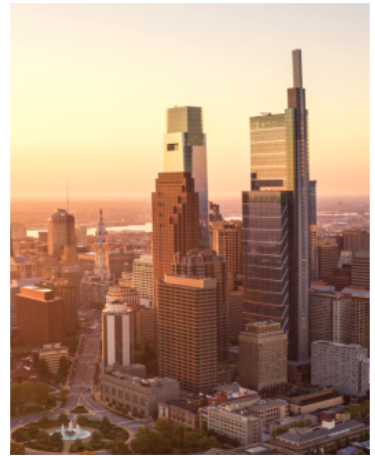
Since 2010, the world has been its hottest in 125,000 years.

As our fossil fuel-burning activities increase the concentration of greenhouse gases in our atmosphere, temperatures are rising, glaciers are retreating, sea level is rising, and extreme weather events are increasing around the world, including in the United States and Pennsylvania.

Pennsylvania's statewide average temperature has risen nearly 2 degrees Fahrenheit since 1900. Unless we lower greenhouse gas emissions, we're on course to get significantly hotter. It's projected that, by the middle decades of this century, Pennsylvania will:

- Be an average of 5.9 degrees Fahrenheit hotter.
- Have an average of five to eight weeks over 90 degrees every year (compared to 5 days per year in 1971–2000).
- Be 95 degrees or hotter 10 days every year (compared to less than one day in 1971-2000).
- Have warmer, wetter winters.
- Experience increasing intensity of extreme weather events.
- Have episodes of drought interspersed with extreme rainfall events, leading to an average 8 percent increase in rain and causing statewide inland flooding events.
- Undergo a 2.1 foot sea level rise and more tidal flooding in the Delaware Estuary coastal zone.
- Experience significant fluctuations in Lake Erie's water levels and temperatures, as well as coastal erosion.

Learn more: [Pennsylvania Climate Impacts Assessment 2021](#), by DEP, ICF Consulting, and Penn State University; [Climate Change 2021](#), by the United Nations; and [Climate Change Indicators](#), by the U.S. Environmental Protection Agency.





Pennsylvania's Greenhouse Gas Emissions Goals

[Governor Wolf set the first ever statewide goals](#) in 2019 to lower Pennsylvania's greenhouse gas emissions from their 2005 levels.*

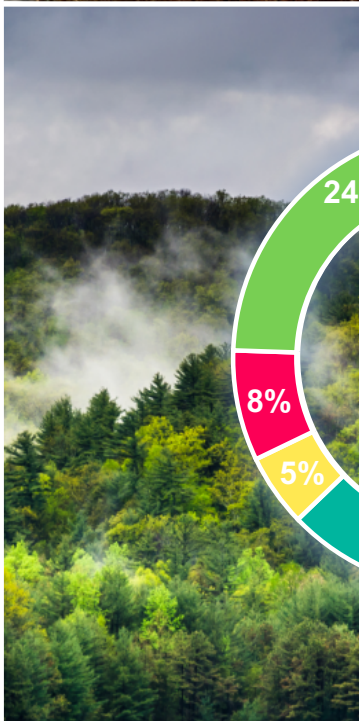
- By 2025: 26 percent lower, to 212.2 million metric tons of carbon dioxide equivalent (MMTCO₂e)
- By 2050: 80 percent lower, to 57.4 MMTCO₂e

Greenhouse gas emissions in 2017*

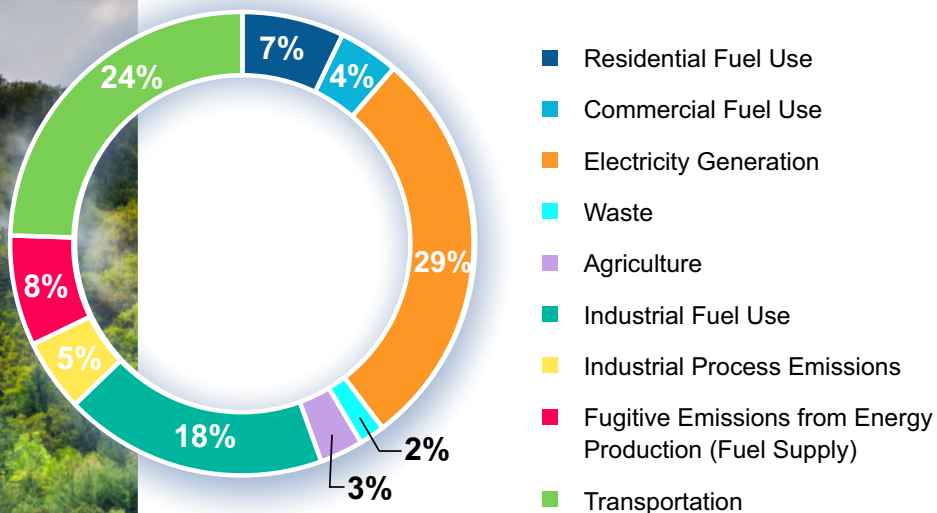
Gross emissions: 263.2 MMTCO₂e

Carbon sequestered by forests statewide: -29.5 MMTCO₂e

Net emissions: 233.7 MMTCO₂e



Pennsylvania 2017 greenhouse gas emissions by sector



Trends:

- Compared to 2005 levels, emissions decreased from electricity generation (38 percent), residential and commercial fuel use (20 percent), and transportation (11 percent).
- Compared to 2005 levels, emissions increased from mining, oil, and natural gas operations (13 percent) and industry (1 percent).
- Electricity supplied by coal-based power plants decreased from 56 percent in 2005 to 22 percent in 2017.
- Higher fuel efficiency standards are helping to lower emissions from gasoline-powered personal vehicles, which generate the majority of transportation emissions.

Takeaway: We've made a start. Pennsylvania's greenhouse gas emissions were nearly 19 percent lower in 2017 than in 2005. But we need to cut emissions significantly more if we're to protect Pennsylvanians' health and safety, jobs, farms, roads and bridges, and recreational opportunities, as well as the ecosystem we all depend on, from worsening impacts of climate change.

Myth: Emissions will continue coming down from market forces alone.

Fact: Quantitative modeling shows that if Pennsylvania doesn't act purposefully to reduce greenhouse gas emissions, net emissions won't continue to decrease from 2005 levels, but rather begin to increase in the future.

For more information, see Chapter 3 in *Pennsylvania Climate Action Plan 2021*. For comprehensive data on statewide greenhouse gas emissions levels, visit <https://www.dep.pa.gov/citizens/climate/Pages/GHG-Inventory.aspx>

*Standard baseline year for greenhouse gas emissions.

**Latest data available.



Especially key to success:

By 2025: Strategies in the fuel supply and industrial sectors.

By 2050: Strategies in electricity generation, transportation, industrial, and buildings sectors.

For the millions of Pennsylvanians who live in Environmental Justice areas: Providing clean-energy options feasible to a range of consumers, for example, not only tax credits for electric vehicles, but also point-of-sale vouchers, car-sharing options, and other programs to enable electric vehicle use by everyone, not just those who can afford high up-front costs and meet credit requirements.

Strategies to Meet Pennsylvania's Greenhouse Gas Emissions Goals

Starting implementation of all of these strategies now will enable Pennsylvania to meet its goals of reducing greenhouse gas emissions 26 percent by 2025 and 80 percent by 2050, compared to 2005 levels.

Start Now and Implement in 5 years:

- Institute the most up-to-date building codes for energy efficiency.
- Improve residential and commercial energy efficiency (electricity and gas).
- Increase distributed on-site solar energy.
- Increase industrial energy efficiency and fuel switching.
- Use programs and incentives to increase energy efficiency for agriculture.
- Incentivize use of distributed combined heat and power.
- Keep nuclear energy generation at current levels.

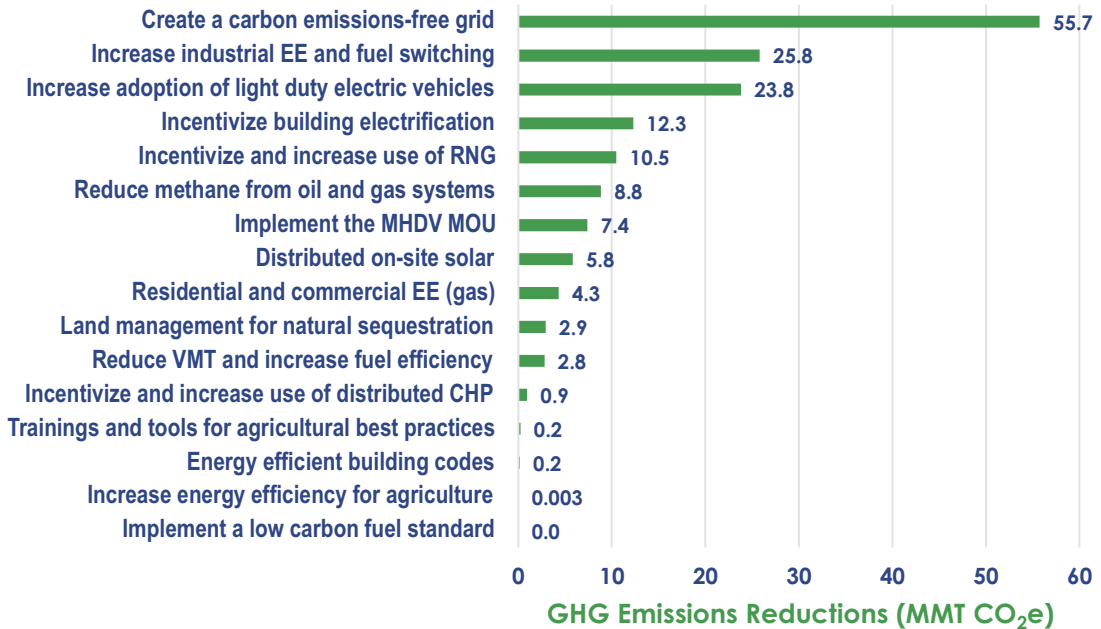
Start Now and Implement in 10 years:

- Incentivize building electrification.
- Increase fuel efficiency of light-duty vehicles and reduce vehicle miles traveled for single-occupied vehicles
- Increase use of light-duty electric vehicles.
- Institute a low-carbon fuel standard to reduce the carbon intensity of transportation fuels.
- Increase capture of biogenic methane from non-fossil sources, including animal manure, food waste, and landfill gas, for use in by commercial and industrial properties.
- Reduce fugitive methane emissions from fossil fuel extraction industries such as oil and natural gas operations.
- Provide training and tools for agricultural best practices.
- Increase land and forest management to increase carbon absorption.

Start Now and Implement in 10+ years:

- Implement a multi-state Memorandum of Understanding to make all medium- and heavy-duty vehicle sales zero emissions vehicles by 2050.
- Establish a carbon emissions-free grid.

Greenhouse gas reductions achieved by 2050 from recommended strategies



EE: energy efficiency; RNG: renewable natural gas; MHDV MOU: Medium and Heavy-Duty Vehicle Memorandum of Understanding; VMT: vehicle miles traveled; CHP: combined heat and power; C-PACE: Commercial Property Assessed Clean Energy.

More strategies that will reduce greenhouse gas emissions:

- Introduce state standards for appliance efficiency.
- Increase availability and use of C-PACE financing and other tools to support construction of net zero and high-performance buildings.
- Reduce and re-use waste, including food waste, generated by residences and businesses.



For more details on these strategies, see Chapter 3 in *Pennsylvania Climate Action Plan 2021*.



Climate Change Preparation and Adaptation Strategies

What can we do to prepare for climate change? *Pennsylvania Climate Action Plan 2021* provides a wealth of recommended actions in response to this common question. It charts adaptation pathways for numerous areas that *Pennsylvania Climate Impacts Assessment 2021* identifies as at greatest risk of negative impacts from climate change:

Increased average temperatures, heatwaves, and flooding will most impact:

- The health of Pennsylvanians statewide
- Overburdened and vulnerable Pennsylvanians, such those living in Environmental Justice areas or locations geographically susceptible to climate change

Rising average temperature will most impact:

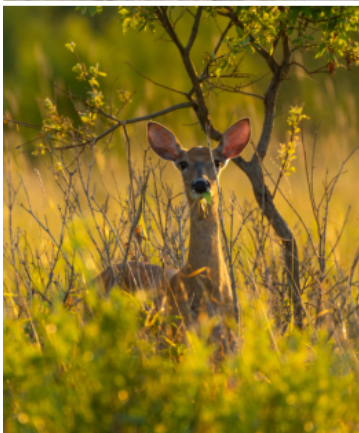
- Forests, ecosystems, and wildlife
- Recreation and tourism

A warmer, wetter climate will most impact:

- Agriculture

Flooding events and landslides will most impact:

- Built infrastructure



Adaptation Pathways

The adaptation pathway for each area begins with recommended foundational actions for leaders to understand vulnerabilities and prepare for impacts. It goes on to identify 5–10 specific strategies to reduce those vulnerabilities and manage impacts.

Finally, each adaptation pathway outlines ongoing work that can be done to ensure adaptive management, key partners for collaboration, costs and benefits, and case examples from Pennsylvania and other states.



Sample adaptation pathway to reduce stormwater infrastructure vulnerabilities to flooding



In Focus: Environmental Justice Areas

The nearly 30 percent of Pennsylvanians who live in Environmental Justice communities statewide will experience the greatest risks from increased heatwaves and flooding events.

Environmental Justice areas are communities where at least 20 percent of residents live at or below the poverty line and/or at least 30 percent identifies as nonwhite minority, based on census data and federal poverty guidelines. Having already experienced decades of disinvestment, Pennsylvanians in Environmental Justice areas contend with ongoing challenges increasingly exacerbated by climate change impacts.

These challenges include living near industrial sites; living in older housing stock, often without air conditioning; facing limited transportation options; and experiencing health conditions stemming from poor air quality and heat exposure.

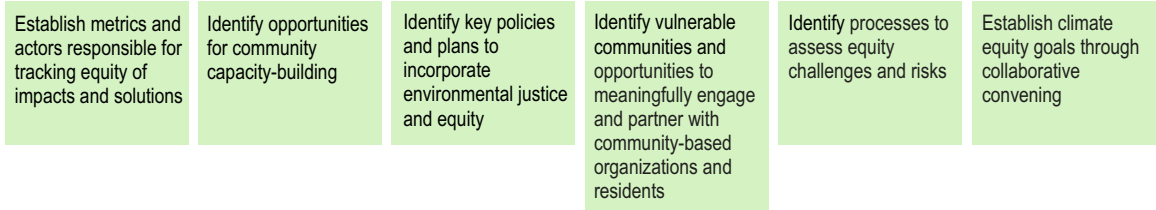
Climate change adaptation strategies must be evaluated in terms of the triple bottom line, with economic, social, and environmental costs and benefits all considered. The costs of inaction may be severe, and the benefits of action may be sizable as, for example, small investments can prevent poor situations from becoming dire and can literally save lives.



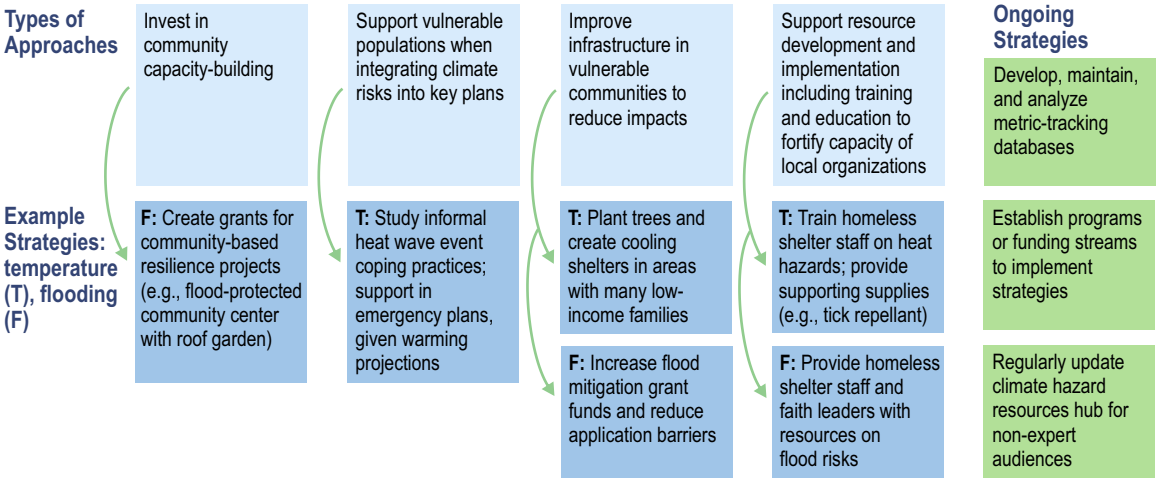


Adaptation pathways to reduce impacts of high heat and flooding on overburdened and vulnerable populations

Foundational actions to prepare to address vulnerabilities and impacts



Strategies to reduce vulnerabilities and impacts





10 Ways to Hit the Ground Running

Pennsylvania can get a running start to reduce greenhouse gas emissions by leveraging a number of programs and initiatives that already exist or are getting underway, and former programs that can be renewed.

1. Join the Regional Greenhouse Gas Initiative: Pennsylvania's participation in this cap-and-invest program will set a regulatory limit on carbon dioxide emissions from fossil fuel-fired electric generating units, auction CO₂ allowances, and permit trading of allowances for cost-efficient compliance with the regulatory limit. Auction revenues will be targeted to traditional energy-based communities and Environmental Justice areas across Pennsylvania and to further reduce carbon emissions statewide.

Supported by many Pennsylvanians and approved by the Environmental Quality Board and Independent Regulatory Review Commission as of September 2021, the RGGI rulemaking is approaching the finish line. Joining RGGI will lower Pennsylvania's CO₂ emissions between 97 and 227 million tons by 2030. Emission of nitrogen oxides, sulfur dioxide, particulate matter, and other pollutants will also drop significantly. These reductions will benefit all Pennsylvanians, and particularly those most often impacted by marginal air quality, such as children and at-risk seniors, especially in low income and Environmental Justice communities.

2. Adopt codes for new buildings that go above and beyond standard codes, such as the International Green Construction Code, Zero Code, or NetZero Code, and increase training for inspectors on existing building codes.

3. Expand the provisions of Act 129 of 2008 to increase the annual energy savings targets for electric distribution companies, effectively boosting residential and commercial electrical energy efficiency.

4. Develop a program similar to Act 129 for gas utilities.

5. Establish a commercial building energy performance program to accelerate energy efficiency.

6. Increase the Alternative Energy Portfolio Standards to require electricity generators to get more of their energy from clean renewable sources.

7. Join the regional multi-state Transportation Climate Initiative Program to cap carbon emissions from the transportation sector and invest the proceeds in programs to increase clean transportation options.

8. Increase the availability of light-duty electric vehicles through a rulemaking that would amend the Pennsylvania Clean Vehicles Program to establish a requirement for automakers to include light-duty electric vehicles as a percentage of their model offerings.

9. Re-fund the PA Sunshine Solar Rebate Program for homeowners and small businesses to help defray the costs of solar panel installation.

10. Ensure that climate action statewide is informed by the work of the DEP Environmental Justice Office.

Consider Tapping Emerging Technologies

The strategies outlined in the Plan will rely on existing and future technologies. Leveraging emerging technologies will allow the Commonwealth to more effectively implement the proposed GHG reduction strategies, typically by optimizing performance, reducing overall implementation costs, and/or by reducing GHG emissions at a greater level than possible through alternative technologies or in the absence of technology. Many of these technologies will also be key elements of increasing the resilience and reliability of Pennsylvania's energy systems.

1. Incentivize battery storage at the grid level. As Pennsylvania's grid mix continues to evolve, battery storage will play an important role in providing capacity for peak load days.
2. Assess the potential role of alternatives to natural gas, such as power-to-gas, and blue and green hydrogen, that may provide lower carbon thermal energy for use in transport, buildings, and electricity generation.
3. Pursue carbon capture, use, and storage technologies for emissions from fossil fuel combustion source points. Pennsylvania has a geologic capacity to potentially store hundreds of years of carbon dioxide emissions.
4. Use direct air capture systems to removing existing atmospheric carbon dioxide. When these systems become commercially viable, they can help offset emissions from sources that are hard to decarbonize, such as transportation and cement production.
5. Implement strategies to increase peak load management and keep the grid in balance as more renewable electricity comes online.

For more details on these technologies and their particular implications for Pennsylvania, see pages 98-108 in *Pennsylvania Climate Action Plan 2021*.



DEP Climate Action Tools

Comprehensive resources for climate action in Pennsylvania:

www.dep.pa.gov/climate

Pennsylvania Climate Action Plan 2021:

<https://www.dep.pa.gov/citizens/climate/Pages/PA-Climate-Action-Plan.aspx>

Pennsylvania Climate Impacts Assessment 2021:

<https://www.dep.pa.gov/citizens/climate/Pages/impacts.aspx>

Local Climate Action Program: www.dep.pa.gov/localclimateactionprogram

Pennsylvania Climate Leadership Academy:

<https://www.paclimateacademy.org/>

Pennsylvania Greenhouse Gas Inventory 2021 (presenting 2018 emissions data): <https://www.dep.pa.gov/citizens/climate/Pages/GHG-Inventory.aspx>

Regional Greenhouse Gas Initiative: www.dep.pa.gov/rggi

Support for sustainable transportation:

<https://www.dep.pa.gov/Citizens/climate/SustainableTransport/Pages/default.aspx>

Solar energy resource hub:

<https://www.dep.pa.gov/Citizens/solar/Pages/default.aspx>

Tools for agricultural energy efficiency: www.dep.pa.gov/agricultureenergy

Energy storage in Pennsylvania:

<https://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/Pages/Energy-Storage.aspx>

Reports on clean energy sector jobs and workforce development needs:

[https://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/EnergyEfficiency Environment and EconomicsInitiative/Pages/Workforce-Development.aspx](https://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/EnergyEfficiencyEnvironmentandEconomicsInitiative/Pages/Workforce-Development.aspx)



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