17. Energy Affordability Impacts Analysis

Draft New York State Energy Plan

July 2025

Key Findings

- **Across the U.S. and New York, households face affordability challenges.** There are many drivers of household affordability, and expenditures in areas such as housing, transportation, food, and healthcare are significant. 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. On average, total energy spending, accounting for household and transportation energy costs, in New York is lower than the national average, as well as the top outmigration states from New York.

- **Low- and moderate-income households are more likely to experience energy affordability challenges.** Across the U.S. and New York, although low- and moderate-income households on average use less energy and spend less on energy than higher income households, their household energy and transportation energy burdens are still often many times greater. In addition, lower income and vulnerable populations experience energy insecurity at above average rates. These dynamics further exacerbate disparities in health and quality of life. Existing programs that promote energy efficiency and offer bill assistance play a key role, but more action is needed to make energy services more affordable, in particular for low-income households, vulnerable populations, and disadvantaged communities.

- **Energy saving measures, such as building envelope efficiency, efficient appliances and equipment, fuel efficient and electric vehicles, and public transit use, can lower overall household energy costs.** Many households pursuing these measures are likely to see net reductions in operating costs on a real dollar basis due to the combined impacts of a variety of efficiency measures, including efficient electrification, on household and transportation energy spending. However, the actual savings and energy costs will vary depending on the unique circumstances of the household when pursuing energy efficiency and electrification projects. These factors include building envelope and insulation, home size and occupancy, type of home (e.g., single-family vs. multi-family), efficiency of existing and new equipment, extent of equipment replacement, and usage of equipment. 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 there are no negative affordability impacts for households pursuing efficient electrification. New York should continue to investigate and develop affordability programming and electric rate designs that enhance low- and moderate-income households' ability to manage electricity costs.

- **Policy and market solutions that focus on lowering up-front costs and other barriers to adoption for a range of energy efficiency 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.

Key Terms

- **Household and transportation energy expenditures** are the total amount households spend on both household energy (such as electricity and heating fuel) and transportation energy (such as gasoline and electricity). This metric is a useful indicator of a household's overall energy spending.
- **Energy Insecurity** is the inability to meet basic energy needs. It may mean having to choose between energy and other expenses, keeping your house at an unsafe or unhealthy temperature to save expenses, or being unable to pay energy bills.
- **Energy Burden** is the percentage of gross income that a household spends on energy. It is calculated by dividing the average housing energy cost by the average annual household income. When a household is described as energy burdened, that generally means that it spends more than 6 percent of household income on energy.[1]
- **Transportation Energy Burden** is the percentage of gross income that a household spends on energy for transportation. It is calculated by dividing the average transportation energy cost by the average annual household income.
- **Disadvantaged Communities (DACs):** The Climate Act defines disadvantaged communities as communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise of high-concentrations of low- and moderate-income households. DACs are identified using criteria as established by the Climate Justice Working Group.[2] On March 27, 2023, the CJWG voted to approve the DAC criteria.[3]
- **Household income strata:**
    - **Low-income** includes households with incomes at or below 60 percent of State Median Income.
    - **Moderate-income** includes households with incomes above 60 percent but below 80 percent of State Median income or Area Median Income, whichever is higher.
    - **Average income** uses the average income of a household in an analysis region to represent households with incomes that fall above the low- or moderate-income range.

[1] U.S. Department of Energy, *Low-Income Energy Affordability Data (LEAD) Tool*, https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool.
[2] New York State, *Environmental Conservation Law* § 75-0101(5) (2019).
[3] New York State Climate Act, *Disadvantaged Communities Criteria*, https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria.

1. Overview

Affordable, clean energy is foundational to ensuring that New Yorkers have access to safe, healthy homes and neighborhoods, clean air, and economic opportunity. Delivering affordable, clean energy will involve necessary upgrades across the energy system to ensure that it is resilient to disruption and that modern, reliable energy services are accessible to households and industries across the state.

Household energy costs are a subset of housing and transportation costs, which in addition to other categories like food and healthcare contribute to overall cost of living. Figure 1 below illustrates household spending by category as a share of income in New York State and in the United States on average.

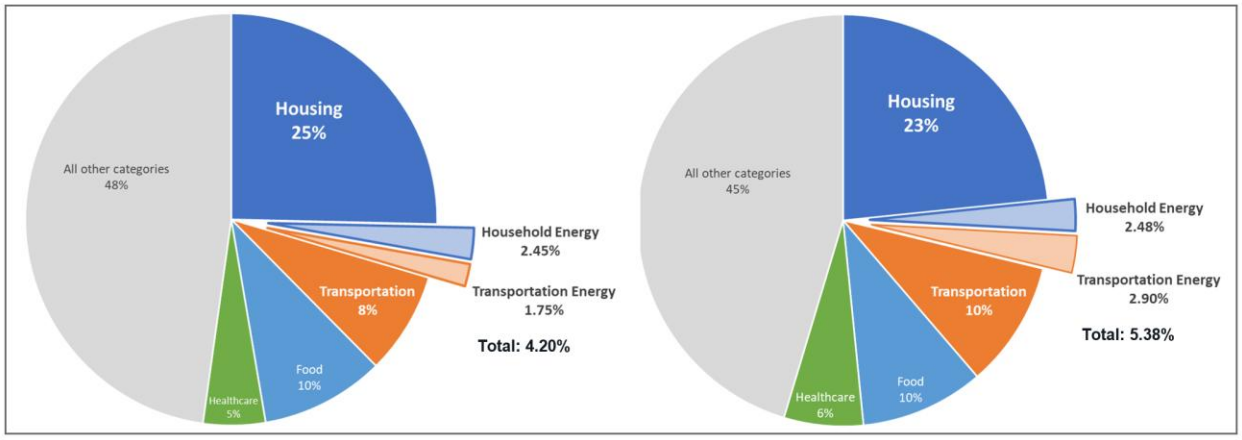


Figure 1. Household spending as share of income, New York State and United States[4]

Although there are broad similarities between average household spending in New York State (NYS) and the United States (U.S.) as a whole, there are some small but notable differences. The share spent on housing is slightly higher in New York State while the transportation share is slightly lower as compared to the US. Total household energy and transportation energy expenditures are a relatively small share of household income relative to other categories, and energy spending in New York State is slightly lower than the US average.

Within the State, household energy consumption patterns differ by region due to factors such as climate, dwelling size and differences in the built environment, and access to public transit. These characteristics contribute to differences in energy expenditures and energy affordability in different regions of the state.

For many low- and moderate-income households, energy affordability remains a challenge. Two concepts used to assess the nature and extent of energy affordability challenges are **energy insecurity**, or the inability to meet basic energy needs, and **energy burden**, the proportion of household income that a household spends on energy. Low- and moderate-income (LMI) households and disadvantaged communities (DAC) experience energy insecurity and energy burden at higher-than-average rates. LMI

[4] U.S. Bureau of Labor Statistics. Consumer Expenditure Surveys. New York and U.S.: 2021 & 2022. Accessed 4/16/25, https://www.bls.gov/cex/tables.htm#geo.

households and DACs are also more likely to face barriers that limit access to affordable clean energy services.

2. State of energy affordability in New York

2.1. Overall affordability

New York State strives to provide affordable clean energy to families across the state. The Climate Act sets NYS on a path to decarbonize its energy system by midcentury, while ensuring that 35–40% of investments flow to DACs. The State has adopted a target of limiting energy burden for low-income households, so that energy costs do not exceed 6% of household income, and affordability is the Governor's top priority in the development of key policies. New York provides support for programs that save energy and save families money, such as efficiency in buildings and vehicle electrification.

Across the U.S. and across New York, households face affordability challenges. As illustrated in Figure 1 above, there are many drivers of household affordability, including significant expenditures in areas such as housing, transportation, food, and healthcare. As a subset of housing and transportation costs, energy is an important, but not a primary, driver of affordability challenges. Energy affordability can be understood as a focus on the energy cost components of the overall cost of living.

To understand how energy costs impact people, it is important to look holistically at both household energy expenditures and transportation energy expenditures. On average, 2.5 percent of income goes toward household energy spending in both NYS and the U.S., while the share of income devoted to transportation energy spending is 1.8 percent in NYS and 2.9 percent in the U.S. In total, the combined average household and transportation energy expenditures as a percent of income are 4.2 percent in NYS and 5.4 percent in the U.S. Together, household and transportation energy expenditures provide a comprehensive perspective on the ways energy policy impacts household expenditures to meet energy needs and provides an opportunity to evaluate tradeoffs between different consumer choices households may make.

As illustrated in Figure 2 below, 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.[5]

[5] We use Consumer Expenditure Survey (CE) data throughout this chapter to characterize combined household and transportation energy expenditures, as well as associated energy burden, transportation energy burden and combined household energy and transportation energy burdens. 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 that as of the time of this writing was removed from publication by the current administration.

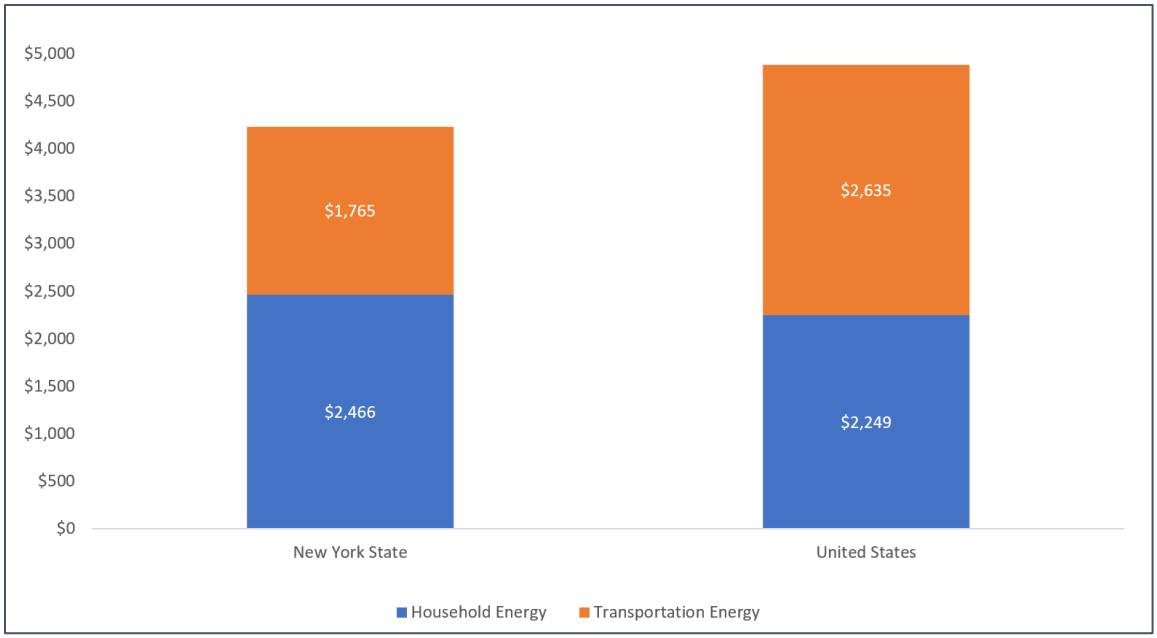


Figure 2. Average household and transportation energy expenditures, New York State and United States, 2021-2022

Energy prices can be higher in parts of NYS than the US average, but energy consumption is lower, leading to lower total household and transportation energy expenditures than the national average. Lower transportation spending offsets slightly higher household energy spending on a statewide basis in NYS. On average, NYS has the lowest average household Vehicle Miles of Travel (VMT) and transportation energy expenditures as a percentage of income in the nation.[6] Within the State, these dynamics vary: Average transportation energy expenditures as a percentage of income downstate is 50 percent lower than upstate, where it is comparable to the national average. This variation reflects the greater access to transit and less reliance on personal vehicles downstate relative to upstate.

As noted in Figure 3, 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 U.S. households above: substantially lower household transportation energy offsets higher household energy spending.

[6] Zhou, Y., et al. Argonne National Laboratory. 2020. Affordability of Household Transportation Fuel Costs by Region and Socioeconomic Factors. Accessed 4/16/25, https://publications.anl.gov/anlpubs/2021/01/165141.pdf.

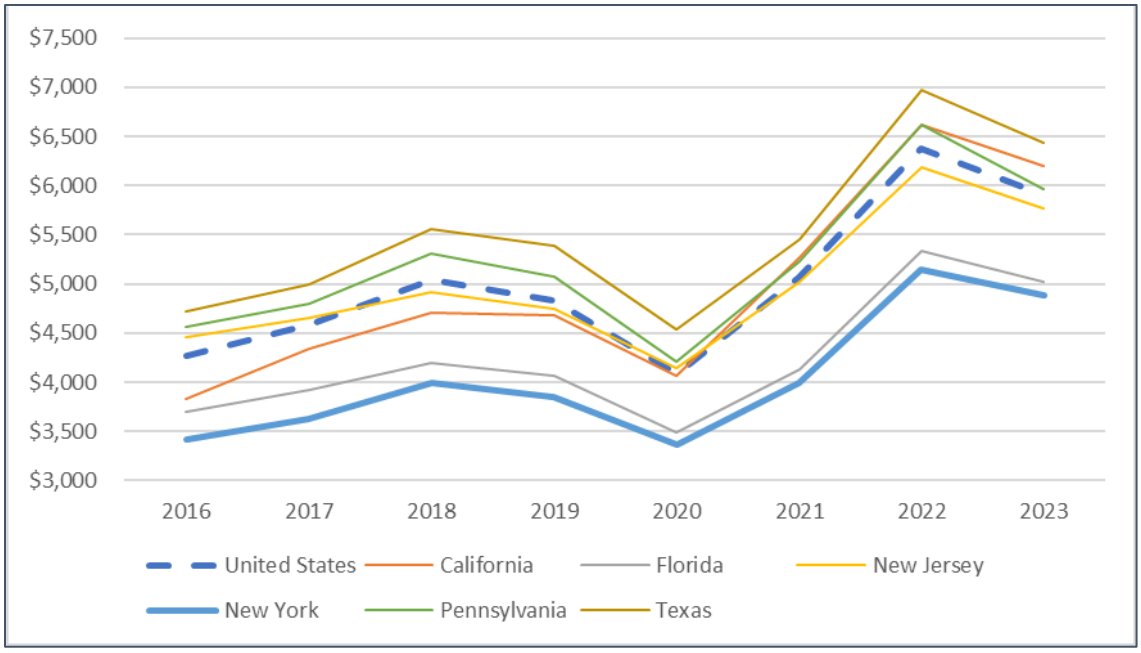


Figure 3. Total household energy and transportation energy cost per household, US, NYS, and top outmigration states from NYS[7]

2.2. Energy burden and energy insecurity

Across the U.S. and across New York, low- and moderate-income households are more likely to experience energy affordability challenges. As shown in Figure 4 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 NYS than the US, the energy affordability needs of all New Yorkers are not always being met. In NYS, energy burdens experienced by 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 burden experienced by the lowest income households is nearly four times higher than average. Notably, on average households in the second lowest income quintile experience energy burdens close to six percent.[8] [9]

[7] Source: U.S. Bureau of Economic Analysis. Regional Data, GDP and Personal Income. Accessed 5/2/25, https://www.bea.gov/itable/regional-gdp-and-personal-income.

[8] In the CE data, incomes in the lowest and second lowest quintile, together representing 40 percent of NYS households, were $12,749 and $35,983, respectively. The comparable U.S. incomes in the lowest and second quintiles were slightly higher at $13,678 and $36,104. The average income for CE households in NYS was $100,630 versus $90,718 for the US.

[9] Researchers are increasingly considering the total combined household energy and transportation energy burden to be a useful complement to energy burden that represents a comprehensive perspective on household energy spending. See, for example, Bell-Pasht, A., ACEEE. 2024. Combined Energy Burdens: Estimating Total Home and Transportation Energy Burdens. Accessed 5/1/25, https://www.aceee.org/topic-brief/2024/05/combined-energy-burdens-estimating-total-home-and-transportation-energy-burdens. See also, NREL. 2025. SLOPE: State and Local Planning for Energy. Energy Affordability – Household Energy and Transportation Burden. Accessed 5/1/25, https://maps.nrel.gov/slope/data-viewer?layer=eej.household-energy-burden.

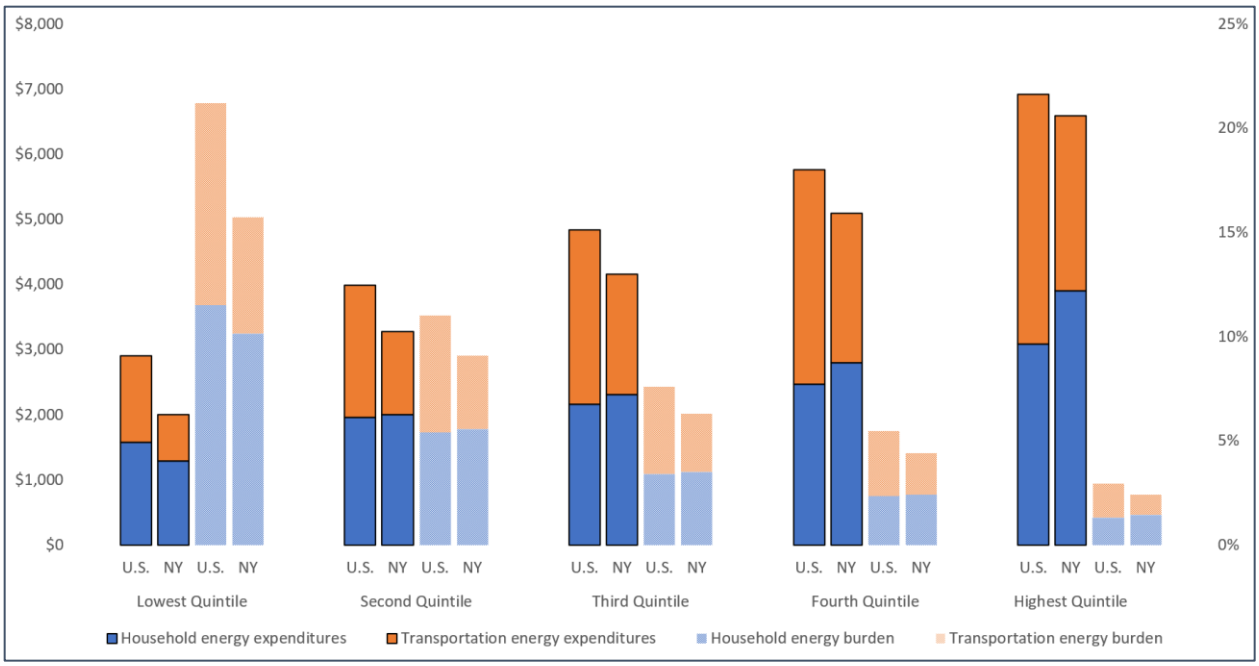


Figure 4. Energy and transportation expenditures and associated burdens by income quintile, United States and New York State, 2021-2022[10]

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.[11] Indeed, at the end of 2024, nearly 1.4 million NYS 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.

It is important to note that the energy expenditures and burdens presented above represent average, population-scale data as opposed to individual household experience. For example, in addition to households that pay for all of their utilities and drive daily, this data will necessarily include households who rent, don't pay a heating bill, and primarily use transit instead of driving. In addition, there is some time lag between the current moment and the most recently available data. For these reasons, these metrics are not directly comparable to any one individual household or segment of households, including those household profiles analyzed as part of the outlook in this chapter.

[10] 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 4/16/25, https://www.bls.gov/cex/tables.htm#geo.

[11] U.S. Census Bureau, Household Pulse Survey. Accessed 4/16/25, https://www.census.gov/data/experimental-data-products/household-pulse-survey.html. US Energy Information Administration, Residential Energy Consumption Survey. Accessed 4/16/25. https://www.eia.gov/consumption/residential/data/2020/. Households experiencing higher than average rates of energy insecurity from these data include minorities, people with disabilities, women, larger households, and households with children.

2.3. Mitigating barriers impacting access to affordable clean energy services

A variety of programs are available to advance energy affordability, either through bill assistance, or by advancing efficiency and electrification of buildings and transportation. Existing programs focused on low-income households include the Weatherization Assistance Program, Empower+, Low-Income Home Energy Assistance Program, Energy Affordability Program, and the Energy Affordability Guarantee Pilot. Even more programs provide support for moderate-income households or households in general, such as Inflation Reduction Act rebates and tax credits, as well as a host of NYS-specific programs. NYSERDA maintains a list of programs here (https://www.nyserda.ny.gov/All-Programs) and a set of dashboards that track clean energy programs and investments here (https://www.nyserda.ny.gov/ny/dashboards).

However, low- and moderate-income households experience a range of barriers that inhibit access to affordable clean energy services. Often resulting from historical patterns of exclusion, segregation, and disinvestment in communities, these barriers can be linked by common themes: **Physical and Economic Structures and Conditions** (e.g., split incentives,[12] limited access to public transit or Electric Vehicle charging), **Financial and Knowledge Resources and Capacity** (e.g., lack of time, expertise, access to credit), **Perspectives and Information** (e.g., lack of trust[13]), and **Programmatic Design and Implementation** (e.g., program complexity, awareness gaps).[14] More action is needed to overcome barriers to affordable clean energy. More information on barriers to access and adoption can be found throughout the plan, and in the transportation, buildings, and environmental and climate justice chapters in particular.

3. Outlook

3.1. Analytic approach

The outlook is informed by a household energy affordability analysis, which assesses household and transportation energy expenditures for a set of household profiles and journeys that are representative of scenarios from the economywide pathways analysis.

As illustrated in Figure 5, The analytic approach starts with technology and measure characterization data and considers technology adoption over time from the economywide 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.

[12] Split incentives occur when the benefits do not accrue to the party that makes an investment.

[13] Households may not always experience a high level of trust in clean energy programs, installers, and contractors to deliver promised performance.

[14] New York State Disadvantaged Communities Barriers and Opportunities Report. 2021. Accessed 4/16/25, https://climate.ny.gov/-/media/Project/Climate/Files/21-35-NY-Disadvantaged-Communities-Barriers-and-Opportunities-Report.pdf.

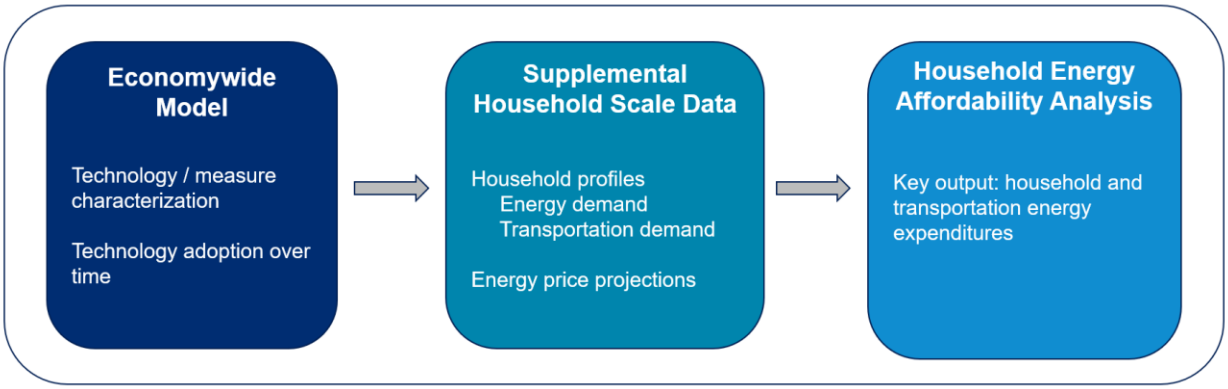
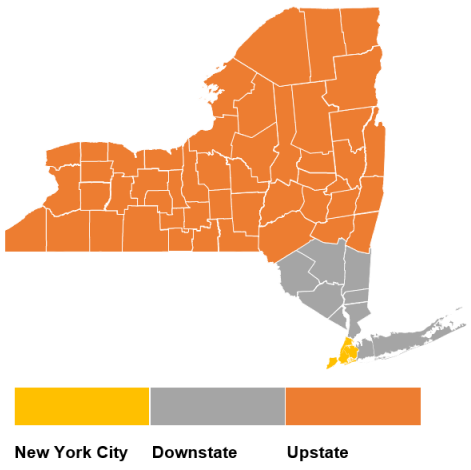


Figure 5. Household energy affordability analysis approach

In this way, the analysis represents household journeys that are consistent with the range of household technology adoption within the economywide scenarios.

The analysis includes household profiles for three income levels, low-, moderate-, and average income, across three regions of the State, Upstate, Downstate, and New York City, for a total of nine profiles. Figure 6 below illustrates the factors that represent and differentiate these household profiles.

Analysis Regions



Household Profiles

Region	Income Level	Housing Type	VMT *
Upstate	Low Income	Multifamily	16,954
Upstate	Moderate Income	Single Family	25,394
Upstate	Average Income	Single Family	29,114
Downstate	Low Income	Multifamily	13,702
Downstate	Moderate Income	Single Family	21,433
Downstate	Average Income	Single Family	32,728
NYC	Low Income	Multifamily	11,217
NYC	Moderate Income	Multifamily	13,178
NYC	Average Income	Multifamily	13,879

* Annual Vehicle Miles Traveled (VMT) for driving households in that region at that income level.

Figure 6. Analysis regions and household profiles

For each household profile, future household and transportation energy expenditures are calculated for four illustrative journeys involving different technology mixes and fuel types.

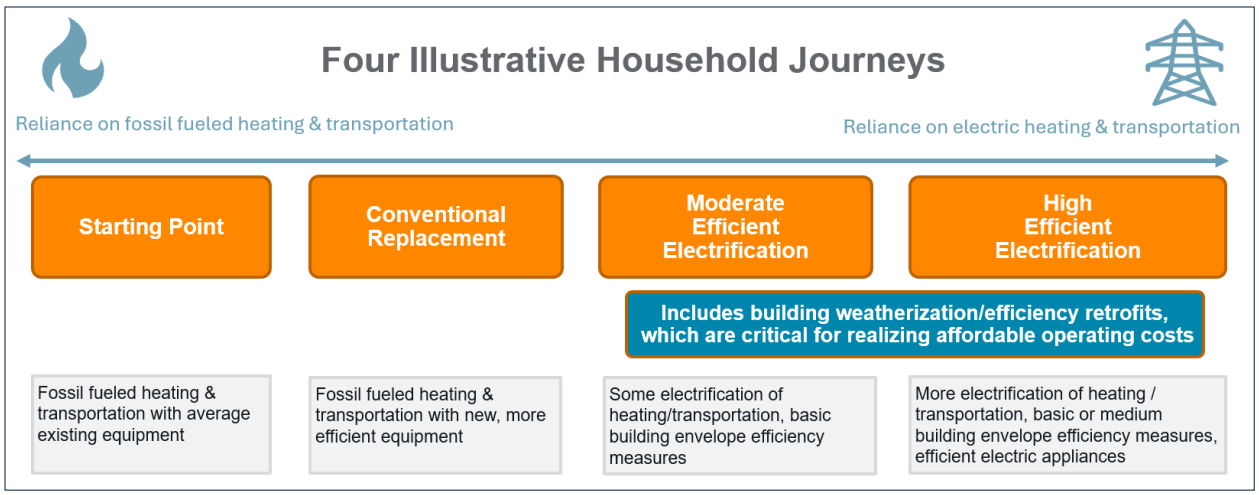


Figure 7. Household journeys

As Figure 7 shows, these journeys range from more reliant on fossil fueled heating and transportation to more reliant on efficient electric heating and transportation, with the critical role of building weatherization and efficiency retrofits reflected in each efficient electrification journey. A more detailed matrix of assumptions can be found in the appendix and the energy affordability data annex.

- Household journeys
    - **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

The analysis explores the cost impacts of these journeys across household profiles in a starting point year of 2026 and a five-year time step of 2031. More detailed assumptions can be found in the appendix and the energy affordability data annex.

3.2. Summary of findings

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 costs. Households pursuing these measures are likely to see gradually declining levels of energy consumption and operating costs 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. In addition, it is important to note that the actual savings and energy costs will vary depending on the unique

circumstances of the household when pursuing energy efficiency and electrification projects. These factors include building envelope and insulation, home size and occupancy, type of home (e.g., single-family vs. multi-family), efficiency of existing and new equipment, extent of equipment replacement, and usage of equipment.

Table 1 shows changes in both total expenditures, and expenditures disaggregated household energy and transportation energy, across household profiles and journeys. These include variations that examine heating with oil as opposed to natural gas. Note that detailed results and additional sensitivities can be found in the energy affordability data annex.

The analysis shows significant opportunities for households to lower transportation energy expenditures. For driving households, both conventional replacement of gasoline vehicles with a more fuel-efficient option and vehicle electrification can lower transportation energy spending relative to the average starting point, and vehicle electrification can further reduce transportation energy spending relative to conventional replacement outside of NYC. In addition, households well-served by public transit, including in NYC, can 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 potentially lower household energy expenditures.

Although all household profiles see savings in combined total household and transportation energy spending relative to the 2026 Starting Point in the Conventional Replacement, Moderate Electrification, and High Electrification journeys, there are some instances where household energy spending increases. These are the upstate Moderate Electrification journey across income levels and the upstate High Electrification journey for low-income and average income households. In these cases, cost savings in transportation energy offset household energy spending increases. The expenditure values from which the percentage changes in Table 1 are derived can be found in Table 2, which also includes disaggregated household and transportation energy expenditures. Detailed results may be found in the energy affordability data annex.

Table 1. Changes in monthly household energy and transportation energy expenditures by profile and journey (real 2025 $)

Compared to Starting Point in 2026		2031			
Household Profile	**Expenditures**	**Starting Point**	**Conventional Replacement**	**Moderate Efficient Electrification**	**High Efficient Electrification**
Upstate, Moderate Income with Oil	Household	*6%*	*-8%*	*-27%*	*-50%*
	Transportation	*1%*	*-39%*	*-48%*	*-63%*
	Total	***4%***	***-22%***	***-36%***	***-56%***
Upstate, Low Income	Household	*2%*	*-15%*	*4%*	*6%*
	Transportation	*1%*	*-39%*	*-56%*	*-69%*
	Total	***1%***	***-30%***	***-32%***	***-39%***
Upstate, Moderate Income	Household	*2%*	*-13%*	*10%*	*-8%*
	Transportation	*1%*	*-39%*	*-48%*	*-63%*
	Total	***1%***	***-29%***	***-25%***	***-41%***
Upstate, Average Income	Household	*2%*	*-13%*	*10%*	*1%*
	Transportation	*1%*	*-39%*	*-48%*	*-63%*
	Total	***1%***	***-30%***	***-27%***	***-39%***
Downstate, Moderate Income with Oil	Household	*6%*	*-8%*	*-18%*	*-34%*
	Transportation	*1%*	*-39%*	*-39%*	*-46%*
	Total	***4%***	***-20%***	***-26%***	***-39%***
Downstate, Low Income	Household	*5%*	*-13%*	*-6%*	*-11%*
	Transportation	*1%*	*-39%*	*-39%*	*-54%*
	Total	***4%***	***-23%***	***-19%***	***-28%***
Downstate, Moderate Income	Household	*5%*	*-11%*	*-7%*	*-23%*
	Transportation	*1%*	*-39%*	*-39%*	*-46%*
	Total	***4%***	***-23%***	***-20%***	***-33%***
Downstate, Average Income	Household	*5%*	*-11%*	*-7%*	*-17%*
	Transportation	*1%*	*-39%*	*-39%*	*-46%*
	Total	***3%***	***-26%***	***-24%***	***-32%***
NYC, Low Income	Household	*5%*	*-12%*	*-9%*	*-14%*
	Transportation	*1%*	*-39%*	*-19%*	*-35%*
	Total	***4%***	***-20%***	***-12%***	***-20%***
NYC, Moderate Income	Household	*5%*	*-12%*	*-9%*	*-14%*
	Transportation	*1%*	*-39%*	*-19%*	*-35%*
	Total	***4%***	***-21%***	***-12%***	***-21%***
NYC, Average Income	Household	*5%*	*-12%*	*-9%*	*-11%*
	Transportation	*1%*	*-39%*	*-19%*	*-35%*
	Total	***4%***	***-21%***	***-12%***	***-19%***

3.3. Results and discussion

3.3.1. Monthly energy demand and expenditures

Figure 8, Figure 9, and Figure 10 below Illustrate the monthly energy expenditures in detail for a selection of profiles and journeys.[15] Although the analysis considers nine total household profiles and two additional variations with oil heat,[16] these selected profiles illustrate some key overall dynamics. Each figure displays average monthly expenditures for all relevant fuels and categorizes them as household energy and transportation energy. Detailed tables and figures for all profiles and journeys are available in the energy affordability data annex.

Relative to the Starting Point, energy efficiency drives sequentially greater reductions in energy consumption in the Conventional Replacement, Moderate Efficient Electrification, and High Efficient Electrification journeys. In the Conventional Replacement journey, energy consumption is reduced due to the replacement of existing equipment, such as more efficient lighting, heating systems, and vehicles, with new, more efficient versions. In the Moderate Efficient Electrification journey, energy consumption is further reduced by basic building envelope efficiency and including efficient electric equipment replacement to meet a portion of heating and transportation demand. The High Efficient Electrification journey results in the lowest energy consumption of the journeys, driven by a more efficient building envelope retrofit[17] and more fully electrifying heating, transportation, and other end-uses with efficient electric appliances.

Reductions in household and transportation energy expenditures generally follow these reductions in energy consumption relative to the starting point. However, there are some exceptions due to differences in energy prices by fuel and region. For example, as shown in Figure 8, household energy costs increasingly decline with the level of efficient electrification for households that heat with oil. However, for households that use natural gas in the starting point, cost dynamics vary by profile and journey. As illustrated in Figure 9, for an upstate household that heats with gas, Conventional Replacement results the greatest reduction in household energy costs, followed by High Electrification, which includes a more efficient building envelope retrofit than the Moderate Electrification profile. This highlights the importance of building envelope efficiency as a key factor in whether conversions to heat pumps from natural gas see operating cost savings. In this profile, savings from transportation electrification offset an incremental cost increase in household energy costs in the Moderate Electrification journey.

[15] Because of substantial differences in condition and energy use patterns across real-world households, not all households will experience the level of savings modeled..

[16] Note that additional sensitivities, such as low-income households in single-family homes, can be found in the appendix and energy affordability data annex.

[17] In the High Efficient Electrification Journey, the low- and moderate-income household profiles include a medium level of building envelope efficiency, while the average income household profiles include a basic level of building envelope efficiency. This distinction reflects the priority to pair heating electrification with weatherization and efficiency retrofits for low- and moderate-income households to ensure that operating costs remain reasonable.

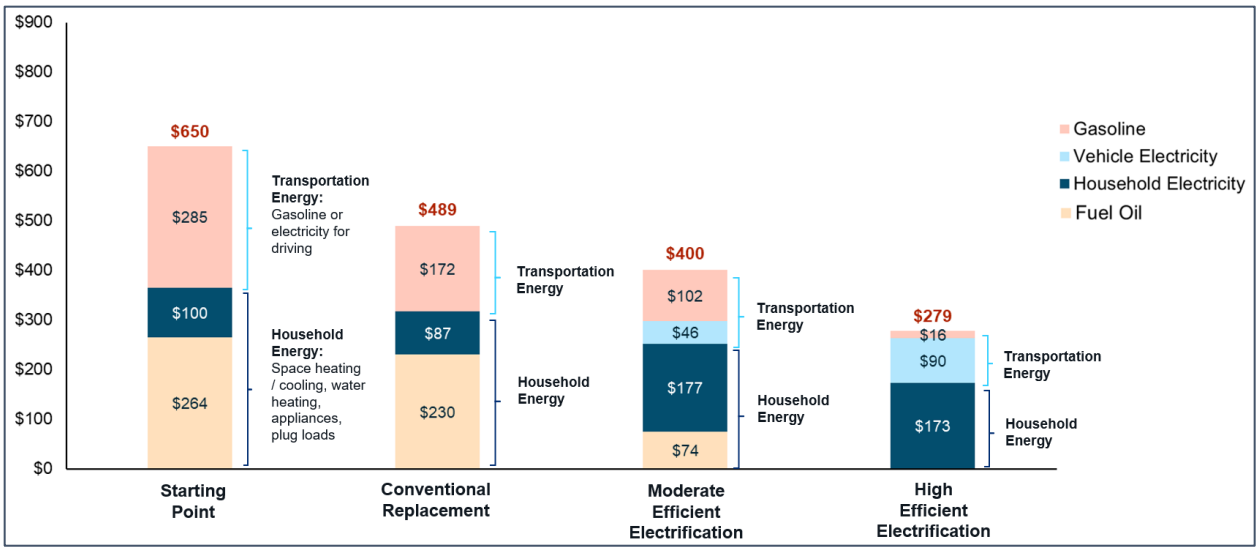


Figure 8. Total monthly household energy and transportation energy expenditures, Upstate, Single Family, Moderate Income, Oil Heat, 2031 (real 2025 $)

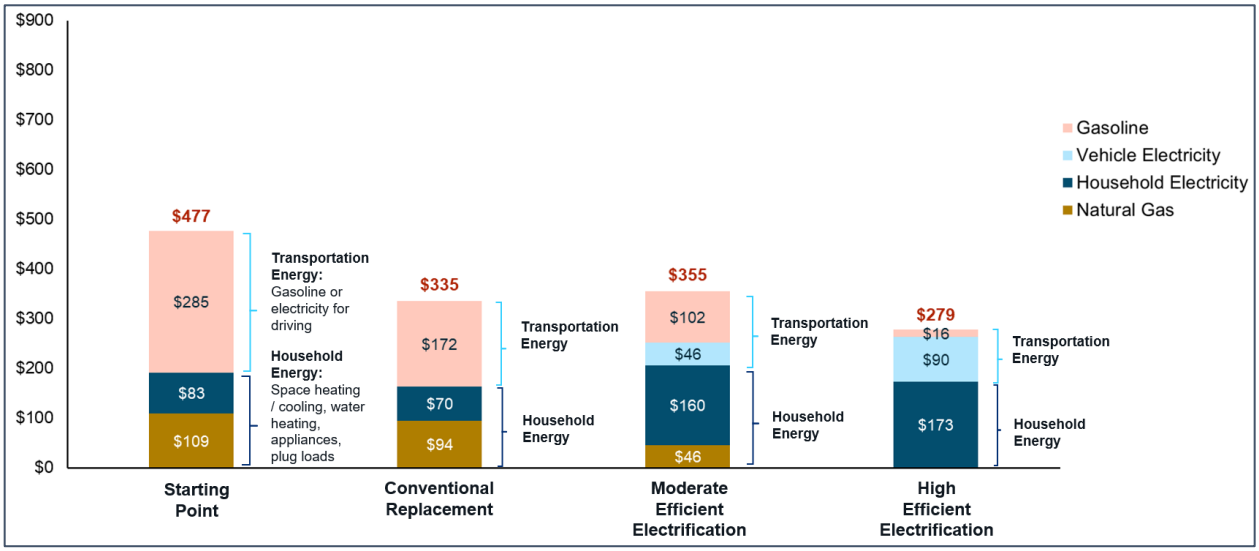


Figure 9. Total monthly household energy and transportation energy expenditures, Upstate, Single Family, Moderate Income, Natural Gas, 2031 (real 2025 $)

The New York City profile shown in Figure 10 presents a special case for a few reasons. First, although the profiles assume a driving household, a high share of households already manage their transportation energy costs by using public transit. In addition, for driving households, the efficiency of electric vehicles results in lower transportation energy expenditures relative to the Starting Point, even in NYC where electricity prices are higher than in other regions. However, in NYC, the transportation energy expenditures in the Conventional Replacement journey are lower than in either of the efficient electrification journeys, due in part to the impact of federal fuel economy standards on vehicle efficiency over time. However, even non-driving households in NYC would see reductions in household energy expenditures in all journeys beyond the Starting Point.

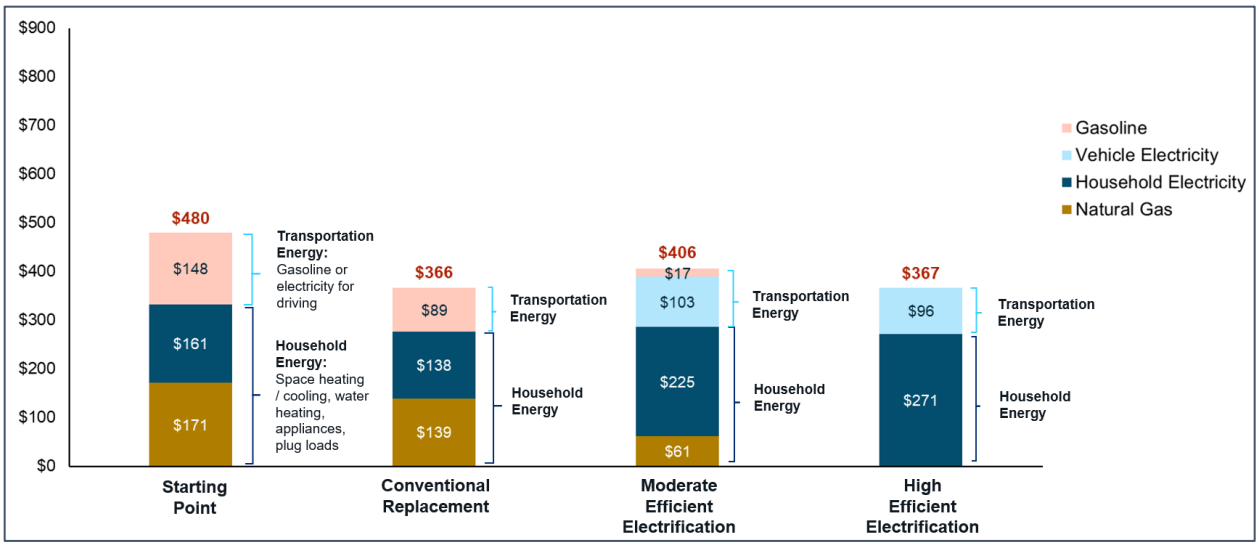


Figure 10. Total monthly household energy and transportation energy expenditures, NYC, Multifamily, Moderate Income, Natural Gas, 2031 (real 2025 $)

Table 2 shows both the total expenditures and expenditures disaggregated by household energy and transportation energy, across household profiles and journeys. Notably, although upstate low-income households in multifamily buildings that drive see operating cost declines in all journeys relative to the Starting Point, household energy expenditures in the Moderate and High Electrification journeys increase for this profile, due in part to the relatively lower energy savings levels realized by the medium level building shell package in multifamily relative to single family homes.

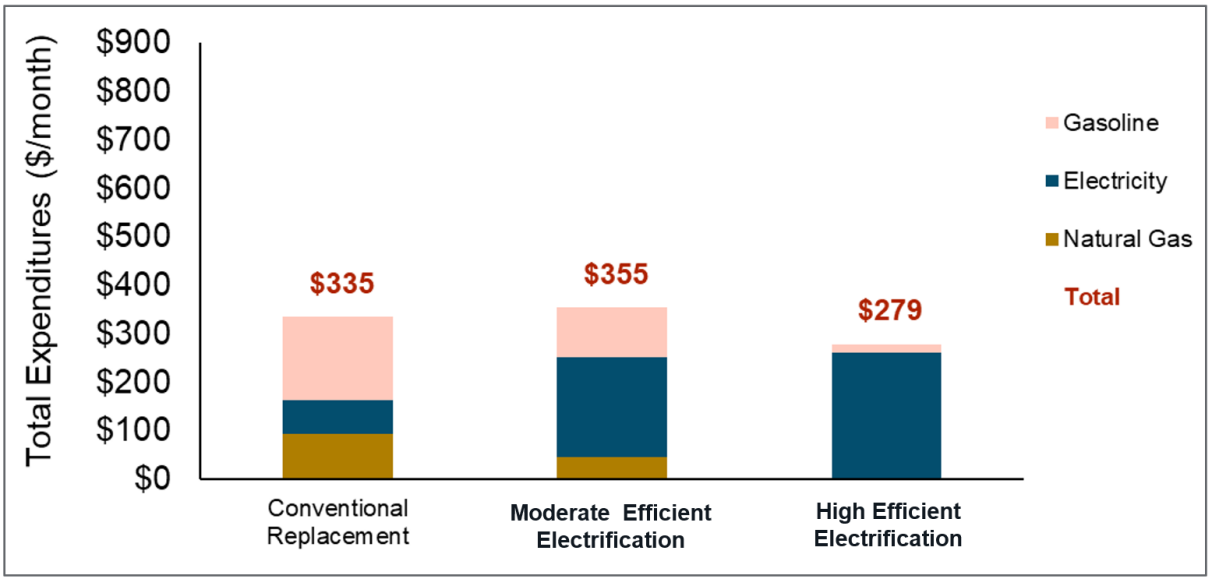
Results such as these underscore the need to pay special attention to transit-using households to ensure that these households experience overall operating cost reductions alongside efficient electrification. Similarly, households that do not currently pay a heating fuel bill (e.g., renters for whom heating is included in the rent), could see an increase in energy expenditures as more end uses are included in their electricity bill if heating fuel savings are not commensurately reflected in rents.

Table 2. Summary of expenditures by type and household profile (real 2025 $)

		2026	2031			
Household Profile	**Expenditures**	**Starting Point**	**Starting Point**	**Conventional Replacement**	**Moderate Efficient Electrification**	**High Efficient Electrification**
Upstate, Moderate Income with Oil	Household	*$344*	*$365*	*$317*	*$252*	*$173*
	Transportation	*$283*	*$285*	*$172*	*$148*	*$106*
	Total	***$627***	***$650***	***$489***	***$400***	***$279***
Upstate, Low Income	Household	*$126*	*$128*	*$107*	*$131*	*$133*
	Transportation	*$189*	*$190*	*$115*	*$84*	*$58*
	Total	***$315***	***$319***	***$222***	***$215***	***$191***
Upstate, Moderate Income	Household	*$188*	*$192*	*$164*	*$206*	*$173*
	Transportation	*$283*	*$285*	*$172*	*$148*	*$106*
	Total	***$471***	***$477***	***$335***	***$355***	***$279***
Upstate, Average Income	Household	*$188*	*$192*	*$164*	*$206*	*$190*
	Transportation	*$325*	*$327*	*$197*	*$170*	*$121*
	Total	***$512***	***$519***	***$360***	***$376***	***$311***
Downstate, Moderate Income with Oil	Household	*$392*	*$415*	*$360*	*$321*	*$258*
	Transportation	*$239*	*$241*	*$145*	*$145*	*$128*
	Total	***$631***	***$655***	***$505***	***$467***	***$385***
Downstate, Low Income	Household	*$226*	*$238*	*$198*	*$212*	*$201*
	Transportation	*$153*	*$154*	*$93*	*$93*	*$70*
	Total	***$379***	***$392***	***$290***	***$305***	***$271***
Downstate, Moderate Income	Household	*$336*	*$355*	*$300*	*$314*	*$258*
	Transportation	*$239*	*$241*	*$145*	*$145*	*$128*
	Total	***$575***	***$595***	***$445***	***$459***	***$385***
Downstate, Average Income	Household	*$336*	*$355*	*$300*	*$314*	*$279*
	Transportation	*$365*	*$367*	*$221*	*$222*	*$195*
	Total	***$701***	***$722***	***$522***	***$536***	***$474***
NYC, Low Income	Household	*$316*	*$332*	*$277*	*$286*	*$271*
	Transportation	*$125*	*$126*	*$76*	*$102*	*$82*
	Total	***$441***	***$458***	***$353***	***$388***	***$353***
NYC, Moderate Income	Household	*$316*	*$332*	*$277*	*$286*	*$271*
	Transportation	*$147*	*$148*	*$89*	*$119*	*$96*
	Total	***$463***	***$480***	***$366***	***$406***	***$367***
NYC, Average Income	Household	*$316*	*$332*	*$277*	*$286*	*$282*
	Transportation	*$155*	*$156*	*$94*	*$126*	*$101*
	Total	***$470***	***$488***	***$371***	***$412***	***$383***

3.3.2. Outlook including equipment cost

Figure 11 illustrates the impact of a sensitivity analysis that assesses the impact of up-front capital costs on monthly expenditures. Although households pursuing Efficient Electrification may experience lower total 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.



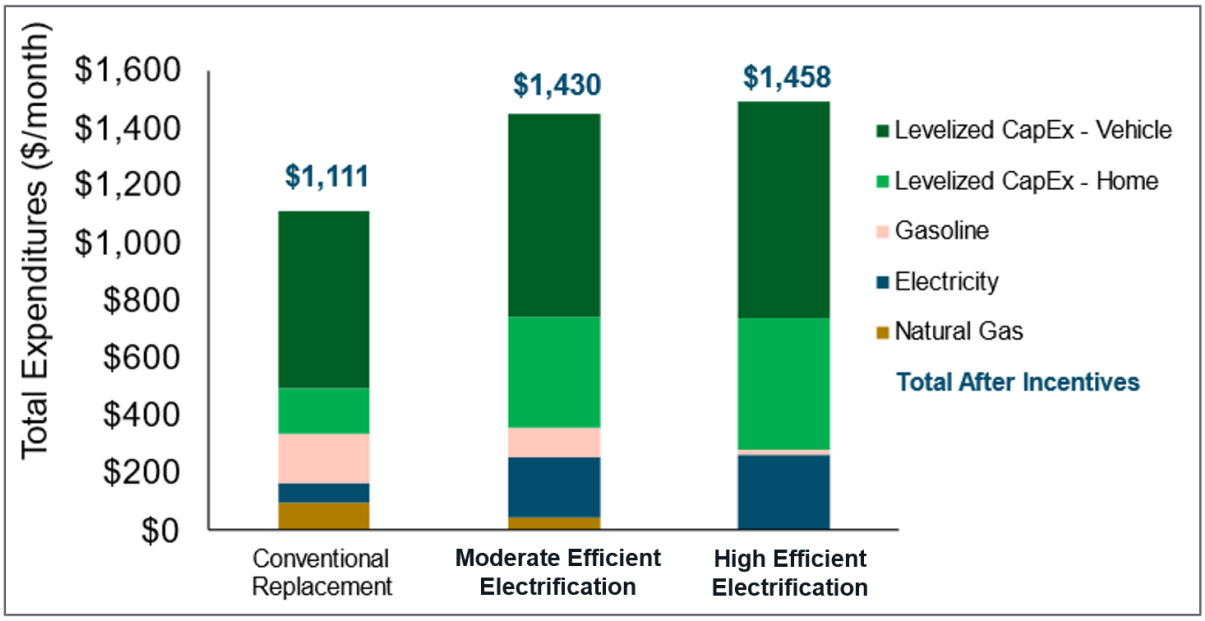


Figure 11. Total monthly household energy and transportation fuel expenditures, without and with levelized capital expenditures in 2031 for an illustrative upstate, single family, moderate income household (real 2025 $)

4. Energy affordability conclusions

Across the U.S. 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 U.S. 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. However, the actual savings and energy costs will vary depending on the unique circumstances of the household when pursuing energy efficiency and electrification projects. These factors include building envelope and insulation, home size and occupancy, type of home (e.g., single-family vs. multi-family), efficiency of existing and new equipment, extent of equipment replacement, and usage of equipment. 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 there are no negative affordability impacts for households pursuing efficient electrification. New York should continue to investigate and develop affordability programming and electric rate designs that enhance low- and moderate-income households' ability to manage electricity costs.

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.

5. Themes and recommended actions

1. **Understanding energy affordability**
    - Although Federal data provides some insights on energy affordability, energy insecurity, and energy burden, these data have limitations in resolution and their continued availability is not guaranteed.
    - New interdisciplinary pilot research efforts are underway to develop capacity for New York State to better understand energy affordability.
    - However, sustained research to better understand the dynamics of energy affordability and household experiences over time is needed to ensure that New York State has access to timely and relevant information and policy-relevant insights.
2. **Advancing household energy affordability**
    - Weatherizing homes and buildings is a cornerstone of energy affordability and will lead to long term energy burden reduction by decreasing energy consumption and associated costs.

- Pursuing efficient electrification across household energy and transportation can drive reductions in overall operating costs for households.
- Continued attention will be needed to ensure there are no negative affordability impacts for households pursuing efficient electrification that are transit dependent or who don't currently pay heating bills.
- Continued investigation and development of affordability programming and electric rate designs can enhance low- and moderate-income households' ability to manage electricity costs.

3. **Opportunities to improve access to affordable clean energy services.**
    - Low- and moderate-income households experience a range of barriers that inhibit access to affordable clean energy services. More action is needed to overcome these barriers.
    - Inclusive program planning with representatives of disadvantaged communities will be key to pursuing opportunities to overcome barriers.
    - Interagency coordination will also be key to reducing program complexity and ensuring streamlined access to resources for LMI households and DACs.

Further recommendations for advancing energy affordability via household and transportation energy savings can be found in the Buildings, Transportation, and Environmental and Climate Justice chapters of this Plan.

Appendix

The household energy affordability analysis assesses household and transportation energy expenditures for a set of household profiles and journeys that are representative of scenarios from the economywide pathways analysis. The household profiles include representative housing types, income levels, and geographies across the state of New York, while the household journeys are scenarios with different technology mixes, fuel types, and levels of electrification and efficiency.

This appendix provides results for additional sensitivity analyses and describes the methodology for the analysis. Results for all household profiles are provided in the energy affordability data annex, along with inputs, assumptions, and sources.

1. Additional sensitivity analysis

1.1. Low-income single family household profile

The low-income household profiles in the primary analysis utilize energy demand levels for multi-family homes, as these align best with available energy demand benchmarks for low-income households, and a higher share of low-income households live in multi-family housing. This sensitivity analysis examines energy affordability for low-income single-family households. Table A1 shows changes in both total expenditures, and expenditures disaggregated by household energy and transportation energy, across household profiles and journeys. These profiles include variations that examine heating with fuel oil as opposed to natural gas.

Although all household profiles see savings in combined total household and transportation energy spending relative to the 2026 Starting Point in the Conventional Replacement, Moderate Efficient Electrification, and High Efficient Electrification journeys, household energy spending increases in the upstate single family natural gas profile in the Moderate Efficient Electrification journey. In this case, cost savings in transportation energy offset household energy spending increases. These results differ slightly from the primary analysis due to the energy savings levels realized by the medium level building shell package in single family relative to multifamily buildings.

The expenditure values from which the percentage changes in Table A1 are derived can be found in Table A2, which also includes disaggregated household and transportation energy expenditures.

Detailed results may be found in the energy affordability data annex.

Table A1. Changes in monthly household energy and transportation energy expenditures by profile and journey, low-income single family household sensitivity (real 2025 $)

Compared to Starting Point in 2026		2031			
Household Profile	**Expenditures**	**Starting Point**	**Conventional Replacement**	**Moderate Efficient Electrification**	**High Efficient Electrification**
Upstate SF, Low Income with Oil	Household	*6%*	*-8%*	*-27%*	*-50%*
	Transportation	*1%*	*-39%*	*-56%*	*-69%*
	Total	***4%***	***-19%***	***-37%***	***-57%***
Upstate SF, Low Income	Household	*2%*	*-13%*	*10%*	*-8%*
	Transportation	*1%*	*-39%*	*-56%*	*-69%*
	Total	***1%***	***-26%***	***-23%***	***-39%***
Downstate SF, Low Income with Oil	Household	*6%*	*-8%*	*-18%*	*-34%*
	Transportation	*1%*	*-39%*	*-39%*	*-54%*
	Total	***4%***	***-17%***	***-24%***	***-40%***
Downstate SF, Low Income	Household	*5%*	*-11%*	*-7%*	*-23%*
	Transportation	*1%*	*-39%*	*-39%*	*-54%*
	Total	***4%***	***-20%***	***-17%***	***-33%***

Table A2. Summary of expenditures by type and household profile, low-income single family household sensitivity (real 2025 $)

		2026	2031			
Household Profile	**Expenditures**	**Starting Point**	**Starting Point**	**Conventional Replacement**	**Moderate Efficient Electrification**	**High Efficient Electrification**
Upstate SF, Low Income with Oil	Household	*$344*	*$365*	*$317*	*$252*	*$173*
	Transportation	*$189*	*$190*	*$115*	*$84*	*$58*
	Total	***$533***	***$555***	***$432***	***$335***	***$231***
Upstate SF, Low Income	Household	*$188*	*$192*	*$164*	*$206*	*$173*
	Transportation	*$189*	*$190*	*$115*	*$84*	*$58*
	Total	***$377***	***$382***	***$278***	***$290***	***$231***
Downstate SF, Low Income with Oil	Household	*$392*	*$415*	*$360*	*$321*	*$258*
	Transportation	*$153*	*$154*	*$93*	*$93*	*$70*
	Total	***$544***	***$569***	***$453***	***$414***	***$328***
Downstate SF, Low Income	Household	*$336*	*$355*	*$300*	*$314*	*$258*
	Transportation	*$153*	*$154*	*$93*	*$93*	*$70*
	Total	***$489***	***$508***	***$393***	***$407***	***$328***

2. Methodology

This section summarizes the methods and data for the household energy affordability analysis. The following sections describe key inputs and assumptions, with additional details provided in the energy affordability data annex. The analytic approach incorporates technology and measure characterization data from the New York Pathways model. It also considers technology adoption over time from the economywide pathways analysis. The analysis then supplements this information with household scale data including household energy demand, transportation energy demand, and energy price projections, and then calculates household and transportation energy demand and expenditures.

2.1. Household profiles

Because energy spending varies by region and income, the analysis includes household profiles across three regions of the State and three income levels: Upstate, Downstate, and NYC; and low-income, moderate-income, and average income. Key assumptions were developed to align with region- and income-specific demand profiles for household energy and transportation energy. For household energy, energy demand profiles for each region for single-family and multifamily housing were reviewed and selected for alignment with energy demand benchmarks that reflect average demand patterns and typical housing types for each region and income level. For transportation energy, region- and income-specific household vehicle miles traveled (VMT) were developed that reflect average demand patterns for each region and income level. Table A3 summarizes key attributes of the nine core household profiles.

Table A3. Household profile matrix

Region	Income Level	Housing Type	Vehicle Miles Traveled
Upstate	Low Income	Multifamily	16,954
Upstate	Moderate Income	Single Family	25,394
Upstate	Average Income	Single Family	29,114
Downstate	Low Income	Multifamily	13,702
Downstate	Moderate Income	Single Family	21,433
Downstate	Average Income	Single Family	32,728
NYC	Low Income	Multifamily	11,217
NYC	Moderate Income	Multifamily	13,178
NYC	Average Income	Multifamily	13,879

The three income level definitions are:

- **Low-income** includes households with incomes at or below 60 percent of State Median Income.
- **Moderate-income** includes households with incomes above 60 percent but below 80 percent of State Median Income or Area Median Income, whichever is higher
- **Average income** uses the average income of a household in an analysis region to represent households with incomes that fall above the low- or moderate-income range.

Buildings

This analysis draws on a variety of sources to represent the components of total household energy expenditures, energy demand, and technology and measure characteristics from buildings. These include the NYSERDA Building Efficiency and Electrification Model (BEEM), which provides data based on empirical research and building simulations on energy demand by end use for different building types and regions in New York, and the New York Pathways model. The household scale BEEM data was used as a starting point and adjusted using assumptions from the New York Pathways model, including equipment efficiencies and costs. This approach represents specific household types while also aligning with building sector assumptions from the pathways analysis.

In this analysis, calculations were normalized to a per-housing unit basis for ease of comparison across household types. For master metered multifamily buildings, this means allocating building-wide bills

equally across all building units. In addition, this analysis assumes that the resident pays for electricity and heating fuels, such as natural gas or oil, even though in reality some energy costs may be built into rent. In some real-world situations where heating fuel bills are included in rent, there may be a cost shift from owners to renters after electrification. For example, this could occur in multifamily units where the owner pays the gas bill, but the tenant pays the electricity bill.

The initial primary heating fuel for each profile is assumed to be natural gas. However, versions of the Upstate and Downstate moderate-income profiles with heating oil as the primary heating fuel are also included. In addition, a sensitivity analysis is included in this Appendix for Upstate and Downstate low-income households with a single-family housing energy demand profile.

Energy demand, equipment efficiency assumptions, and building shell measure savings are included in the energy affordability data annex.

Transportation

This analysis uses a variety of sources to represent the components of total energy expenditures, energy demand, and technology characteristics from transportation. These include the National Household Transportation Survey (NHTS) and the New York Pathways Model. The NHTS provides data on household transportation behavior, including household transportation demand, expressed as VMT, and number of vehicles per household, including for regions within New York State at different levels of household income. The VMT are multiplied by vehicle efficiencies drawn directly from the economywide pathways analysis to calculate energy demand, and subsequently, transportation energy expenditures. This approach represents regional- and income-differentiated transportation demand from different household types while also aligning with the light-duty vehicle assumptions from the pathways analysis.

Households were assumed to have either one or two vehicles based on region- and income-specific data.

Energy demand, vehicle efficiency assumptions, and VMT values are included in the energy affordability data annex.

2.2. Household journeys

For each household profile, household and transportation energy expenditures were calculated for four illustrative journeys with different technology mixes, fuel types, and levels of electrification and efficiency:

- ***Starting Point:*** a scenario with existing equipment in which natural gas or fuel oil and gasoline are the predominant energy sources for home heating and transportation, respectively.
- ***Conventional Replacement:*** a scenario with new equipment in which natural gas or fuel oil and gasoline are the predominant energy sources for home heating and transportation, respectively.
- ***Moderate Efficient Electrification:*** a scenario with basic building envelope and appliance efficiency measures where heat pumps meet most of the annual heating load and natural gas or fuel oil is used for heating in the coldest hours of the year. Transportation is partially decarbonized with a plug-in hybrid electric vehicle.

- ***High Efficient Electrification:*** a scenario with basic or medium building envelope efficiency measures and efficient electric appliances where heat pumps meet all heating and cooling loads, heat pump water heaters meet all water heating loads, and transportation is decarbonized with battery electric vehicles and plug-in hybrid electric vehicles.

Although the economywide pathways model includes a simulation of stock rollover at the sector, subsector, and end-use level, it does not explicitly model households. Therefore, the household energy affordability analysis cannot directly incorporate specific technology adoption profiles from the New York Pathways model. Instead, the analysis represents potential household journeys that are consistent with the range of household technology adoption within the economywide scenarios. Table A4 summarizes the equipment, vehicle, and shell measure assumptions by household profile and journey in greater detail.

While many variables determine household energy bills, a primary driver of home energy costs is heating and cooling. In the Starting Point journey, the home was assumed to have existing equipment, heated using natural gas or fuel oil and cooled with a central air conditioner (AC) for single-family homes and a window AC for multifamily homes. In the Conventional Replacement journey, the home was assumed to have new equipment including a boiler or furnace fueled with natural gas or fuel oil as well as a central or window AC. In the Moderate Efficient Electrification journey, the home was assumed to have a ducted air source heat pump (ASHP) for single-family homes and a ductless ASHP for multifamily homes, where the heat pump provides 80% of space heating requirements and a natural gas or fuel oil furnace or boiler provides backup for the remaining 20%. In the High Efficient Electrification scenario, the home was assumed to have a ducted ASHP for single-family homes and a ductless ASHP for multifamily homes, without any fossil fuel backup.

In the Starting Point and Conventional Replacement journeys, the home was assumed to have an existing building shell without any efficiency improvements. In the Moderate Efficient Electrification journey, single-family homes were assumed to have a shell improvement consisting of air sealing, ceiling/attic insulation, and rim joist insulation. Multifamily homes were assumed to have a shell improvement consisting of air sealing and roof insulation. In the High Efficient Electrification journey, single-family low- and moderate-income homes were assumed to have a shell improvement consisting of air sealing, ceiling/attic insulation, rim joist insulation, and wall insulation. Multifamily low- and moderate-income homes were assumed to have a shell improvement consisting of air sealing, roof insulation, and double-pane windows. Average income homes were assumed to have the same shell improvements as the Moderate Efficient Electrification scenario. This distinction reflects the priority to pair heating electrification with weatherization and efficiency retrofits for low- and moderate-income households to ensure that operating costs remain reasonable.

For transportation, energy bills were calculated for the number of vehicles that are typical for each area. In New York City, expenditures include transportation costs for one vehicle per household. For the Downstate and Upstate regions, expenditures include transportation costs for one vehicle per household for low-income households and two vehicles per household for moderate- and average-income households. In the Starting Point journey, the home was assumed to have existing internal combustion

engine (ICE) vehicles. In the Conventional Replacement journey, the home was assumed to have new ICE vehicles with higher efficiency. In the Moderate Efficient Electrification journey, the home was assumed to have either one plug-in hybrid electric vehicle (PHEV) or one ICE vehicle and one PHEV, depending on whether the home has one or two vehicles. In the High Efficient Electrification scenario, the home was assumed to have either one battery electric vehicle (BEV) or one PHEV and one BEV, depending on whether the home has one or two vehicles.

In addition to space heating, space cooling, and transportation, this analysis also included appliances and plug loads. In the Starting Point journey, the home was assumed to have an existing gas or electric stove and a mixture of incandescent, CFL, and LED lighting. Additionally, single family homes were assumed to have a gas or electric clothes dryer. In the Conventional Replacement and Moderate Efficient Electrification journeys, the home was assumed to have a new gas or electric stove and LED lighting. Single family homes were assumed to have a new gas or electric clothes dryer. In the High Efficient Electrification scenario, the home was assumed to have an efficient electric clothes dryer, an induction stove, and LED lighting.

Table A4. Equipment, vehicle, and building shell assumptions by household profile and journey

Household Profile	Starting Point	Conventional Replacement	Moderate Efficient Electrification	High Efficient Electrification
Upstate, Moderate Income with Oil	* Oil space heating with central AC * Oil water heating * Two fleet average gasoline vehicles * Electric clothes dryer and stove, incandescent/CFL/LED lighting	* Efficient oil space heating and central AC * Efficient oil water heating * Two new gasoline vehicles * Efficient electric clothes dryer and stove, LED lighting	* Basic shell + ducted ASHP, 20% fuel backup * Efficient oil water heating * One new gasoline vehicle, one PHEV * Efficient electric clothes dryer and stove, LED lighting	* Medium shell + ducted ASHP * Heat pump water heating * One PHEV, one BEV * Efficient electric clothes dryer, induction stove, LED lighting
Upstate, Low Income	* Gas space heating with window AC * Gas water heating * One fleet average gasoline vehicle * Gas stove, incandescent/CFL/LED lighting	* Efficient gas space heating and window AC * Efficient gas water heating * One new gasoline vehicle * Efficient gas stove, LED lighting	* Basic shell + ductless heat pump, 20% fuel backup * Efficient gas water heating * One PHEV * Efficient gas stove, LED lighting	* Medium shell + ductless heat pump * Heat pump water heating * One BEV * Induction stove, LED lighting
Upstate, Moderate Income	* Gas space heating with central AC * Gas water heating * Two fleet average gasoline vehicles * Gas clothes dryer and stove, incandescent/CFL/LED lighting	* Efficient gas space heating and central AC * Efficient gas water heating * Two new gasoline vehicles * Efficient gas clothes dryer and stove, LED lighting	* Basic shell + ducted ASHP, 20% fuel backup * Efficient gas water heating * One new gasoline vehicle, one PHEV * Efficient gas clothes dryer and stove, LED lighting	* Medium shell (moderate income), basic shell (average income) * Ducted ASHP * Heat pump water heating * One PHEV, one BEV * Efficient electric clothes dryer, induction stove, LED lighting
Upstate, Average Income				
Downstate, Moderate Income with Oil	* Oil space heating with central AC * Oil water heating * Two fleet average gasoline vehicles * Electric clothes dryer and stove, incandescent/CFL/LED lighting	* Efficient oil space heating and central AC * Efficient oil water heating * Two new gasoline vehicles * Efficient electric clothes dryer and stove, LED lighting	* Basic shell + ducted ASHP, 20% fuel backup * Efficient oil water heating * One new gasoline vehicle, one PHEV * Efficient electric clothes dryer and stove, LED lighting	* Medium shell + ducted ASHP * Heat pump water heating * One PHEV, one BEV * Efficient electric clothes dryer, induction stove, LED lighting
Downstate, Low Income	* Gas space heating with window AC * Gas water heating * One fleet average gasoline vehicle * Gas stove, incandescent/CFL/LED lighting	* Efficient gas space heating and window AC * Efficient gas water heating * One new gasoline vehicle * Efficient gas stove, LED lighting	* Basic shell + ductless heat pump, 20% fuel backup * Efficient gas water heating * One PHEV * Efficient gas stove, LED lighting	* Medium shell + ductless heat pump * Heat pump water heating * One BEV * Induction stove, LED lighting
Downstate, Moderate Income	* Gas space heating with central AC * Gas water heating * Two fleet average gasoline vehicles * Gas clothes dryer and stove, incandescent/CFL/LED lighting	* Efficient gas space heating and central AC * Efficient gas water heating * Two new gasoline vehicles * Efficient gas clothes dryer and stove, LED lighting	* Basic shell + ducted ASHP, 20% fuel backup * Efficient gas water heating * One new gasoline vehicle, one PHEV * Efficient gas clothes dryer and stove, LED lighting	* Medium shell (moderate income), basic shell (average income) * Ducted ASHP * Heat pump water heating * One PHEV, one BEV * Efficient electric clothes dryer, induction stove, LED lighting
Downstate, Average Income				
NYC, Low Income	* Gas space heating with window AC * Gas water heating * One fleet average gasoline vehicle * Gas stove, incandescent/CFL/LED lighting	* Efficient gas space heating and window AC * Efficient gas water heating * One new gasoline vehicle * Efficient gas stove, LED lighting	* Basic shell + ductless heat pump, 20% fuel backup * Efficient gas water heating * One PHEV * Efficient gas stove, LED lighting	* Medium shell (low- and moderate-income), basic shell (average income) * Ductless heat pump * Heat pump water heating * One BEV * Induction stove, LED lighting
NYC, Moderate Income				
NYC, Average Income				

2.3. Electricity and fuel prices

Economy-wide trends are expected to impact the rates charged for energy services, with important implications for customer affordability. While recognizing that there are significant unknowns, this analysis drew on the best available data to provide informed projections of future customer rates. The electric rates in this analysis are utility-specific average residential rates based on 2023 utility residential revenue and sales as reported by the U.S. Energy Information Agency (EIA) in Form EIA-861. These initial electric rates were adjusted using escalators based on EIA's Annual Energy Outlook 2023 Retail Rate Forecast, which differentiates by upstate versus downstate regions as well as by customer class. Between 2024 and 2031, the escalators result in an annual average nominal compound annual growth rate (CAGR) of approximately 1.9% downstate and 1.1% upstate. Similarly, utility-specific residential volumetric rates and monthly charges for natural gas customers were adjusted using escalators based on a 10-year trend (2014-2023) of the NY Department of Public Service (DPS) utility total bill estimates, which differ by customer class and utility. Between 2024 and 2031, this results in an annual average nominal CAGR of approximately 3.5% downstate and 2.4% upstate.

The analysis used the projected costs of residential fuel oil and vehicle gasoline from the economywide pathways analysis, using the Central fuel price scenario.

The electricity, natural gas, fuel oil, and gasoline prices are included in the energy affordability data annex.

2.4. Equipment costs

In addition to the cost of energy, the analysis assessed the upfront capital costs of equipment and the associated annual maintenance costs. The analysis used capital and maintenance costs from the pathways analysis for building shell upgrades; space heating, space cooling, water heating, clothes drying, and cooking equipment; and vehicles. To make a meaningful comparison with other cost categories, capital costs were levelized assuming a 7% financing rate, using equipment lifetimes from BEEM for space heating and from the pathways analysis for all other equipment.

A range of incentives are potentially available to households that invest in electrification and building shell improvements. Given the uncertainty in federal incentive levels, the analysis included a sensitivity to assess the impact of federal Inflation Reduction Act (IRA) tax credits for cold climate heat pumps, heat pump water heaters, building shell improvements, and electric vehicles.

The equipment cost and incentive assumptions are included in the energy affordability data annex.