Draft New York State Energy Plan for Public Comment
Summary for Policymakers

Draft New York State Energy Plan for Public Comment

Advancing abundant, reliable, affordable, and clean energy for New York

The New York State Energy Planning Board is pleased to publish for public comment and hearings the Draft New York State Energy Plan, which assesses meeting the state's future energy needs through 2040, in a manner that ensures energy system reliability, advances economy-wide decarbonization, and balances objectives around affordability, equity, the environment and climate change, public health, and economic development.

Public hearings on the Draft Plan will be held in the upstate and downstate regions, as well as via two virtual hearings, according to the schedule posted at: energyplan.ny.gov/Process/Public-Hearings.

Public Hearing Schedule

Date	Time	Location
Tuesday, 8/19/2025	2:00p.m.-4:00p.m.	Virtual
Wednesday, 9/3/2025	5:00p.m.-7:00p.m.	Buffalo
Thursday, 9/4/2025	11:00a.m.-1:00p.m.	Rochester
Wednesday, 9/10/2025	5:00p.m.-7:00p.m.	Albany
Tuesday, 9/16/2025	5:00p.m.-7:00p.m.	Hudson Valley
Wednesday, 9/17/2025	5:00p.m.-7:00p.m.	New York City
Thursday, 9/18/2025	11:00a.m.-1:00p.m.	New York City
Monday, 9/29/2025	5:00p.m.-7:00p.m.	Long Island
Tuesday, 9/30/2025	5:00p.m.-7:00p.m.	Virtual
See: energyplan.ny.gov/Process/Public-Hearings for venues		

1. Introduction

Energy is central to New Yorkers' lives. It powers the economy, keeps homes and workplaces comfortable, moves people and goods, and runs critical infrastructure. New York is one of the most energy-efficient states in the nation based on energy use per person and state economic output.[1] Additionally, our power grid is becoming cleaner. Roughly half of New York's in-state electricity generation comes from zero-emission sources,[2] and renewable generation projects that are in the pipeline today would double the state's renewable generation by 2030.[3] Yet, like the rest of the country, New Yorkers face volatile energy prices, intensifying extreme weather, and environmental and health impacts associated with reliance on fossil fuels and aging fossil fuel infrastructure. These shared concerns do not affect all communities equally. Low-income households and otherwise disadvantaged communities are disproportionately impacted by energy cost burdens and by community and environmental health concerns like water and air pollution.[4] Disadvantaged communities also face significant barriers to accessing clean energy choices.[5]

The State Energy Plan provides broad program and policy development direction to guide energy-related decision-making in the public and private sectors within New York State. New York's energy policy and programs support the transition to a cleaner energy system and a more productive economy that drives meaningful benefits to local communities. State actions will also help New Yorkers to manage their energy costs and to equitably participate and share in the benefits of our clean energy future. These are all goals that the State can meet, without sacrificing one for another.

The New York State Energy Planning Board is pleased to publish for public comment and hearings the Draft New York State Energy Plan ("Draft Plan" or "Plan") and companion draft technical Chapters. Stakeholder engagement is an integral component in this energy planning process, informing both the scope of the proceeding and the development of the plan.

Note: To inform the Draft Plan, a "Pathways Analysis," which models multiple scenarios for future energy pathways for New York, as well as quantitative analyses of the impacts of the plan on jobs, public health, and household energy affordability were completed in June 2025 based on assumptions set in March 2025. These analyses do not reflect more recent State policy updates or the federal policy environment as of summer 2025. The final State Energy Plan will include a range of updates to the analyses, including to federal tax law and possibly changes to regulatory policies such as appliance and

[1] U.S. Energy Information Administration (EIA). "New York State Energy Profile: Analysis." EIA, January 2025. https://www.eia.gov/state/analysis.php?sid=NY

[2] Renewable and nuclear resources as of 2023. New York Independent System Operator (NYISO). *2024 Load & Capacity Data Report (Gold Book)*. NYISO, April 2024. https://www.nyiso.com/documents/20142/2226333/2024-Gold-Book-Public.pdf.

[3] Operating renewables and pipeline projects as of June 6, 2025 from Climate Act Dashboard: climate.ny.gov/dashboard.

[4] See the "Energy Affordability Impacts" chapter in this Plan on energy cost burden. On air pollution, see: Jbaily, Abdulrahman, Xiaodan Zhou, Jie Liu, Ting-Hwan Lee, Leila Kamareddine, Stéphane Verguet, and Francesca Dominici. "Air pollution exposure disparities across US population and income groups." Nature 601, no. 7892 (2022): 228-233. Also: Mohai, Paul, David Pellow, and J.T. Roberts. "Environmental Justice." Annual Review of Environment and Resources, Vol. 34 (2009): 405-430.

[5] NYSERDA, DEC, and NYPA. *New York State Disadvantaged Communities Barriers and Opportunities Report.* NYSERDA Report 21-35, December 2021. https://climate.ny.gov/-/media/Project/Climate/Files/21-35-NY-Disadvantaged-Communities-Barriers-and-Opportunities-Report.pdf.

vehicle efficiency requirements. These forthcoming updates are anticipated to have an impact on all analytic products, including the Pathways Analysis, the assessment of the impacts of the plan, and recommended State actions that are informed by these analyses.

The Energy Planning Board acknowledges that at the time of developing the Draft Plan, the energy sector faces significant uncertainty, stemming from economic pressures and, more recently, a shift in political priorities and policies at the federal level. These uncertainties impact long-term planning, investment decisions, and possibly the pace of transition to clean energy.

Like many industries, the energy sector has been impacted by the significant inflation experienced globally and in the United States, especially prevalent from mid-2021 to mid-2023. Multiple factors contributed, including the COVID-19 pandemic (declared from March 2020 to May 2023) and subsequent recovery and Russia's invasion of Ukraine in February 2022.[6] The pandemic led to disruptions in manufacturing, shipping, and labor availability. It also shifted consumer demand patterns; in New York, petroleum fuel use for transportation fell dramatically in 2020, with more modest declines in energy use in other sectors. As the economy and energy use recovered from late 2020 on, the combination of strong demand and ongoing supply chain bottlenecks led to upward pressure on prices. Russia's invasion of Ukraine triggered a sharp increase and volatility in fossil fuel prices, contributing further to inflation, as well as accelerating demand for clean energy technologies. These international dynamics interacted with preexisting factors in New York State, including infrastructure constraints, to yield periods of sharply elevated energy prices.

Consistent with broader energy sector trends, prices for some key clean energy technologies also rose globally in 2021 and 2022, due largely to higher input prices for critical minerals, semiconductors, and bulk materials like steel and cement.[7] In New York, offshore wind and other clean energy technologies continue to see elevated costs reflective of supply chain constraints and disruption, tight regional labor markets, and high interest rates.

The federal administration's energy and unpredictable tariff policies bring additional political and regulatory uncertainty, which threatens critical federal support for clean energy development and creates barriers to private investment. This includes the rollback of tax credits provided under the Inflation Reduction Act, planned denial of permits for wind generation, and attempts to remove state-based clean car and clean truck rules.

Inflation has helped to bring a renewed focus on affordability across all aspects of New Yorkers' lives, including energy costs. At the same time, the recent volatility in fossil fuel prices has highlighted the importance of clean energy investment and energy security measures.

[6] Vasquez, Leonardo. "Unpacking the Causes of Pandemic-Era Inflation in the US (Summary of NBER Working Paper 31417)." *The Digest,* National Bureau of Economic Research, September 2023. https://www.nber.org/digest/20239/unpacking-causes-pandemic-era-inflation-us

[7] International Energy Agency (IEA). *World Energy Investment 2023*. IEA, May 2023. https://www.iea.org/reports/world-energy-investment-2023

In this context, the Draft Plan examines long-term energy planning considerations and offers strategies and actions for New York to make an equitable and just transition to a modernized, clean energy system that is increasingly reliant on electricity, in a manner that supports reliability and resilience, affordability, quality of life, and economic growth. The Plan overall is driven by the State's commitment to plan for and advance:

- Abundant, reliable, resilient, and clean energy for New Yorkers;
- Affordable energy for households and equitable clean energy benefits;
- Economic growth and competitiveness;
- Innovation; and
- Continued progress toward decarbonization and a clean energy economy.

Successful implementation of the Plan, like other statewide plans, will require coordination across State agencies; partnership with other levels of government and communities; and the participation of private sector entities. New York State will build on our significant progress toward a clean energy economy, such as investing in energy efficient technologies that are saving New Yorkers money; installing over six gigawatts (GW) of distributed solar; completing South Fork Wind, and breaking ground on the Champlain Hudson Power Express, Empire Wind 1, and Sunrise Wind projects; and the $1 billion Sustainable Future Program, the largest single State Budget commitment to climate and clean energy in New York's history.

1.1. New York State Energy Planning Requirements

New York's Energy Law establishes a State Energy Planning Board to periodically develop and adopt a State Energy Plan.[8] In its consideration and development of State policies, programs, and other actions, the Energy Planning Board is guided by multiple goals and long-range energy planning objectives that are specified in the law. These include:

- Improving the reliability of New York State's energy systems;
- Protecting consumers from market price volatility and minimizing the cost of energy services;
- Minimizing public health and environmental impacts, in particular, environmental impacts related to climate change;
- Maximizing energy conservation, energy efficiency, and load management; and
- Supporting economic development and the ability of the state to compete economically.

Under Article 6 of the Energy Law, the State Energy Plan is to include an assessment of the ability of energy supply sources, together with the energy transmission and delivery systems, to meet forecasted

[8] Consolidated Laws of New York, Energy Chapter 17-A, Article 6 – Energy Planning. September 22, 2014. https://www.nysenate.gov/legislation/laws/ENG/6-102

energy demand for electricity and fuels for at least a ten-year period. For the current planning cycle, the Energy Planning Board decided to evaluate energy demand and supply through 2040. Furthermore, many components of this State Energy Plan dovetail with the planning requirements of the 2019 Climate Leadership and Community Protection Act (Climate Act), which set ambitious statutory targets to guide New York State's clean energy and climate agenda.

Clean Energy and Climate Targets Set by the Climate Act

Signed into law in July 2019, the Climate Leadership and Community Protection Act has laid the foundation for much of the work of State agencies tasked with contributing to the transition to a clean energy economy in New York. The Climate Act sets out targets to reduce economy-wide greenhouse gas (GHG) emissions 40% by 2030 and 85% by 2050, as well as the following sector-specific targets:

- *Zero-emission electricity system by 2040*
- *70% renewable electricity generation by 2030*
- *9,000 megawatts (MW) of offshore wind by 2035*
- *3,000 MW of energy storage by 2030*
- *6,000 MW of solar by 2025*
- *185 trillion British thermal units (Btu) of end-use energy savings in the buildings and industrial sectors*

The Climate Act requires that at least 35%—with a goal of 40%—of the benefits of clean energy investments are directed towards disadvantaged communities (DACs). This aims to make the energy transition inclusive and equitable, providing economic opportunities, job creation, and environmental benefits to communities that have historically been overburdened by pollution.

The Draft State Energy Plan is informed by the energy policy and program recommendations made in the 2022 *New York State Climate Action Council Scoping Plan*, an economy-wide climate action plan. It further builds upon and complements multiple established energy planning processes and recent State analyses, such as electricity sector grid planning, reliability needs assessment, and economic planning; winter reliability and long-term planning by gas distribution utilities; energy security and emergency planning; transportation planning; and a range of assessments for specific clean energy resources and technologies. Likewise, it integrates multiple recent and ongoing regulatory proceedings.

In synthesizing a large volume of energy-related information and analysis, the Plan provides a resource for both decision-makers and the general public. The Draft Plan further examines existing policies and recommends new actions, topics on which the Energy Planning Board invites public comment.

2. New York's Energy System Today

2.1. Energy Flows

The Energy Flow diagram[9] in Figure 1 shows the *primary energy sources* that comprise New York State's complex energy system and how those sources provide energy to end users. Electricity is considered a *secondary energy* source that is generated from primary energy sources such as natural gas, nuclear, and renewables. The major *end use sectors*—which include the transportation, residential, commercial, and industrial sectors—consume electricity from the electric power sector as well as energy from the on-site use of fossil fuels, bioenergy, and solar energy. The electric power sector is the state's largest user of primary energy, consuming 35 percent, followed by transportation (31 percent), residential and commercial buildings (29 percent), and industrial (5 percent), as of 2022.[10] Across sectors, approximately three-quarters of New York's primary energy use comes from fossil fuels, mainly natural gas (39 percent) and petroleum (36 percent).

The majority (64 percent) of primary energy used in New York State is lost or wasted during conversion from the primary energy source to a useful form such as space heat or powering an appliance. Energy losses in the form of waste heat are particularly large for fossil fuel combustion in electricity generation and in the transportation sector.[11] Opportunities to reduce waste in the energy system include transitioning away from combustion (because losses for these sources are particularly high), reducing transmission and distribution losses in energy delivery systems, capturing and reusing waste heat, and improving the energy efficiency of final end use.

[9] Data for Figure 1 and Sections 2.1 and 2.2 are sourced from "Patterns and Trends: New York State Energy Profile Dashboard." NYSERDA, updated in December 2024. https://www.nyserda.ny.gov/About/Publications/Energy-Analysis-Reports-and-Studies/Patterns-and-Trends. Primary data sources are the U.S. Energy Information Administration *State Energy Data System (SEDS)* and the NYISO *Load & Capacity Data Report (Gold Book)*.

[10] Including electricity consumed by each end-use sector, buildings consume 59%, transportation 32%, and industrial 9% of primary energy, as of 2022.

[11] In primary energy terms, renewable sources can appear smaller because they are diluted by the wasted energy that comes along with combustion.

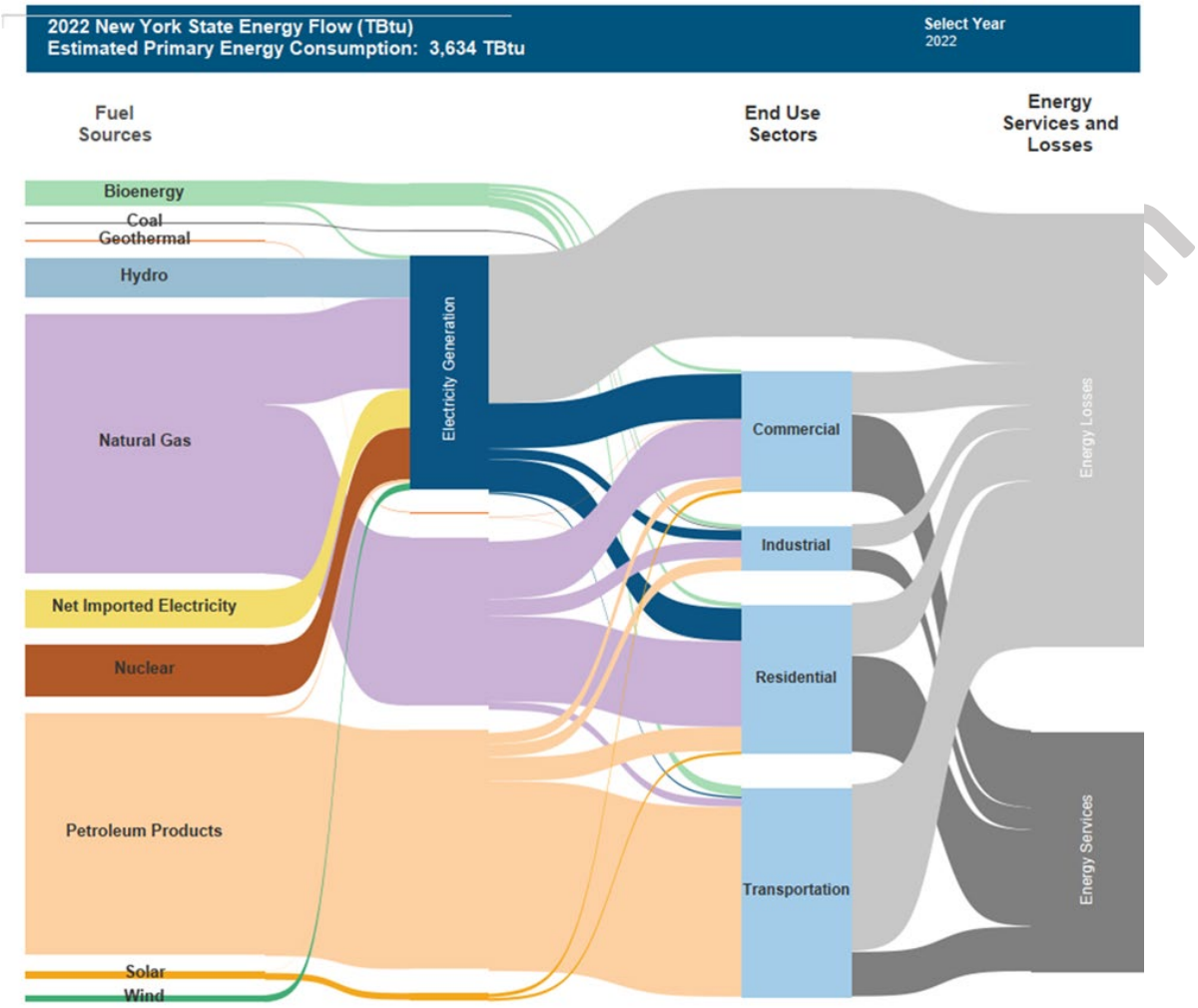

Figure 1. 2022 New York State Energy Flow – Estimated Primary Energy Consumption

2.2. Energy Consumption by Sector

Energy consumption also is measured based on the final (or end-use) energy that consumers buy and receive, such as electricity used in their home or business, heating fuel, or gasoline at the pump.[12]

As shown in Figure 2, New York consumes a significant amount of both natural gas and electricity to heat and power its residential and commercial buildings. Heating oil, a petroleum product, also is used for heating buildings. The transportation sector relies mainly on petroleum in the form of motor gasoline, aviation fuel, and diesel. The industrial sector draws on diverse energy sources to meet the unique demands of industrial processes, including natural gas, electricity, petroleum products, and biomass from process waste streams. A small amount of coal use is limited to the industrial sector, but coal is no longer used for electricity generation in the state.

[12] Since end-use energy consumption accounts for the energy that reaches the ultimate consumers in the residential, commercial, industrial, and transportation sectors, the data reported in Figure 2 exclude electrical system energy losses and include estimated electricity generated by customer-sited (or "behind-the-meter") solar.

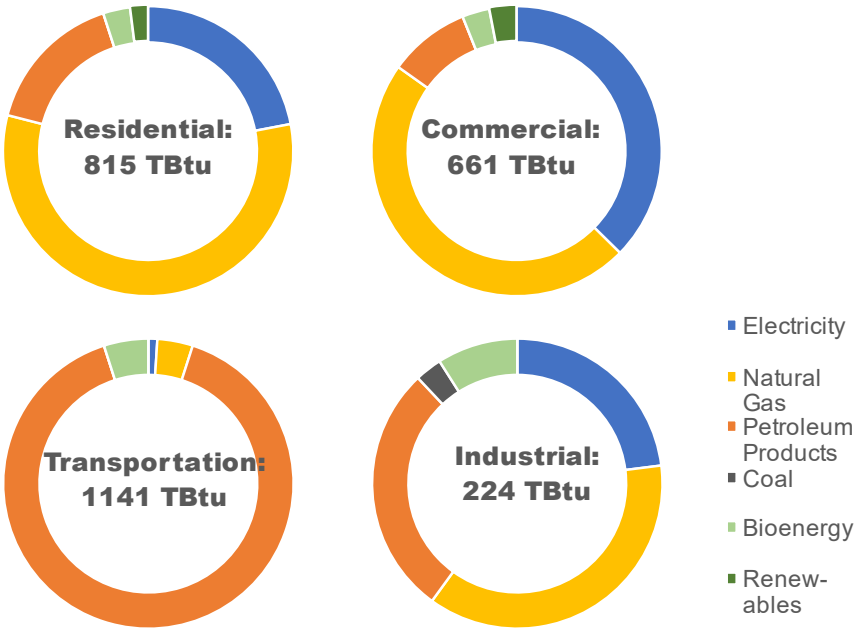

Figure 2. 2022 New York State Final Energy Consumption by Sector and Fuel

2.3. Energy Supply and Delivery

New York's energy supply and delivery systems are complex and critical infrastructure with multiple owners, operators, planning entities, and regulatory bodies operating in different regions and at different scales. New York State prioritizes robust oversight and planning for the reliable and safe operation of the electricity and natural gas systems, partners closely with industry participants in the delivered petroleum fuel sector and works to advance cross-sector energy security and emergency preparedness. In addition to the specific agency responsibilities described for each sector below, the New York State Research and Development Authority (NYSERDA) acts as New York State's Energy Office, supporting long-term planning activities, policy development and evaluation, energy technology research and deployment, energy assurance, and other key functions.

2.3.1. Electricity

New York's electric power grid is broadly divided into two components. The bulk system is a network of large generators connected to the high-voltage transmission system that transmits electricity over long distances. Distribution systems take power from the bulk system and deliver it directly to customers and their appliances.

In 2023, 27 percent of New York's in-state bulk electricity generation came from renewable sources, including hydroelectric, solar, and wind. Nuclear generation contributed another 22 percent. Combustion generation units, including natural gas, oil, biofuels, and solid waste generation produced 51 percent of in-state bulk electricity.

Multiple entities work together to ensure the reliable and safe operation of New York's electricity system:

- The Federal Energy Regulatory Commission (FERC) oversees the nation's natural gas and electric power markets, bulk power system operations, and utility system planning.
- The North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC) develop, evaluate, and enforce reliability standards approved by FERC.
- The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, and conducting long-term planning for the state's electric power system. The New York Control Area (NYCA) is the area of the electric power system under the operational control of the NYISO.
- The New York State Reliability Council (NYSRC) develops reliability rules specifically for the NYISO and parties that transact on the state's power system.
- The New York State Public Service Commission (PSC) regulates generation and transmission siting and electric, gas, steam, telecommunications, and water utilities statewide. The PSC is responsible for ensuring that utilities provide safe and adequate service at just and reasonable rates and that utility planning, investments, and operations align with state policy goals. The Department of Public Service (DPS) is the staff arm of the PSC.
- The New York Power Authority (NYPA) is the largest state public power organization in the nation, operating 17 generating facilities as well as transmission lines. NYPA supplies low-cost electricity to a statewide customer base, which includes businesses, not-for-profit organizations, community-owned electric systems and rural electric cooperatives, and government entities.
- New York's electric utilities provide electricity to consumers across the state. Six investor-owned utilities and one large municipal utility, the Long Island Power Authority (LIPA), provide electric service to the majority of New Yorkers. There are also forty-seven municipal electric systems and four rural electric cooperatives that buy hydropower from NYPA.

2.3.2. Natural Gas

New York's natural gas system is physically and financially connected to a broader regional, national, and international market for natural gas and infrastructure for natural gas supply and delivery. New York is not a major producer of natural gas, so its supply mostly comes from imports delivered through a network of interstate transmission pipelines. The supply pipelines that serve New York primarily draw from production and storage areas to the southwest (PA, WV, OH, and Gulf states) with some coming from the north (Alberta, Ontario). Gas utilities are responsible for delivering gas to end-use customers through their gas distribution networks.

The natural gas system is broadly divided into three stages or components. The upstream stage is where natural gas is extracted from the ground. The midstream stage is where natural gas is transported

through large-diameter, high-pressure interstate transmission lines from production areas to demand centers. The midstream stage also includes large-scale natural gas storage. The downstream or distribution stage is where natural gas is delivered via lower-pressure distribution pipelines to homes, businesses, and industrial users by distribution utilities.

Multiple entities work together to ensure the safe and reliable delivery of natural gas to New York residents and businesses. At the federal level:

- FERC regulates interstate pipeline siting and transportation rates.
- The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates interstate pipeline operations and maintenance with support from DPS.
- The U.S. Environmental Protection Agency (EPA) plays a role in regulating the environmental impacts of natural gas operations such as methane emissions.

At the State level:

- The PSC regulates gas distribution systems and the utilities that own and operate them, consistent with the responsibilities noted above for the electricity system.
- The New York Division of Homeland Security and Emergency Services (DHSES) and DPS are responsible for winter preparedness and emergency response.
- The New York State Department of Environmental Conservation (DEC) regulates the environmental impacts of natural gas operations and pipelines including through air and water quality standards.
- New York's gas utilities provide gas to consumers. Eight investor-owned utilities and several small distribution companies and municipal utilities provide gas service to New Yorkers.

2.3.3. Delivered Petroleum Fuels

New York relies on imports for petroleum products, since the state has minimal oil production and no refineries. New York Harbor is an important entry point for international deliveries of fuel products into the region as well as a market pricing point. Downstate areas including Long Island and New York City are served by multiple marine terminals and pipelines for bulk delivery of petroleum products. The Hudson River allows marine transportation of petroleum products from New York Harbor to terminals in the Mid-Hudson Valley and the Capital District regions. Upstate cities, including Binghamton, Syracuse, Utica, Rochester, and Buffalo, are supplied by pipelines, whereas the North Country relies on truck deliveries from upstate cities and Canada to meet demand.

Large terminals that receive and store bulk petroleum products supply smaller terminals that blend in additives and then load liquid fuels onto trucks for delivery to gas stations and buildings. Fuels, including propane and biodiesel, are also moved by rail across the state.

NYSERDA provides monitoring and emergency response, in coordination with DHSES, for the delivered petroleum fuels sector, including managing a strategic fuel reserve to ensure supply during emergencies.

2.3.4. Energy Security and Emergency Preparedness

New York State maintains robust and interconnected plans to ensure secure, reliable, and resilient energy infrastructure and supplies. Since all critical infrastructure sectors depend on energy, this planning is essential to protect public health, safety, and welfare; minimize economic disruption; and direct energy supplies in an equitable manner among essential uses in the event of an emergency. There are two core plans that address energy security and emergency preparedness in New York State. First, the New York State Energy Emergency Plan is an integrated resource plan specifying actions in the event of an energy or fuel supply emergency. This plan is part of and coordinated with the state's larger Comprehensive Emergency Management Plan. It provides advance notice of emergency response strategies and options to energy suppliers, energy users, and all levels of government to allow for necessary preparations before an actual emergency occurs, in order to maximize response speed, cooperation, and effectiveness during an energy emergency. Second, the state's Energy Security Plan provides the State, federal government, and other stakeholders with an up-to-date, comprehensive assessment of New York's energy supply chain, its energy risk profile, and energy emergency mitigation and response measures. This plan details how the State, working with energy partners, can secure its energy infrastructure against physical and cybersecurity threats; mitigate the risk of energy supply disruptions; enhance the response to, and recovery from, energy disruptions; and ensure that the State has a secure, reliable, and resilient energy infrastructure.

State agencies routinely engage in multistate and regional collaboration regarding energy assurance planning and response. This collaboration occurs regularly and is enhanced during any potential energy disruptions, including ahead of major storms or other conditions which could affect energy markets in New York State as well as nearby neighboring states. The energy industry likewise collaborates closely with the State in preparing for, responding to, and mitigating against energy emergencies, including by sharing information and managing critical energy infrastructure.

2.4. Energy Prices and Expenditures

As shown in Table 1, average New York State energy prices reached high levels during 2022 due to the combination of strong demand as the global economy recovered from the COVID-19 pandemic, ongoing supply chain bottlenecks, and the invasion of Ukraine causing a sharp increase and volatility in fossil fuel prices. These global dynamics combined with state-level factors that impact energy prices, including regional supply constraints for electricity and natural gas.

Table 1. Average Annual Residential Prices, 2014-2022

Average New York State Residential Energy Prices				
	Electricity	Natural Gas	Distillate	Motor Gasoline
	Residential	Residential	Residential	Transportation
	Nominal $			
	Cents/kWh	$/MMBtu	$/Gallon	$/Gallon
2014	20.07	12.13	3.79	3.42
2015	18.54	10.84	2.65	2.47
2016	17.58	10.51	2.28	2.18
2017	18.03	11.66	2.53	2.42
2018	18.52	11.98	2.79	2.68
2019	17.94	12.22	2.64	2.52
2020	18.36	12.38	2.16	2.15
2021	19.48	13.35	2.55	2.87
2022	22.08	15.83	3.86	3.79
2023	22.25	16.37	3.60	3.38

Retail electricity and natural gas prices – that is, the final price paid by customers – include both supply and delivery costs as well as surcharges associated with other costs. The supply price, sometimes called the wholesale price or the commodity price, is set by competitive markets. New York's electricity and gas distribution utilities purchase electricity or gas supplies on behalf of their customers and use hedging strategies to reduce price volatility seen in the spot market commodity prices. For electricity, the supply price is determined primarily through the NYISO's energy markets; it includes costs associated with generating electricity at a specific location (where transmission constraints may increase cost), and the cost to maintain sufficient capacity to serve peak load. For natural gas, the supply price includes the cost of the gas itself, contracts to secure interstate pipeline capacity, storage costs, and transportation of the gas to the distribution utility's service area. The delivery price for electricity and gas includes the cost of distribution infrastructure (such as wires and pipelines) to bring the electricity and gas to homes and businesses, as well utility operational expenses. Delivery rates are specific to the distribution utility serving a given area and are set by the PSC.

In New York, retail electricity and gas prices are generally higher downstate than upstate, reflecting factors that include the higher costs of building and maintaining infrastructure in the denser downstate region and the higher supply costs in the downstate region, which experiences high demand and infrastructure constraints. Retail bills depend on both energy prices and patterns of energy usage. New York utilities annually post average monthly bill data for typical residential, small commercial, and large commercial customers.[13] Figure 3 and Figure 4 show trends for Con Edison (a utility that provides electricity and gas in the downstate region) and for National Grid (a utility that provides electricity and gas in the upstate region and gas in the downstate region), specifically for residential customers. In the typical bills shown in Figure 4, the monthly electricity bill for a single-family home upstate is comparable to that for an apartment in New York City, though the (larger) upstate home uses more than twice as much electricity.

[13] Utility ten year historic average monthly bill data for typical customers is available for electric utilities at https://dps.ny.gov/electric-utility-ten-year-historic-average-monthly-bill-data-typical-customers and for gas utilities at https://dps.ny.gov/gas-utility-ten-year-historic-average-monthly-bill-data-typical-customers.

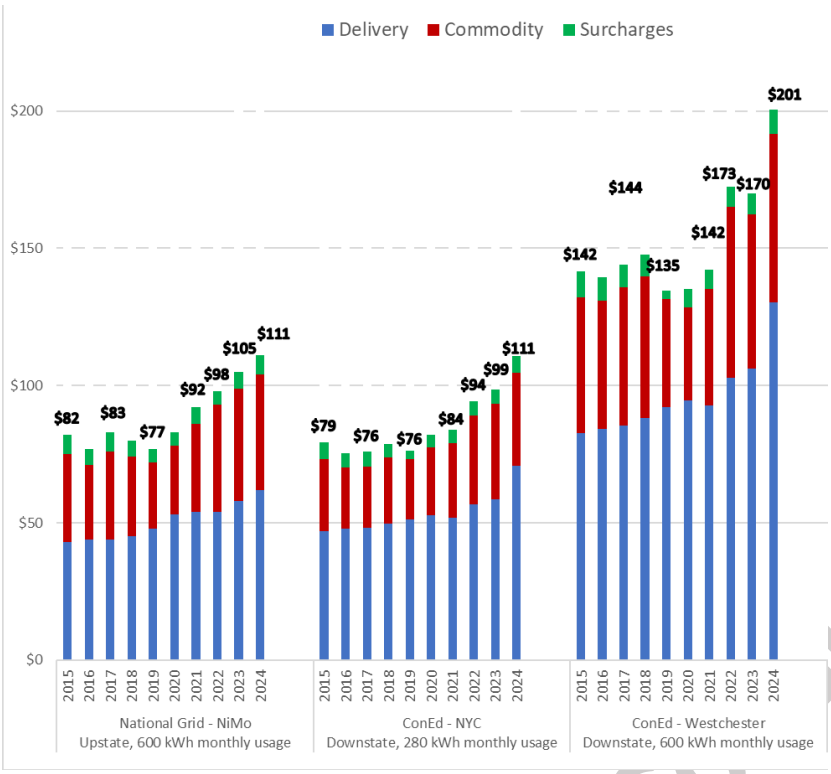

Figure 3. Average Monthly Residential Electricity Bills

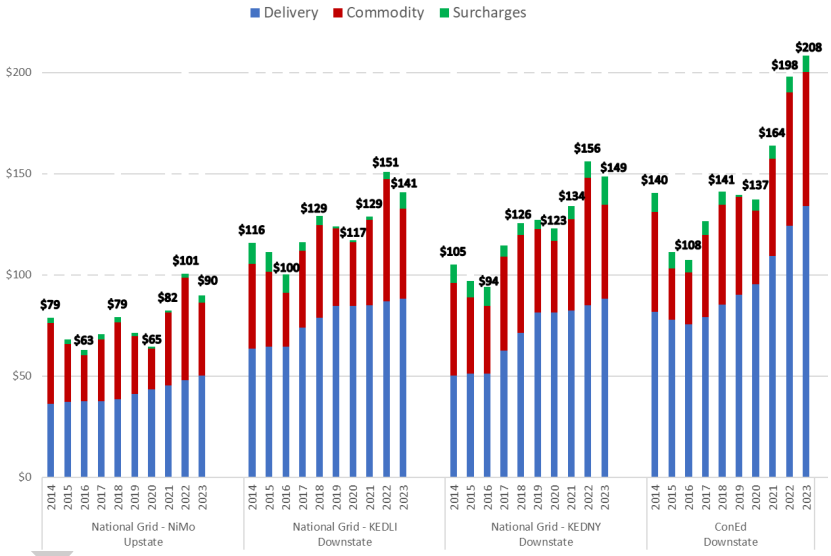

Figure 4. Average Monthly Residential Gas Bills (1,000 therm annual usage)

With elevated energy prices, elevated expenditures follow. NYSERDA reports that for most fuel types, 2022 represented the highest expenditures in 15 years, and shown in Figure 5.[14] New York's total energy expenditure reached nearly $80 billion in 2022, over one-third of which was for out-of-state expenditures ($29 billion). Energy prices for some fuel types have declined since peaking in 2022, though statewide expenditure data is not yet available for more recent years.

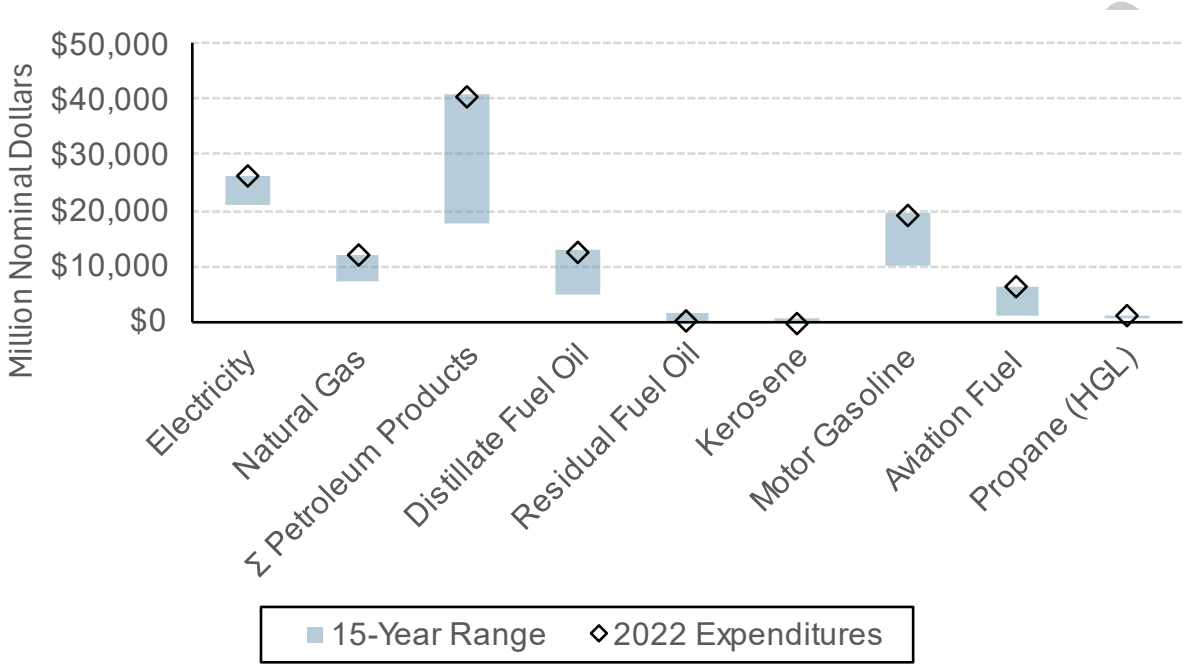

Figure 5. New York State Energy Expenditures in 2022

2.4.1. Household Energy Affordability

Across the US and across New York, households face affordability challenges. There are many drivers of household affordability, including significant expenditures in areas such as housing, transportation, food, and healthcare. Figure 6 below shows household expenditures by category. As a subset of housing and transportation costs, energy is an important, but not a primary, driver of affordability challenges.

[14] NYSERDA. *Patterns and Trends: New York State Energy Profile 2008–2022*, Appendix B, B-10. December 2024. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Energy-Analysis/EEAPT2024-8Appendix-Bacc.pdf.

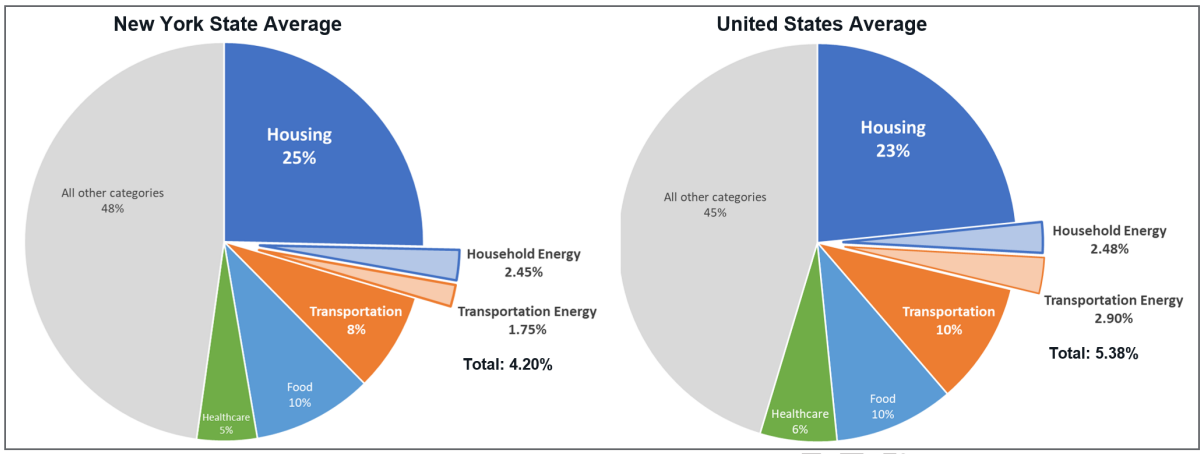

Figure 6. Household spending as share of income, New York State and United States[15]

To understand how energy costs impact people, it is important to look holistically at both household energy spending and transportation energy spending. Together, household and transportation energy expenditure provides a comprehensive perspective on the ways energy policy impacts household spending to meet energy needs and provides an opportunity to evaluate tradeoffs between different consumer choices households may make.

On a combined basis, New York compares favorably to the national average in terms of total energy spending. At $4,231 annually (comprised of $2,466 for household energy and $1,765 for transportation energy), New York households on average spend less annually on energy expenses than the national average of $4,884 (comprised of $2,249 for household energy and $2,635 for transportation energy), according to the Consumer Expenditure Survey, a longstanding measure of consumer spending across common categories of goods and services.[16]

Energy prices can be higher in some parts of New York than the US average, but average energy consumption is lower, leading to lower total household and transportation energy expenditures than the national average. Lower transportation energy spending offsets slightly higher household energy spending on a statewide basis in NYS. On average, New York has the lowest average household Vehicle Miles of Travel (VMT) and transportation energy expenditures as a percentage of income in the nation. Notably, there is regional variation within the state across these metrics, with average transportation energy expenditures as a percentage of income approximately 50 percent lower downstate than it is upstate, reflecting less reliance on personal vehicles.

[15] US Bureau of Labor Statistics. Consumer Expenditure Surveys. New York: Quintiles of Income before taxes, 2021-2022 and US: Quintiles of Income before taxes, 2021 & 2022. Accessed April 16, 25. https://www.bls.gov/cex/tables.htm#geo.

[16] Consumer Expenditure Survey (CE) data are used to characterize combined household and transportation energy expenditures, as well as associated energy burden, transportation burden and combined household and transportation burden. The CE data has a number of key features that make it useful for this analysis: It is an internally consistent data set that situates energy expenditures within household spending more broadly and includes both household energy and transportation fuel spending. Although not identical, energy burden calculated using CE data is broadly in line with other approaches to calculate energy burden, such as the approach based on Census data used in the Low-Income Energy Affordability Data tool, a commonly used Federal Government resource for understanding energy burden.

As noted in Figure 7, New York households also spend less on energy compared to states that are the predominant targets of outmigration from the state. That is, households migrating to these other states would expect to spend more on energy after their move. These dynamics are similar to the comparison between average New York and US households above: substantially lower household transportation energy offsets higher household energy spending.

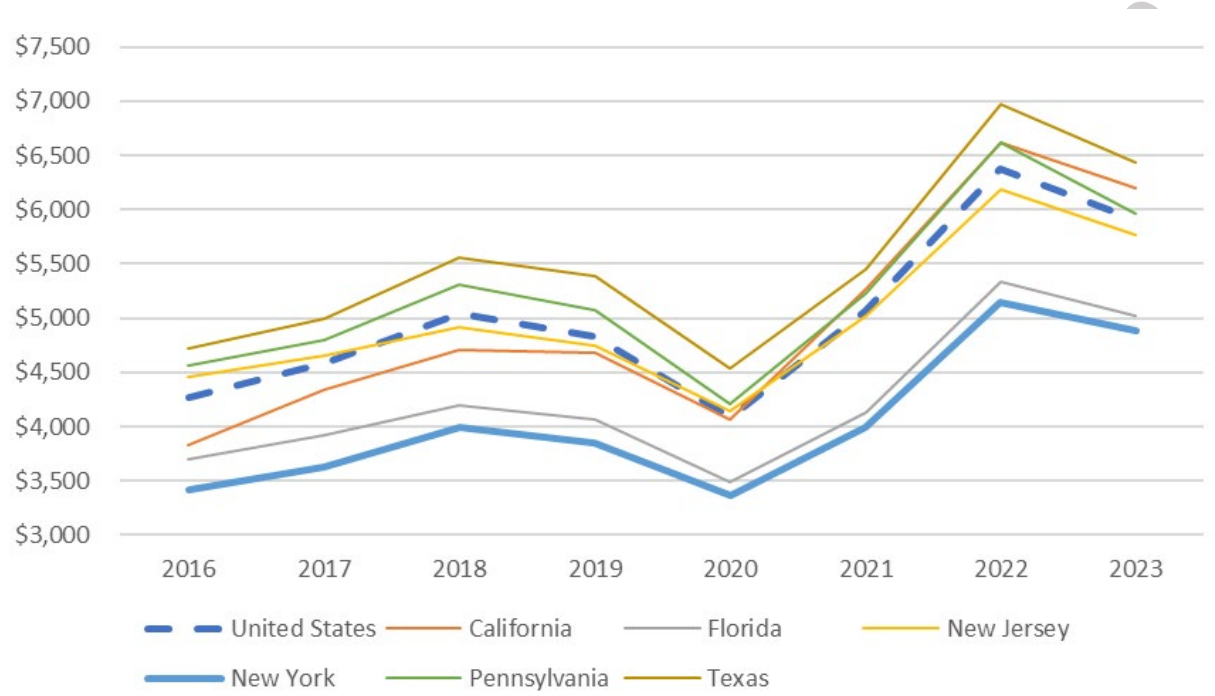

Figure 7. Combined household and transportation energy cost per household, United States, New York State, and top outmigration states from New York State [17]

Across the US and across New York, low- and moderate-income (LMI) households are more likely to experience energy affordability challenges. As shown in Figure 8 below, energy expenditures and burdens follow a pattern of lower expenditures but disproportionate burdens at lower incomes. While on average and across all income levels, total household and transportation energy expenditures are lower in New York as compared to nationally, the energy affordability needs of New Yorkers are not always being met. Energy burdens experienced by New York households in the lowest income quintile are approximately 10 percent, or four times higher than average, and transportation energy burdens experienced by the lowest income quintile are approximately 6 percent, or three times higher than average. At nearly 16 percent, the total household energy and transportation energy burdens experienced by the lowest income households in New York State are nearly four times higher than average.

[17] Source: US Bureau of Economic Analysis. Regional Data, GDP and Personal Income. Accessed May 2, 2025. https://www.bea.gov/itable/regional-gdp-and-personal-income.

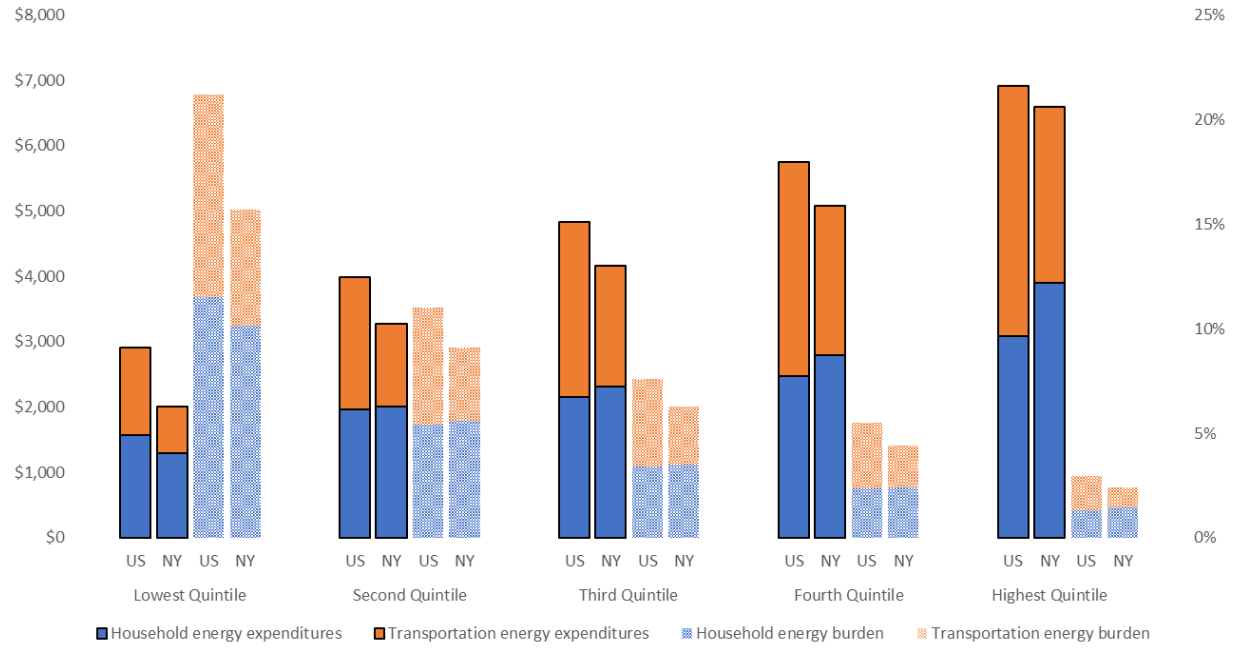

Figure 8. Household and transportation energy expenditures and associated burden by income quintile, United States and New York State, 2021-2022 [18]

In addition to energy burden, lower income and more vulnerable households experience energy insecurity—for example, foregoing other expenses to pay for energy, keeping one's home at an unsafe temperature, or getting behind on an energy bill—at above average rates.[19] Indeed, at the end of 2024, nearly 1.4 million New York households were in arrears with outstanding balances on their utility bills greater than 60 days overdue, representing a total amount owed of nearly $1.9 billion. These dynamics further exacerbate disparities in health and quality of life for vulnerable populations.

2.4.2. Business Energy Costs and Competitiveness

Energy is an essential input across most sectors of the economy, however its total contribution to business costs in New York is relatively small compared to other inputs. Costs for New York businesses are instead dominated by factor payments, primarily labor, and intermediate inputs, which include materials and services purchased by the business.

While energy costs that are affordable for businesses is a component of ensuring continued economic competitiveness for the state, the degree to which energy costs impact the competitiveness of any individual business or economic sector varies substantially with its energy intensity. shows the

[18] US Bureau of Labor Statistics. Consumer Expenditure Surveys. New York: Quintiles of Income before taxes, 2021-2022 and US: Quintiles of Income before taxes, 2021 & 2022. Accessed April 16, 2025. https://www.bls.gov/cex/tables.htm#geo.

[19] U.S. Census Bureau, Household Pulse Survey. Accessed April 16, 2025: https://www.census.gov/data/experimental-data-products/household-pulse-survey.html. US Energy Information Administration, Residential Energy Consumption Survey. Accessed April 16, 2025: https://www.eia.gov/consumption/residential/data/2020/. Households experiencing higher than average rates of energy insecurity from these data include lower income households, minorities, people with disabilities, women, larger households, and households with children.

contribution of energy costs to overall cost structure for a sample of economic sectors and industries in New York. Just a small handful of industries, including cement, paper, and semiconductors, spend more of their budget annually on energy than the average New York household.

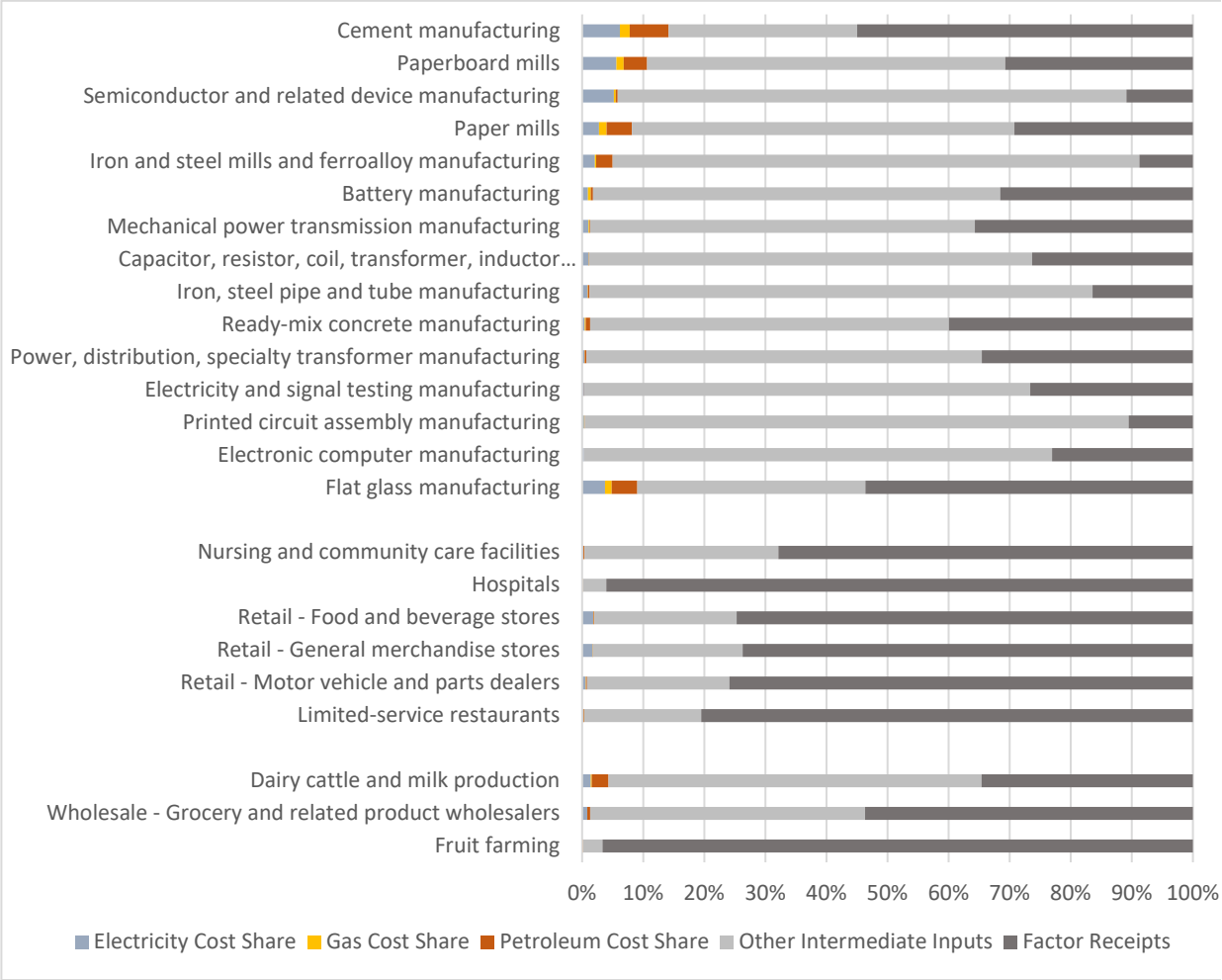

Figure 9. Cost Structure of Select New York Business Sectors, 2023[20]

2.5. Greenhouse Gas Emissions

The New York State Statewide Greenhouse Gas Emissions Report is released annually by DEC. As required under the Climate Act, New York's GHG emissions accounting methodology differs from United Nations Framework Convention on Climate Change Accounting (UNFCCC) in three key ways:

- It measures emissions using a twenty-year timeframe, as opposed to the standard one-hundred-year time interval.

[20] Based on analysis conducted for NYSERDA by BW Research. Data is from IMPLAN for calendar year 2023, from the State Industry Balance Sheets, Commodity Demand, and Social Account Matrix.

- It 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.
- 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.

The 2024 Statewide GHG Emissions Report[21] finds that 2022 economy-wide gross emissions totaled 371 million metric tons of carbon dioxide equivalent (371 MMT CO_2e), which represents a 9.3 percent reduction below 1990 levels. The energy sector accounted for approximately 76 percent of statewide emissions in 2022 (). Under conventional UNFCCC accounting, 2022 statewide emissions were 192 MMT CO_2e, with the energy sector comprising 84 percent of this total, and emissions declined 23 percent from 1990 to 2022. New York saw the eighth largest percent decline in energy-related CO_2 emissions among all US states over this period.[22]

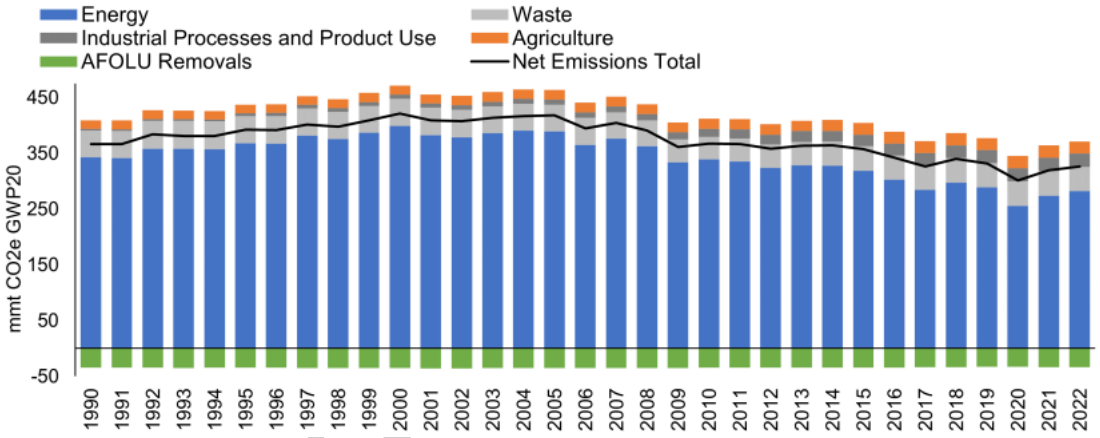

Figure 10. Annual GHG Emissions by Sector. Source: 2024 Statewide GHG Emissions Report

The electricity, buildings, transportation, industrial, and oil and gas sectors are the primary economic sectors with energy-related emissions. Under Climate Act emissions accounting in 2022, building 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.

According to 2024 Statewide GHG Emissions Report data, gross energy emissions declined significantly from 1990 to 2022, which saw an:

- 18 percent decrease in total energy sector emissions.
- 34 percent decrease in electricity emissions.

[21] New York State Department of Environmental Conservation (DEC). 2024 Statewide GHG Emissions Report. Accessed June 2024 from: https://dec.ny.gov/environmental-protection/climate-change/greenhouse-gas-emissions-report#Report.

[22] U.S. Energy Information Administration (EIA) "State Carbon Dioxide Emissions Data, Table 1 - State energy-related carbon dioxide emissions by year." State Carbon Dioxide. October 29, 2024. https://www.eia.gov/environment/emissions/state/.

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

It is important to note the impacts of the COVID-19 pandemic on the energy sector when considering recent trends. Energy emissions increased between 2020 and 2022 as energy use continued to return to pre-pandemic levels. In addition, electricity emissions increased 22.5 percent between 2019 and 2022, even as 2022 sales of electricity were slightly (1.6%) lower. This is due to the closure of the Indian Point nuclear power plant and a subsequent increase in gas and petroleum fuel use for electricity generation.

3. Meeting New York's Energy Needs through 2040

The Draft Plan is underpinned by analysis of possible future energy demand and supply across a range of future scenarios. Through economywide modeling of multiple future energy pathways for New York, this "Pathways Analysis" simulates possible future energy systems that meet energy needs and advance policy objectives. The analysis completed for the Draft Plan is based on assumptions set in the first quarter of 2025, which do not reflect more recent State policy updates or the federal policy environment as of summer 2025. The final State Energy Plan will include updates to this analysis.

The two planning scenarios modeled include a Current Policies scenario reflecting progress consistent with enacted policies and an Additional Action scenario reflecting further acceleration of adoption of clean energy technologies from some mix of future policies. The core planning scenario for the State Energy Plan is Additional Action, a forward-looking scenario that is consistent with ambitious but achievable progress. Across scenarios, forthcoming updates for the final State Energy Plan will explore how recent changes to federal energy and emissions programs and policies impact what is considered achievable over the planning horizon.

As a reference point, the analysis also includes a No Action scenario that includes federal incentives (as of the first quarter of 2025) and legacy New York State policies but excludes State and local policies from 2019 onward. The net zero scenarios reflect what would be needed for full achievement of the 2050 emission reduction targets for comparison.

As shown in Figure 11 for the planning scenarios, the energy system undergoes a meaningful transformation in final energy demand between 2025 and 2040.

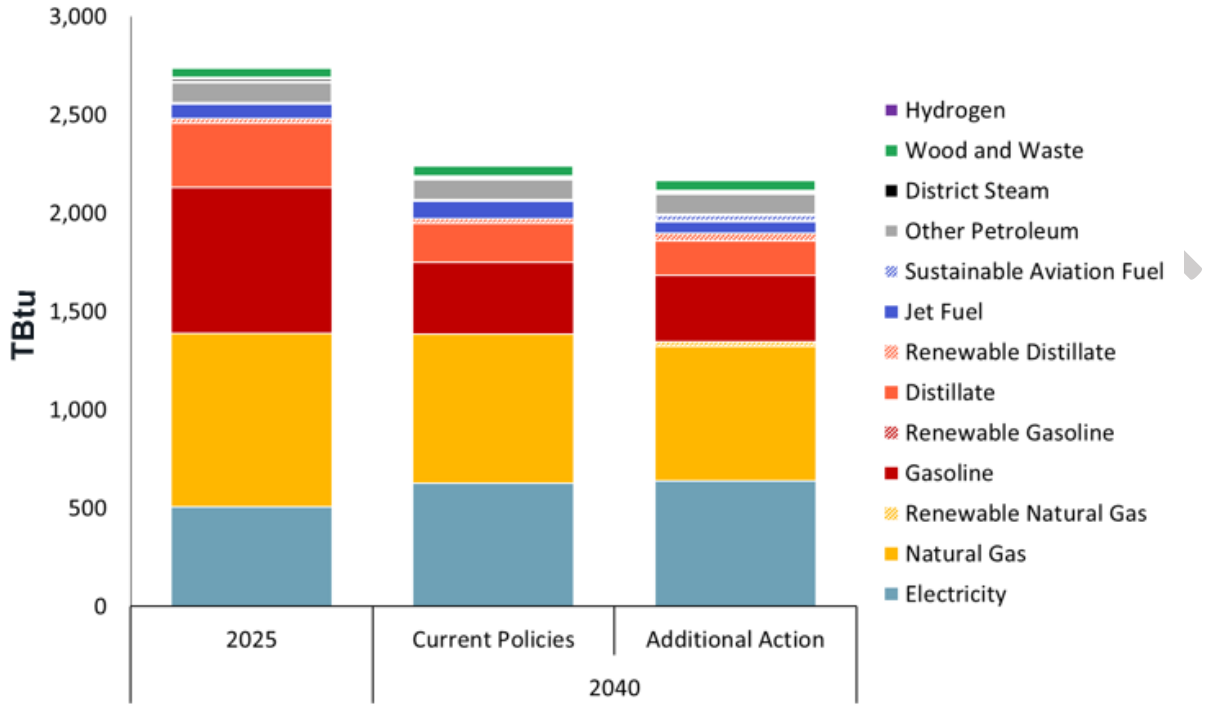

Figure 11. 2025 vs 2040 Final Energy Demand by Fuel

3.1. Annual and Peak Electricity Demands

In all pathways scenarios, new large loads interconnecting to the system drive growing electricity demand, across both annual loads and peaks (Figure 12).[23] Planning early for abundant supply for these projects can ensure continued opportunities for economic growth.

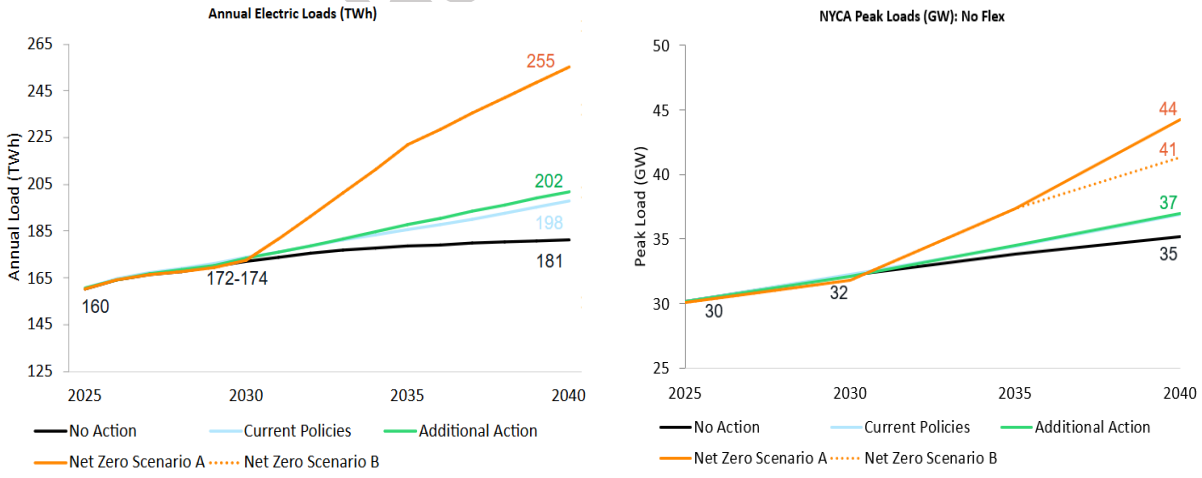

Figure 12. Annual Electric Loads in TWh (Left) and NYCA Peak Loads in GW (Right) for each Pathway

[23] Large loads include new large industrial and commercial projects as included in the NYISO *2025 Load & Capacity Data Report (Gold Book)*. April 2025. https://www.nyiso.com/documents/20142/2226333/2025-Gold-Book-Public.pdf

Electricity demand is also projected to grow due to electrification of transportation and buildings. Adoption of clean energy technologies, such as electric vehicles (EVs), building energy efficiency, and heat pumps, is already underway driven by consumer preferences and federal, State, and local policies and programs. As existing heating and cooling appliances and vehicles age out and are replaced, State actions—such as various transportation decarbonization initiatives and investments, all electric new construction and advanced building codes, and heat pump incentive programs—will accelerate adoption of more efficient and electrified alternatives. By 2040 in the planning scenarios, 17–24 percent of the residential heating stock is heat pumps and 53–59 percent of the light-duty vehicle (LDV) stock is a zero-emission vehicle (ZEV). These shifts can lead to further electric system growth.

3.2. Electricity Supply

Meeting this growing electricity load, while maintaining system reliability, will require investments in expansion of the electricity system in all pathways. Moreover, progress toward a zero-emission electric grid will necessitate a transformation of the generation mix. This builds upon the deployment of renewables already underway from the Clean Energy Standard (CES) program. Consistent with the findings of the CES biennial review, the modeling shows achievement of a 70% renewable grid in 2033.

In the core planning scenario, by 2040, 35 GWs of solar and 9 GWs each of storage, offshore wind, and onshore wind are deployed for electricity supply, which add to the system's resource diversity (Figure 13, left).[24] Existing nuclear and hydroelectric generation remain major contributors. While the process for establishing a zero-emission definition is still underway, the modeling assumes firm capacity could be met by green hydrogen. Under this assumption, the combustion generation fleet remains critical. Over the study period, many existing combustion units retire, 6 GW are repowered and convert to run on hydrogen, and 11 GW of existing units convert to run on hydrogen. Hydrogen faces significant deployment challenges and is just one of several resources that could provide clean firm power. The overall combustion fleet is lower than today, reflecting the reliability contributions of other resources like the Champlain Hudson Power Express transmission project and storage.

However, a sensitivity based on the core planning scenario shows that if deployment headwinds persist (as experienced through slower renewable generation build rates), there would be increased reliance on combustion units as compared to the core scenario, including 2.2 GW repowering in Zone J in 2035 and an overall 1.2 GW larger thermal fleet in 2040 (Figure 13, right). Given insufficient renewable energy generation, natural gas units would need to provide 15 TWh of electricity under this sensitivity; or alternatively, this electricity could be supplied by other resources like new nuclear with transmission and/or renewable natural gas.

[24] Deployment of solar and energy storage includes both distributed and utility-scale projects.

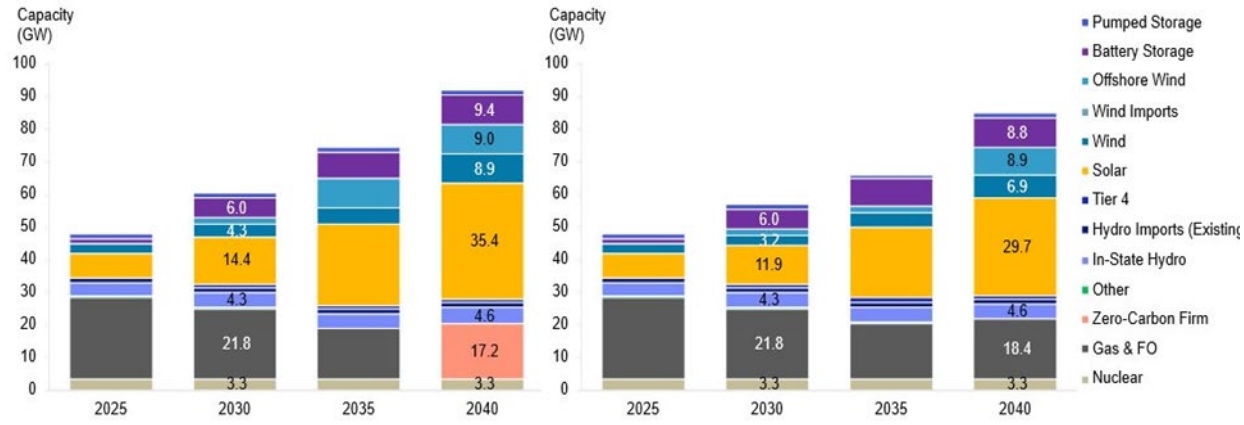

Figure 13. Total Installed Capacity for the Additional Action Pathway (Left) and the Limited Build Rate Additional Action Pathway (Right)

3.3. Natural Gas Supply and Delivery

While the electricity system is expected to grow in all scenarios, the gas system transformation is pathway dependent. In all scenarios, the gas system remains an important energy delivery system, necessitating investments for reliable ongoing provision of service. Residential and commercial consumption declines in all cases with efficiency improvements and customers switching to heat pumps to varying degrees (Figure 14). Throughput declines even further with electric system progress toward 0x40, although electric generators typically have interruptible service which lowers their impact on overall system infrastructure needs. Residential customers grow in the No Action scenario absent more recent State action, with new construction and conversions from electric resistance and heating oil driving new connections. Residential customers decline over time in the remaining scenarios, reflecting the potential for all electric new construction and heat pump programs to stem growth. However, regional variability is expected based on the findings of the utility Long Term Plans, and targeted regional investment in system expansion may be needed to increase supply diversity and meet peak demand.

Overall, in the Current Policies and Additional Action scenarios, final energy served by electricity increases from 19 percent in 2025 to 28–29 percent in 2040, and final energy served by direct fossil fuel consumption decreases from 78 percent in 2025 to 63–67 percent in 2040.

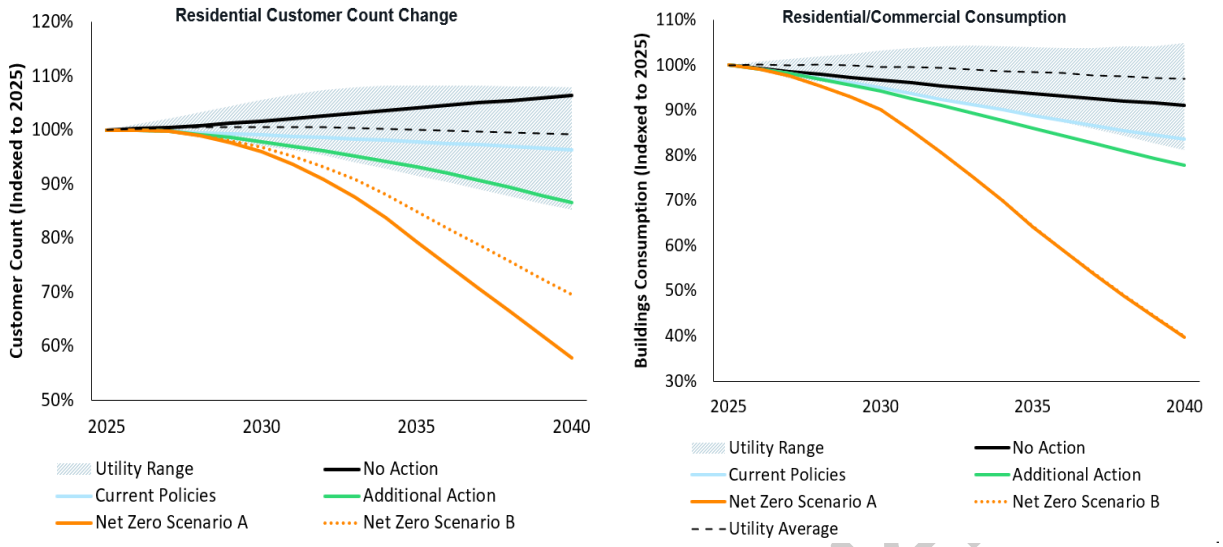

Figure 14. Residential Customer Count Change (Left) and Residential/Commercial Consumption (Right) for all Pathways

3.4. Greenhouse Gas Emissions

New York's economywide emissions today have already declined nearly 10 percent from 1990 levels. The modeling finds that existing State policies are laying groundwork for further economywide emissions reductions, with significant contributions from power generation, transportation, buildings, and fugitive emissions including methane and hydrofluorocarbons (HFCs) (Figure 15). Under the current set of assumptions and the Climate Act GHG accounting methodology, Current Policies will hit 40 percent economywide emissions reduction in 2038, while Additional Action will hit 40 percent reduction in 2036. Under conventional UNFCCC accounting, a standard in many other jurisdictions, Additional Action achieves a 40 percent reduction in economywide emissions by 2030 and Current Policies is within 2 MMT of the target in that year.

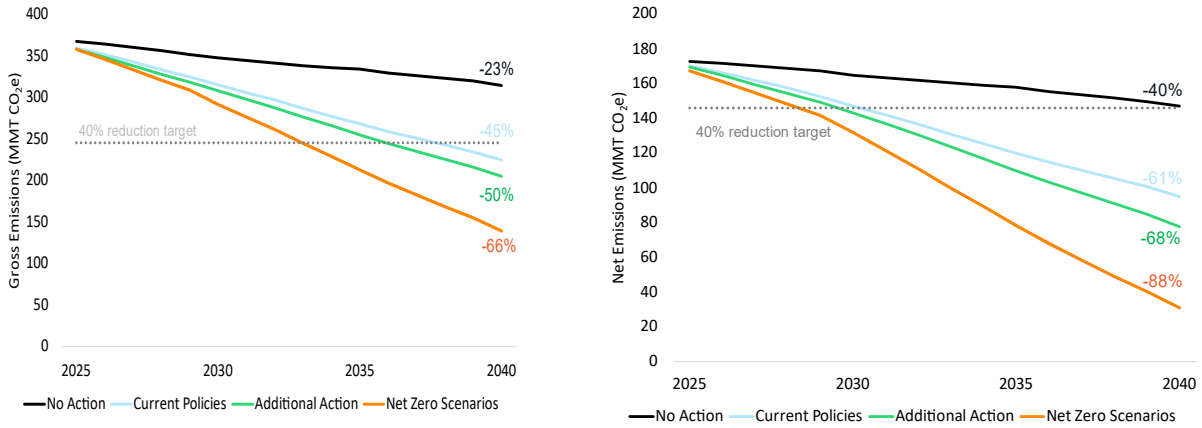

Figure 15. Economywide Emissions for all Pathways under Climate Act (Left) and UNFCCC (Right) GHG Emissions Accounting Methodology

Achievement of the net zero economywide emissions target will require significant incremental action beyond what is currently contemplated by existing policies, including further electrification and decarbonization in buildings and industry, pursuing electrification and fuel-switching in on-road and non-road transportation sectors, and pursuing ambitious non-energy sector mitigation.

Due to external factors including supply chain disruptions, inflation, recent cuts to federal clean energy tax credits and incentives, and other changes in energy and tariff policy from the federal administration, there is considerable uncertainty in the timeline for progress toward emissions reductions.

3.5. Societal Costs of the Plan

Regardless of the specific future pathway for New York's energy system, continued investment to maintain and modernize existing infrastructure, replace aging equipment, and purchase fuels to meet energy needs will be necessary. As shown in Figure 16,[25] analysis found that the No Action scenario requires annual system-wide spending of approximately $120 billion (in 2024$) every year through 2040, with annual spending seeing a slight downward trend over the period. These funds support replacing end-use equipment at end of useful life, constructing new and replacement natural gas generators to meet electricity needs which are being transformed by new large loads and other needs. Because end-use equipment is anticipated to grow more efficient over the period as a result of existing policies, operating fuel expenses trend downwards over time.

By 2030 (Figure 16) and 2040 (Figure 17), the Additional Action scenario raises costs modestly by 2 percent and 9 percent, respectively, relative to the No Action scenario. Additional Action meets over 90 percent of its investment needs in every year by reallocating anticipated spending from legacy energy sources and equipment to energy efficiency and clean alternatives, replacing spending on combustion generators with renewable generation, gas appliances with energy efficient heat pumps, and internal combustion vehicles for battery electric alternatives. In contrast, the cost premium for the Net Zero scenarios reaches in excess of 35 percent by 2040.

[25] Costs are net of federal IRA incentives which were in place at the time of modeling. Adjustments to the modeling will occur in the final State Energy Plan to reflect federal policy changes.

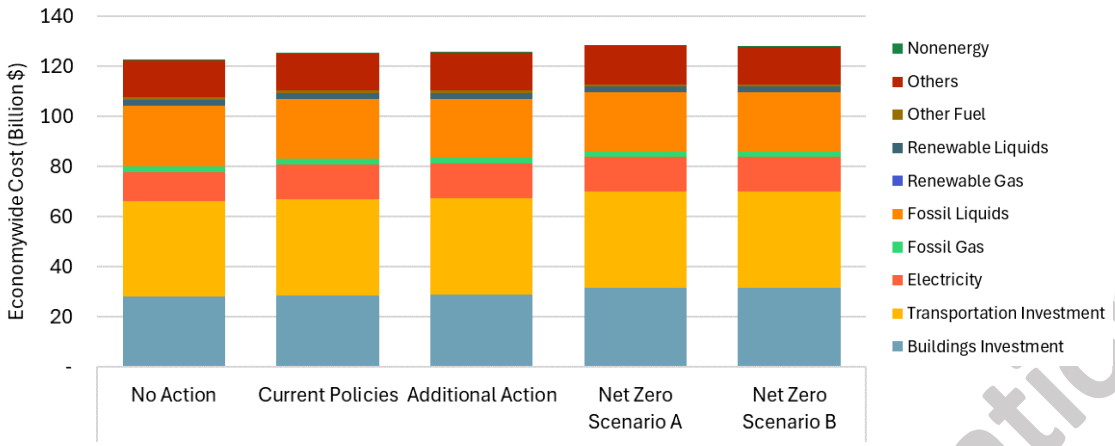

Figure 16. 2030 Gross Annual Costs by Scenario (2024$)

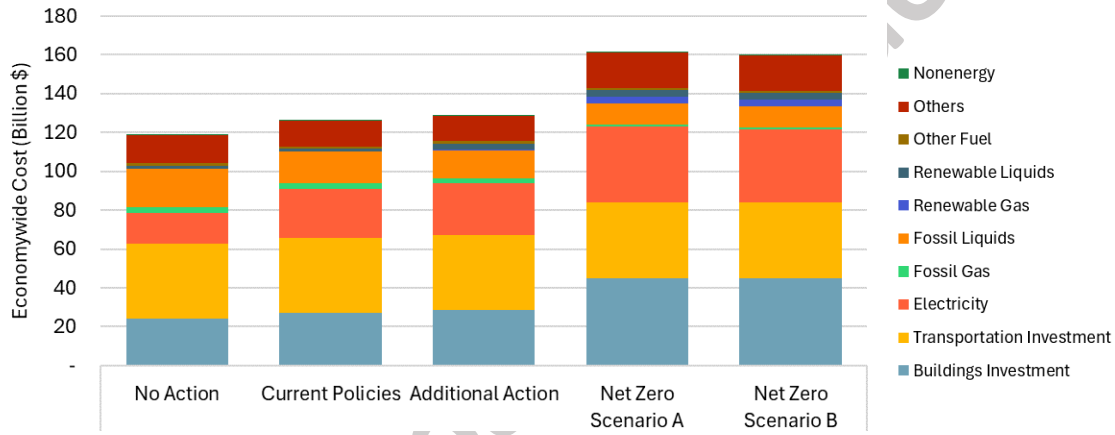

Figure 17. 2040 Gross Annual Costs by Scenario (2024$)

Across each of the scenarios, the emissions mitigation achieved via State policies yields societal benefits. The core planning case, Additional Action, sees the total net present value of net benefits reach $48 billion by 2040. These benefits grow substantially over the planning period as greater amounts of clean energy substitute for fossil fuel use across the scenarios. As shown in Figure 18 and Figure 19, Additional Action's 2030 incremental spending of $3 billion secures approximately $5 billion in benefits; by 2040, incremental spending of $10 billion provides benefits of $25 billion. While greenhouse gas emission reductions provide a meaningful share of the cumulative benefits over the full planning period, more than two thirds of the benefits are associated with health improvements, including estimated reduction in premature mortality and avoided lost workdays, emergency room visits, non-fatal heart attacks and more. For more information on these health benefits see Section 6.2.

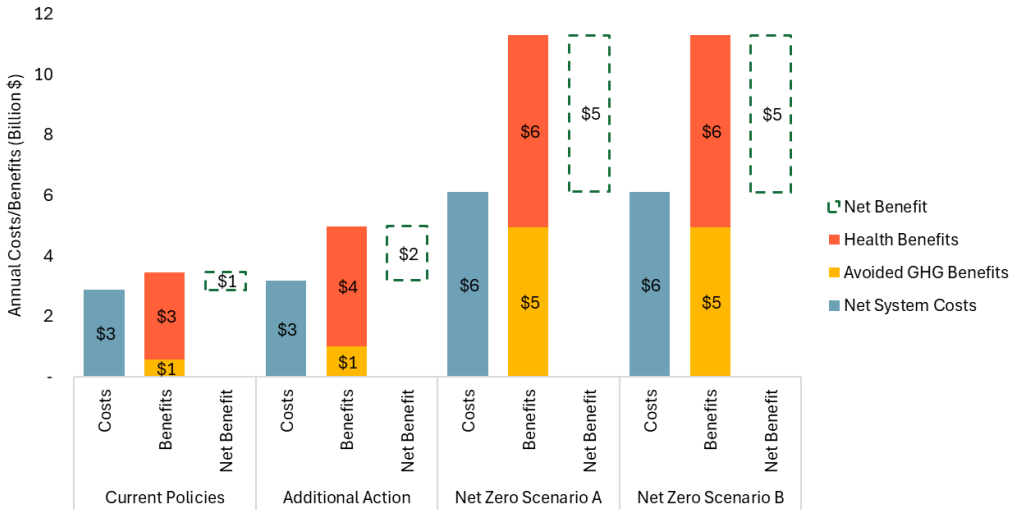

Figure 18. 2030 annual net costs and benefits by scenario (billion 2024$)

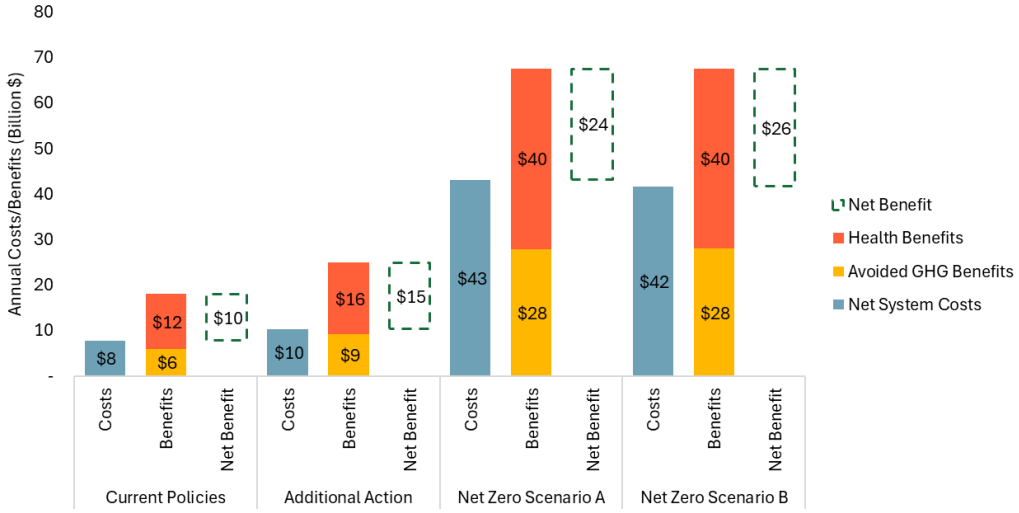

Figure 19. 2040 annual net costs and benefits by scenario (billion 2024$)

For discussion of household energy costs, see summary of Affordability Impacts in Section 6.4.

3.6. Summary: Ability of Energy Systems to Meet Forecast Energy Demand

Across electricity, natural gas, petroleum, and alternative fuels, medium- to long-term demand forecasts are uncertain. Future demand is highly dependent on factors such as economic trends, policy shifts, technology adoption rates, and consumer behavior. To ensure that the state's energy systems are able to reliably meet demand at reasonable cost, New York State policy makers, system operators, and stakeholders will pursue planning and strategies that remain adaptable across a broad set of potential futures.

New York's electricity demand is forecast to grow significantly through 2040 – a marked change from the relatively flat electricity usage over the past decade.[26] New York State is prepared to meet this growing electricity demand while maintaining system reliability and making progress toward a zero-emission grid. New York State likewise will support the reliable provision of natural gas and petroleum fuels, as all major fuels used in the state today are forecast to provide meaningful volumes of energy throughout the planning period.

The core planning scenario developed to inform this Draft Plan projects a 26 percent increase in annual electricity demand and a 23 percent increase in peak demand by 2040 as compared to 2025. This forecast incorporates anticipated new large loads, expanded use of electric vehicle and heat pumps, and energy efficiency upgrades that help manage load growth in buildings. There is uncertainty as to whether the continuous growth in clean energy supply resources will meet growing demand given the federal policy context, broader economic headwinds, and the need for new clean firm technologies to become commercially available. As a result, the State and electricity system operators will continue to pursue careful coordination and planning to adapt as the energy system evolves.

While the State Energy Plan provides statewide and regional forecasts and broad policy direction, multiple ongoing planning processes exist to inform specific decisions such as electricity system investments or whether a given generating unit is needed for system reliability. The NYISO conducts regular reliability planning on both a near-term and long-term basis, including the biennial Reliability Needs Assessment (RNA); if the RNA identifies a reliability need for the bulk system, the NYISO issues competitive solicitations for projects to address it. Importantly, the PSC has initiated changes to the utilities' planning practices in response to clean energy policies and grid modernization needs. For example, the first statewide Coordinated Grid Planning Process (CGPP) is underway.

The scenarios modeled for this Draft Plan suggest declining demand through 2040 for natural gas and petroleum products, though these fuels remain important energy sources. However, notable variability exists across the forecasts that each New York gas utility has developed for natural gas demand in their service area (Figure 14). As directed by the PSC, the gas utilities produced and will regularly update long-term plans (LTPs) with gas demand and supply forecasts for multiple scenarios over a 20-year horizon. These LTPs are important to inform gas system investments because they include utility-specific attention to supply sources needed to meet peak day needs during the winter heating months, with consideration of different scenarios that allow for a variety of contingencies to meet energy needs at all times. Electric and gas system planners also need to strengthen coordination measures to ensure fuel adequacy and maintain reliability across both systems.

[26] Between 2013 and 2023, electric energy usage declined by an average of 1.0 percent annually and electric peak demand declined by an average of 1.1 percent, with similar trends observed in the upstate and downstate regions. Source: NYISO *2024 Load & Capacity Data Report (Gold Book)*. April 2024.

4. Energy Plan Direction and Vision

This Plan supports New York's ongoing progress toward a clean energy economy – one that uses energy efficiently, is increasingly powered by clean energy resources with lower environmental and health risks, modernizes infrastructure, fosters technology innovation, and supports family-sustaining jobs. It likewise supports New York's commitment to ensure that all communities, and especially people within historically disadvantaged communities, can participate in and will benefit from the State's clean energy transition. Broad planning goals are discussed in this section, followed by corresponding objectives and actions in Section 5.

4.1. Deliver Abundant, Reliable, Resilient, and Clean Energy

Reliable and resilient energy is critical to the well-being of every New Yorker. It runs life-saving medical equipment and communications systems, keeps buildings at safe temperatures with clean running water, and allows New Yorkers to travel and do their work without interruption. Reliability describes the ability of an energy system to consistently function and deliver energy services. Resilience is the ability of systems and communities to anticipate, prepare for, respond to, recover from, and adapt to a disruption, with minimum damage to social well-being, public health, the economy, and the environment.

Across New York's energy systems, maintaining reliability and resilience depends on adequate supplies of energy, a robust delivery infrastructure, and planning practices that keep pace with the energy transition and changing risks from physical, natural, and cyber hazards.

A primary challenge for New York's energy system is its advancing age, which creates unique risks for reliability. The NYISO has reported, for example, that by 2028 a quarter of the state's combustion generators (by capacity) will reach an age at which most such facilities are retired. For several utilities serving the Hudson Valley and Upstate New York, 60 percent to over 95 percent of transmission structures are 70 years old or older. The oldest still operational natural gas pipeline in New York dates to the Centennial, turning 150 years old next year. This aging infrastructure is more prone to failure, requiring more costly repairs, and results in a greater environmental impact than newer technologies. Over the planning period and beyond, maintaining safe and reliable energy service will require substantial investment in New York State's aging energy infrastructure.

In the electricity sector, demand is projected to grow significantly through 2040 due to the addition of new large loads such as manufacturing facilities alongside growing customer preferences for electrification of buildings, transportation, and industry. This expected load growth combined with aging infrastructure means that planning approaches and the build out of energy infrastructure will need to become more nimble.

Both today and looking forward, resilience and adaptation efforts are critical to respond to hazards – such as hotter temperatures, more frequent and severe storms, and sea level rise – that pose significant risks to New York's energy systems. Proactive and appropriate planning, as in this plan, multi-agency energy security planning, and multiple other processes will equip New York to respond to such hazards.

4.1.1. Energy Sources and Supply Infrastructure

An abundant and diverse mix of energy sources and supply infrastructure benefit reliability and resilience by reducing the impact of energy supply disruptions. In addition, resource diversity mitigates the impact of price fluctuations for any given fuel. For example, New York's reliance on natural gas, including for power generation, coupled with limited infrastructure expansion has created vulnerabilities, especially in winter months when the gas supply system becomes constrained. These constraints contribute to higher, more volatile prices for natural gas and electricity.

Accelerating the integration of wind, solar, and other renewable energy resources into New York's energy system increases the resource diversity of the system, offering economic and reliability benefits, as well as important environmental and public health benefits from reducing the use of fossil fuels. As New York adds these new resources and as load grows, planners must expand and modernize the grid fast enough to maintain reliability, which will require streamlining processes and accelerating the pace at which infrastructure can be built. This Plan underscores the importance of New York's ambitious commitments to invest in large scale renewables, distributed and community solar, energy storage, advanced nuclear technologies, and transmission and distribution grid infrastructure upgrades, while also recognizing the value of existing nuclear and hydropower generating facilities.

As New York looks toward 2040, the State will need to identify and integrate clean firm technologies that support the operation of a zero emissions electric grid. Clean firm resources are able to reliably and flexibly provide energy and capacity to the grid (especially when intermittent sources like wind and solar are unavailable) and provide support services like voltage regulation. This will require innovation and complementary investments in clean firm technologies such as long-duration energy storage and advanced nuclear reactors. To maintain reliability while promoting affordability, wholesale electricity market reforms may also be needed so that capacity, reliability, reserves, and balancing services are properly valued.

Demand-side resource diversification, which includes strategies like energy efficiency and load flexibility, also offers numerous benefits. A continued focus on energy efficiency is a bedrock strategy. When households and businesses make energy efficiency upgrades, their energy bills are immediately lower and can stay stable even as rates increase. At a system level, energy efficiency helps to avoid wasteful commitments of ratepayer funds to infrastructure that could otherwise be avoided. The Plan speaks to strategies to continue to leverage and expand the deployment of energy efficiency across fuels, as well as energy storage and other demand side resources to lower the cost of the clean energy transition and enhance grid reliability.

All major fuels currently used in New York State are projected to continue to provide meaningful volumes of energy throughout the planning period, while the contributions of clean and renewable energy sources will grow. As clean energy resources ramp up over time, the State will maintain adequate supplies of other major energy sources. This means that through the 2040 planning period, New York will continue supporting the safe and reliable provision of natural gas and petroleum fuels to electric, residential, commercial, industrial and transportation sectors. In part this will require continued investment in the natural gas system, including to guarantee adequate supply infrastructure to meet

demands even during the coldest days and to help relieve upward pressure on gas prices that can result from infrastructure constraints. Combustion generating units also will remain essential parts of electric grid reliability and energy affordability, and New York will seek to carefully manage the retirement of existing assets and evaluate whether there is need for new generation that is compatible with long-term policy targets.

4.1.2. System Investments and Strategic Energy Planning

Substantial investment will be needed in New York's energy systems to modernize aging infrastructure and address a range of risks and hazards, including those posed by climate change, and to meet new demands for energy that come from economic development opportunities. While the transition to clean energy will bring some incremental costs, the bulk of energy-related investments during the planning period will go to ensuring that energy services (like heating and cooling in buildings, commuting to work, and manufacturing processes) are available when and where they are needed. In turn, these energy-system investments will provide large and long-term benefits to current and future New Yorkers. Managing the cost implications will be essential, through careful, strategic energy planning and the integration of advanced technologies.

Rather than rebuilding our energy system as it exists, new infrastructure will enable operational flexibility for the electricity system and load flexibility on the part of households, businesses, and industry. In addition, the State needs to evolve its long-term energy system planning paradigms, integrating planning for the electricity and natural gas systems. Consumer fuel choices will have meaningful impacts on the operational and financial needs of both of these systems. For example, as heat pumps increase in popularity, the way buildings use energy during very cold periods will impact annual and peak needs on both the electric and gas systems, impacting needed local and bulk system capacity requirements, utility revenues, and more. Moving away from planning each system in a silo will help manage overall energy system costs by planning toward joint optimization and avoiding unnecessary ratepayer commitments.

As a threat multiplier, the effects of climate change can further worsen non-climate related impacts on the state's energy system. Layering a changing climate on factors like aging infrastructure and existing disparities will increase the risks to the system and communities. Considering climate change in all aspects of energy system planning and identifying and hardening critical infrastructure are important cross-cutting responses. To be prepared, the State in coordination with the energy industry will continue to prioritize multi-level and multi-agency energy security and emergency management preparedness, response, and mitigation efforts.

4.2. Provide Affordable Energy to Households and Equitable Clean Energy Benefits

Affordable energy as well as broad access to energy efficiency and clean energy choices are essential for New York's continued prosperity as well as to advance community and economic development, an equitable energy transition, and other policy goals. Advancing equity in our energy and climate actions means that New York is working to ensure that all communities, and especially people within disadvantaged communities, will benefit from the State's clean energy transition.

4.2.1. Affordable Energy for New York Households

Relative to the national average, New York's lower combined expenditures across household energy and transportation fuel reflects the state's broader energy efficiency. New York benefits from a longstanding commitment to programs and energy codes that reduce energy waste and from living patterns that reduce driving and household energy needs as compared to peer states. Ensuring that these benefits continue and extend to a greater share of New Yorkers, especially those disproportionately burdened by energy costs, is foundational to the State's energy affordability strategy.

As described in greater detail in Section 6.4, the use of efficient equipment—gasoline cars and natural gas furnaces—offers the prospect of reduced energy expenses for households across all New York geographies and housing typologies. Energy efficiency standards, adopted via federal and State regulations, mean that over time New Yorkers can expect gradually declining real energy expenses *even if rates continue to increase*. Federal retreat on existing standards could jeopardize these benefits.

Even greater energy affordability benefits are available to many households if they go further, replacing existing fossil fuel appliances with heat pumps paired with improved building shells and opting for electric vehicles or public transit. Notably, realizing these benefits will require overcoming existing barriers to entry, namely the higher capital costs associated with some clean energy options, which can be addressed, in part, through State actions such as direct financial incentives and continued public-private partnerships to support market development and innovation.

The State should take action to keep household energy costs manageable, including based on combined household energy and transportation fuel expenses. Federal policy and financial support will be critical to ensuring the success of this approach. The State should be attentive to how these policy portfolios impact different households in New York. For example, households that already depend on public transit for the bulk of their transportation needs would see lower energy cost savings from energy transition as compared to a driving household that migrates away from both natural gas and gasoline. Likewise, households that currently do not pay heating bills but may do so after a heat pump installation need careful attention.

Concerted State and federal actions are needed to address the disproportionate burden of energy costs borne by low- and many moderate-income households. This includes continued and expanded commitment to programs that support energy affordability in concert with and independent of energy transition, including bill assistance, Solar for All, the Low Income Home Energy Assistance Program (LIHEAP), and other programs that help families. Alongside these programs, the State should pursue strategies that ease access to these benefits for eligible households.

4.2.2. Access to Clean Energy Choices

A related and crucial role for State policy is reducing the upfront capital costs associated with the energy efficiency and clean energy choices that households – as well as the public and commercial sector energy users – can pursue to gain a wide range of benefits, including lower energy bills, health and comfort benefits, and others. The State can reduce the upfront cost of clean energy options through a

combination of innovation, market development and transformation, and incentives to offset a portion of these costs.

Continued public and private investment in electric vehicle charging infrastructure and zero-emissions vehicles, coupled with actions to encourage affordable managed charging, will help make the low operating cost of EVs available for more New Yorkers. The Energy Plan further emphasizes the importance of increasing the availability and affordability of safe and convenient transportation options, including through investment in smart growth development and co-locating transit in communities.

For existing buildings, financial incentives and low-cost financing are needed to reduce the upfront costs of phased energy upgrades and to motivate New Yorkers to weatherize, cut energy waste, and install high efficiency heat pumps. Other priorities include near-term emphasis on efficiency and electrification opportunities that see energy cost savings and support affordability; ongoing support for initiatives that build market confidence and capacity; and innovation that brings additional technology solutions to the market and lowers costs.

State financial support should prioritize multiple values and benefits, which means supporting energy efficiency *alongside* electrification efforts. This portfolio approach to investment planning ensures continued progress toward State goals and societal benefits, including providing air quality and health benefits and minimizing electricity system impacts from efficient electrification.

Alongside State efforts to increase access to solutions available today, support for a diverse research, development, and demonstration (RD&D) portfolio to catalyze innovation and commercialization of emerging technologies will help to expand attractive clean energy solutions and lower their cost. For example, through the Clean Heat for Challenge, New York City Housing Authority (NYCHA), NYPA, and NYSERDA have partnered to spur innovation on a packaged cold climate heat pump product that better serves the needs of large and hard-to-retrofit multifamily apartment buildings; to date, the resulting product exceeded expectations for efficiency, price point, and resident satisfaction.[27]

4.2.3. Community Benefits

There are communities within New York that have been historically overburdened by environmental pollution and harms, including from energy production, consumption, and infrastructure. The Climate Act charged the Climate Justice Working Group (CJWG) with the development of criteria to identify disadvantaged communities (DACs) to ensure that frontline and otherwise underserved communities benefit from the state's transition to cleaner sources of energy, reduced pollution and cleaner air, and economic opportunities. The Climate Act requires that no less than 35 percent with a goal of 40 percent of the investments and benefits from the State's clean energy programs accrue to DACs.

Energy affordability is a core element of energy equity. This is especially true for low- and moderate-income households, given the outsized impact of energy costs on their health, well-being, and economic

[27] Bonomo, Jordan. "NYCHA's CH4A Pilot." Presentation at a Building Energy Exchange event on the Clean Heat for All initiative. January 16, 2025. https://be-exchange.org/wp-content/uploads/2025/01/20250116_CleanHeat_Slides-UPDATED.pdf

mobility. In addition, investments can create workforce and economic development opportunities in disadvantaged communities.

The Plan further speaks to the importance of developing clean energy programs that are tailored to meet the needs of disadvantaged communities, including low-income New Yorkers. A transformative opportunity exists to invest in and expand access to quality housing that is energy efficient, comfortable, and resilient, with a focus on support for low-and-moderate income households and housing in disadvantaged communities. Across sectors, strategically targeting public investments to reduce fossil fuel combustion from transportation corridors, buildings and industry, and electricity generation in areas located in or near disadvantaged communities will improve local air quality.

4.2.4. Inclusive Outreach

Inclusive outreach to and engagement of residents and community-based organizations, with robust engagement of disadvantaged communities, is central to ensure that all communities have a voice. This spans a spectrum: from increasing the accessibility of informational resources, to involving community members during project development, to facilitating engagement of community-based leaders and the public in clean energy policy development, planning, and program design. The State also plays an important role in supporting local government capacity to undertake inclusive land-use and energy planning.

4.3. Support Economic Growth and Competitiveness

4.3.1. Affordable and Abundant Energy

Access to reliable and affordable energy is essential to attract and develop strategic industries and to support continued economic growth, including the creation of new jobs. New York benefits from a variety of features that make it competitive for future economic development, including a skilled and educated workforce, a thriving research and innovation network, access to capital, transportation infrastructure, and plentiful water and land. Recent commitments to New York from industries as diverse as semiconductors and agribusiness show the range of sectors in which the state offers an attractive setting for business investment. These industries are typically-energy intensive and require access to reliable and affordable energy, including electricity and natural gas. It is likewise important to offer businesses long-term energy cost stability and affordability.

For business and industry in New York, energy cost as a portion of total business costs varies across economic sectors (see Section 2.4.2), and so does the impact of energy cost on competitiveness. The State is attentive to the differing impacts of energy and environmental policies for different types of New York businesses. While the State will continue to pursue general energy affordability for all economic sectors, energy intensive and trade exposed businesses merit focused attention to safeguard economic competitiveness. These are generally manufacturing businesses, with certain industrial sectors experiencing greater costs than others.

State economic development efforts provide complementary support for maintaining competitiveness and localizing clean energy supply chains. Identifying and developing power ready sites to help meet the needs of large energy users is a key tool for attracting new industry, including clean energy leaders.

4.3.2. Clean Energy Choices

In addition, State clean energy programs are available to partner with new and existing businesses, government and institutional buildings, industrial energy users, and farms to advance cost-effective energy efficiency and electrification projects. In the near-term, technical assistance and targeted financial support are key State actions to reduce the upfront cost of clean energy options for non-residential energy users. Over the medium- and long-term, new and emerging technologies will expand the options for decarbonization of large existing buildings, high-heat industrial processes, and other large energy users.

4.3.3. Workforce Development

Over 318,000 workers are employed in New York's energy sector. More than half of these workers make up a mature and steadily growing clean energy workforce. 2023 marked New York's biggest year-over-year increase in new clean energy workers (5%) since tracking began, with continued growth expected.[28]

The clean energy transition provides substantial employment opportunities for New Yorkers. To support high quality jobs and local economic benefits, this Plan calls for continued investment in workforce development initiatives coupled with labor standards. It further recommends State support for training, outreach, and related wraparound services to increase equity in job access for workers who are from disadvantaged communities, veterans, displaced fossil fuel workers, and other priority populations.[31]

4.4. Advance Innovation

As discussed throughout this Plan, innovation helps reduce the cost of and increase the variety of energy technologies and services. State support for energy innovation (RD&D and commercialization) plays an important role in catalyzing the development and commercialization of technologies that help enable New York's energy transition.

Strengthening partnerships across New York's innovation ecosystem will foster economic development, create jobs, and provide greater leverage for State investments. New York is one of the leading clean energy innovation hubs in the country thanks to the strong, mutually beneficial partnerships across State agencies, universities, and the private sector – with the State as a critical anchor and coordinator.

Notably, the State University of New York (SUNY) system is a nationally recognized leader in clean energy research and innovation, with among the largest university-owned clean energy patent portfolios in the country, offering top-notch education and workforce development across 64 campuses, and as the host to large-scale clean energy demonstration projects.

[28]NYSERDA 2024 Clean Energy Industry Report.

4.5. Continue Progress Toward Decarbonization and a Clean Energy Economy

4.5.1. Place New York's Clean Energy Transition on a Sustainable Financial Footing

New York State invests public resources to catalyze the state's clean energy transition. New York's electric ratepayers have provided significant resources via programs like the Regional Greenhouse Gas Initiative (RGGI), the CES, the Clean Energy Fund, utility-administered programs for energy efficiency and electrification, and others. These programs have delivered critical progress and benefits that include energy savings, avoided greenhouse gas emissions and air pollution, improved energy independence, greater resource diversity, and more, making the investments worthwhile for ratepayers and the state as a whole. Other funding sources include federal funding, direct State appropriations, the Environmental Bond Act, and the recently enacted Sustainable Future Program. These public dollars contribute to building decarbonization (including Empower+, Clean Green Schools, thermal energy networks, energy efficient appliances), zero emission transportation (including electric school buses, Charge Ready NY, and more), renewable energy, and other efforts.

New York State also mobilizes private investment into underserved clean energy sectors. NY Green Bank, a division of NYSERDA, identifies investment opportunities to bridge financial gaps and incentivize private capital participation in developing clean and renewable energy infrastructure. Through targeted investments, NY Green Bank and NYSERDA leverage market policy mechanisms to supplement State investments and maximize the efficient use of ratepayers' dollars, further accelerating the deployment of clean energy infrastructure, and incentivizing the adoption of energy efficiency, electrification, and clean transportation.

In addition to expanding access to risk-adjusted capital, New York State also supplements state and federal investments by further expanding access to low-cost financing and credit enhancements, aimed at mitigating consumer credit risks and reducing the long-term costs of financing the adoption of clean and energy-efficient infrastructure and technologies. By partnering with specialized financial intermediaries, credit unions, and community development financial institutions, NY Green Bank and NYSERDA continue to support all market participants with financing and direct financial support.

This Plan recognizes the benefits that a clean energy transition will provide and that securing these benefits is likely to require policy reforms described in this Plan paired with strategic investments to catalyze greater adoption. While ratepayer-funded programs will continue to provide an important building block, it is not feasible to continue increasing the number and scale of programs that electric ratepayers need to fund. Doing so would run contrary to the State's long-term commitment to energy affordability and ultimately creates a disincentive to the adoption of zero-emission end-use equipment like electric cars, trucks and buses, and heat pumps.

New York's energy transition needs to be on a sustainable financial footing to secure wide benefits. Federal funding and permitting is essential to this objective. The State should continue to evaluate the role of market-based policy mechanisms (including RGGI, the New York Clean Air Initiative, and a clean transportation standard), which both provide a price signal to encourage clean energy choices and generate dedicated sources of funding that can be used to lower the cost of clean energy adoption and

for affordability investments. Other promising options include supportive State tax policy and continued advancements in financial, lending, and insurance strategies to leverage private capital. It is possible that these and other strategies may be used in combination to maximize benefits and unlock the greatest opportunities.

Extending the reach of public investments with financial strategies that boost the availability of private capital is essential to catalyze action at scale. New York State should continue to support and partner with insurance and re-insurance companies to adapt and develop new products aimed at mitigating risks associated with project completion, cost-overruns, long-term revenue performance, supply-chain constraints, residual value, and performance of new technologies. These products, coupled with climate premium credit programs, adaptive pricing, and climate impact reserves, could catalyze the clean energy transition by reducing financial risks and their associated costs, further unlocking private capital participation and supplementing state investments and direct financial support. For example, the availability of Residual Value Reserves may lead to a substantial reduction in the cost of leasing electric vehicles and energy storage systems, incentivizing the expansion of secondary markets and the adoption of third-party ownership business models. Similarly, the availability of cost-overrun insurance may further reduce the overnight cost of capital-intensive energy infrastructure projects, implicitly mitigating completion and technology risks, and potentially increasing the availability of low-cost debt financing.

4.5.2. Plan for Accelerated Action in the 2030s

Projections incorporated into the core planning case developed for this Plan represent an ambitious but achievable pace for energy transition over the next fifteen years. In the 2030s, this planning case envisions achieving 100 percent ZEV sales—a tenfold increase from 2024; heat pumps becoming the primary residential space heating choice made by consumers as they replace aging appliances; continued deployment of renewable energy alongside substantial forward progress in developing clean firm resources; increased use of waste-based alternative fuels replacing fossil fuels; and more. Measured on a like-for-like basis, the scale of energy transition and emission reductions embedded in this scenario would put New York among the leading jurisdictions globally. Achieving this level of transition will require effective implementation of the policies New York State has already enacted as well as additional actions, many of which are incorporated in this Plan, and would require support from the federal government.

Setting New York on track in the 2030s toward long-term Climate Act targets would require further policy actions, along with the development and commercialization of a number of new technologies. Incorporated below are a range of technologies and policy categories that would be needed to further accelerate the pace of energy transition above the core planning scenario. While the list below is not exhaustive, evaluating these at minimum will be necessary over the balance of this decade to understand how and whether they should be pursued by the State in the 2030s. As the State evaluates these items, it should weigh their costs and benefits, informed by robust input from stakeholders and the public, to understand whether they are appropriate for New York and to consider whether modifications or alternatives may be preferable.

Technologies. Numerous technologies will be necessary to address end uses that today rely on fossil fuels with few available alternatives or only expensive ones. These technologies are at various places in their maturity, but each of the below needs either substantial innovation or rapid commercialization to meaningfully contribute to the energy transition. Focused attention on these technologies by the State can help address gaps in available clean energy solutions and their costs.

- Solutions to address residual emissions and energy demands in difficult to decarbonize sectors:
    - *High heat/high energy density* solutions including hydrogen clusters, nuclear, and electric furnaces and heat pumps for industrial application.
    - *Negative emissions technologies.*
    - *Carbon capture and sequestration* (CCS) in particular to address emissions likely to remain in the long-term in the industrial sector.
- Expanding clean energy solutions for difficult to address market segments:
    - *Clean heating and cooling product innovation* to lower costs and barriers to installation in existing buildings, especially for multifamily and other large buildings, paired with building shell and thermal storage solutions for higher efficiency and load flexibility.
    - *Zero emission options for heavy duty and long-distance freight*, including battery electric vehicles paired with grid-integrated technologies to manage electricity system impacts and hydrogen fuel cells.
- Expanding the diversity of clean energy sources available to New York:
    - Expand hydrogen sourcing beyond *electrolysis* including thermal hydrogen and hydrogen produced from waste products, to reduce electricity system impacts from production.
    - *Sustainable aviation fuels* (SAF) including a rapid expansion of commercialization and availability and expanded authority for higher blend rates.
    - *Nuclear, especially advanced nuclear options*, to provide zero-emission, firm generation.
    - Additional electricity system resources to support flexibility and reduce the need for high-cost resources, including *virtual power plants and long duration energy storage.*
- *Grid modernization technologies* that improve the grid's performance, increase resiliency, and help avoid unnecessary transmission buildouts, including hybrid transmission and storage solutions, expanded integration of dynamic line ratings and power flow control devices, virtual power plants, and long-duration energy storage.

Policy categories. Given the significant level of long-term emissions reductions outlined in the Climate Act, the stringency of which is amplified by New York's unique emissions accounting system, the State should continue to evaluate a range of policies to improve the economics of the energy transition, create standards for the pace of transition, and promote efficient use of energy across the economy. Policies

should be evaluated for their costs and benefits, with a careful eye to implications for disadvantaged communities and low- and moderate-income households. These policies may need to take into account changes in the federal government's policies and regulations. While the policy categories below or comparable alternatives are likely necessary to further accelerate the pace of energy transition in the 2030s toward the State's long-term energy goals, they are complex and would have substantial implications for citizens and businesses in New York. These concepts would need to be carefully evaluated to determine whether they should be adopted and, if so, how to manage policy design to maximize benefits, reduce disruption, and promote affordability and reliability of energy supply.

- *As the electric grid decarbonizes, require a transition to electric technologies* with priority focus on neighborhood scale interventions.
- *Financial and operational transition strategies for the gas system* to manage cost impacts associated with reduced system utilization while ensuring continued availability for remaining residential, commercial, and industrial customers.
- *Building energy performance standards* that would apply to defined categories of buildings, such as buildings over a certain size or rental apartments.
- *Performance standards, portfolio standards, or other approaches to increase penetration of alternative fuels* including sustainably-sourced renewable diesel, renewable natural gas, and clean hydrogen to address residual combustion in industrial, transportation and building sectors and SAF to address aviation needs.
- *Policy interventions including financial incentives to accelerate adoption of zero-emission medium- and heavy-duty vehicles* including potentially measures that support early retirement of high emitting and low efficiency vehicles.

5. Planning Objectives and Guidance for Energy-Related Actions

This section offers objectives, strategies, and recommended actions to advance New York's clean energy transition consistent with the State Energy Law and the Vision set forth in Section 4.

5.1. Responsibly Advance Clean and Reliable Energy Resources

An abundant and diverse mix of clean energy sources increases the resource diversity of the energy system, offering economic and reliability benefits, and provides important environmental and public health benefits from reducing the use of fossil fuels. Multiple challenges need to be overcome to deploy the level of clean energy supply resources required to meet demand and preserve reliability in a low-carbon economy. While previously there was a sustained trend of decreasing costs for clean and renewable energy generation, that trend has reversed in recent years through the combined impacts of inflation, supply chain constraints, and, more recently, tariff uncertainty. There also are indications that the domestic supply of skilled workers will be constrained as New York and other states ramp up their renewable energy programs.

To support and advance the future development of renewable energy projects that are compatible with agricultural lands and forests, it is important to execute further assessment and to continue engagement with relevant stakeholders and facilitate the integration of smart siting practices.

5.1.1. Accelerate the Deployment of Clean Energy Resources

New York State continues to support the deployment of clean energy resources including large scale renewables, distributed and community solar, and existing clean firm capacity resources to meet demand and preserve reliability. The State's Clean Energy Standard (CES) encompasses multiple programs that support the development of new renewable generation as well as the maintenance of existing clean energy resources. NYSERDA also is advancing large-scale renewable generation through its Offshore Wind and Build-Ready programs. The NY-Sun program provides incentives to support the installation of distributed solar. NY-Sun achieved a statewide target of installing 6,000 MW of distributed solar early, in 2024, and it is on track to install 10,000 MW of distributed solar by 2030. New York also has become the nation's largest community solar market. In 2024, the PSC adopted a Statewide Solar for All program to further accelerate the development of distributed solar and energy storage projects while providing an additional bill credit to electric customers participating in the energy affordability policy (EAP). Programs across multiple energy generation and distributed energy resources will enable the State to meet its energy goals.

The State will continue to strategically navigate challenges that are affecting the pace of progress, including federal policy uncertainty and siting challenges. The 2024 Renewable Action through Project Interconnection and Deployment (RAPID) Act established the Office of Renewable Energy Siting (ORES) under DPS as the State's one stop-shop for reviewing, permitting, and enforcing permit requirements for both major renewable energy generation and transmission facilities.

Recommendations

- Support the renewable energy industry and increase clean energy supply by continuing CES solicitations and leveraging additional recommendations from the CES Biennial Review process.
- Continue to build-out distributed solar through NY-Sun to achieve the 10 GW target; and leverage Statewide Solar for All as a cost-effective way to drive additional development while maximizing benefits for fixed- and low-income New Yorkers.
- Monitor the effectiveness of the RAPID Act with respect to the pace of additions and local community engagement.
- Support strategies that expedite and streamline development including advancing Clean Energy Zones and leveraging NYPA's authority to build renewables.
- Continue to support workforce development including by directing efforts to those in disadvantaged communities and fossil fuel workers transitioning to clean energy jobs.
- Continue to evaluate the State's existing clean firm capacity resources since they will be critical to achieving a zero-emissions grid.

5.1.2. Advance Demand-Side Solutions and Flexible Resources

Leveraging demand response and harnessing the ability of flexible resources (as well as energy efficiency) to lower energy demand can reduce the scope and costs of infrastructure buildout. The New York PSC initiated the Grid of the Future (GOTF) proceeding in April 2024 to develop and maintain a plan that encourages investment in flexible resources to reduce infrastructure and operational costs, improve system reliability, and increase customer benefits and bill savings.

Energy storage enables the state to use existing resources more efficiently and helps to ensure energy is available when it is needed most. In June 2024, the PSC increased the Climate Act target of 3,000 MW of energy storage to 6,000 MW of energy storage by 2030 and established an interim target of 1,500 MW by 2025. Progress toward these targets is ongoing.[29] The Inter-Agency Fire Safety Working Group, with leadership from DHSES, Office of Fire Prevention and Control (OFPC), NYSERDA, DEC, DPS, and DOS, has guided New York State towards the adoption of some of the nation's most robust safety standards for energy storage systems, reinforced by stringent oversight and independent third-party review.[30]

Recommendations

- Improve integration of flexible resources into grid planning and grid operations.

[29] See New York State Public Service Commission Case 18-E-0130, In the Matter of Energy Storage Deployment Program. New York State Department of Public Service. "2025 State of Storage in New York: Annual Energy Storage Deployment Report." April 15, 2025.

[30] "New York's Inter-Agency Fire Safety Working Group." Accessed June 2025: https://www.nyserda.ny.gov/All-Programs/Energy-Storage-Program/New-York-Inter-Agency-Fire-Safety-Working-Group

- Continue to evaluate the contributions of longer duration storage to enhance the reliability of the electric grid.
- Investigate opportunities for flexible resources to provide grid-forming capabilities.
- Identify opportunities to enhance energy efficiency and managed electrification measures and other building upgrades.
- Continue to lead the nation in energy storage safety.

5.1.3. Support Existing Nuclear Generation and Explore New Technologies

Nuclear energy provided 22 percent of in-state bulk electrical generation in 2023, and nuclear generation has been a reliable and zero-emission electricity source in New York State for decades. The current nuclear facilities are supported, in part, by the Zero Emission Credit (ZEC) Program. The ZEC program, established in the Order Adopting a Clean Energy Standard in 2016, provides a credit to existing nuclear facilities for their zero-emissions environmental attributes to enable their continued operation. Nuclear energy is expected to play an important role in providing clean firm generation. Advanced nuclear technologies are rapidly emerging with significant improvements in modularity, scale, and safety. However, many of these technologies still need significant research, development, and deployment resulting in uncertainty in costs and timeline.

Recommendations

- Continue the ongoing evaluation of the extension of the ZEC program and conclude this evaluation prior to any federal relicensing application deadlines, to ensure the continued operation of the existing nuclear fleet to contribute to climate goals and help maintain fuel diversity and fuel security. Any extension should be done with ratepayer protection in mind, in addition to the reliability needs of the grid.
- Through the Master Plan for Responsible Development of Advanced Nuclear in New York, which has been underway since January 2025, continue to examine key considerations for advanced nuclear for long-term planning. The Master Plan process should examine the key issues raised by the January 2025 Blueprint for Consideration of Advanced Nuclear Technologies and develop recommendations for implementation of advanced nuclear technologies in the State.
- Through New York State leadership of the First Movers Initiative and other initiatives, continue to pursue multi-state collaborations to support economies of scale and de-risk new nuclear development, such as collaboration to help build out an advanced nuclear reactor order book, supply chains for construction of new reactors, and a trained workforce.
- Through NYPA's efforts to develop at least 1 GW of nuclear power generation and other actions, continue to pursue opportunities for early deployment action. Early deployment action should be undertaken in coordination with the Master Plan process and reflecting collaboration with other states to ensure that any deployment commitments leverage the insights and benefits from those initiatives.

5.1.4. Advance Strategic and Responsible Use of Low-Carbon Alternative Fuels

Zero- and low-carbon alternative fuels such as hydrogen, renewable natural gas (RNG), renewable diesel, and sustainable aviation fuel are an important complement to electrification in the State's energy transition strategy. Zero- and low-carbon alternative fuels are particularly useful in helping to decarbonize hard-to-electrify end-uses where continuing to use liquid or gaseous fuels may be necessary. These end uses could include high-heat industrial processes, supplemental and district heating, long-distance heavy-duty trucking, aviation and other non-road applications, and power generation.

Recommendations

- In cases where electrification and zero-emission solutions are impracticable due to technological, safety, cost, or reliability constraints, low-carbon alternative fuels should be prioritized for end uses where they can deliver the greatest GHG emissions reductions with the lowest cost and environmental impact. Their use should ensure net reductions in co-pollutant emissions and avoid disproportionate impacts associated with such emissions where possible.
- New York State should prioritize the use of waste-based, locally sourced feedstocks for fuels production. Recognizing the limits of waste-based and in-state supplies, the State should remain open to regionally sourced and other low-impact feedstocks that advance global GHG reductions, with a continued emphasis on minimizing land use and environmental impacts.
- To meet State policy goals, alternative fuels will need to be produced, transported, and used in the broader energy system. The blending of hydrogen into existing natural gas pipeline infrastructure remains untenable due to safety, integrity, and indoor air quality concerns.
- Alternative fuels and their associated GHG emissions should be strategically managed and accurately tracked as they move from production locations, both in- and out-of-state, to end-use to ensure realization of GHG emissions reductions. Policies and tracking systems should balance rigor with feasibility to accelerate alternative fuel deployment. To claim the use of an alternative fuel, along with the associated emissions reductions, there should be a physical and contractual path linking the source of the fuel and its use location in New York.
- Life cycle analysis can inform fuel selection and State policies and programs but under State law cannot replace Climate Act Accounting which determines the amount of GHG emissions reductions from alternative fuel use that count towards New York's statutory emissions targets.

5.1.5. Identify and Integrate Clean Firm Technologies into the Electricity System

The State will need to be strategic in identifying and integrating clean firm technologies that have the attributes necessary to support a zero-emission electric system. DPS Staff issued a November 2024 whitepaper proposing definitions of relevant terms, which is currently under consideration by the PSC.

NYSERDA and DPS are conducting a technoeconomic study of various clean firm resources that could help reduce the potential gap between electricity demand and supply in 2040 and beyond, examining

key features of each technology as relevant to New York State's context. The study is expected to evaluate the following technologies: hydrogen; biofuels including renewable natural gas and renewable diesel; advanced nuclear; advanced geothermal; carbon capture and storage; long duration energy storage; and virtual power plants. It will provide a resource for the State's ongoing assessment of viable clean firm technologies, to be conducted in conjunction with multiple State agencies.

Recommendations

- Identify and propose pathways for the deployment of viable clean firm technologies that can be deployed to address reliability needs.
- Continue to support innovation and demonstration projects as appropriate.

5.1.6. Manage the Pace of Combustion Unit Retirements to Maintain Reliability

New York's generation fleet is aging, the rate of renewable deployment is uncertain, reliability margins are shrinking, and significant levels of large loads are being added. Due to these factors, the State will need to be strategic about the pace of combustion unit retirements and/or replacements as it works towards its clean energy goals and to meet reliability needs as quickly and cost-effectively as possible. Combustion generating units will remain essential parts of electric grid reliability and affordability, and retirement of these units will not be able to occur until resources that provide the same grid reliability attributes are put in place. New York will seek to carefully manage the retirement of existing assets and evaluate whether there is a need for new generation that is compatible with long-term policy targets.

5.2. Modernize Energy System Infrastructure, Planning, and Markets

Modernizing New York's energy system infrastructure, planning, and operations is essential for energy to continue to be delivered with high levels of reliability and resilience. As discussed in Section 4, it is important to make these upgrades in a strategic and cost-effective manner.

5.2.1. Ensure New York's Energy Systems are Secure and Resilient

New York State is well prepared to respond to energy system hazards and emergencies via multi-level and multi-agency energy preparedness, response, and mitigation activities in coordination with industry. As climate change, aging systems, new energy demands, and the energy transition introduce new and evolving risks to energy systems, New York's energy security planning and emergency response practices need to keep pace. Notably, future energy system investments must be designed to withstand the impacts of a changing climate and more extreme weather events.

Recommendations Across Sectors

- Continue to prioritize energy emergency preparedness and support multi-level, multi-agency energy emergency management in the State. Support related emergency planning and the implementation of response and mitigation efforts with relevant stakeholders.
- Continue applying risk-based assessments to monitor and evaluate the changing threats upon the evolving energy system in New York.

- Consider and identify critical infrastructure or supply points for the delivery of fuels to end-users, including in the unregulated delivered fuels system. Identify any areas of concern that may need additional support to maintain reliability and resiliency.
- Undertake additional research on climate hazards with higher uncertainty, such as changes in storm intensity, winter weather, and extreme precipitation and impacts on energy systems.
- Conduct research on performance and effectiveness of emerging resilience and adaptation technologies for the energy system, particularly under changing climate conditions.
- Study and plan for vulnerabilities, such as through the Utility Climate Vulnerability Studies and Resiliency Plans and planning for extreme heat protections.

Recommendations for the Electricity and Gas Systems

- For the electricity system, continue to incorporate the impacts of climate change into future reliability planning scenarios. Further consider whether the current reliability-related metrics should be supplemented given the evolving nature of the grid and the increased risks of high-impact reliability events. Establishing criteria for metrics like effective unserved energy (EUE) may help supplement traditional criteria based on loss of load expectation (LOLE) by providing information about risks of long-duration outages.
- Gas utilities and planners should adopt a comprehensive perspective on gas system reliability, informed by the best available climate science, ensuring that utilities are prepared to meet peak needs and are able to continue providing service even in the event of potential disruptions to gas supply from individual points of failure.
- For the natural gas system, continue winter reliability and preparedness planning; enforce compliance with pipeline safety regulations; and ensure installation of on-system safety devices.

5.2.2. Advance Strategic Planning to Upgrade and Modernize Electricity Transmission and Distribution Infrastructure

The State will continue to advance smart and strategic energy system planning to enhance system reliability and drive down the cost of necessary transmission and distribution system investments. These planning efforts are particularly important considering the anticipated economic development driven load growth and long-term electrification of transportation and buildings.

Ongoing, multi-year State planning includes the Coordinated Grid Planning Process and the Proactive Planning Proceeding. The NYISO leads the Public Policy Transmission Planning Process and regular reliability planning, notably through its Reliability Needs Assessment and Comprehensive Reliability Plan. Energy planners also pursue efficiencies through enhanced interregional planning and collaboration on multi-state projects and with federal agencies, like what is being done through the Northeast States Collaborative on Interregional Transmission.

Recommendations

- Continue to ensure the state's planning processes provide actionable information for decision-makers regarding future system needs and cost-effective solutions.
    - Continue to strengthen collaboration between State agencies, NYISO and Utilities to enhance Coordinated Grid Planning Process (CGPP) in future cycles and improve the coordination of distribution and transmission planning under CGPP.
    - Continue progress towards adoption of cost-saving advanced transmission technologies.
    - Enhance interregional coordination.
- Continue collaborative efforts to address interconnection costs and processes.
- Consider new transmission and distribution system cost allocation options.
- Pursue integrated system planning for both the electric and gas systems, as further elaborated in Section 5.2.5.
- In planning processes, consider the strategic location of generation and energy storage and evaluate battery storage as a transmission asset.

5.2.3. Integrate Renewable Energy into Local Land Use Planning

Integrating renewable energy into local land use planning and zoning can result in more coordinated opportunities to produce and store energy and enhance community resilience. State agencies including DOS, DPS, NYSERDA, and the Department of Transportation (DOT) are coordinating to continue delivering tools and resources that support local planning efforts.

Recommendations

- Continue to develop local land use best practices, tools, and ordinances for planning for and siting renewables, battery storage, electric vehicle charging stations, and clean distributed energy resources. Provide additional educational opportunities for municipal officials, stakeholders, and residents to understand benefits of clean energy facilities, including job opportunities.
- Enhance technical assistance, outreach, and education on minimizing impacts of renewable energy siting on natural and working lands.
- Collaborate with regional planning boards and counties to help localities plan, zone, and review renewable energy projects, including tools for assessing appropriate locations.

5.2.4. Evolve Electricity Markets and Rates

To maintain reliability while promoting affordability, wholesale electricity market reforms are needed to appropriately value energy, capacity, reliability, reserves, and balancing services. The expected changes in the composition of electricity supply warrant consideration of how wholesale electricity markets can

attract and retain an economically efficient portfolio of resources to continue to meet all system reliability needs, particularly in 2040 and beyond. The State should continue to work with the NYISO and market participants to investigate the opportunities to evolve current markets and rules over time.

New compensation structures and retail rates also can better incentivize active participation of load in markets, including flexible resources that provide grid resiliency, improve grid reliability, and drive down costs. Retail rates should allocate costs to customers in a way that avoids an inequitable cost shift to any non-participating customers while enabling adoption of distributed energy resources (DERs).

Significant investments in the electricity system will be made in the coming decades. This draft Energy Plan places emphasis on strategies and actions that the State can take to ensure that the investments are cost-effective for New York residents and businesses. The PSC and DPS work to ensure access to safe, reliable utility service at just and reasonable rates. New York State also is advancing energy affordability through consumer protection efforts at DOS, including the Utility Intervention Unit's work to represent consumer concerns in utility rate cases, and via the PSC's Energy Affordability Policy and State and utility-administered incentive programs that help households and businesses adopt clean energy choices.

Recommendations

- Assess whether the current capacity market construct sends the proper incentives for the portfolio of resources that will be needed to support resource adequacy as the State transitions to a zero-emission grid.
- Explore how to support a glide-path to a zero-emission grid, such that technologies with the attributes needed to maintain reliability in 2040 are incentivized to be online and operational in the years leading up to 2040.
- Evaluate whether the current mix of ancillary services (and future planned changes from NYISO, i.e., Dynamic Reserves and Uncertainty Reserves) are adequate through 2040 and beyond.
- Examine additional reliability attributes that are not currently compensated through competitive market products and identify a pathway for ensuring that future portfolios maintain these attributes.
- Identify additional planning or operational rules that should be further examined and potentially adjusted to support a zero-emission electric system. An example would be to examine the loss of source limitations that constrain the sizing of offshore wind transmission networks.
- Examine the role of electricity rates and program incentives to enable deployment of DERs and flexible resources.

5.2.5. Advance Long-Term Gas Planning and Integrated Gas and Electric Planning

Declining gas system utilization—driven both by State policy and by market forces like the availability of economically and technically viable substitutes for gas—is expected to put upward pressure on retail rates and bills, threatening affordability especially for low-income customers. This dynamic also poses risks for gas utilities and other gas sector businesses, including an increased risk of stranded assets.

Enhanced gas planning practices are needed to help address these significant challenges, especially by enabling safe and strategic reductions in gas system investment while maintaining reliability and affordable energy.

Recommendations

- Continue to require New York's gas utilities to produce long-term plans (LTPs). In future LTPs, the PSC should require gas utilities to identify areas where the gas system will be necessary in the long-term and prioritize investment in those areas over others.
- Build on past progress to further advance integrated planning. This would include directing gas and electric utilities to develop standardized, locationally-specific, and transparent joint planning practices that enable optimized energy system investments. Early efforts may focus on areas where gas and electric service are provided by the same company to ease integrated planning.
- Promote the development of data sets and analytical tools that can support integrated planning. These may include locationally granular forecasts of gas and electric system peak demand, models which link gas hydraulic analysis and electric power flow modeling, and tools that map physical components or assets of the natural gas and electric systems.
- Continue to advance investments in non-pipeline alternatives (NPAs). Relatedly, the PSC should direct utilities, with support from DPS and NYSERDA, to develop planning tools and practices to enable the successful identification and deployment of NPAs to avoid investments in system extension, capacity expansion, and pipeline replacements.
- The PSC should continue to direct utilities to prioritize lower cost alternatives to pipe replacement such as pipe repair and re-lining, where safe and technically feasible. DPS and NYSERDA should work with utilities to support innovation and commercialization of technologies that enable cost-effective pipe repair and re-lining.
- Gas utilities should transparently evaluate whether their planning and investment standards properly balance the need for reliability with the need to avoid imposing unnecessary costs on ratepayers. Among other considerations, gas utilities' planning should be informed by the best and latest available climate science. Gas utilities' methodologies for forecasting design day demand—including how they incorporate the impacts of demand reduction measures when calculating usage-per-customer—should be transparent. At the same time, gas planning should incorporate a comprehensive view of reliability, including ensuring the system is available to continue to provide needed service even if individual components fail.
- The State should conduct a gas system transition plan in collaboration with one or more utility and other key stakeholders to be published concurrently with the next State Energy Plan update. The State should subsequently leverage the lessons from this initial study to develop a statewide strategic gas system transition plan with all New York utilities.

5.3. Deliver Abundant Energy Services for Economic Competitiveness

Unprecedented growth in energy demand for the industrial sector is expected in the coming years. State agencies should continue to collaborate to ensure that reliable, affordable power can be provided to the sector in a way that supports economic competitiveness as well as local communities and aligns with the State's energy goals. Supporting economic development opportunities in the clean energy sector will further promote job growth and investments, while also localizing supply chains, reducing costs, and ensuring the availability of clean energy products.

Industrial facilities can bring jobs and economic growth to communities but also increased fuel combustion and pollution. The State should prioritize public investments that benefit disadvantaged communities, and work to promote energy efficiency and low-emission technologies.

5.3.1. Meet the Growing Energy Needs of Industry and Other Large Energy Users

Energy demand from industry is expected to grow, especially from new high-tech and energy-intensive industries. Continued State coordination and investments in reliable, clean, and affordable power are needed.

Recommendations

- Continue to advance interagency coordination and planning on generation and transmission infrastructure investments.
- Continue to pursue new rate designs and demand side programs that provide competitive utility rates, reduce the cost of industrial electrification, and incentivize reduced or flexible usage of energy. Consider rate designs that differentiate charges based on peak and off-peak usage; incentivize flexible usage, including on-site energy generation; and value the storage and/or recycling of thermal energy.
- Leverage opportunities to stimulate the development of clean, firm energy supply by developing partnerships with energy intensive industry to explore the development of clean energy resources.
- Examine opportunities and challenges presented by emerging energy intensive subsectors to best accommodate new load while balancing State policy goals and targeting support to strategic industries that create wider community, economic, and workforce benefits.

5.3.2. Attract Large Employers in Strategic Industries to New York State, Including Advanced Manufacturing and Clean Energy Technology Supply Chains

New York's energy system is critical for attracting strategic industries and driving the State's competitiveness. Localizing clean energy supply chains and providing power-ready sites can help the State capitalize on these high value opportunities.

Recommendations

- Continue and enhance interagency coordination to meet the energy needs of new, large customers, thereby supporting New York's competitiveness.
- Continue supporting investments into power-ready sites for new large-scale manufacturing, with emphasis on strategic industries like semiconductors, agribusiness, transportation equipment, and other advanced manufacturing and materials processing—including related to clean energy technologies. When possible, prioritize brownfield redevelopment to leverage existing, underutilized sites.
- Identify opportunities and strategies to grow in-state clean energy supply chains, including through the development of marketing campaigns and other targeted programs.
- Continue to ensure consideration of disadvantaged communities and minority and women-owned businesses and enterprises (MWBEs) when making economic development investments, as applicable.

5.3.3. Promote Energy-Efficient, Low-Emissions Industry

Cost-effective opportunities for industrial energy efficiency and electrification (typically for low- and medium-temperature processes) can reduce energy use and on-site fuel combustion. Support for an RD&D portfolio of emerging technologies will allow deeper decarbonization over the medium- and long-term, targeting innovation for specific subsectors and high-temperature heat industrial processes.

Recommendations

- Continue to provide technical assistance to large industrial facilities to facilitate energy-efficiency and decarbonization upgrades and provide targeted financial support for promising investments.
- Prioritize action on process heating, given its status as the top source of industrial energy demand. Measures that can reduce energy needs include enhanced insulation and heat recycling. Electric alternatives include electric boilers, infrared heating, and microwaves.
- Continue to support RD&D for promising industrial decarbonization solutions for hard-to-decarbonize processes without market alternatives, such as high-temperature heating, carbon capture utilization and sequestration, low-emission processes for chemicals and construction materials production, and low-carbon alternative fuels.
- Pursue risk-sharing mechanisms with the federal government, other states, and industry to reduce the barriers to developing new energy sources and novel decarbonization solutions.
- Support the use of low-carbon alternative fuels in industrial subsectors that have limited capacity for electrification and prioritize proximity to the fuel source to reduce midstream transportation issues (e.g., fugitive emissions, pipeline costs) and to promote offtake clustering.
- Study the public health benefits of clean energy investments at industrial and agricultural facilities.

5.3.4. Promote Energy-Efficient, Low-Emissions Agriculture

Agricultural operations can reduce costs and enhance resiliency through energy efficiency, efficient electrification, and on-site energy production. Farms often lack connectivity to the energy system and can benefit from on-site investments that reduce energy needs, result in energy production on-site, or increase grid/pipeline connectivity.

Recommendations

- Support efficient electrification systems on farms including three-phased power upgrades.
- Expand the NYS Climate Resilient Farming Program to support adaptation projects that also reduce GHG emissions or at least do not increase emissions.
- Continue to support RD&D and deployment of RNG, electricity, and biogas production from on-farm waste sources, such as co-digestion of anaerobic manure and food waste for strategic and limited use. Facilitate pilot projects for small-scale digestion systems that incorporate new and innovative technologies as well as demonstration projects for community anaerobic digestion systems for multiple farms and food waste supplies.
- Support the measurement, monitoring, and verification of energy efficiency co-benefits associated with the adoption of conservation management best practices.

5.4. Support Equitable Participation in the Clean Energy Transition

New York State is committed to investing in clean energy solutions that reduce emissions, lower energy costs, and build a resilient, equitable energy system, especially for disadvantaged communities that have historically borne the brunt of pollution and energy insecurity.

5.4.1. Reduce Energy Burden for Low- and Moderate-Income Households

Responsibly developed energy efficiency and clean energy policy should maximize the energy security, safety, and comfort of low-income households while reducing their energy burden. This policy objective spans across end-use sectors and is especially relevant as households face broad cost of living challenges.

Recommendations

- Increase outreach within disadvantaged communities to ensure residents who are eligible for bill assistance can participate in available programs.
- Continue prioritizing weatherization and energy efficiency upgrades in homes as a foundational strategy for affordability and explore funding options to address structural issues that prevent home energy upgrades.
- Explore and pilot holistic decarbonization interventions within DACs. A multi-disciplinary approach that combines transportation decarbonization, building energy retrofits, onsite

renewable energy, and relevant non-energy programs - such as health and housing - can generate greater beneficial impacts than if these interventions are pursued separately.

- Maintain and expand access to transportation options, including public transit and active transportation, and address transportation mobility deserts that most severely impact LMI households and DACs.

5.4.2. Pursue Outreach and Engagement with Representatives of Disadvantaged Communities

Outreach is needed to provide clean energy benefits to residents and businesses in disadvantaged communities. Overcoming barriers like community mistrust, language access, and low program awareness requires dedicated, community-focused strategies.

Inclusive, robust engagement of disadvantaged communities in clean energy planning and program design also is essential for achieving the State's energy goals. This will help make important decisions in partnership with communities and ultimately improve access to clean energy benefits. This means engaging community leaders and residents in culturally responsive ways.

Recommendations

- Address language barriers that may hinder participation in programs by developing, regularly reviewing, and improving language access plans, building on the progress of New York State's current language access policy. Efforts may include regularly reviewing and improving language access for vital documents, translating outreach materials, and hiring multilingual staff.
- Expand community-based outreach and engagement strategies, including culturally relevant communication, face-to-face engagement, and stronger partnerships with schools, community and health centers, and local businesses.
- Consider opportunities to leverage the forthcoming Extreme Heat Action Plan's urban heat island map and DEC's Community Air Monitoring results to assist in conducting additional targeted outreach for clean energy programs such as weatherization, clean heating and cooling, solar paired with storage, and other technologies that can support health and safety during hot weather and improved air quality.
- Sustain and expand agency staff capacity to support DAC stakeholder engagement in early-stage program design as well as in energy-related regulatory proceedings and public comment processes.
- Support technical and operational capacity-building among community-based organizations (CBOs) that serve or represent DACs. Expand and increase participation in energy-related planning and regulatory processes from more frontline nonprofits, faith-based institutions, and CBOs that reflect the full spectrum of DAC needs, characteristics, and health vulnerability indicators.

- Continue to support Indigenous Nation consultation for all energy generation and storage projects that are 25MW or greater in size which may affect Indigenous Nation interests, through existing regulations and new regulations forthcoming pursuant to the RAPID Act.

5.4.3. Strategically Deploy Clean Energy to Reduce Local Air Pollution

Targeting clean energy funds to reduce air pollution from fossil fuel combustion will help address existing disproportionate air pollution burdens and prevent further inequities.

Recommendations

- Continue to advance retrofit offerings for homes and multifamily buildings that improve indoor air quality and address existing health and safety needs, with particular emphasis on advancing these measures for projects located within DACs, and for LMI households.
- Explore all pathways to accelerate the deployment of medium- and heavy-duty electric trucks and buses, along with charging infrastructure, to maximize health benefits for populations living near high-traffic roadways in disadvantaged communities.
- Pursue strategies to reduce GHG emissions and air pollutants, with particular consideration to projects that are identified or informed by stakeholder groups that work in or represent DACs, such as the DAC Community Advisory Committees of the Community Air Monitoring Initiative.

5.4.4. Deliver Economic Benefits in Disadvantaged Communities

Clean energy investments can be a powerful engine of economic growth across New York State, and particularly so in disadvantaged communities and among priority populations.

Recommendations

- Further synchronize workforce development programs to close equity gaps in job access for priority populations.[31]
- Continue to integrate on-the-job training opportunities and strong labor standards into transportation infrastructure and clean energy projects to expand quality workforce opportunities in DACs.
- Building on proven models, explore expanding renewable energy and energy efficiency retrofit programs that procure goods and services from MWBEs and service-disabled veteran-owned businesses (SDVOBs).

[31] Consistent with NYSERDA's Workforce Development and Training Definitions, Priority Populations include: Veterans; Individuals with disabilities; Low-income individuals, whose household's total income is below or at 60% of the State Median Income, or whose household has been determined eligible for or is receiving assistance through the Home Energy Assistance Program (HEAP), Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), or other human service benefit programs; Incumbent or unemployed fossil fuel workers; Previously incarcerated individuals; 16- to 24-year-olds who are enrolled in or have completed a comprehensive work preparedness training program such as those offered by Boards of Cooperative Education Services (BOCES), technical high schools, Conservation Corps, YouthBuild, and AmeriCorps; Homeless individuals; and Single parents.

5.4.5. Improve Interagency Coordination to Streamline Access to Assistance and Resources

Greater interagency, utility, and non-profit coordination can maximize participation from and benefits to DACs from energy efficiency and clean energy programs. This can result in simpler, streamlined applications, enhance impact and synergy between programs, and minimize stakeholder fatigue from repeated engagement.

Recommendations

- Through the New York State Low-Income Energy Task Force, support cross-agency efforts to streamline application processes and create universal applications for programs serving overlapping populations.
- Pursue more consolidated funding applications for communities and local governments where doing so would streamline processes and better leverage resources for clean energy.
- Continue expanding interagency membership and collaboration within the Energy Equity Collaborative to strengthen cross-sector planning.

5.5. Expand Access to Clean Transportation Options and Livable Communities

New York's robust transportation system allows New Yorkers to get where they need to go, supporting critical activities ranging from emergency response and commerce to recreation and social connectivity. The transportation sector accounts for roughly 40 percent of final energy use in the state, as well as the majority (80%) of the statewide consumption of petroleum products in the form of motor gasoline, aviation fuel, and diesel.

The State is working to accelerate a managed transition toward a transportation system that minimizes greenhouse gas emissions while providing affordable, reliable, and healthy transportation options to all members of the travelling public and promoting sustainable land use patterns. The Energy Plan proposes the following main strategies for achieving this vision:

- Continued investment in public transit, active transportation, and other mobility options, while supporting a range of transportation preferences.
- Encouragement of smart growth development that results in compact, mixed-used neighborhoods in transit accessible and location-efficient areas, where feasible.
- Continued support for EV adoption, including funding for charging infrastructure and incentives.
- RD&D in the use of alternative fuels in the transportation sector.
- Reduction of embodied emissions in transportation system construction.

Transportation investments should be made in recognition of the fact that disadvantaged communities have historically experienced an outsized share of the negative environmental impacts of the transportation system. Targeted investments in public transit, active transportation, and ZEV

infrastructure can substantially improve air quality, workforce opportunities, and overall quality of life within these communities.

5.5.1. Invest in Public Transit, Active Transportation, and Other Mobility Options

Investment in multiple modes of transportation is necessary to support diverse travel needs statewide and provide affordable, accessible options for all New Yorkers. These investments should recognize the diversity of land use patterns that exist throughout the state. For example, supporting development that provides reliable access to public transit and active transportation while linking clean transportation networks through options like shared mobility and vehicle charging hubs will make these options more viable and affordable for more New Yorkers. This, in turn, will reduce overall emissions and reliance on personal vehicles. These investments support broader initiatives that promote energy efficient land use patterns.

Recommendations

- Expand public transit through transit service enhancements, improving affordability, connectivity and convenience. Facilitate local and regional coordination to proactively plan for public transit needs.
- Modernize transit fleets through the broader transition to zero-emission transit buses.
- Introduce Bus Rapid Transit (BRT) where there is high transit demand but without the population density or land-use characteristics to justify light rail investments.
- Support shared mobility services that provide access to affordable, flexible transportation options that connect more people to transit and provide additional options in communities with limited transit.
- Offer micro-transit services, which can be more efficient than underused fixed routes by offering wider coverage and using right-sized vehicles.
- Enhance active transportation planning to enable more walking and bicycling opportunities.
- Develop municipal guidance resources, such as a template for site plan regulations that localities could adopt that require developers to include active transportation and transit amenities within commercial and residential developments where feasible.

5.5.2. Encourage Compact, Mixed-Use Neighborhoods in Location-Efficient Areas

Smart Growth development patterns and practices can result in communities that are less dependent on energy-intensive transportation and infrastructure, and are therefore more walkable, bikeable, transit-accessible, and less dependent on private vehicles. Strategic land use planning that facilitates compact, dense, and mixed-use communities combined with open space land conservation (including forests, farmlands, public parks, and coastal lands) will help reduce transportation-related energy use and make communities more livable, resilient, healthy, and equitable. A range of State policies and programs delivered by DOS, DOT, DEC, NYSERDA, and other agencies contribute to Smart Growth. State support for

local governments for planning and investment is important to encourage sustainable, equitable, and resilient community development.

Recommendations

- Prioritize and coordinate investments in location-efficient areas to enable compact development where feasible. This includes enhancing interagency coordination to support more active transportation and public transit use, and to support locating housing and mixed-use development in location-efficient areas.
- Develop resources to support local governments' Smart Growth development. This may include developing a guidebook to help communities navigate State programs and policies, design manual(s) for local governments and developers to advise on incorporating Smart Growth principles into neighborhoods in different contexts (rural, suburban, urban), model Smart Growth local laws, best practices, and increasing accessibility to relevant data.
- Develop guidance for local incorporation of energy-efficient, environmentally sustainable design (e.g., green infrastructure, passive neighborhood design) into comprehensive plans, zoning ordinances, capital plans, and other local government activities.
- Expand opportunities to redevelop distressed, vacant, abandoned, contaminated and brownfield areas to facilitate efficient infill development.

5.5.3. Support Zero-Emission Vehicle Charging Infrastructure and Purchase and Promote Managed Charging

Continued public and private investment will help make EVs a more affordable and reliable option for New York drivers. Investment in charging infrastructure in priority locations will help reduce EV "range anxiety" by making access to charging more reliable and increasing convenience. Regulations and incentives that make zero-emission passenger vehicles and medium- and heavy-duty vehicles, including non-road vehicles, more available and affordable for New Yorkers will help ZEVs reach price parity and widespread consumer adoption.

Charging equipment should be appropriate for the context of its use and State entities that fund charging equipment should aim for consistency in technical requirements. Public charging stations that may require payment for electricity provided should be able to meet accuracy and measurement standards so the validity of the public sale of energy can be verified and accountable. The National Institute of Standards (NIST) Electrical Vehicle Supply Equipment Program (EVSE) establishes key standards for equipment testing.

Recommendations

- Light-duty (LD) EVs:
    - Continue, and expand where possible, existing programs that support both Level 2 charging and DC fast charging. Coordinate charging programs across agencies to develop

consistent EV charging technical standards and application processes, and to prioritize transparency and support for charging stations in strategic locations.

- Expand efforts to encourage local governments to adopt best-practice EV charging station permitting policies.
- Continue to fund the Drive Clean Rebate and look for opportunities to increase its impact through higher targeted incentives, as feasible. Consider adding incentives for LMI buyers of new and used EVs.

- Medium- and heavy-duty (MHD) EVs and non-road vehicles:
  - Continue the ongoing MHD EV Make Ready proceeding under the PSC and continue the development of a proactive investment strategy for utility upgrades supporting EV infrastructure. Consider expanding Make Ready efforts to incorporate non-road vehicle needs, including hydrogen fueling.
  - Identify and fund opportunities for installing MHD EV charging stations at public truck parking locations.
  - Further investigate shared public site business models for MHD charging and work to remove any barriers to enabling the construction and possibly make-ready financial support for these types of sites.
  - Expand availability of funding for fleet electrification plans, as feasible, and fund EV charging installations for public fleets, like school buses, transit buses, and State and municipal fleets.
  - Continue to develop specific resources to assist school bus fleets in their electrification process and assist school districts to complete individualized fleet electrification plans.
  - Expand funding for MHD EV incentives, as feasible, and enhance eligibility for existing programs, focusing on priority market segments where zero-emission solutions are commercially available and phasing in additional market segments as they become commercially available.
  - Pilot approaches for reducing MHD EV residual value risk in the financial sector through partnerships with the private sector. Collect and analyze data associated with MHD EVs to provide better information about vehicle performance and economics to the market.
  - Undertake further non-road vehicle demonstrations and market and fleet studies for non-road market segments, which will help expand understanding of the energy needs for these hard-to-electrify sectors. This includes farm vehicles that face challenges including high equipment cost, relatively low turnover, and often grid-constrained locations.

- Managed charging:

- Continue to refine load management and managed charging programs to increase participation and efficacy.
- Further investigate effective managed charging and technologies that support vehicle-grid interaction to maximize the ratepayer benefits of transportation electrification and minimize the cost of installing charging equipment to power EVs.

5.5.4. Support RD&D for the Use of Alternative Fuels in the Transportation Sector

Investment in alternative fuels can play a role in the reduction of transportation greenhouse gas emissions. While a shift to electrification and zero-emission fuels is the sector priority, other fuels like renewable diesel and biodiesel can be an effective option in harder-to-electrify market segments and provide a pathway to include more subsectors in achieving emissions reductions.

Recommendations

- Perform further demonstrations of in-service hydrogen fuel cell vehicles and fueling infrastructure. Continue working with local authorities to demonstrate the safety of hydrogen fuel cell vehicles.
- Perform additional research to bring down the cost of hydrogen fueling infrastructure and generation or transportation of hydrogen for use as a transportation fuel.
- Continue to encourage demonstration-scale and larger applications of advanced biofuels, including sustainable aviation fuel and renewable diesel, with published test results of the performance of these fuels.
- Consider additional research and pilot projects for zero emission non-road applications, especially for large emitters operating in populated areas such as construction equipment, marine port equipment, and intermodal facilities.

5.5.5. Reduce Embodied Emissions in Constructing the Transportation System

Clear and cost-effective opportunities exist for reducing embodied emissions associated with construction materials when new transportation infrastructure projects are built or renovated. Because transportation construction materials are often sourced locally, especially aggregates as well as other materials, these measures could promote reduced energy use and emissions associated with in-state manufacturing and transportation of these materials. Environmental Product Declarations (EPDs) are the most common way of quantifying and reporting the emissions impacts of a product. As part of New York State's commitment to lead by example under Executive Order 22, State projects are accounting for embodied emissions in procurements associated with capital projects and reporting on data to increase transparency and provide data to inform future decisions.

Recommendations

- Collect better life cycle embodied carbon data for covered materials to identify the best opportunities for achieving material performance and emission reductions.

- Update material specifications in a manner that supports industry, construction performance and drives scale and progress toward lowering embodied carbon emissions in high volume construction materials.
- Coordinate with other States and jurisdictions on standardized reporting requirements and methods used in EPDs.
- Support market development of technologies and firms to produce affordable, low-carbon materials within New York State.

5.6. Expand Access to Healthy, Efficient, and Low-Emission Homes and Buildings

New York State's buildings are as varied as their surrounding communities. Upgrading the structures where New Yorkers live, work, and learn offers unique challenges as well as significant opportunities. Modernizing and decarbonizing buildings will deliver comfort, health and safety, resiliency, and economic benefits to New Yorkers. In particular, the energy transition provides an opportunity to invest in and expand access to quality housing, with a focus on support for low-and-moderate income households and buildings in DACs.

This Plan recommends five main strategies as central to improve and decarbonize New York's buildings sector, keep buildings comfortable, prioritize affordability, and support reliability of the grid and gas system:

- Prioritizing energy efficiency and weatherization.
- Advancing efficient electrification to reduce on-site fossil fuel use.
- Continuing innovation and market development for new and emerging clean building technologies.
- Enabling demand management and load flexibility at scale.
- Reducing embodied greenhouse gas and refrigerant emissions.

In existing buildings, a phased approach to capital investments is an effective way to manage the associated cost and disruption. In large buildings, Resource Efficient Decarbonization is a proven approach to strategic capital planning that creates a path towards efficiently decarbonizing buildings. This model provides a repeatable process to help alleviate space constraints, optimize peak thermal capacity, increase operational efficiencies, utilize waste heat, and reduce the need for oversized electric thermal energy systems, creating retrofit cost compression. A similar approach can be taken in smaller buildings and homes, by weatherizing to improve comfort and reduce heating and cooling costs, and by upgrading to energy-efficient and electric appliances as old appliances become unreliable (but before an emergency replacement is needed).

5.6.1. Provide Financial Incentives and Affordable Financing for Energy Upgrades in Buildings

Energy efficiency and decarbonization upgrades deliver significant value to building owners and occupants but upfront and operating cost barriers persist. For existing buildings, financial incentives and affordable financing can reduce upfront costs and motivate New Yorkers to make energy upgrades in buildings. New York State currently invests over $1 billion annually in public funds for State- and utility-administered customer incentives and financing offerings that help make energy efficiency and decarbonization solutions more available and affordable. Well-established policies and programs are in place to help New Yorkers lower energy use and save on energy bills and to assist residents and business owners understand, plan, and pay for energy upgrades.

Recommendations

- Continue to offer financial incentives to reduce upfront costs and motivate New Yorkers to make energy upgrades in buildings, supporting strategic measures that result in energy load reduction and enable decarbonization through weatherization, heat recovery, and electrification.
- State- and ratepayer-supported incentives should prioritize support for energy upgrades in existing buildings that are likely to deliver both energy and cost savings.
- Explore expanding access to affordable financing programs such as Green Jobs-Green New York (GJGNY) and continue offering zero-cost and below-market-rate predevelopment lending options to affordable housing building owners.
- Ensure the efficient and effective rollout of the three-part rate design (customer charge, contract demand charge, daily as-used demand charge) adopted by the Commission under the standby rate proceeding.

5.6.2. Prioritize Support for Energy Upgrades in Low- and Moderate-Income Housing

State support for low-and-moderate income households and buildings in disadvantaged communities to make energy-related upgrades will help make homes and communities healthier places to live, while addressing historical inequities. NYSERDA, New York State Homes and Community Renewal (HCR) and LIPA – in coordination with the utilities and the New York State Office of Temporary and Disability Assistance – provide State leadership in administering ratepayer, RGGI, federal, and State funding across residential LMI programs like Empower+, the Weatherization Assistance Program, and the Affordable Multifamily Energy Efficiency Program. These programs support energy efficiency and electrification solutions that will help LMI New Yorkers save energy and money, increase comfort, and improve the quality of their homes. The PSC's Energy Affordability Policy sets a goal of ensuring that low-income households will pay no more than six percent of annual household income toward energy bills, with major electric and gas utilities providing low-income customers with energy bill payment assistance through monthly tiered discounts.

Recommendations

- Continue to prioritize and coordinate public support across energy and housing programs to address energy performance and housing quality for LMI housing and buildings in disadvantaged

communities. In State and utility-administered programs that support energy upgrades in LMI housing, focus on weatherization in the near-term.

- Explore new and expanded funding sources that can support non-energy building improvements including health and safety upgrades that are necessary to install energy measures, as well as expanded funding for energy upgrades in LMI housing.
- Continue to simplify and streamline access to LMI programs, including those administered by the investor-owned utilities. This should include streamlining program application processes to help support New Yorkers' ability to smoothly access eligible services across agencies and leveraging the Regional Clean Energy Hubs.
- Consider opportunities to expand or modify energy bill assistance. This should include continuing to expand opportunities for community solar projects or other clean energy projects that provide electric bill savings to income-eligible households and/or that benefit affordable housing or buildings in disadvantaged communities.
- Continue to support opportunities for LMI residents and buildings in DACs to pair electrification with solar energy to benefit both the building owner and residents.
- Consider updates to policies that enable equitable electrification for regulated affordable housing.

5.6.3. Transform the Market for Efficient and Low Carbon Building Technologies

Building market confidence and capacity and encouraging innovation will expand decarbonization solutions across various building types. Market development support is needed to help expand the clean energy workforce and support existing supply chain actors and businesses in adapting to effectively deliver clean energy technologies, all while building awareness and confidence in clean heating solutions among consumers and contractors. Existing initiatives are providing technical assistance and financial support, engaging consumers and the supply chain, and supporting workforce development and training to enable the delivery of energy efficiency and clean energy solutions.

Additionally, public investments, coordinated with strategic public-private partnerships, are critical to spur further technological innovation, demonstration, and commercialization and to help bring emerging solutions to the market and lower costs. This is especially the case for hard-to-decarbonize building types or specific energy uses in buildings.

Recommendations

- Through GJGNY, continue to provide free audits for single family residential and small business applications, and consider opportunities to scale virtual remote audits.
- Continue to cost-share technical assistance and energy planning that provides actionable information for how larger, more complex buildings can cost-effectively decarbonize over time following the Resource Efficient Decarbonization model.

- Continue to support workforce development and training for critical growing building occupations.
- NYSERDA, NYPA, and utility program administrators should continue to engage key weatherization and heat pump supply chain actors – including manufacturers, distributors, and contractors – to streamline delivery models and help build confidence in heat pump products while improving availability of heat pump products for both residential and larger-scale heat pumps in New York State.
- Explore providing product stocking incentives to motivate local distributors of heating and air conditioning equipment to stock a range of modern heat pump products at fair prices, increasing availability and consumer choice to support sale of high efficiency heat pumps for homes, small- and mid-sized businesses, and public buildings.
- Continue State support for innovation and demonstration for drop-in decarbonization solutions – in partnership with portfolio owners that can deploy equipment at scale – that are cheaper than existing solutions and significantly streamline the design/installation phase of a heating, ventilation, and air conditioning (HVAC) project.
- Accelerate technology transfer, product testing, and commercialization to make it easier to bring emerging solutions for efficient electrification to market in New York State and regionally. Also support development of growth-stage companies and capital partners to scale clean energy solutions and new business models.
- Support market development of technologies and the development of New York industries to produce affordable, low-carbon materials. Integrate embodied greenhouse gas considerations, including the use of EPDs, into programs that are designed to bring awareness to sustainable building practices. Seek to advance partnerships with other states to increase demand for low-emissions construction materials.

5.6.4. Coordinate Efficient Building Electrification with Gas and Electric System Planning

Coordinated efforts with gas system and electric grid planning are needed to enable a shift beyond building-by-building conversions to networked solutions, including thermal energy networks (TENS). Enabling efficient, community-scale decarbonization will be important in unlocking strategies such as thermal energy networks, neighborhood redevelopment plans, area-based thermal energy planning, and other integrated planning approaches, while taking into consideration the avoided costs of gas system maintenance. Integration of energy efficiency and electrification projects with neighborhood redevelopment and master planning should be prioritized, so that decarbonization is central when redevelopment, replacement, and total rehabilitation occurs.

Recommendations

- Develop a Thermal Energy Network Roadmap for New York State that lays out the market barriers currently facing TENs development in the state, while identifying a set of holistic solutions in the near and mid-term to address these barriers.

- Advance analysis of TENs. Topics for study include geospatial analysis to identify areas of the state that may be most viable for thermal energy networks (based on proximity of thermal demand and available thermal resources) and to improve public access to thermal resource data. Analysis should also help to understand the impacts, benefits, and tradeoffs for the energy system of investing in TENs versus standalone building decarbonization strategies.
- DPS should continue to advance regulatory framework development for TENs in a manner that provides increased market understanding and certainty as to what regulations will require and for which types of systems. This is especially integral for multi-user (non-campus) TENs.
- Explore the role of area-based thermal energy planning and resources that support municipalities and communities to identify locations with high potential and local support for TENs.

5.6.5. Support Regulatory Frameworks

Regulatory frameworks are important to drive broad and sustained improvements in building energy performance, support load flexibility, and to reduce emissions from building operations, equipment, and construction materials.

As zero-emission codes for new construction go into effect, continued advancement and timely enforcement of building and energy codes will improve comfort, indoor air quality, and resilience while helping shift buildings away from fossil fuels. Appliance and product standards are lowering energy usage as existing residential and commercial buildings upgrade their equipment and can further help promote demand flexibility. Improved access to building energy consumption data provides actionable insights to identify the best opportunities for achieving energy cost savings and emissions reductions. Lessening the environmental impact of the buildings sector also requires managing refrigerants and embodied carbon.

Recommendations

- Utilities should continue efforts to provide customers with readily available access to their energy consumption data, with tools to aggregate and automate the process of sharing this data.
- Continue to support capacity-building and education for local governments to help support successful implementation of new code requirements.
- DOS, in partnership with other agencies, should continue to support enforcement of the zero-emission new construction requirement as the first phase comes into effect in 2026, including training and certification of building officials, monitoring compliance rates and market trends, providing technical support, and providing continuing education to support code enforcement.
- DOS and NYSERDA should continue to prioritize reduced energy use intensity as part of the next iteration of the Energy Code to continue reducing energy use in new and substantially renovated buildings. The agencies should also continue to track and evaluate the need for further code

improvements that support the safe roll-out of ultra-low global warming potential (GWP) refrigerants and consider incorporation of embodied emissions requirements.

- Support training and/or certifications for industry technicians, system designers, and other stakeholders on proper use of alternative refrigerants and best practices for leak detection and reclamation of refrigerants.
- Advance research and demonstration to enable adoption of the next generation of low and ultra-low GWP refrigerants.

5.6.6. Encourage Resilient Buildings

Buildings of all ages, functions, and locations across New York State are vulnerable to the impacts of climate change and investments should consider associated long-term risks. Making design decisions in both new and existing buildings that align buildings' and building components' life cycles with future climate projections and expected hazards will lead to more cost-effective, sustainable, and future-ready buildings that can support many generations of use.

A variety of programs are available to support homeowners to proactively prepare for future conditions. HCR has expanded the Resilient Retrofits Program, a combination of low-interest loans and grants to low-and-moderate income single-family homeowners whose homes are in flood-prone areas or have been damaged due to heavy rainfall. This program enables them to render their homes more resilient to flood damage and, if desired, to decrease their GHG emissions by improving the energy efficiency or electrification of the home. HCR is also administering federal disaster recovery funding that goes beyond damage repair to support resilient investments for future storms. NYSERDA has begun to incorporate forward-looking climate projections into competitively awarded programs to encourage efficient and resilient buildings in multifamily, single family, commercial, and industrial sectors.

Recommendations

- Explore pairing weatherization/energy efficiency measures with resilience measures in State and utility-administered clean energy programs. Such measures should include back-up power solutions and should inform broader community and building-level resilience strategies that can meet community safety and passive survivability needs in acute situations.
- Explore and consider piloting a "resiliency first" energy storage incentive; prioritizing the ability of an energy system to withstand and recover from disruptions, such as power outages, natural disasters, or other emergencies; starting with critical community serving public sector facilities.
- Consider investing in energy-efficient resilience hubs that incorporate clean energy resources, especially in disadvantaged communities that are vulnerable to climate change.

5.7. Grow Clean Energy Jobs

New York's energy workforce is essential to the safe and reliable construction and operation of our energy system. The State's energy system is also a meaningful job creator and driver of economic growth. As the system transitions, new economic opportunities will emerge. To meet its clean energy

goals, New York will need to rapidly deploy new energy infrastructure, adopt new technologies, accelerate building decarbonization activities, and efficiently manage existing systems. These goals can only be met by growing and supporting a well-trained workforce to carry out transformational work across the entire energy system. As the clean energy sector grows in New York State, so too do clean energy job opportunities for New Yorkers.

In New York, clean energy jobs are among the fastest growing employment sectors. While clean energy jobs make up just 2 percent of the employed statewide workforce—at 178,000 clean energy jobs—the number of clean energy jobs increased roughly 27 percent over the last decade, exceeding statewide job growth. Significant job growth can be expected to continue as clean energy industry investments expand, though the most impacted sectors and sub-sectors will shift and evolve as new technologies emerge and others mature. To create high quality jobs and local economic benefits, this Plan recommends continued investment in workforce development initiatives coupled with labor standards.

5.7.1. Expand Clean Energy Sector Workforce Training and Curricula

Continued State investments into workforce development programs and related services are essential to provide the scale and speed of workforce training needed for the clean energy transition. Strategically developed workforce development programs can build up the capacity of skilled workers so that the State can meet the needs of the clean energy ambitions. Extensive coordination is needed to ensure that the career pipeline will materialize for these trained workers.

NYSERDA serves as the leading State agency responsible for promoting clean energy workforce development, alongside key clean energy workforce training initiatives at the New York State Department of Labor (DOL), SUNY and CUNY, Empire State Development (ESD), NYPA, and others. State investments support employers in “upskilling” their employees through additional training, micro-credentials, and certifications; facilitate the placement of entry-level workers with jobs, apprenticeships, or paid internships; connect fossil fuel workers with opportunities to pivot to the clean energy economy; and provide wraparound services to employees (such as transportation and tuition assistance).

Recommendations

- Identify opportunities to incentivize and bolster workforce training participation in key occupations where shortages are projected, such as technicians, construction trades, and manufacturing.
- Workforce development efforts should also prioritize: expanding the capacity of the energy efficiency workforce and the development of installation and operation skills for high-efficiency HVAC equipment; expansion and operations of EV charging infrastructure; a growing demand for building and maintaining new transmission and distribution infrastructure; further investments in energy storage, distributed and large scale solar, wind, and thermal energy networks; and building up transferrable skills that would support future nuclear development.
- Continue funding Direct Entry and pre-apprenticeship programs that support clean energy projects, including identifying any need for additional long-term State funding.

- Expand clean energy career awareness initiatives in K-12 schools and initiatives to provide educational resources.
- Continue and expand investments into clean energy career training curriculum on SUNY/CUNY campuses and BOCES across the state.
- Continue coordinating across State agencies to streamline evaluation of workforce development programs in the clean energy sector, facilitate study of related career pathways, modernize civil service titles to meet clean energy labor demands within State jobs, and support faster and better results from clean energy programs.

5.7.2. Improve Accessibility for Workers from Disadvantaged Communities.

Improved program awareness and accessibility can facilitate equitable participation of workers from DACs in the clean energy workforce. By prioritizing the accessibility of workforce trainings, the State can improve DAC representation within the clean energy workforce and deliver benefits of the transition to these communities. Accessibility can be improved by partnering with trusted community organizations, ensuring DAC representation amongst trainers and educators, tailoring communications campaigns to specific communities, and providing wraparound services such as childcare, transportation, and tuition assistance.

Recommendations

- Consider launching new statewide communications campaigns to promote inclusive participation in clean energy careers.
- Continue to identify and pursue opportunities to fund wraparound services.
- Expand clean energy training programs in correctional facilities.
- Further study the representation and retention of individuals from DACs in clean energy jobs, especially individuals who have completed State-funded training.

5.7.3. Support a Just Transition for Fossil Fuel Workers

The State is committed to creating pathways for New Yorkers to move into new, high-quality clean energy jobs and to support those transitioning out of fossil-fuel-energy-based employment. Currently there are roughly 80,000 jobs in fossil fuel electric generation plants, the natural gas distribution system, the transportation and storage of delivered fuel, and other related fossil fuel jobs. Many of these positions will transition to clean energy roles with little or no adjustment on the part of the workers. Other workers, however, are likely to experience displacement. For example, gas station utilization is declining as drivers shift to home charging. To support a just transition for impacted fossil fuel workers, it is essential to develop safety net policies for workers at risk of job loss. The creation of the Office of Just Energy Transition (OJET) under the New York State Department of Labor is an important step to support this critical energy workforce.

Well-designed workforce and labor policy can promote a just transition for these workers through a combination of proactive investments into retraining, upskilling, or right of first refusal for workers transitioning into clean energy fields. The State can also provide protective measures for fossil fuel workers who are negatively affected by the State's climate policy but for whom transitioning to a clean energy field is not possible, such as compensation and benefits through a bridge to retirement program.

Recommendations

- Undertake research to assess the employment impacts of transitioning fossil fuel subsectors to better inform how to design and prioritize just transition policies.
- Research and estimate the potential impacts of safety net measures that support workers negatively impacted by climate policies. Such measures could include wage guarantees, bridge to retirement, transitional opportunities, or support for communities facing plant closures.
- Consider a Just Transition Fund, with dynamic support from multiple sources, that could support safety net measures.

5.7.4. Identify Opportunities to Further High-Quality Energy Jobs

Labor standards for energy projects are a key tool to improve the quality of life of workers, minimize inequality, and generate local economic benefits. For example, prevailing wage requirements can ensure that minimum pay standards are met, while Project Labor Agreements and Labor Peace agreements ensure the rights of organized workers are protected. Safety regulations can protect workers from dangerous working conditions, such as extreme weather and other unsafe working conditions. Labor standards also lead to high quality work products, the result of standardized training and high productivity. However, the clean energy industry is highly varied, and there is no one-size-fits-all set of labor standards that will guarantee high job quality.

New York should continue to implement policy that improves job quality for clean energy projects, by encouraging a combination of union labor, prevailing wage standards, Project Labor Agreements, Labor Peace Agreements, community benefits plans, workplace health and safety requirements, or Buy American standards, as applicable.

Recommendations

- Undertake research that analyzes the labor standards that apply to clean energy jobs. This analysis should identify gaps in federal or State labor standard coverage and consider policy actions that can ensure clean energy jobs are high quality.

5.8. Grow Innovation in the Clean Energy Economy

New York's clean energy goals have already helped to catalyze a robust clean energy industry. The State currently boasts one of the largest, most mature clean energy workforces, advanced markets for clean energy technologies, and extensive research and innovation hubs. Public and private investment in clean energy companies has been significant between 2021 to 2023, reaching nearly $4 billion, a 71 percent

increase over that period. Growth can be expected to continue as New York remains committed to expanding existing markets and fostering the growth of emerging technologies.

New York also holds one of the most robust innovation ecosystems in the U.S., ranked third nationally in both clean energy and technology sector jobs based on the DOE's U.S. Energy and Employment Jobs Report and U.S. Bureau of Labor Statistics, and second in total R&D spending. Investing in education, outreach, and innovation for clean energy technologies can ensure that New York has the capacity to develop yet-to-be scaled technology solutions that can enable the State to meet its energy goals.

The State is committed to continuing to support this vibrant ecosystem to increase the supply of reliable and clean energy sources, lower greenhouse gas emissions, and ensure clean energy affordability and accessibility throughout the state. As part of these efforts, New York is also committed to integrating the priorities, needs, and participation of disadvantaged communities (including but not limited to, the siting of demonstration sites, project participation, and in benefits assessments). New York also seeks to build on the success of prior investments and coordination activities that have brought numerous beneficial technologies like building sensors and controls for more efficient heating and cooling, ground source heat pumps, grid responsive technologies for dynamic load management, alongside growth of key local energy ecosystems, in battery storage, offshore wind, and management.

5.8.1. Support R&D, Demonstration, and Commercialization for Clean Energy Technologies

New York's energy innovation strategy is supported by NYSERDA, ESD, SUNY, and other partners. NYSERDA supports research and development, demonstrations, commercialization, and the broader innovation ecosystem, in clean energy focus areas including grid modernization, power generation and storage, and technologies that support buildings, transportation, and industry, with an emphasis on ensuring reliability and resilience across the energy system. ESD runs New York Ventures and other technology accelerators. SUNY is a nationally recognized leader in clean energy research and innovation, with among the largest university-owned clean energy patent portfolio in the country. The system is comprised of 64 schools, with three campuses focused specifically on clean energy research and innovation: the Stony Brook Advanced Energy Research and Technology Center; the University at Buffalo RENEW Institute, and the Binghamton University S3IP Center of Excellence.

Sustained support for innovation throughout the demonstration, commercialization, and market adoption phases plays an important role. These later stages are essential to effectively integrating beneficial clean technologies into the energy system. Although continued investment in research remains important for long-term innovation, state commercialization programs can help advance later-stage technologies and support carbon reduction goals while minimizing economic disruption.

Recommendations

- Continue to invest in RD&D aligned with key priorities and needs identified across all energy sectors to accelerate the deployment of beneficial technologies, increasing performance and reducing costs.

- Continue to support commercialization activities, startup growth, and bringing market-ready products and businesses to New York State.
- Continue to commission studies and performance evaluations to provide objective information to the public on the trade-offs in cost, performance, environmental benefits and policy compatibility of emerging and existing energy technologies.

5.8.2. Strengthen Partnerships Across New York's Innovation Ecosystem

The State's innovation ecosystem is also comprised of many critical, non-governmental players, including private research laboratories, investors, national labs, military facilities, investor owner utilities, and others. State programs are designed to leverage existing funding, partnerships, and expertise, as well as play a coordinating role in driving clean energy innovation. As New York welcomes new industry partners into the state, coordination among regional and statewide technology partnerships is critical to continue driving innovation, attracting new talent and industry, and supporting our energy needs.

Recommendations

- Continue to strengthen and formalize partnerships across the entire New York State innovation ecosystem. This includes working with public and private organizations and universities to accelerate deployment of key energy technologies, and activities such as developing strategic market roadmaps and matching appropriate sites with first-of-a-kind demonstrations that have potential for widespread replication.
- Coordinate with universities and community organizations to consider development of a set of effective and feasible best practices for integrating the priorities, needs, and participation of disadvantaged communities that can include demonstration sites, project participation, and project benefits assessments.
- Build upon successful models to leverage combined market share and economies of scale to accelerate cost reductions and market adoption of key energy technologies.

5.8.3. Harness the State's Clean Energy Technology Education Pipeline

Investing in the State's clean energy technology education pipeline can ensure that the talent needs for the growth and evolution of New York industries are met. New York's education system serves as the linchpin of the State's clean energy research and innovation portfolio, providing not only education and workforce development, but also driving research and commercialization efforts and hosting large-scale demonstration projects.

Recommendations

- Continue to prioritize and expand the SUNY clean energy research and education portfolio, in addition to continuing to identify opportunities to leverage SUNY's expansive physical footprint (111 million square feet of conditioned space or 40% of the state's footprint, including 54,000 acres) to support clean energy demonstration sites.

- Continue to leverage SUNY's successful climate research task force model to develop and advance a clean energy research strategy that builds on ongoing research programs across multiple SUNY campuses.

6. Impacts of the Draft Plan

This section assesses impacts associated with the implementation of the Draft Plan with respect to economic impacts, health and environmental quality, and energy costs for households.

6.1. Economic Impacts: Energy Jobs

Over the 2025 to 2040 planning period, the Draft Plan's core planning scenario (Additional Action) is expected to generate meaningful economic benefits for New York. The Additional Action scenario is expected to generate over 60,500 net jobs—a 13 percent increase—between 2025 and 2040 (see Table 2). The electricity and buildings sectors experience notable growth, jointly adding more than 80,000 net jobs, driven by sizeable investments into clean electricity generation, building efficiency and electrification, and clean transportation. The employment expansion in these sectors is nearly four times the projected decline in transportation and fuels sectors, driven by decreased investments in vehicle maintenance, fueling stations, and other fossil fuel-related subsectors.

Table 2 Additional Action Scenario Jobs

	2025	2030	2035	2040	Change 2025 to 2040
Electricity	138,701	164,007	184,665	183,331	32 %
Buildings	169,445	188,840	203,116	208,298	23 %
Transportation	136,808	134,030	129,155	118,190	-14 %
Fuels	31,616	31,496	29,284	27,449	-13%
Total	**476,570**	**518,373**	**546,221**	**537,268**	**13 %**

Projected employment increases in the electricity sector are concentrated largely in renewable energy sources such as wind, hydropower, and solar, as well as in storage and electric distribution jobs. This growth meaningfully outpaces projected displacements in fossil-fuel generation. Additionally, repowering fossil fuel generation plants near retirement to clean, dispatchable energy sources helps offset many of jobs that would otherwise be displaced. In the buildings sector, growth is expected in both the commercial and residential subsectors, with notable increases in the residential shell subsector, where jobs are expected to grow nearly fourfold to support increased investments in decarbonizing New York's housing stock.

Construction jobs and manufacturing jobs are expected to see the largest increases. Within the two net growth sectors, the electricity sector and the buildings sector, roughly half of the added jobs (or 43,900 jobs) are in the construction industry. About a fifth (21%) are in other supply chain work (including operations and related work), 14 percent are in manufacturing, and the balance are in professional services and in jobs induced across other industries (see Figure 20).

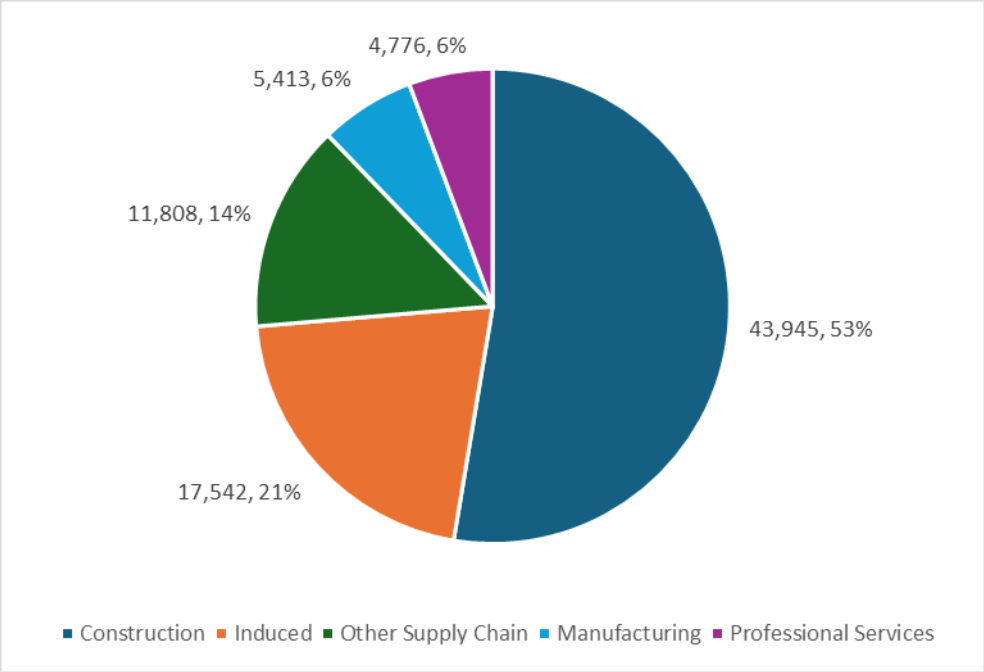

Figure 20. Net Job Growth by Industry, Growth Sectors (Electricity and Buildings) (2025-2040)

6.2. Public Health Impacts

The economywide energy policies included in the Draft Plan's core planning scenario (Additional Action) would lead to reductions in air pollutant emissions, improvements in statewide air quality, and ensuing public health benefits.

The health analysis estimated public health benefits from reduced exposure to fine particulate matter ($PM_{2.5}$) concentrations at the community scale and reduced exposure to ozone concentrations at the county scale. Reductions in exposure to $PM_{2.5}$ and ozone concentrations from the Additional Action scenario is projected to result in health benefits for all communities statewide, and benefits are expected to increase over time from 2025 to 2040.

By 2040, the Additional Action scenario is projected to result in nearly 1,200 avoided premature mortality cases per year and to annually avoid nearly 500 nonfatal heart attacks and over 1,400 emergency room visits for asthma (Figure 21). In total, over the 2025-2040 planning period, the Additional Action scenario is estimated to result in nearly 9,700 avoided premature mortality cases and to avoid 4,100 nonfatal heart attacks and nearly 12,500 emergency room visits for asthma. These projections represent statistical estimates of health benefits based on modeled changes in air pollution exposure, reflecting risk reductions across populations, rather than definitive outcomes for specific individuals.

Health Effect	Avoided Cases Per Year	Fraction in DAC Areas
Population of Disadvantaged Communities in New York:		36%
Premature Mortality	1,200	46%
Nonfatal Heart Attacks	500	44%
Hospitalizations	320	46%
Acute Bronchitis	510	46%
Respiratory Symptoms	16,000	46%
Emergency Room Visits, Asthma	1,400	72%
Asthma Exacerbation	9,800	46%
Minor Restricted Activity Days	321,500	45%
Work Loss Days	54,600	45%

Figure 21. Annual avoided public health impacts in 2040 from reduced $PM_{2.5}$ concentrations under Additional Action

While all New Yorkers would benefit from reduced pollution, air quality improvements are projected to be greater in disadvantaged community areas than in non-DAC areas, leading to greater health benefits in DACs. In New York City, while there would be local differences, DACs and non-DACs would experience similar average improvements in air quality. In addition, for all health outcomes, DACs have higher existing levels of health conditions, which is another reason DACs would experience a greater proportion of the health benefits. While geographic DACs account for 36 percent of the State's population, 44-72 percent of the health benefits are expected to accrue in these communities in the Additional Action scenario, depending on the health outcome. For example, DACs are expected to experience 72 percent of the avoided emergency room visits for asthma under the Additional Action scenario (Figure 21). Higher benefits within DAC areas are expected in all areas of the state.

The statewide value of the health benefits associated with the Additional Action scenario is estimated to reach $16 billion annually by 2040, for a total cumulative value of $65 billion (net present value 2024$) from 2025 through 2040 due to reduced exposure to ozone and $PM_{2.5}$. All areas of the state are projected to experience health benefits, with most benefits accruing in urban areas where population and air pollutant emissions are greatest. In each region of the state, DAC areas are expected to receive a larger share of the value of benefits relative to their fraction of the population in the region, and statewide, 50 percent of the monetary health benefits would accrue to geographic DACs.

Under the Additional Action scenario, most statewide benefits would result from reductions in emissions from buildings and on-road vehicles, with the total benefits from emission reductions in these sectors increasing from 2025-2040. In addition to the importance of these sectors to statewide health benefits, DAC areas are projected to receive a higher proportion of benefits from certain sources compared to non-DAC areas. For example, while electricity is a small relative contributor to overall benefits, cumulative benefits from electricity generation (2025-2040) in DAC areas are higher than in non-DAC areas and are therefore effectively more than double the non-DAC benefits from that sector per capita.

Physical and monetary health benefits from the Additional Action scenario are estimated to be approximately 30 percent greater than the Current Policies scenario. Projected benefits from Net Zero A are approximately double the Additional Action scenario.

6.3. Environmental Impacts

New York State's air pollution control and clean energy programs are contributing to improving air quality and environmental benefits for communities and ecosystems across the state. Over the past twenty years, market forces, economic drivers, and the implementation of federal, State, and local clean energy and energy-related air quality policies have resulted in substantially reduced emissions and decreases in concentrations of ambient air quality pollutants. In addition to the health benefits associated with cleaner air, the observed decreases in sulfur dioxide (SO2) and nitrogen oxides (NOx) have significantly reduced acid (rain) deposition across New York. Ecosystems are slowly recovering, and many are now able to support more diverse and abundant wildlife and associated recreational opportunities.

These trends in air pollution reductions and associated benefits are projected to continue under each of energy pathways scenarios modeled for this Draft Plan.

New York State has a robust regulatory framework for identifying and mitigating environmental impacts associated with energy development, generation, transmission, and use. The energy modeling performed for this plan identifies increasing amounts of solar, storage, offshore wind, and onshore wind for electricity generation by 2040. The most pronounced impacts from deployment of large-scale clean energy sources are associated with the conversion of mostly undeveloped lands to energy generation. The most land-intensive energy generation source is solar energy, which requires approximately 5 acres per MW of capacity.

New York State has developed and continues to refine strategies for procuring and permitting energy resources to reduce risks to ecosystems and wildlife and avoid or minimize land use conflicts. Relatedly, the State is actively investing in research and monitoring related to the environmental implications of new and emerging technologies or fuels, siting and mitigation practices, and dual-use opportunities. For example, New York State is funding research to produce data on crop and grazing potential, environmental and species use, and optimal siting design considerations for large solar projects. In addition, the State conducted extensive environmental and fisheries data collection as part of the New York State Offshore Wind Master Plan to inform an understanding of environmental sensitivities and user conflicts associated with potential offshore wind areas.

These types of early investments in data collection can reduce environmental and project risks, help to inform construction windows and permit conditions; and accelerate project timelines. New York State convenes multiple stakeholder groups to inform and advise on issues associated with energy development. These stakeholder groups have proven successful in identifying areas to advance research to inform responsible energy development policies.

6.4. Affordability Impacts

The household energy affordability analysis assesses household and transportation energy expenditures for household profiles and journeys that are representative of scenarios from the economywide pathways analysis.

The analytic approach starts with technology and measure characterization data and technology adoption over time from the economywide pathways model, supplements this with household scale data (such as household energy and transportation energy demand) and energy price projections, and calculates household and transportation energy demand and expenditures.[32]

The analysis includes household profiles for three income levels (low-, moderate-, and average income) across three regions of New York State (Upstate, Downstate, and New York City), for a total of nine profiles. For each household profile, future household and transportation energy expenditures are calculated for four illustrative journeys involving different technology mixes and fuel types, ranging from more reliant on fossil fueled heating and transportation to more reliant on efficient electric heating and transportation.

Household journeys:[33]

- **Starting Point**: Fossil fueled heating and transportation with average existing equipment
- **Conventional Replacement**: Fossil fueled heating and transportation with new, more efficient equipment
- **Moderate Efficient Electrification:** Some electrification of heating and transportation, with basic building envelope efficiency measures
- **High Efficient Electrification:** More electrification of heating and transportation, with basic or medium building envelope efficiency measures, and efficient electric appliances

Key Analysis Takeaways

Energy saving measures, such as weatherization and building envelope efficiency, efficient appliances and equipment, fuel efficient and electric vehicles, and transit use can lower overall household and transportation energy expenditures. Households pursuing these measures are likely to see gradually declining rates of energy consumption and energy spending in real dollar terms over time due to the combined impacts of adopting more efficient equipment. The nature and extent of these cost savings differs by profile, with dynamics that vary across regions, building types, and income levels.

The analysis shows significant opportunities for households to lower transportation energy expenditures. For driving households, both conventional replacement with a more fuel-efficient option and vehicle electrification can lower transportation energy spending relative to the average starting point, and

[32] The analysis focuses on energy expenditures and includes a sensitivity where equipment costs are also included

[33] A more detailed description is available in the affordability impacts chapter and appendices. Both efficient electrification journeys include building weatherization/efficiency retrofits, which are critical for realizing affordable operating costs.

vehicle electrification can further reduce transportation energy spending relative to conventional replacement outside of NYC. In addition, households well-served by transit, including in NYC, are able to keep overall energy costs lower than average by minimizing or avoiding transportation energy expenditures.

Household energy expenditures vary across profiles and journeys. Households that heat with a delivered fuel, such as heating oil, can realize substantial savings from efficient electrification. For some households that use natural gas heating, household energy costs could increase with heat pump adoption alone; however, the combined impacts of heat pump adoption, building envelope efficiency, and more efficient lighting and appliances can lower household energy expenditures.

Although households pursuing efficient electrification may experience lower combined operating costs, the analysis shows these households would see a net cost increase relative to a conventional replacement journey when including the combined up-front costs for vehicles, heating systems, efficient appliances, and building envelope measures.

Energy Affordability Conclusions

Across the US and New York, households face affordability challenges. As a subset of housing and transportation costs, energy is an important, but not a primary, driver of affordability challenges. To understand how energy costs impact people, it is important to look comprehensively at both household and transportation energy spending, which is lower in New York than the national average, as well as lower than the top outmigration states from New York.

Low- and moderate-income households are more likely to experience energy affordability challenges. Across the US and New York, although low- and moderate-income households on average use less energy and spend less on energy than higher income households, their combined energy burdens are still often many times greater. In addition, lower income households and vulnerable populations experience energy insecurity at above average rates. These dynamics further exacerbate disparities in health and quality of life.

Energy saving measures, such as building envelope efficiency, efficient appliances and equipment, fuel efficient and electric vehicles, and transit use, can lower overall household energy costs. Many households pursuing these measures are likely to see net reductions in operating costs due to the combined impacts of a variety of efficiency measures, including efficient electrification, on household and transportation energy spending. For some low- and moderate-income households, such as transit dependent households and those that do not currently pay a heating bill, continued attention will be needed to advance overall energy cost reductions when pursuing efficient electrification.

Policy and market solutions that focus on lowering up-front costs and other barriers to adoption for a range of energy efficiency and efficient electrification measures have the potential to enable households to realize more affordable operating costs. This can in turn help to alleviate energy insecurity and energy burdens.