3 New York State Energy Profile

The consumption, prices, and expenditures for fuels and energy form the fundamentals of the NYS energy profile, summarized in this section. The data presented in this energy profile come from several sources including:

- NYISO, *Load & Capacity Data Report* (NYISO 2022)
- EIA, *State Energy Data System* (SEDS; EIA 2024)
- U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA), *Highway Statistics 2022* (USDOT 2024)

Appendix B organizes these datasets by sector, and fuel type, detailing consumption, prices, and expenditures, along with a 15-year historical perspective.

Appendix C presents a selection of NYS data points for additional considerations and calculations among the compiled energy datasets. These energy indicators reflect various economic, social, and transportation factors to further evaluate changes in energy patterns for New York State.

To support data accessibility, Appendix D is a data annex containing a file that reflects all data summarized in this report and presented in the online dashboard. Supplemental datasets in the data annex, although not explicitly discussed herein, continue the presentation from the previous issue of Patterns and Trends.

Historical issues of Patterns and Trends presented estimates of greenhouse gas emissions by fuel type. Appendix E provides resources the NYS Department of Environmental Conservation (DEC) and NYSERDA developed to maintain consistency in calculating and accounting for greenhouse gas emissions.

This Patterns and Trends report, the online dashboard, and the appendices offer a detailed examination of various energy topics for New York State. The energy research NYSERDA conducted is expansive, and Appendix F highlights additional resources that extend beyond these 2022 datasets to showcase completed or ongoing NYSERDA research efforts.

3.1 New York State Energy Consumption

EIA presents a comprehensive energy consumption dataset through SEDS for the entire U.S. that provides consumption estimates for each state. As energy transitions to renewable technologies occur across the U.S., EIA changed its methodology for converting renewable (noncombustible) technologies from physical units in gigawatt hours (GWh) to energy units in British thermal units (Btu). and

Historically, EIA SEDS applied a fossil fuel equivalency method to noncombustible renewable technologies (solar, wind, hydropower, geothermal) generating electricity for consumption. The previous approach for a conversion factor based on fossil fuel consumed to generate electricity included an assumption that inefficiencies, such as heat loss, were identical across different generation technologies. This approach resulted in the conversion of GWh of renewable generation into Btu values that included fossil fuel–induced inefficiencies that do not actually apply to these resources.

Starting with the 2022 EIA SEDS datasets, a captured energy conversion, was applied. This method uses a constant conversion factor reflecting the heat content of electricity, instead of the heat content of fossil fuels used to generate electricity, resulting in lower Btu for the GWh attributed to these noncombustible technologies compared to the previous method. Appendix A has additional resources and details.

For New York State, NYSERDA compared the impact of this conversion on primary consumption (Figure 2).

Figure 1. Noncombustible Renewables Conversion Factor Methodology Comparison for New York State

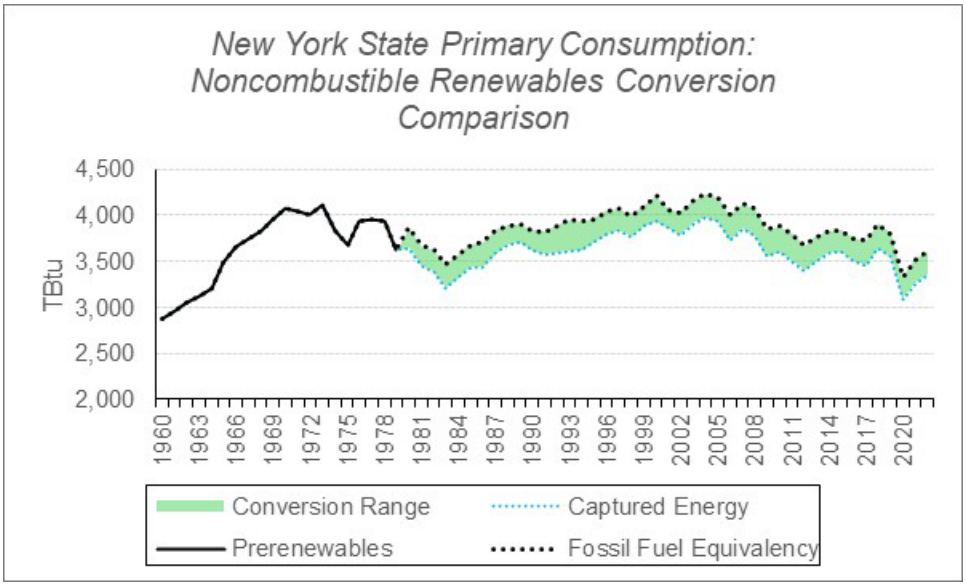


Figure 2 highlights the impact of this methodology change to the overall energy profile. Typically, the EIA's new captured energy method decreases NYS primary consumption by 5% to 10%, resulting in results different than historical estimates. this reduction is a result of attributing a decreased value for trillion British thermal units (TBtu) for these renewable generation technologies. In a DOE report, the complexity of this decision on conversion method to use is highlighted (USDOE 2016):

> …neither option is considered more technically "correct" or more "accurate" than the other, as each option needs to be considered along with its intended use to determine which is appropriate." (DOE 2016, p. 3)

NYSERDA recognizes that EIA has implemented this change in SEDS for the 2022 dataset and will evaluate how the conversion methodology options impact this and future issues of Patterns and Trends. For this Patterns and Trends issue, NYSERDA will continue to rely on fossil fuel equivalency-based conversions historically used for this energy estimation. Appendix B presents renewable technologies with both conversions for awareness, and the data are also available within the data annex as part of Appendix D.

Primary consumption in New York State reached approximately 3,634 TBtu for 2022, reflecting an increase of approximately 2.3%compared to 2021. This marks a second consecutive year of growth since 2020, but remains 5.1% lower than the approximately 3,830 TBtu consumed in 2019. Table 1 summarizes 2022 primary consumption for New York State.

Table 1. New York State Consumption Summary (in Trillion British Thermal Units)

Fuel	Residential	Commercial	Industrial	Transportation	Net Sectoral Consumption/Generation	Electric Generation	Primary Consumption
Coal	0.0	0.0	6.1	0.0	6.1	0.0	6.1
Natural Gas	463.8	313.4	91.6	43.4	912.2	490.1	1,402.3
Petroleum Products[b]	*130.0*	*60.3*	*68.7*	*1,033.6*	*1,292.6*	*16.4*	*1,309.0*
Distillate	103.6	48.7	11.9	202.7	366.8	6.1	373.0
Residual	0.0	1.2	2.9	18.6	22.7	10.3	33.0
Kerosene	2.2	0.2	0.5	0.0	2.9	0.0	2.9
Propane (HGL)	24.2	10.2	4.5	0.3	39.1	0.0	39.1
Gasoline	0.0	0.0	0.0	571.6	571.6	0.0	571.6
Aviation Fuel	0.0	0.0	0.0	240.4	240.4	0.0	240.4
Other Petroleum	0.0	0.0	49.0	0.0	49.0	0.0	49.0
Supplemental Gaseous Fuel[a]	0.4	0.3	0.1	0.0	0.8	0.4	1.2
Renewables	*17.0*	*21.8*	*0.3*	*0.0*	*39.1*	*253.0*	*292.1*
Solar[c]	16.0	20.1	0.3	0.0	36.3	0.9	37.2
Wind	0.0	0.0	0.0	0.0	0.0	37.8	37.8
Geothermal	1.0	1.7	0.0	0.0	2.7	0.0	2.7
Hydroelectric Generation (C)	0.0	0.0	0.0	0.0	0.0	214.4	214.4
Renewable Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bioenergy	*26.1*	*19.5*	*22.3*	*54.7*	*122.6*	*18.6*	*141.1*
Wood	26.1	4.9	18.3	0.0	49.3	0.0	49.3
Waste Energy	0.0	14.6	4.0	0.0	18.6	13.9	32.6
Ethanol	0.0	0.0	0.0	44.2	44.2	0.0	44.2
Biodiesel	0.0	0.0	0.0	10.5	10.5	0.0	10.5
Landfill Gas	0.0	0.0	0.0	0.0	0.0	4.6	4.6
Electric Sales	178.2	246.4	55.2	8.9	488.6	-	-
Net Consumption	815.1	661.4	244.2	1,140.6	2,861.2	-	-
					Hydroelectric Generation (PS)	-3.5	-3.5
					Nuclear Generation	279.6	279.6
					Net Imported Electricity	207.2	207.2
					Primary Consumption	1,261.5	3,634.0

[a] Due to the derivation of synthetic gas fuel (SGF) from other petroleum product source processes, these have been accounted for in different fuel types (EIA 2023). These SGFs are not included in consumption summations and are presented for completeness only.

[b] Renewable and bioenergy fuels are estimated in their respective groupings. In this table, fuels such as gasoline and distillate are not comingled with their renewable and biofuels.

[c] Total solar generation for New York State is a sum of the electric generation sector and the behind-the-meter solar from the *2023 Gold Book* (NYISO). Sectoral estimates for solar rely on using EIA SEDS estimates for sectoral contribution applied to the NYISO behind-the-meter value.

[d] For hydroelectric generation: “C” represents conventional, and “PS” represents pumped storage. These generation types are included with renewable and nonrenewable energy accounting, respectively.

As energy consumption has continued to increase since 2020, the supply chain from production to end use carefully experienced the return of demand for energy The following energy-specific observations emerged:

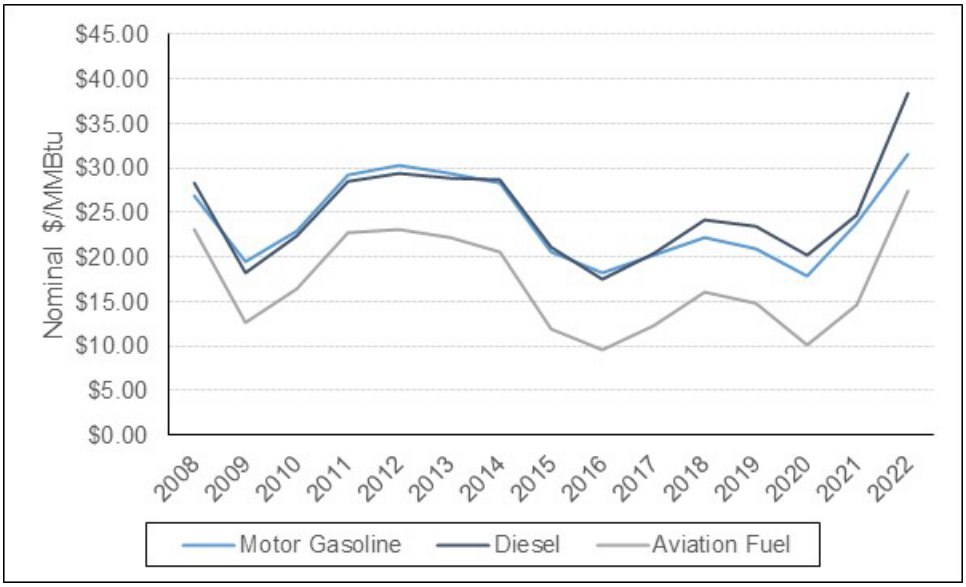
- Increased consumption of all fuels during 2022 compared to the prior year, with limited exceptions for pumped storage hydroelectric generation, nuclear generation, renewables generation, and net imported electricity.
    - Pumped storage hydroelectric generation was lower by 162.0% (by GWh) compared to the value reported for 2021.
    - Nuclear generation continued to decline (-14.0%) due to the shutdown of Entergy's Indian Point Unit 3 on April 30, 2021 (Entergy 2021).The 2022 energy profile dataset reflects this facility's first full year without nuclear generation.
    - Imported electricity declined by approximately 3% compared to 2021, likely accounted for by increases in generation from other sources such as natural gas, petroleum products, and solar.
- Increased renewables consumption during 2022, led by an increase in solar (32.0%) and wind (17.4%) generation alongside a decrease in conventional hydroelectric generation decreased by 4.6% during the same year.
- Consumption of distillate and residual fuel oils for electric generation sharply increased. This increased reliance on liquid petroleum products likely resulted from the elevated cost of natural gas during 2022, making the switch to liquid products more financially advantageous for generation facilities than prior years.
- Net energy consumption across the residential, commercial, and transportation sectors increased during 2022, reflecting returning energy demand. A decrease in net consumption for the industrial sector by approximately 3.9% likely resulted from the slow post-pandemic return to normal operations and potential challenges in supply chains to deliver needed goods for industrial processes.

3.2 New York State Energy Prices

Energy prices for 2022 reflect the challenges along the supply chain for energy products. Appendix B highlights that every sector experienced significant price increases compared to 2021. For some fuels, 2022 prices represented the highest energy prices over the past 15 years.

Transportation fuel, including motor gasoline and diesel, saw significant price increases for 2022 (Figure 2). Evaluating prices per million British thermal units (MMBtu) in nominal dollars, motor gasoline prices increased by approximately 32%, while diesel prices increased by approximately 56% compared to 2021. This year-to-year increase is significant, but is more apparent compared to prepandemic 2019 prices, with motor gasoline approximately 35% higher and diesel approximately 92% higher in 2022.

Figure 2. New York State Transportation Sector Select Fuels Prices 15-Year History

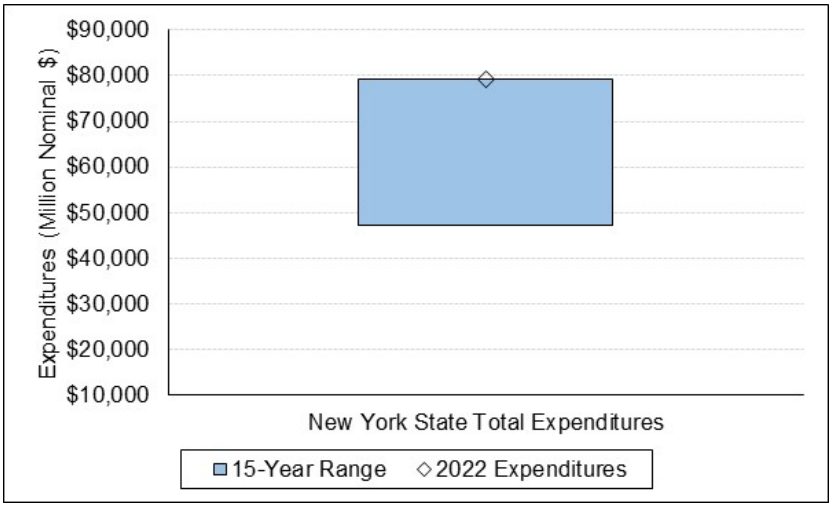


3.3 New York State Energy Expenditures

Energy expenditures reflect the annual consumption of fuel and the annual price. Appendix B highlights 2022 values and trends for specific energy products.

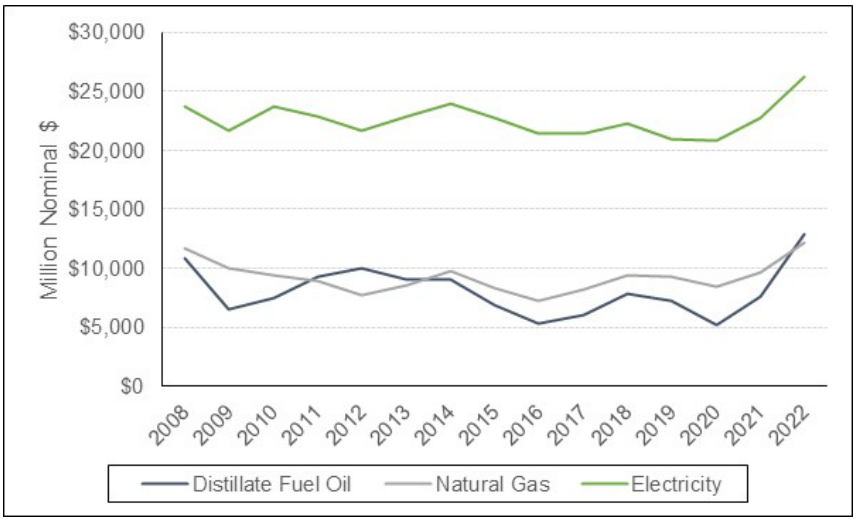
Expenditures increased significantly in 2022, consistent with the increases in consumption and prices during the same period (Figure 3). Increasing consumption, coupled with elevated prices led to substantially elevated total energy expenditures. Increases in expenditures for energy and fuels in New York State ranged between approximately 8% for propane to 156% for aviation fuel. The estimated out-of-state expenditures for 2022 increased approximately 25% overall to approximately $28.7 billion.

Figure 3. New York State Total Energy Expenditures 15-Year Summary



Expenditures for heating fuels also increased during 2022 (Figure 4), including distillate (71%), kerosene (47%), and natural gas (25%). Electricity expenditures increased by approximately 15%. Across all sectors and end uses, 2022 experienced high costs for the fuels and energy consumed in New York State.

Figure 4. New York State Total Energy Expenditures Select Fuels 15-Year History



3.4 New York State Sources of Energy

New York State relies on deliveries of various energy and fuel types via pipeline, marine, rail, highway, and transmission lines, with some production activities occurring in-state.

Table 2 summarizes the energy products produced in New York State.

Table 2. New York State Sources of Energy and Production (TBtu)

Year	Conventional Hydroelectric Generation	Natural Gas	Crude Oil	Σ Bioenergy	Renewable Diesel	Solar	Wind	Geothermal	Total Production
2008	234.9	51.4	2.2	124.3	0.0	0.2	11.4	2.2	426.6
2009	239.1	45.8	1.9	76.4	0.0	0.3	20.5	2.5	386.5
2010	217.4	36.6	2.2	91.0	0.0	0.5	23.3	2.8	373.8
2011	244.3	31.9	2.2	99.1	0.0	0.8	25.0	3.3	406.6
2012	213.8	27.2	2.1	98.1	0.0	1.5	26.0	3.0	371.7
2013	218.2	24.2	2.1	106.6	0.0	2.1	30.1	3.0	386.4
2014	217.2	20.8	2.1	106.6	0.0	3.1	33.3	2.9	386.1
2015	214.4	17.9	1.6	122.0	0.0	4.9	33.0	2.9	396.7
2016	216.7	13.9	1.3	115.3	0.0	6.9	32.5	2.9	389.4
2017	240.1	11.8	1.1	114.2	0.0	8.7	34.3	2.8	412.9
2018	234.3	11.0	1.3	115.0	0.0	12.5	32.1	2.8	409.0
2019	238.0	11.3	1.6	114.8	0.0	17.8	35.2	2.7	421.5
2020	231.8	10.0	1.4	86.2	0.0	21.0	32.7	2.7	385.8
2021	223.4	10.0	1.5	88.1	0.0	28.0	32.0	2.7	385.7
2022	214.4	10.0	1.5	98.8	0.0	37.2	37.8	2.7	402.5
% Difference 2022 - 2021	**-4%**	**0%**	**0%**	**12%**	**N/A**	**33%**	**18%**	**1%**	**4%**

Notes:

[a] Σ Bioenergy represents a summation of ethanol, biodiesel, wood, waste energy, and landfill gas production.

[b] Solar and wind production estimates rely on consumption data as an approximation for production.

[c] Overall, NYS production increased by approximately 2% during 2022 compared to the prior year. The most significant contributors to this increase include solar, bioenergy, and wind, with growth rates of 33%, 12%, and 10%, respectively, compared to the previous year.