6. Climate Change, Adaptation, and Resiliency

Draft New York State Energy Plan

July 2025

Key Findings

- **Without resilience and adaptation efforts, projected changes in climate hazards will pose a significant risk to New York's energy system.** Increasing temperatures, changes in precipitation, and sea level rise can affect nearly all aspects of the system, including electricity generation and transmission, natural gas supply and infrastructure, and demand across all fuel sources. These hazards are already affecting the energy system, and the risks will only increase as the climate continues to change.
- **As a threat multiplier, the effects of climate change can exacerbate non-climate-related impacts on the energy system.** Evolving energy demands and aging or inadequate infrastructure already place stress on New York's electricity system. When compounded by the impacts of a changing climate, these non-climate-related challenges further increase risks to the system, underscoring the critical need to enhance resilience and maintain reliability across the State's energy infrastructure.
- **While climate hazards are projected to escalate significantly in the next few decades, their worst impacts can still be prevented if swift global action is taken to reduce emissions.** The scientific community has stated that substantial reductions in greenhouse gases by the middle of the century will be required to minimize the risk of severe climate impacts. An assessment of climate projections shows significantly higher impacts to New York State from a high-emissions scenario when compared to a lower-emissions scenario.
- **The energy sector contributes 76 percent of total greenhouse gas emissions in New York State, though energy sector emissions have declined 18 percent since 1990.** The State's clean energy policies have already reduced emissions, and both existing and emerging policies are laying the foundation for deeper, economy-wide emissions reductions statewide.
- **Actions to adapt to an already changing climate are essential to building a more resilient energy system now and in the future.** As New York State advances electrification and expands its zero-emission electricity supply, it has a unique opportunity to implement innovative strategies to enhance climate resilience. New approaches will be essential not only to address the long-term impacts of climate change but also to respond to today's severe weather events and ensure the energy system remains flexible, safe, resilient, and cost-effective.

Key Terms

- **Adaptation** – In human systems, the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; the process by which a system moves toward resilience.[1]
- **Climate Mitigation/Greenhouse Gas Mitigation** – A human intervention to reduce emissions or enhance the sinks of greenhouse gases.[2]
- **Climate Resilience** – A system's ability to anticipate, prepare for, respond to, recover from, and adapt to a disruption, such as an extreme climate hazard, with minimum damage to social well-being, public health, the economy, and the environment.[1]
- **Greenhouse Gas –** Gases that trap some of the Earth's outgoing energy, thus retaining heat in the atmosphere. This heat trapping, known as the greenhouse gas effect, alters climate and weather patterns at global and regional scales. Greenhouse gases include carbon dioxide, methane, nitrous oxide, and certain synthetic chemicals such as fluorocarbons and sulfur hexafluoride.[3]
- **Hazard Mitigation** – Any sustained action taken to reduce or eliminate long-term risk to life and property from hazard events. It is an on-going process that occurs before, during, and after disasters and serves to break the cycle of damage and repair in hazardous areas.[4]
- **Reliability** – The energy system's ability to function consistently during normal conditions. In many cases, adaptation strategies that improve resilience also have the benefit of improving reliability.[5]
- **Resilience** – The capacity to withstand or to recover quickly from negative events such as natural disasters, climate change, and other threats/hazards.

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[1] Stevens, A., & Lamie, C., Eds. (2024). *New York State Climate Impacts Assessment: Understanding and preparing for our changing climate.* https://nysclimateimpacts.org

[2] Intergovernmental Panel on Climate Change (IPCC). (2023). Annex VII: Glossary. In *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 2215–2256). backmatter, Cambridge: Cambridge University Press.

[3] From NYSCIA, adapted from U.S. EPA

[4] New York State Department of Homeland Security and Emergency Services. Hazard Mitigation. https://www.dhses.ny.gov/hazard-mitigation

[5] Kroposki, B., Garrett, B., MacMillan, S., Rice, B., Komomua, C., O'Malley, M., & Zimmerle, D. (2012). Energy systems integration: A convergence of ideas (NREL/TP-6A00-55649, 1046325). National Renewable Energy Laboratory. https://doi.org/10.2172/1046325

1. Overview

Climate change is no longer a future threat: it is already driving measurable impacts worldwide. According to the World Meteorological Organization, the number of climate-based disasters worldwide increased fivefold between 1970 and 2019, while economic losses from climate- and weather-related events have risen sevenfold.[6]

New Yorkers have experienced the impacts of climate change in numerous ways in recent years, including extreme storms, heat waves, seasonal drought, and smoke from wildfires in the Western U.S. and Canada.

- In 2011, Tropical Storm Irene caused widespread destruction, largely due to catastrophic flooding that washed out roads and overwhelmed wastewater treatment plants. While New York communities worked to rebuild they were faced with another major storm, Tropical Storm Lee, less than two weeks later.
- Superstorm Sandy devastated much of New York City in 2012, with 13-foot-high storm surges battering the region along with heavy rains and strong winds. The storm left hundreds of thousands of New Yorkers without power and resulted in dozens of fatalities.[7] Over the next five years, the Federal Emergency Management Agency contributed over $25 billion to recovery efforts in New York and New Jersey.[8]
- In 2020, high winds from Tropical Storm Isaias damaged critical infrastructure and caused power outages for more than 800,000 New Yorkers.[9]
- Historic flooding from Hurricane Ida in 2021 caused lasting damage to the Gulf Coast and devastated the Northeast. The National Weather Service issued its first flash flood emergency warning for parts of northeastern New Jersey and its second ever flash flood emergency for New York City.[10]
- In late September 2023, the Governor issued a State of Emergency for an extreme precipitation event downstate, during which over nine inches of rain fell in Nassau County.

New York is expected to face a wide range of climate-driven impacts, reflecting the state's diverse geography and socioeconomic conditions. Intensifying heat waves and long-term warming trends are expected to increase localized heat stress, requiring New York's electricity grid to adapt to rapidly shifting demand patterns. Heavy rainfall events will lead to more frequent localized flooding, disrupting

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[6] World Meteorological Organization. 2021. *WMO Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970-2019)*. Geneva. Accessed at https://library.wmo.int/index.php?lvl=notice_display&id=21930#.YaY979DMJ9N.

[7] Weissman Center for International Business, Baruch College/CUNY. 2021. "Disasters: New York City Hurricane Sandy – 2012." *NYCdata.* Accessed on November 30, 2021 at https://www.baruch.cuny.edu/nycdata/disasters/hurricanes-sandy.html.

[8] Federal Emergency Management Agency. October 28, 2017. "Remembering Sandy Five Years Later." https://www.fema.gov/press-release/20210318/remembering-sandy-five-years-later.

[9] U.S. Department of Energy Office of Cybersecurity, Energy Security, and Emergency Response. August 12, 2020. "Tropical Storm Isaias Update #11." https://www.energy.gov/ceser/articles/tropical-storm-isaias-situation-report-11

[10] Harvey, Chelsea. September 2, 2021. "Ida smashes rain records in glimpse of future warming." *E&E News.* https://www.eenews.net/articles/ida-smashes-rain-records-in-glimpse-of-future-warming/.

food production, water resources, and both natural and built environments statewide. Rising sea levels will pose growing risks to coastal communities and sensitive ecosystems. Disadvantaged communities (DACs) are especially vulnerable, as they face disproportionate impacts from climate change.

While addressing climate change requires global action, New York's nation-leading policies position the State to take meaningful action, both to confront local climate challenges and to contribute to global emission reduction efforts. The urgency of coordinated international response is underscored in recent reports from the Intergovernmental Panel on Climate Change (IPCC). The IPCC's latest assessment (AR6) emphasizes that sustained and significant reductions in greenhouse gas (GHG) emissions are essential to curbing the worst impacts of climate change and slowing the pace of unprecedented changes being felt around the world. New York must join with partners around the world to prioritize aggressive GHG reductions alongside strategic investments in climate resilience.

Meeting the challenge of climate change begins with a clear understanding of statewide emissions and shifting climate patterns. Through robust research and strategic planning, New York can adapt, leveraging the strength of its people, systems, and technologies. Efforts such as the New York State Department of Environmental Conservation (DEC) Statewide Greenhouse Gas Emissions Report and the New York State Climate Impacts Assessment (NYSCIA) play a critical role in guiding State actions, informing investments, and shaping adaptation strategies to ensure that communities across New York continue to receive clean, reliable energy for decades to come.

2. Summary of New York State Emissions

As required by New York's 2019 Climate Leadership and Community Protection Act (the "Climate Act"), DEC publishes a GHG emissions report to track progress towards meeting the State's 2030 and 2050 reduction targets. The first Statewide Greenhouse Gas Emissions Report, released in 2021, covered emissions from 1990 through 2019. The 2024 report includes data through 2022 and examines emissions of the seven primary greenhouse gases: carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride. These gases are measured in terms of carbon dioxide equivalent (CO_2e) using a twenty-year time horizon, as required by the Climate Act.

To measure progress towards the Climate Act targets, New York accounts for GHG emissions differently than other jurisdictions in two primary ways: the twenty-year timeframe required by the Climate Act diverges from the more widely used interval of one hundred years; and the report incorporates emissions from electricity generation and fossil fuel extraction and transmission that occur outside of New York State but are imported for use within the state. A third difference is that for the gross emissions inventory, which is the basis of the emission reduction targets adopted in State law, combustion emissions associated with bioenergy are not considered carbon neutral and emissions and emissions benefits associated with land use are excluded. Therefore, New York's inventory is not always directly comparable to other governments', nor to pre-2019 New York inventories.

The 2024 Statewide GHG Report found that the energy sector accounted for approximately 76 percent of statewide emissions in 2022 using the Climate Act accounting methodology.[11]

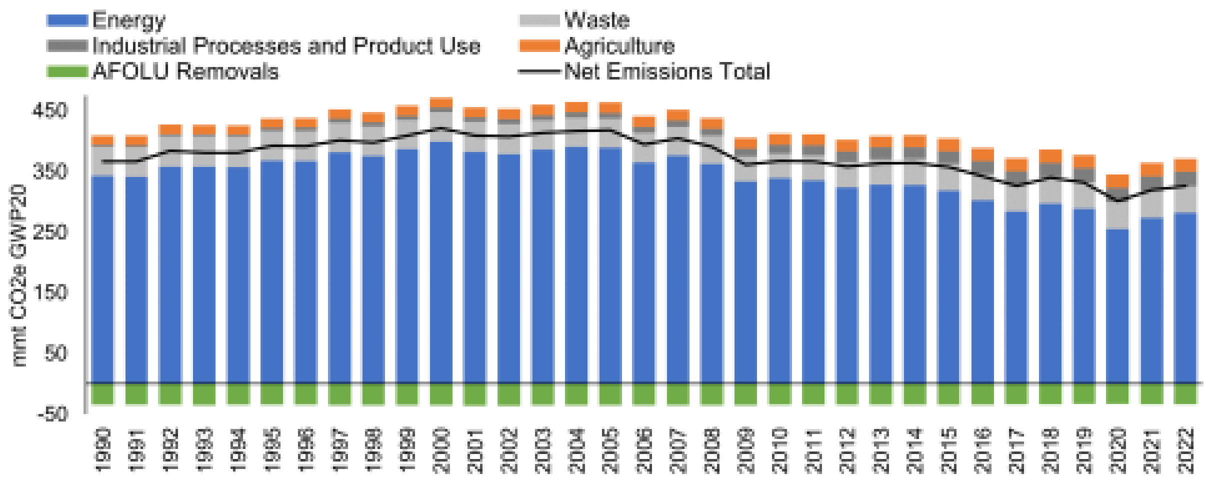

Figure 1: NYS Statewide GHG Emissions by Sector, 1990 - 2022 (mmt CO_2e GWP20)

Energy-related emissions can span across almost all economic sectors, but are primarily included in electricity, buildings, and transportation sectors.

- In 2022, buildings and transportation were the highest-emitting sectors, at approximately 31 percent and 26 percent of total emissions, respectively, followed by emissions from the electricity sector, at 17 percent of statewide emissions. These sectors include GHG emissions from fuel use as well as emissions associated with the production and transport of imported fuels.
- The transportation sector includes GHG emissions associated with on-road transportation; non-road transportation modes (such as aviation, rail, and marine); and other mobile equipment, as well as HFCs used for mobile heating, ventilation, and air conditioning (HVAC).
- The buildings sector includes fuels used in residential and commercial buildings and HFCs used in HVAC.
- The electricity sector includes fuels used for generating electricity within the state, imported electricity, and the transmission and distribution of electricity. The industrial sector, although a smaller fraction of total state emissions, is made up largely of energy-related emission sources, including fuels used in industrial buildings and for industrial processes as well as emissions from the oil and gas industry in the state. The remaining sectors, waste, and agriculture and forestry, account for approximately 17 percent of state emissions combined, with minimal energy-related emission sources.

[11] *2024 Statewide GHG Emissions Report.* New York State Department of Environmental Conservation. 2024.

With 2022 gross emissions totaling the equivalent of 371 million metric tons of carbon dioxide (371 MMT CO_2e), New York State will need to reduce emissions by 33.7 percent to meet the 2030 GHG reduction target. Net emissions in 2022 were 326 MMT CO_2e.

According to the 2024 Statewide GHG Emissions Report, by 2022, gross emissions had dropped markedly compared to a broad historic context, but have more recently remained largely unchanged:

- 19.3 percent below 1990 emissions
- 19.9 percent below 2005 emissions
- 1.7 percent below 2019 emissions
- 0.8 percent above 2021 emissions

Gross emissions reflect a decrease across key economic sectors between 1990 and 2022, including:

- a 34 percent decrease in electricity emissions;
- a 36 percent decrease in industrial energy emissions;
- a 4 percent decrease in transportation energy emissions; and
- a 7 percent decrease in building energy emissions, primarily driven by a decrease in commercial building energy emissions.

The report found that 2022 energy emissions were 17.7 percent lower than in 1990 and 27.5 percent lower than in 2005. As noted above, the electricity sector alone has experienced some of the largest reductions, a 34 percent decrease between 1990 and 2022. However, it is important to note recent trends reflect the collective impacts of the COVID-19 pandemic on the energy sector.

Despite significant reductions, the report documents the largest increase in energy emissions from the previous year, rising by 8 MMT CO_2e, or 2.9 percent (continuing to return to pre-pandemic levels). Electricity emissions increased by 22.5 percent between 2019 and 2022, even as electricity sales were 1.6 percent lower. This increase is likely due to a decrease in nuclear generation, as New York saw the closure of Indian Point and a subsequent increase in gas and petroleum fuel use for electricity production.

Of energy sector emissions, approximately 75 percent are carbon dioxide, including carbon dioxide emissions from plant-based fuels. Methane makes up about 25 percent of energy sector emissions, the majority of which is associated with out-of-state sources. Nitrous oxide and sulfur hexafluoride account for only fractions of a percent.

When developing plans to mitigate GHG emissions, it is important to consider the impact of carbon sequestration on the statewide emissions inventory and incorporate efforts to minimize disturbance to New York's natural lands. Several land use types, including forests, croplands, and wetlands, are capable of "carbon sequestration," a process where carbon is captured and stored, thereby removing it from the atmosphere. Although these "net removals"[12] slightly declined from the previous year, they still amounted to 33.83 million metric tons of carbon dioxide equivalent in the 2024 report, reducing New York's total emissions on a net basis to 325.96 MMT CO_2e.

A Pathways Analysis was completed in 2025 to inform this energy plan and other state climate planning efforts and is included in this Plan. The analysis explores current trends in the energy sector, models several mitigation scenarios, and provides a forecast of future statewide emissions.

3. Climate Change in New York State

3.1. Scientific Evidence of a Changing Climate

The 2024 New York State Climate Impacts Assessment (NYSCIA)[13] offers a thorough evaluation of historical climate data and concludes that New York State's climate has already changed, with impacts evident across economic sectors, industries, natural systems, communities, and regions.[1] The assessment explores and evaluates specific climate observations and projections and their unique physical, ecological, and societal impacts on the state. It takes a deeper look into how these hazards are magnified in different geographic areas of the state, as well as how these hazards may affect state economies and crucial natural resources. In addition to detailing the impacts the state is experiencing and projected to experience, the assessment presents information on vulnerabilities and offers recommendations on adaptation and resiliency strategies, with an eye toward recognizing inequities and advancing solutions that respond to climate hazards justly, comprehensively, and equitably.

Research from both the U.S. Global Change Research Program (USGCRP) and the IPCC have concluded that in order to limit the global average increase in temperature to 2°C (if possible, 1.5°C) and minimize the risk of the most severe climate impacts, substantial reductions in GHG emissions by mid-century are required. Despite commitments by national governments to limit warming to under 1.5°C, global average temperatures temporarily exceeded 1.5°C for more than half of 2024, with an annual average that may have exceeded 1.5°C for the first time. The last ten years have been the hottest on record globally. NASA recently confirmed 2024 surpassed 2023 as the hottest year on record since record-keeping began in 1880.[14] GHGs already emitted into the atmosphere will continue to contribute to warming for years, and often decades. It is clear that New York State's climate has already changed, and some amount of further climate change has already been set in motion, regardless of global efforts to reduce future emissions. Therefore, preparing communities and infrastructure for projected climate impacts, and incorporating adaptation and resiliency measures to address these impacts, is crucial to preserve the safety and well-being of all New Yorkers.

3.2. Climate Projections for New York State

The 2024 NYSCIA provides a science-based analysis of projected climate change for multiple hazards in New York. Physical variables like temperature, rainfall, heat waves, extreme precipitation, and sea level

[12] This term refers to the difference between GHG emissions from land use types and the amount of carbon removed by them.
[13] New York State Climate Impacts Assessment, accessed July 20, 2025, https://nysclimateimpacts.org.
[14] Bardan, Roxana, "Temperatures Rising: NASA Confirms 2024 Warmest Year on Record," NASA, January 10, 2025, accessed February 24, 2025, https://www.nasa.gov/news-release/temperatures-rising-nasa-confirms-2024-warmest-year-on-record/.

are likely to change between now and 2100. The NYSCIA projections were modeled for both a moderate and a high emissions scenario, and it is important to note that modeling shows the moderate scenario leads to significantly lower changes in the climate and the resulting impacts of those changes.

3.2.1. Temperature

Average and maximum temperatures are projected to continue to rise throughout the 21st century. The number of days above approximately 32°C (90°F) and 35°C (95°F), days with high heat index, and the maximum heat index are all projected to increase. Heat waves are expected to occur more often and become more intense, posing greater risks for human health, built infrastructure, ecosystems, and other sectors. All regions of the state, including the North Country and Western New York, will experience large increases in temperature and extreme heat.

The annual number of days below 0°C (32°F) and below approximately 18°C (0°F) are projected to decrease across the state. The reduction in days below freezing will affect animal migration, pests (e.g., ticks), and hydrological cycles, and more generally whether precipitation falls as rain or snow.

3.2.2. Precipitation

New York State has experienced increases in total and heavy precipitation, trends that are expected to continue through the century. Heavy rainstorms that lead to flooding will likely become more frequent. In the Great Lakes region, warmer water and reduced ice cover may initially increase lake-effect snow, but as temperatures rise further, more of this precipitation will fall as rain. Overall, snowfall and snowpack are projected to decline across the state due to warmer winters, with a shorter snow season and a shift from snow to rain.

3.2.3. Extreme Events

Climate change is creating conditions that will increase the frequency and severity of many types of extreme events. As noted in Section 3.2.2, heavy precipitation events will become more frequent, and hurricanes and tropical storms may become more intense. Short-term, seasonal droughts may happen more often, especially in the summer. Wildfire season in the Northeast may begin earlier and last longer. As a result, wildfires may become more common, although overall wildfire risk will likely remain relatively low. However, increased wildfires in other parts of the region and country may impact air quality in New York more frequently.

3.2.4. Ocean Conditions

Sea level is projected to rise along the New York State coastline and in the tidal Hudson by approximately two to three feet by the end of the century, although some models project an even higher rise. There is also a chance of even more dramatic rise due to “low-probability, high-impact” events, such as the collapse of the Antarctic ice sheet. Rising sea levels will continue to increase the severity and frequency of coastal flooding, including both high-tide floods and storm surge floods.

Rising temperatures will increase sea surface temperature, affecting ocean currents, weather, and ecosystems. Continued high carbon dioxide in the atmosphere will lead to increased acidification of the ocean.

3.2.5. Lakes and Rivers

New York State's lakes and rivers will continue to experience increased water temperature, fluctuating water levels, and decreased ice cover. Lakes are projected to experience more severe summer heat waves and decreased winter ice cover as temperatures rise in the coming decades. While future water levels in the Great Lakes are difficult to project, the lakes will likely experience greater variability in those water levels, driven by periods of drought and extreme precipitation. Flood intensity and associated damages are expected to rise due to extreme rainfall and broader changes in river and streamflow patterns.

3.2.6. Compound Events

The changes described above become more severe and damaging when multiple stressors combine or co-occur. These combinations are referred to as compound events. As many of the individual risks increase with climate change, it follows that the risk of increasingly severe combinations will also grow.

As defined and described in the NYSCIA, compound events fall into four main categories, all relevant to New York State:

- *Preconditioned events* occur when one or more hazards cause an impact, or lead to an amplified impact, only because of a pre-existing, climate-driven condition. Examples include heavy rainfall on top of snow and false spring (when cold conditions return after unseasonable warmth).
- *Multivariable events* refer to the co-occurrence of multiple climate hazards in the same geographic area. An example is the vulnerability of communities along the tidal Hudson River to flooding from a combination of high streamflows and tidal flooding exacerbated by sea level rise.
- *Temporally compounding events* refer to a succession of hazards that affect a given geographic area, creating or amplifying an impact when compared with a single hazard. Examples include a heat wave after a coastal storm has knocked out power, a cold snap after a destructive storm (as occurred with Superstorm Sandy in 2012), and back-to-back Nor'easters associated with persistent troughs in the jet stream.
- *Spatially compounding events* occur when multiple connected locations are affected by the same or different hazards within a limited time window, causing an impact. For example, the entire Northeast could experience heavy precipitation over the same period, leading to large increases in riverine flood risk in New York State and beyond. Some authors have considered cases in which compounding goes beyond climate hazards to include other aspects of human and natural systems, such as the risk of power failures and poor air quality, both of which are correlated with extreme heat.

These compound events are particularly important to consider in any planning process. They are not well-studied from a modeling perspective but can have severe consequences when they occur.

3.3. Key Hazards for New York's Energy System

Extreme heat, changes in precipitation, and other climate hazards are already stressing the State's energy infrastructure and affecting supply and demand. These risks will only increase with the changing climate. Examples of climate impacts already experienced and expected in the future are highlighted in this section. More information and detail are presented in subsequent chapters of this plan and in the NYSCIA.[13]

- **Increasing temperatures.** Increasing temperatures can lead to performance reduction for critical energy assets, including a loss of electric generating efficiency in combustion-based, wind, and solar resources and a potential reduction in the capacity, efficiency, and life span of battery storage components. High temperatures can disrupt electricity delivery by reducing the efficiency and capacity of transmission and distribution systems, causing equipment derating and increasing the sagging of transmission lines. Increased extreme heat events, in particular, could also significantly increase cooling demand. Natural gas and fuel oil infrastructure can be damaged through movement caused by increased frequency of frost heaves and changes in freeze-thaw cycles. Demand for natural gas and other heating fuels may decrease as winter temperatures rise, although New York State will still likely experience cold snaps in the near term. Heating degree days will decrease in New York over the course of the 21st century and cooling degree days will increase, as winters warm and summers become hotter. This will be a complicating factor for electricity demand and grid resilience, as heating systems become more electrified and cooling systems are used more often statewide.

- **Precipitation changes.** Changing precipitation patterns and intensity can damage energy assets as well as impact performance and generation capacity. Flooding from extreme precipitation events can result in equipment and asset damage and lead to inaccessible or washed-out access roads. Rain and floodwaters can infiltrate into underground natural gas pipelines and low-pressure natural gas delivery systems, corrode and undermine fuel tanks, and damage underground electrical equipment. Short-term, seasonal drought can result in impacts to the operations of small hydropower facilities.

- **Sea level rise.** Rising sea levels will lead to higher storm surge and more coastal flooding of critical energy facilities and fuel storage tanks, as well as increased damage to and corrosion of underground natural gas and electric transmission and distribution infrastructure. Nuisance flooding, inundation, or storm surge can disrupt access to facilities and fuel delivery distribution systems that require the use of roads. Drainage and stormwater flooding can impede automatic pumps to remove floodwater from facilities.

- **Changes in wind speed and direction**. Extreme events, such as hurricanes and other storms, affect the energy system in multiple ways, including causing damage to overhead lines, poles, and transmission towers from wind and debris. High winds can also affect solar electricity generation and damage photovoltaic (PV) panels. Changes in wind patterns not linked to extreme events remain uncertain. However, recent research indicates that any such changes, if they occur, are likely to fall within the range of natural variability and are not expected to impact the generation potential of wind turbines.

- **Cascading impacts across sectors.** It is important to recognize that every sector of New York State's economy depends on the energy sector.[15] Climate-driven disruptions to the energy system can have ripple effects that impact other interconnected sectors and potentially cause failures. Similarly, disruptions in sectors like transportation and water can also affect energy systems, such as hindering fuel delivery.[16] Digitalization and the increasing reliance on the internet for a wide range of functions within and beyond the energy sector have already changed the way disruptions, including climate-driven ones, can impact other industries.

3.4. Non-Climate Factors

Other factors unrelated to climate change can still interact with climate hazards, influencing and potentially exacerbating their impacts. For instance, the electrification of buildings and transportation will increase the need to ensure the resilience and reliability of the electric system.

Electrification will shift demand patterns by increasing overall annual electricity consumption and altering peak usage times. As it expands, electricity demand will become more sensitive to climate, with greater needs for both heating and cooling. Climate change adds further complexity: under a high GHG emissions scenario, winter warming reduces the need for heating more than in a moderate scenario. However, the resulting hotter summers drive up cooling demand even more sharply, leading to a greater overall increase in electricity use for cooling than under moderate emissions. Additionally, aging transmission and distribution infrastructure will need to be upgraded to accommodate future conditions and enhance the system's resiliency to the changing climate.

Uncertainty in federal positioning on climate adaptation and resiliency, including policy, resources, tools, data, and more, may impact infrastructure sectors in meeting resilience needs, including the energy sector.

4. The Case for Climate Action in New York

While climate hazards are projected to escalate significantly in the next few decades, the worst impacts can still be prevented if swift global action is taken to reduce emissions. Here in New York, actions to adapt to an already changing climate are essential to build a more resilient energy system.

4.1. Mitigation, Adaptation, and Resilience

To effectively address the climate-related vulnerabilities of New York State's energy systems and reduce both current and future impacts, the State must adopt an integrated energy planning approach that incorporates mitigation, adaptation, and resiliency, while recognizing the interdependence of these three pillars of climate strategy.

[15] Including but not limited to transportation, communications, and water systems.
[16] See also the Energy Security Planning and Emergency Preparedness chapter of this Plan.

Drastically reducing global GHG emissions produced by human activity is essential to mitigating the impacts of climate change. Climate change mitigation can also include the removal of GHGs that have already been emitted in the atmosphere through carbon sequestration and storage by natural ecosystems such as forests, wetlands, soils, and grasslands. When these natural ecosystems are disrupted or converted for development, sequestered GHGs are often re-released into the atmosphere. Therefore, climate mitigation measures are broad and far-reaching. They encompass strategies that include the transition to renewable energy sources; changes in consumer behaviors; the development of energy efficient technologies; land conservation, reforestation, and afforestation initiatives; and any action that reduces emissions or sequesters GHGs.

Adaptation is the process of identifying risks and vulnerabilities to future climate hazards, adjusting plans and behaviors, and incorporating measures in the design and construction of infrastructure that will prepare systems to withstand or adjust to changing climate conditions. Successful adaptation can sometimes be accomplished with simple adjustments, but it can also require complete transformations from existing processes. For example, adaptation can include elevating important infrastructure above future projected flood levels or changing zoning to limit new development in projected future floodplains. Importantly, adaptation processes and investments need to be re-assessed over time to ensure systems are adequately able to adapt. Timely investment in effective and adequate adaptation strategies is critical in order to avoid the larger costs of recovery from damaging climate events.

Climate resilience is closely related to adaptation. It refers to a system's ability to prepare for climate hazard risks in a proactive manner, respond effectively to reduce damages from climate hazards, and recover from extreme climate hazard events quickly. A climate-resilient system, be it natural or human-made, is prepared for climate impacts and experiences minimal damage from events. Natural systems offer many benefits to engineered systems, particularly in terms of risk reduction. Conserving and enhancing ecosystems, such as forests, flood plains, and wetlands, can greatly improve the climate resilience of the built environment and energy infrastructure by offering protection from flooding and storm surges. Resilience is a process, not an endpoint, and as such requires continued re-evaluation to current and future conditions. It is important to note that resilience is not exclusively used in reference to climate hazards. Resilience, in a general sense, refers to a system's ability to prepare for any threat or hazard, adapt to changing conditions, and withstand and recover rapidly from adverse conditions and disruptions, regardless of the cause.

The concepts of climate change mitigation, adaptation, and resilience are closely interconnected and mutually reinforcing. Mitigation efforts often include adaptation strategies that enhance overall climate resilience, while true resilience can only be achieved through effective adaptation. At the same time, mitigation must account for adaptation needs to ensure preparedness for evolving climate conditions. According to the IPCC's Sixth Assessment Report, adaptation is critical to minimizing harm, but its effectiveness diminishes as global warming intensifies, highlighting the urgent need for ambitious greenhouse gas emission reductions. In this context, integrating mitigation, adaptation, and resilience is essential to ensuring the long-term reliability of New York's energy systems.

4.2. Benefits of Climate Action and Costs of Inaction

The direct and indirect social costs of climate change are already significant and expected to rise as impacts intensify. These include damage to infrastructure, increased strain on public health systems, and disruptions to critical services—including energy. For example, in New York, climate hazards like rising temperatures and more frequent extreme weather events are projected to increase total energy expenditures in some counties by up to 10 percent by the end of the century.[17]

Climate change vulnerabilities intersect with, and are exacerbated by, underlying and systemic social/economic stressors and fragilities.[18] However, proactive investments in climate mitigation, adaptation, and resilience can yield substantial and wide-ranging benefits. These include improvements in public health, system reliability, energy and resource security, and long-term economic stability. Integrating the latest understanding of projected climate hazards into planning and development processes helps reduce the need for costly future repairs and retrofits, particularly for infrastructure not designed for evolving conditions.

Ultimately, while the specific economic outcomes of climate change depend on the severity of physical impacts, the evidence is clear: failing to act will lead to far greater social and economic costs. A forward-looking approach that centers resilience and equity can deliver lasting advantages across both natural and built environments. New York can also continue to set an example as a climate leader, demonstrating successful implementation of climate mitigation and adaptation strategies for other local and national jurisdictions to replicate.

Climate action can benefit all sectors of society. As the latest energy-efficient technology makes its way into homes and businesses, New Yorkers can benefit from cost-savings as well as cleaner, more reliable heating and cooling systems. Distributed energy resources, primarily seen as a GHG reduction strategy, can also offer the additional benefits of affordability and reliability. An increase in uptake of zero-emission transportation will offer economic benefits and jobs, while also driving a reduction in harmful co-pollutants that disproportionally impact DACs. See the Environmental and Climate Justice, Clean Energy Jobs and a Just Transition, Buildings, Transportation, Public Health Impacts Analysis, and other chapters of this Plan for more detailed information on these initiatives.

4.2.1. Benefits of GHG Emission Mitigation

Reducing emissions can deliver immediate and substantial benefits by helping to prevent the most severe impacts of climate change. Swift emissions reductions may avert illnesses and fatalities linked to extreme heat; flooding; and the spread of food-, water-, and vector-borne diseases. Transitioning to cleaner energy sources also brings indirect health benefits by reducing harmful co-pollutants both indoors and outdoors. Smart growth strategies that promote active transportation, like walking and

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[17] Hsiang, S., Kopp, R., Jina, A., Rising, J., Delgado, M., Mohan, S., Rasmussen, D. J., Muir-Wood, R., Wilson, P., Oppenheimer, M., Larsen, K., & Houser, T. (2017). Estimating economic damage from climate change in the United States. *Science , 356* (6345), 1362–1369. https://doi.org/10.1126/science.aal4369

[18] Aguirre-Torres, Luis, Robin Leichenko, Mary Austerman, Deborah Balk, Hallie E. Bond, Riobart E. Breen, David Burgy, Cassandra John, Franchelle Parker, Kenneth Schlather, Amanda Stevens, "New York State Climate Impacts Assessment Chapter 08: Society and Economy," Annation of the New York Academy of Sciences, December 9, 2024, accessed July 1, 2025, https://doi.org/10.1111/nyas.15199.

biking, can improve public health at the community level. Energy efficiency retrofits further reduce health risks in the home by replacing combustion-based fuels with cleaner, safer alternatives. Moreover, investments in climate mitigation stimulate economic growth, create clean energy jobs, and enhance housing security, social equity, accessibility, resource efficiency, and the quality of mobility services. See the Electricity, Transportation, Buildings, Environmental and Climate Justice, and other chapters of this Plan for more detail.

4.2.2. Benefits of Adaptation and Resilience

Adaptation and resilience planning helps prepare communities, ecosystems, and the built environment for the impacts of climate change, enabling them to thrive into the future. This planning process identifies actions and strategies that can be implemented now or over time to address risks to quality of life, public safety, infrastructure, and natural systems. These risks are especially high for DACs, which face increased vulnerabilities due to longstanding and systemic inequities. Like GHG mitigation, investments in adaptation and resilience can enhance quality of life, support local economic development, reduce future recovery costs, advance equity in both rural and urban areas, and protect the environment.

While adaptation and resilience planning is often associated with reducing vulnerabilities from climate change hazards (e.g., sea level rise, extreme heat, heavy precipitation events), planning for the energy system must also consider non-climate-hazard-related vulnerabilities that may be worsened by climate change. Shifts in population densities can occur as people affected by climate change relocate to avoid climate impacts.[19] Regions of the state that receive those who are relocating may see a change in energy demand with potential subsequent implications for existing infrastructure or energy generation planning. Incorporating consideration for non-climate-related vulnerabilities into adaptation and resilience planning can aid in the development of strategies that provide co-benefits and support additional community energy needs beyond those related to climate impacts.

Land use planning and decision-making regarding development siting is a primary mechanism for risk avoidance. As noted in the sections above, climate change impacts will be felt broadly across New York State. Flooding is one of the costliest and most widespread hazards in the state, but there are locations that are less risky to develop than others. While there is no guarantee that flooding will not occur outside the floodplain, these areas are typically safer for development. Local knowledge and history of flooding should be considered when determining locations for development, such as energy infrastructure. Avoidance of hazard risk through appropriate site location will decrease the likelihood of needing to mitigate impacts into the future. In addition to proper siting, there are other safeguards that can be implemented to decrease potential impacts from flooding, such as floodproofing or elevating structures above expected flood levels where possible.

4.3. Environmental/Climate/Energy Justice

DACs are projected to experience greater impacts from climate change, and energy-related climate impacts are no exception. Existing inequalities and burdens in New York State's energy system heighten the risk of disproportionate impacts, especially as the energy system evolves. For instance, low-income

[19] For example, moving inland to escape rising sea levels and flood inundation.

households, DACs, and other vulnerable populations, such as people with existing health conditions, are already more likely to face challenges cooling their home in hot weather and are more vulnerable to power outages during extreme weather events.[10] However, reliance on fossil fuels has long been a source of social injustice, with the siting and operation of fossil-fuel-based energy infrastructure resulting in greater environmental health and safety burdens on some communities more than others. An energy sector transition provides an opportunity to work towards a more just and resilient energy system where all New Yorkers receive equitable benefits of clean and resilient energy infrastructure, affordable energy, and associated jobs.

4.4. National and Global Context for Climate Action

For decades, national and global policymakers have collaborated to mitigate climate change, beginning with the establishment in 1992 of the United Nations Framework Convention on Climate Change (UNFCCC) as the primary international platform for climate action. This effort was strengthened by the 1997 Kyoto Protocol and the 2015 Paris Agreement, both of which included commitments to reduce GHG emissions and limit global temperature rise to below 2°C above pre-industrial levels, particularly from developed nations. The UNFCCC acknowledged that climate change is primarily driven by human-generated GHG emissions and set the goal of preventing "dangerous anthropogenic (human-caused) interference with the climate system" by stabilizing these emissions. The latest report from the IPCC, AR6, underscores an even more urgent need for bold, immediate action.

In recent years, federal support for the UNFCCC and the Paris Agreement has wavered, with President Trump ordering the United States to formally withdraw from these partnerships in 2017 and again in 2025.[20] When the intention to withdraw was first announced, the governors of New York, Washington, and California responded with the formation of the United States Climate Alliance (USCA). The USCA reaffirmed member states' commitments to key provisions of the Paris Agreement in the absence of federal support, agreeing to emissions reductions targets, accelerating policies that reduce GHG pollution, centering equity and environmental justice, and reporting on progress to the global community. Since its 2017 inception, the USCA has grown to include over 24 states with support of bipartisan governors that represent over 50 percent of the U.S. population and over 60 percent of the U.S. economy.[21] Policy priorities largely center around the energy sector and include adoption of:

- Clean electricity, fuels, heat, car, and truck standards;
- Economy-wide GHG targets and net-zero GHG targets;
- 100 percent clean electricity goals, Solar for All programs, offshore wind goals, and energy storage goals; and
- Standards and programs to reduce methane from oil and gas and to phase down HFCs.[22]

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[20] "Putting America First In International Environmental Agreements," The White House, January 20, 2025, accessed July 1, 2025, https://www.whitehouse.gov/presidential-actions/2025/01/putting-america-first-in-international-environmental-agreements/.

[21] "States United for Climate Action," United States Climate Alliance, accessed May 9, 2025, https://usclimatealliance.org/.

[22] "Policy Priorities," United States Climate Alliance, accessed February 5, 2025, https://usclimatealliance.org/policy-priorities/.

Regardless of the federal administration, continued action at the state level is needed to prepare the country's energy sector for the challenges and opportunities that lie ahead.

5. Past and Current Climate Action in New York's Energy Sector

Through the Climate Act and other landmark legislative and executive actions, New York has established itself as a national leader in climate action. The State has a long history of advancing the clean energy transition. Early initiatives, including the 2004 Renewable Portfolio Standard, demonstrated New York's commitment to clean energy and laid the groundwork for later action, such as the Clean Energy Standard (CES) and the clean energy targets in the Climate Act. The CES was established in 2016 alongside a suite of clean energy and climate initiatives, together called "Reforming the Energy Vision," to support local adoption of renewable energy and clean transportation. The State's Clean Energy Communities program provides grants to help local governments lower their energy use, reduce GHG emissions, and advance clean energy projects in their communities. The interagency Climate Smart Communities (CSC) program, created in 2009, is another example of New York's pioneer climate initiatives to encourage climate action at a local level. CSC significantly expanded due to its success and popularity, with nearly half of New York State's population currently residing in a registered Climate Smart Community.[23] Through early actions like these, and a continued focus on climate initiatives in the years since, New York is well-positioned to meet future challenges.

5.1. The Climate Act

The 2019 Climate Act established statewide GHG emission targets, including a 40 percent reduction in statewide GHG emissions from 1990 levels by 2030 and an 85 percent reduction by 2050.[24] The Act also established a target of net zero emissions across all sectors of the economy by 2050.[25] In addition, the Climate Act directed the New York State Public Service Commission (PSC) to establish a program which aims to decarbonize the electric sector and achieve 70 percent of the State's electricity generated by renewable[26] energy systems by 2030 (70x30) and 100 percent zero-emission electrical demand system by 2040 (100x40).[27] The Climate Act includes provisions that codified existing clean energy goals, including a target for the procurement of at least 9,000 megawatts (MW) of offshore wind by 2035, 6,000 MW of distributed solar generation by 2025, and 3,000 MW of energy storage by 2030.[28] The State has since set increased targets to deploy 10,000 MW of distributed solar and 6,000 MW of energy storage by 2030.[29]

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[23] "State Support for Local Climate Action," Climate Smart Communities, accessed February 26, 2025, https://climatesmart.ny.gov/.

[24] ECL § 75-0107(1).

[25] ECL § 75-0103(11).

[26] PSL § 66-p(1)(b).

[27] PSL § 66-p(2).

[28] PSL § 66-p(5).

[29] In September 2021, Governor Hochul called for an expansion of the State's distributed solar program from 6,000 MW to 10,0000 MW and tasked NYSERDA and DPS with developing a distributed solar roadmap to outline a framework to advance the expanded target in a resilient, cost-effective and responsible manner. In April 2022, the PSC approved this new framework for the State to achieve at least 10,000 MW of distributed solar by 2030. In January 2022, Governor Hochul directed DPS and NYSERDA to update New York State's Energy Storage Roadmap to double deployment, reaching at least 6 gigawatts of energy storage by 2030.

The Climate Act's provisions are comprehensive and expansive. Other notable directives include:

- **Climate Action Council.** The 22-member Climate Action Council[30] is comprised of representatives from 12 State agencies and authorities and several members appointed by the Governor and Legislature. The Climate Act established the Council and charged it with developing an economy-wide Scoping Plan to provide recommendations to achieve the Climate Act emission targets. To inform the plan, the Council was directed to convene several advisory panels to provide expertise on topics such as transportation, power generation, and energy-intensive and trade-exposed (EITE) industries. The Climate Act also directed the Council to convene a Just Transition Working Group to identify sites of electric generating facilities that could face closure due to the transition to a clean energy sector and to advise the Council on issues and opportunities related to workforce development with additional considerations for DACs, EITE entities, and impacts to State and local economies.

- **Climate Justice Working Group (CJWG).** The Climate Act established the CJWG within DEC, comprised of representatives from environmental justice communities and State agencies.[31] Under the Climate Act, the CJWG was tasked with defining what constitutes a DAC in New York State. Based on criteria that were adopted by the CJWG on March 27, 2023, 35 percent of census tracts in the State are defined as DACs.[32]

- **Community Air Monitoring Program.** In accordance with the Climate Act, DEC undertook a significant community air monitoring initiative. While the Climate Act required monitoring in no less than four DACs, the State expanded this effort to ten DACs to identify sources contributing to disproportionate air pollution burdens. DEC and community stakeholders will develop strategies to reduce air pollution in these communities, including GHG emissions that contribute to climate change, with the goal of implementing these strategies statewide. [33]

- **Investments in DACs.** The Climate Act acknowledges that DACs bear disproportionate and inequitable impacts from climate change. In response, it establishes mechanisms to ensure these communities benefit from the clean energy transition envisioned by the Climate Act. This includes provisions that at least 35 percent of the overall benefits from spending on clean energy and energy efficiency programs are directed to these communities, with a goal of reaching 40 percent.[34]

5.2. Scoping Plan and State Energy Plan

The Climate Action Council finalized the Scoping Plan in 2022, outlining recommendations to meet the statewide GHG emission targets and achieve economy-wide net-zero targets.[35] While the Scoping Plan

[30] ECL § 75-0103.
[31] ECL § 75-0111.
[32] New York State Disadvantaged Communities Criteria. 2023.
[33] ECL § 75-0115.
[34] ECL § 75-0117.
[35] ECL §§ 75-0103(11)-(14).

mainly focused on strategies to reduce GHG emissions across all sectors of the economy, it also introduced innovative approaches to address the systemic risks posed by climate change. Additionally, the Plan emphasized the need to address the disproportionate impacts on DACs. The final Scoping Plan was shaped by ongoing Council deliberations and extensive public input. In accordance with the Climate Act, the Plan will be updated at least every five years.[36]

The current State Energy Plan was amended in 2020 to align with the new energy and emissions targets outlined in the Climate Act. The Climate Act requires that the Scoping Plan and its recommendations inform the subsequent State Energy Plan.

5.3. Other Mitigation Policies and Goals

Aside from the Climate Act, State leaders have advanced a variety of policies to target energy-related emissions via legislation, executive action, and regulatory measures.

5.3.1. Electricity Sector

The Regional Greenhouse Gas Initiative (RGGI) was established in 2005, becoming the first mandatory market-based emissions trading program in the United States to reduce CO_2 emissions, and the first anywhere to use the cap-and-invest model for reducing pollution.[37] New York and other RGGI-participating states set a regional cap on total CO_2 emissions from electric generation facilities and implement the program through their own regulations. The regionwide RGGI cap declines over time, gradually lowering CO_2 emission limits. Revisions made in 2020 further reduce the CO_2 emissions cap by 30 percent through 2030 and expand applicability to peaking units. On July 3, 2025, RGGI-participating states agreed to strengthen their regional CO_2 emissions cap through 2037, starting in 2027, and to establish new mechanisms to protect energy affordability.

DEC has been permitting and regulating emissions of co-pollutants from power plants for over 50 years. DEC regulates new, modified, and non-modified existing major electric generating facilities under Part 251, which created CO_2 emission rate limits. The 2019 revisions to this regulation were critical to ensuring the State fulfilled its commitment to eliminating coal from the electric generation sector by 2020 and that any new or modified sources comply with stringent CO_2 emissions standards.[38] DEC's subpart 227-3, often called the "Peaker Rule," established ozone season nitrogen oxide (NO_x) emission limits for simple cycle and regenerative combustion turbines.[39]

Enacted in 2020, the Accelerated Renewable Energy Growth and Community Benefit Act established a first-in-the-nation Office of Renewable Energy Siting and Electric Transmission (ORES) to dramatically speed up the siting and construction of clean energy projects by improving and streamlining the process for the environmentally responsible and cost-effective siting of large-scale renewable energy projects across New York.[40] The 2024 Renewable Action through Project Interconnection and Deployment Act

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[36] ECL § 75-0103(15).
[37] DEC 6 NYCRR Part 242 Regulations and NYSERDA 21 NYCRR Part 507.
[38] DEC 6 NYCRR Part 251 Regulations.
[39] DEC 6 NYCRR Subpart 227-3 Regulations.
[40] Chapter 58 of the Laws of 2020.

(the "RAPID Act") consolidated the environmental review, permitting, and siting of major renewable energy facilities and major electric transmission facilities[41] under the purview of ORES.[42]

In 2020, the PSC implemented key provisions to align the CES and Offshore Wind Standard with the Climate Act and provide NYSERDA with the authorization to procure the renewable energy needed to meet emission reduction targets. These provisions included increased renewable procurement targets, the adoption of the 9,000 MW offshore wind procurement directive, and new initiatives that aid in the delivery of renewable energy to New York City.[43] The CES also includes the Tier 2 Maintenance Resource program, which is an important mechanism to keep existing renewable facilities operational.

The 2023-24 Enacted State Budget authorized the New York Power Authority (NYPA) to plan, design, develop, finance, construct, own, operate, maintain, and enhance renewable energy generation projects in order to ensure a reliable and sufficient supply of electricity and to advance New York State's renewable energy targets as outlined in the Climate Act.

New York State has already made significant progress in reducing emissions from the electricity sector including investing in energy efficient technologies that are saving New Yorkers money, installing six gigawatts of distributed solar, completing South Fork Wind, and breaking ground on the Champlain Hudson Power Express, Empire Wind 1, and Sunrise Wind. Governor Hochul has taken additional action by directing the New York Power Authority to develop and construct at least one advanced nuclear energy power plant – the first new nuclear power construction in New York State in a generation.

5.3.2. End-Use Sectors

Energy emissions expand well beyond those associated with the electricity sector. Policymakers have advanced a wide breadth of cross-cutting measures that target building, transportation, and industrial sector emissions.

To address building sector emissions, recent policy measures aim to update building codes and support adoption of alternatives to fossil fuels. These include policies to support energy efficiency and GHG reduction strategies, weatherization, and utility thermal energy networks, including district geothermal and other community-scale thermal infrastructure projects, for heating and cooling homes.[44] Recent policy updates support expanded appliance standards and changed building code law to permit climate-friendly refrigerant alternatives,[45] while the All-Electric Buildings Act restricts the installation of fossil-fuel equipment and systems in new constructions, offering flexibility to ensure a safe, affordable, and practical transition.

DEC recently adopted regulations to limit the venting of fossil natural gas and establish rigorous leak detection and repair requirements. The regulation reduces methane and volatile organic compound

[41] Chapter 56, part QQ, of the Laws of 2023.
[42] Chapter 58 of the Laws of 2024.
[43] New York State Department of Public Service. "Case 15-E-0302, Implementation of a Large-Scale Renewable Program and Clean Energy Standard, Order Adopting Modifications to the Clean Energy Standard." Issued October 15, 2020.
[44] Chapter 375 of the Laws of 2022.
[45] Chapter 374 of the Laws of 2022.

(VOC) emissions from sources in New York's oil and natural gas sector and is expected to cut methane emissions by 1.2 million metric tons of CO_2e.[46]

In the transportation sector, policies largely encourage adoption of zero-emission vehicles (ZEVs) through tax credits and rebates, as well as funding mechanisms to cover installation costs of new charging infrastructure and support municipal fleet transitions. New York State also has adopted regulations that require automakers of passenger vehicles and medium- and heavy-duty vehicles to sell an increasing percentage of ZEVs in the State over time.[47] New York's ability to implement and enforce these Advanced Clean Cars 2 and Advanced Clean Trucks rules, however, is currently subject to litigation challenging the federal government's attempt to revoke the federal preemption waivers for these rules using the Congressional Review Act.[48,49] New York State has established an interagency working group focused on the successful implementation of the clean vehicle transition and enhancing existing efforts to build out electric vehicle charging infrastructure. New York State also is a member of the U.S. Climate Alliance Affordable Clean Cars Coalition. For more information, see the Transportation Chapter of this Plan.

Many policy measures mitigate emissions from multiple economic sectors. In 2024, DEC adopted two new regulations to address emissions of fluorinated gases, a particularly potent type of GHGs, which will primarily reduce emissions from refrigeration and air-conditioning equipment and electricity transmission and will support a transition to climate-friendly alternatives.[50,51] The 2010 State Smart Growth Public Infrastructure Policy Act requires that public infrastructure projects align with certain smart growth criteria.[52] New York voters also prioritize climate change mitigation, having approved the $4.2 billion Clean Water, Clean Air, and Green Jobs Environmental Bond Act (the "Bond Act") to support the implementation of the Climate Act, funding GHG mitigation projects, and other initiatives including flood risk reduction and resilient infrastructure projects. Like the Climate Act, the Bond Act requires that DACs receive at least 35 percent of the fund benefits, with a goal of 40 percent.[53] The FY 2026 State budget includes the $1 billion Sustainable Future Program, the largest single State Budget commitment to climate and clean energy in New York's history. The program provides targeted funding to lower emissions, reduce household energy costs, and spur green job growth.[54]

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[46] DEC 6 NYCRR Part 203 Regulations.
[47] DEC 6 NYCRR Part 200 and Part 218 Regulations.
[48] New York State Attorney General's Office, "Attorney General James Sues Trump Administration for Unlawfully Stripping New York of Clean Vehicle Protections," June 12, 2025, https://ag.ny.gov/press-release/2025/attorney-general-james-sues-trump-administration-unlawfully-stripping-new-york.
[49] New York relies on three Clean Air Act waivers from the U.S. Environmental Protection Agency (EPA) to enforce its clean vehicle programs. These EPA waivers were previously granted to California and then New York adopted these same standards under federal law, which allows states to follow California's more protective emission rules.
[50] DEC 6 NYCRR Part 494 Regulations.
[51] DEC 6 NYCRR Part 495 Regulations.
[52] Chapter 433 of the Laws of 2010.
[53] ECL § 58-1101.
[54] Governor Hochul Announces Historic Investments to Secure a Sustainable Future for All New Yorkers and Support Our Agriculture Industry as Part of the FY 2026 Budget. https://www.governor.ny.gov/news/governor-hochul-announces-historic-investments-secure-sustainable-future-all-new-yorkers-and

5.4. Adaptation and Resilience Actions

In an effort to build systems capable of withstanding and recovering quickly from climate hazards while maintaining reliability, in 2022 Governor Hochul signed legislation that required the major utility corporations in the State to conduct a Climate Change Vulnerability Study (CCVS) and a Climate Change Resilience Plan (CCRP).[55] This requires these utilities to evaluate infrastructure, design specifications, and operational processes that are at risk from climate change[56,57,58] and must include measures to improve system hardness, as well as reduce outage time and restoration costs over 5-, 10-, and 20-year time horizons. Utilities must also propose adaptation measures that would improve equity and reliability. In December 2024, the PSC acted on the first iteration of the CCVSs and CCRPs and recognized the utilities' climate resilience plans will need to be updated every five years, with ongoing engagement with stakeholders, and will be subject to approval by the PSC.[59]

Incorporating input from over 29 agencies and authorities, DEC and NYSERDA recently published an Extreme Heat Action Plan (EHAP) to help New Yorkers respond to more frequent and intense extreme heat events driven by climate change.[60] EHAP includes 49 discrete actions that the State plans to take to support statewide adaptation and resilience to extreme heat and centers New York's most vulnerable communities. Many EHAP recommendations focus on planning and implementing adaptation and resilience measures within infrastructure and built environments statewide. Key priorities include expanding access to cooling centers, supporting weatherization and thermal resilience, developing model laws and planning standards, and enhancing protections for worker health and safety. EHAP recognizes the critical and increasingly important role that grid reliability and grid resilience have in ensuring the health and well-being of New Yorkers in extreme heat emergencies.

The New York Community Risk and Resiliency Act (NYCRRA) was signed into law in 2014[61] to improve New York's resilience to rising sea levels and extreme flooding. NYCRRA directs the Department of Environmental Conservation to adopt sea level rise projection regulations and to update these projections at least every five years. 6 NYCRR Part 490, Projected Sea Level Rise, was adopted using data from the 2014 ClimAID report and was updated in 2024 using projections from the latest NYSCIA. It establishes statewide sea-level rise projections for use in the consideration of permits and other decision-making processes specified under NYCRRA. Additionally, several guidance documents were

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[55] New York State Public Service Commission. (2022). PSC directs utilities to conduct climate vulnerability studies. https://dps.ny.gov/system/files/documents/2022/10/psc-directs-utilities-to-conduct-climate-vulnerability-studies.pdf

[56] Assembly Bill 3360, New York State Assembly, 2021–2022 Legislative Session (2021). https://www.nysenate.gov/legislation/bills/2021/A3360

[57] New York Senate Bill S4824A, New York State Senate, 2021–2022 Legislative Session (2021). https://www.nysenate.gov/legislation/bills/2021/S4824

[58] New York State Department of Public Service. (n.d.). 22-E-0222. Retrieved May 23, 2023, from https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=67333&MNO=22-E-0222

[59] Case 22-E-0222, Proceeding on Motion of the Commission Concerning Electric Utility Climate Vulnerability Studies and Plans, Order Regarding Electric Utility Climate Change Resilience Plans (issued December 19, 2024).

[60] *Extreme Heat Action Plan*. New York State. 2024.

[61] Chapter 355 of the Laws of 2014.

developed to support the implementation of NYCRRA,[62] including State Flood Risk Management Standards, Model Local Laws for Resilience, and the use of Natural Resilience Measures to Reduce Risk of Flooding. The Climate Act expanded the scope of NYCRRA to incorporate additional climate hazards, cover additional projects and permitting programs, and allow State agencies and other entities to require mitigation of climate risks, including adverse impacts on DACs.[63]

To help put many of these strategies into action New York also launched the "Green Resiliency Grant" program, that supports transformative infrastructure projects in various flood prone communities across the state.

6. Looking Ahead

While climate change reveals the vulnerabilities of New York's existing energy infrastructure, it also presents an opportunity to identify new strategies that can support the development of a climate-resilient energy system. Uncertainties remain on both the demand and supply sides of the electricity system, including renewables' sensitivity to climate change, and the need for new technologies, infrastructure, and operations. Ensuring a reliable energy supply and delivery will require diverse solutions such as investments in new energy infrastructure, hardening of current energy infrastructure, new business models, and demand-side management programs.

Coordinating efforts to mitigate GHG emissions while adapting to our changing climate can also offer additional opportunities and benefits. Direct resilience benefits of the State's GHG reduction commitments include enhanced building resilience, availability of backup power in storm events, job opportunities, air quality improvements, and reduced energy costs. It also provides an opportunity to address social injustices in the energy system as the State invests in cleaner energy sources.

6.1. Greenhouse Gas Mitigation Strategies

Patterns of energy demand are shifting due to climate change and will continue to evolve as the State decarbonizes and electrifies sectors that historically rely on fossil fuels. GHG mitigation policies discussed earlier in this chapter, such as clean transportation requirements and zero-emission building codes, will increase electricity demand and thereby increase the amount of renewable electric generating capacity needed to meet the Climate Act targets. Altered demand patterns driven by climate change, such as a shift in peak demand from summer to winter, can strain energy supply and delivery and could result in higher energy prices and greater risk of damage to infrastructure.

The Scoping Plan has outlined detailed recommendations that can be implemented in the energy sector to mitigate GHG emissions and support a gas system transition, many of which have been incorporated into this plan. Load flexibility and controllability will play a vital role in the development of a more manageable electric grid that will accommodate the large volume of renewable energy being procured and developed in pursuit of the Climate Act targets. Statewide upgrades to transmission and distribution systems will be needed, including specific investments to deliver energy from where the generation is

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[62] DEC, *Community Risk And Resiliency Act (CRRA)*, accessed July 5, 2025, https://dec.ny.gov/environmental-protection/climate-change/new-york-response/crra.

[63] Climate Act § 9.

located to where demand exists. The PSC will conduct biennial reviews to update and refine Clean Energy Standard policies, ensuring that program requirements and procurement targets are aligned with the 2030 and 2040 emission reduction targets while safeguarding the future of the existing renewable energy infrastructure.

Fortunately, actions that mitigate GHG emissions in the energy system often have the added benefit of improving resiliency, reliability, and affordability. For example, energy efficiency measures in buildings typically reduce GHG emissions by lowering energy consumption. This, in turn, decreases the overall demand on backup energy services, thereby enhancing energy resilience. On a large scale, homes with efficient building envelopes can significantly reduce electricity demand, which helps prevent generator failure during emergency events. Targeted, reliability-focused energy efficiency programs can reduce emissions while enhancing electric grid reliability. One study found that such programs, implemented over a single summer in California, saved approximately 700 MW of capacity and 1,700 GW-hours of energy over the following year.[64] Building envelope improvements also enhance the ability of the structure to maintain comfortable and safe conditions during extreme weather conditions and power outages.

6.2. Adaptation and Resilience Strategies for New York's Energy Systems

As described above in Section 4.1, adaptation and resilience strategies will play an important and distinct role in developing a safe, reliable, and flexible energy system that can withstand the challenges and uncertainties of increased climate impacts, changing energy demands, and a growing reliance on emissions-free electricity supply sources.

Solutions such as demand-side behavior changes, operational adjustments, investments in system capabilities and capacities, modified business models, and new technologies that are attuned to the changing energy system can moderate the effects of uncertainty due to climate change.

To encourage these solutions, the Scoping Plan includes recommendations for adaptation and resilience, outlining several strategies to build capacity and enhance resiliency in communities, infrastructure, and living systems. Several of these recommendations specifically guide energy system adaptation and resiliency planning, including periodically revising existing energy system resilience standards and developing strategies for grid outages and extreme weather events.

The Climate Change Adaptation Cost Recovery Program was signed into law in 2024 to support projects that bolster New York's resiliency to climate impacts. The legislation aims to shift the cost of climate adaptation to the fossil fuel companies most responsible for the pollution by creating a "Climate Superfund." The law, which is currently the focus of litigation, directs investments to fund climate change adaptive infrastructure projects, which may include energy efficiency upgrades and electric grid upgrades that help increase stability and resilience, including the creation of self-sufficient clean energy microgrids.[65]

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[64] Frick, N. M., Carvallo, J. P., & Schwartz, L. C. (2021). Quantifying grid reliability and resilience impacts of energy efficiency: Examples and opportunities. Lawrence Berkeley National Laboratory. https://doi.org/10.2172/1834369

[65] Chapter 679 of the laws of 2024.

The State is also currently developing a statewide adaptation and resilience plan (NYSARP). This effort will establish the vision, principles, and actions to adapt and prepare for extreme weather events and other climate impacts to New York's communities. The results of the NYSARP initiative will equip the State and its local partners to equitably adapt to and prepare for climate change, create consistency and shared direction, and foster collaboration across regions and sectors, including the energy sector.

Examples of adaptation strategies that may increase resilience of the energy system are below.

6.2.1. Supply

Plans and policies have already started to incorporate future climate change in ways that will increase the resilience of the energy supply and generation system. For example, at the direction of the Department of Public Service, the State's electric generation utilities have undertaken climate change vulnerability studies and adaptation plans specific to their operations and assets. The New York Independent System Operator (NYISO) has incorporated climate projections into its planning and electric demand activities and is exploring new and updated approaches for valuing flexibility and responsiveness of the grid, which would improve resilience to climate hazards.

6.2.2. Delivery

Key stakeholders in the electricity sector acknowledge and agree that the electricity grid and its components require improvements in system adaptability and resilience in the face of projected climate hazards. This can be accomplished through the incorporation of new and innovative techniques that enable more reliable and flexible energy delivery processes. Examples include creating vulnerability curves and risk heat maps, identifying and prioritizing adaptation measures for investments, evaluating grid-impact models, conducting asset mapping and processing physical event data, and implementing intervention actions that reduce GHG emissions.[66] The New York State Reliability Council (NYSRC) has also begun to study extreme weather transmission planning criteria in response to a noticeable increase in the frequency and severity of extreme weather events and its impact on the power grid.[67] After Superstorm Sandy, a workshop was held that explored electric system-related challenges that occurred during extreme events and potential opportunities to address them. The workshop identified several technologies that could improve resilience and reliability of the grid, including advanced meter infrastructure; control and data acquisition systems for power lines; line sensors and smart relays; and management systems for energy, distribution, outages, and enhanced automated mobile work. [68]

[66] D'Aprile, P., Geissmann, T., López, F. P., González, J. R., & Tai, H. (2021). How to increase grid resilience through targeted investments. McKinsey & Company. https://www.mckinsey.com/~/media/mckinsey/industries/electric%20power%20and%20natural%20gas/our%20insights/how%20to%20increase%20grid%20resilience%20through%20targeted%20investments/how-to-increase-grid-resilience-through-targeted-investments-vf.pdf.

[67] New York State Reliability Council. (2022). Development of NYSRC rules for mitigating extreme system conditions. https://www.nysrc.org/PDF/Documents/Extreme%20Conditions%20White%20Paper%20-%20EC%20Approved%20%207-8-22.pdf.

[68] The GridWise Alliance. (2013). Improving electric grid reliability and resilience: Lessons learned from Superstorm Sandy and other extreme events. https://www.energy.gov/sites/prod/files/2015/03/f20/GridWise%20Improving%20Electric%20Grid%20Reliability%20and%20Resilience%20Report%20June%202013.pdf

Redundant communication systems and smart meters can offer improvements in grid recovery speed, and microgrids can build resilience by acting as an emergency power option in the event of an outage from the primary energy source. [69]

6.2.3. Demand

To manage electricity demand during periods of high-grid-stress events, traditional hardening and adaptation techniques can prepare the grid in advance and can also provide backup power in the event of an outage. An example of traditional hardening techniques includes strategic flood protection measures for critical energy infrastructure, like substations. Distributed energy solutions, such as distributed solar, can also help manage demand in these periods and support reliability by reducing the overall need for electricity from the grid. Combining these distributed energy systems with storage can improve energy system resiliency by providing backup power that supports grid operations. These systems can support individual buildings or customers during outages and can also offer cost savings during high-demand hours if customers store energy for later use.[70] Climate modeling can also play a key role in energy demand resiliency. By incorporating climate models into load forecasting models, utilities can be better equipped to build additional system capacity, develop redundant systems, or incorporate energy storage solutions in preparation for peak demands that could occur during low-likelihood climate events.

6.2.4. Overarching Adaptation Considerations

Strategies aimed at other sectors can positively impact the energy sector, and vice versa. For instance, reducing the heat island effect to lessen the health impacts of extreme heat can also lower energy demand for cooling. Resilience and adaptation strategies for buildings, such as passive cooling, will reduce demand and strain on the energy system. These types of cross-sector strategies are important, as they can result in significant co-benefits. Similarly, coordination and collaboration across sectors, organizations, and jurisdictional levels is critical for effective adaptation and resilience to ensure a holistic approach.

It is imperative that energy inequities be addressed as part of a holistic adaptation and resilience strategy. Existing energy disparities will only be exacerbated by climate change, and vice versa. Strategies such as workforce development in the renewable energy space, increasing energy affordability, and expanding new energy technologies with a focus in vulnerable and DACs can help reduce energy-related inequities and thereby reduce the potential for climate change to worsen these conditions.

6.2.5. Local and Regional Planning and Implementation

Municipalities in New York have broad authority to enact local laws and regulate land use and zoning. Local governments can pass laws on zoning and land use, local services (like fire and police), environmental regulations, public health and safety, and administration and structure of local

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[69] U.S. Department of Energy. (2017). Transforming the nation's electricity system: The second installment of the QER (Quadrennial Energy Review). https://www.energy.gov/sites/prod/files/2017/02/f34/Quadrennial%20Energy%20Review--Second%20Installment%20%28Full%20Report%29.pdf

[70] Dyson, M., & Li, B. X. (2020). Reimagining grid resilience: A framework for addressing catastrophic threats to the U.S. electricity grid in an era of transformational change. Rocky Mountain Institute. http:// www.rmi.org/insight/reimagining-grid-resilience

government. Generally speaking, municipalities can undertake planning processes to determine their vision for the future, typically in the form of a comprehensive plan, though permitting for major renewable energy facilities is handled at the State level and may supersede local zoning and land use regulations. Comprehensive plans may include specific recommendations to address climate vulnerabilities, but other planning processes can also reflect local considerations of climate risk. For example, a local hazard mitigation Plan or a standalone climate adaptation and resilience plan can also serve this purpose. These planning processes benefit immensely from an actively engaged public. Local knowledge and experiences with climate and extreme weather impacts can lead to identification of equitable and effective adaptation and resilience solutions. State programs, such as the Climate Smart Communities Program, the Department of State's Smart Growth program, and NYSERDA's Clean Energy Communities program, can support municipalities as they navigate both planning and implementation. Regional planning occurs in New York State through collaborative governance, which involves the coordination among local governments, regional planning councils, and State agencies (see the Smart Growth and the Local, Regional, and Federal Government Collaboration chapters of this Plan for more information). There are many common intermunicipal issues that can be solved with regional planning, such as regional cooperation for economic development and solid waste facilities. Regional planning is important to ensure that resilience measures implemented by one municipality are not detrimental to another (e.g., ensure that flood mitigation measures do not negatively affect downstream localities).

7. Themes and Recommendations

7.1. Research Needs

The NYSCIA revealed gaps in knowledge that could be valuable to fill in the years ahead. Research will be needed to better understand how climate change will impact the State and its energy system, as well as identify and progress development and implementation of new solutions for adapting to future climate conditions.

Recommendations

- **NYSERDA should undertake additional research on climate hazards with higher uncertainty,** such as changes in wind conditions, storm intensity, winter weather, and changes in extreme precipitation, along with the resultant impacts on the energy system. For example, the impact of climate change on winter weather conditions as they pertain to New York's energy systems will require additional research, modeling, and monitoring, such as research on the effects of less snowfall and earlier snowmelt on hydropower generation and the impact of warmer weather on residential energy use. The impact of climate change on natural gas demand will also require additional research and monitoring.
- **NYSERDA should conduct research on the performance and effectiveness of emerging resilience and adaptation technologies for the energy system,** particularly under changing climate conditions. For example, more research should be conducted on battery storage, including performance under various conditions, both current and future, and how battery storage may affect overall electric system reliability and resilience under these different conditions. Additional research is also needed to explore the effectiveness of hydrogen

production, storage (including long-duration energy storage technologies), transportation, and end uses; this includes market research to examine the potential hydrogen economic development opportunities and research into reduction of NO_x emissions from hydrogen combustion.

7.2. Overarching Considerations

Several themes emerged that are not specific to a particular sector of the energy system. These overarching actions will be important for ensuring an efficient and just transition to a more resilient energy system.

Recommendations

- **The State should continue to coordinate efforts to mitigate GHG emissions with efforts to adapt to the changing climate.** For example, the State should use statewide climate plans, particularly the Climate Action Council Scoping Plan, the EHAP, and the upcoming New York State Adaptation and Resiliency Plan, to inform a coordinated set of strategies aimed at achieving State GHG mitigation targets and building climate resiliency. DEC and NYSERDA, along with other State agency partners, should continue to elicit feedback from key stakeholders and from the public to inform climate plan development and future updates, and should ensure plans incorporate the latest climate science and GHG emissions data.[71] Recommendations across plans should be distinct, actionable, and complementary. Outreach and education efforts to advance clean energy adoption should include resilience benefits alongside GHG reduction and energy savings benefits. The State should consider demand-side interventions for business and consumers that encourage energy use behavior change which could moderate the effects of uncertainty due to climate change and align with the forecasted changes in the energy system.

- **The State should identify and implement actions and policies that reduce the disproportionate impacts of climate change resulting from unequal distribution of energy system burdens and benefits.** Actions and policies should be identified that reduce the disproportionate distribution of energy system burdens, such as through clean energy workforce training, job development, and regional economic transition for communities that have historically relied on the fossil fuel industry as a main source of employment, as well as energy assistance and weatherization programs focused on DACs. Likewise, the State should ensure that the benefits of transitioning to a clean and resilient energy system are distributed to these communities, such as clean technology deployment and resilience measures such as green infrastructure. The State should facilitate meaningful participation in energy system decisions, particularly in these DACs.

- **The State should ensure that climate change is considered in all aspects of the energy system, including planning, infrastructure, and program design.** For example, existing energy infrastructure should be hardened against both current extreme weather and future climate change impacts, particularly where infrastructure cannot be relocated, and system redundancies

[71] Primary sources for climate projections and statewide emissions should include the latest New York State Climate Impacts Assessment (NYSERDA) and the Statewide Greenhouse Gas Emissions Report (DEC).

should be expanded where necessary to ensure resilience to climate change. Climate resilience considerations should be incorporated where feasible into clean energy programs—for example, energy storage deployment efforts and incentives, including considerations for system sizing and siting (such as siting storage out of floodplains where feasible and sizing storage capacity to support critical functions for a set period in times of outage or emergency). When siting renewables, climate risks should be considered over the anticipated useful life of the assets.

- **The State should consider investing in energy-efficient, clean-energy resilience hubs, especially in DACs that are particularly vulnerable to climate change.** These community-serving facilities would serve as resource centers during climate and other emergencies and support year-round resilience services and ongoing programming to build community resilience and adaptive capacity. The State should ensure that such facilities are equipped with cost-effective onsite power systems, using renewable sources of energy to provide locally generated power and behind-the-meter storage, capable of reliably sustaining operations during an extended power outage.