

17

Energy

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Acronyms/Abbreviations

Btu.....	British thermal unit
CEQ.....	Council on Environmental Quality
EIA.....	United States Energy Information Administration
EPA.....	United States Environmental Protection Agency
LRT.....	light-rail transit
NEPA.....	National Environmental Policy Act
NYS DOT.....	New York State Department of Transportation
VMT.....	vehicle miles traveled

17 Energy

Transportation energy is the energy required to move people and goods from place to place, and is generally discussed in terms of operational and construction energy consumption.

Operational energy consumption, also known as “direct” energy, involves all energy consumed by vehicle propulsion. This energy is a function of traffic characteristics such as volume, speed, distance traveled, vehicle mix and the thermal value of the fuel being used. Operational energy consumption also includes the energy required to operate the rail system and maintain the associated transportation facilities, such as lighting and ventilation systems, stations and maintenance facilities.

Construction energy consumption, also known as “indirect” energy, involves the non-recoverable, one-time energy expenditure involved in constructing the physical infrastructure associated with a project.

17.1 REGULATORY FRAMEWORK

Under the Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA)¹, consideration of energy efficiency is specifically required. Under Section 1502.16(e) regarding the requirements for analyzing and documenting environmental consequences, agencies are required to discuss "energy requirements and conservation potential of various alternatives and mitigation measures." Section 1502.16(f) requires agencies to consider the "natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures."

Energy efficiency and conservation concepts may also be interpreted as a necessary consideration in addressing the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources as required by the CEQ regulations (Section 1502.16).

Several executive orders and policies have been promulgated over the years that require or promote the consideration of energy efficiency in federal actions, including the following:

- Executive Order 13221, Energy Efficient Standby Power Devices (Signed 2001)
- Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use (Signed 2001)

¹ Available at <https://ceq.doe.gov/>

17.2 METHODOLOGY

Energy is commonly measured in terms of British thermal units, or Btu. A Btu is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. For transportation projects, energy usage is predominantly influenced by the amount of fuel used. The average Btu content of fuels is the heat value (or energy content) per quantity of fuel, as determined from tests of fuel samples.

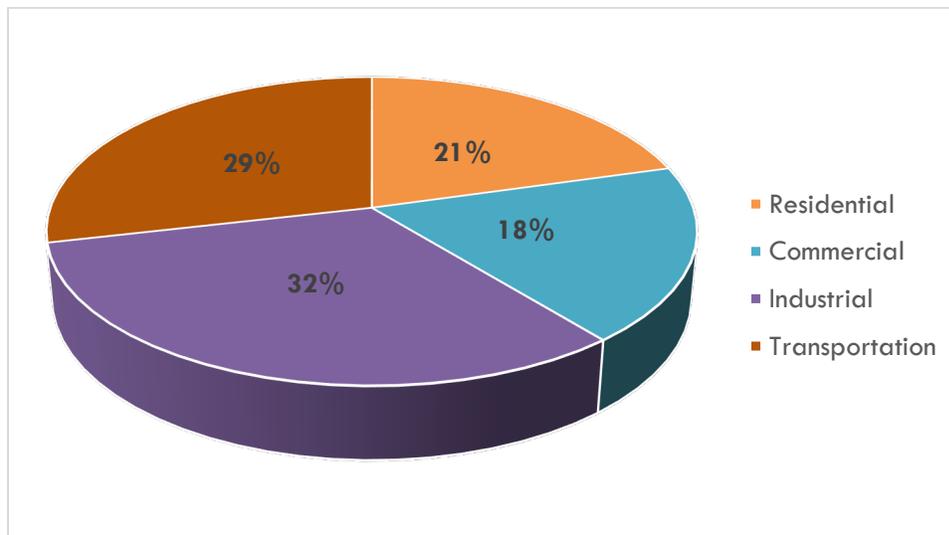
This analysis considers the project’s direct, or operational, energy impacts, which are a result of changes in regional traffic between the No Action condition and Proposed Action. Direct energy was estimated by obtaining energy usage rates from EPA’s MOVES2014b model, using inputs provided by the New York State Department of Transportation (NYSDOT) and the Greater Buffalo Niagara Transportation Council (GBNRTC). Input data are detailed in Chapter 16, “Air Quality”.

Indirect energy is the energy needed to construct the project. Accurate indirect energy costs are extremely difficult to estimate given the uncertainty of field variables at this point in the analysis. As such, indirect energy is qualitatively discussed.

17.3 EXISTING CONDITIONS

Transportation accounts for a major portion of the energy consumed in the United States. As shown in Figure 17-1, transportation accounted for approximately 29 percent of energy consumption in the United States in 2016. Transportation is the second-largest consumer of energy in the United States after the industrial sector, which accounted for 32 percent of energy consumption in the United States in 2016. The residential and commercial sectors accounted for 21 percent and 18 percent of energy consumption in the United States in 2016, respectively.

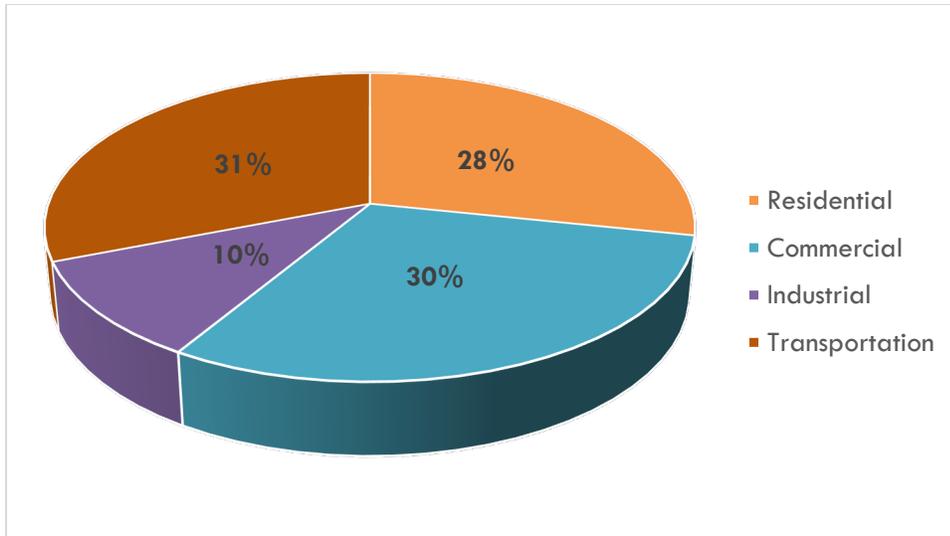
Figure 17-1. United States Energy Consumption by Sector, 2016



Source: EIA 2019

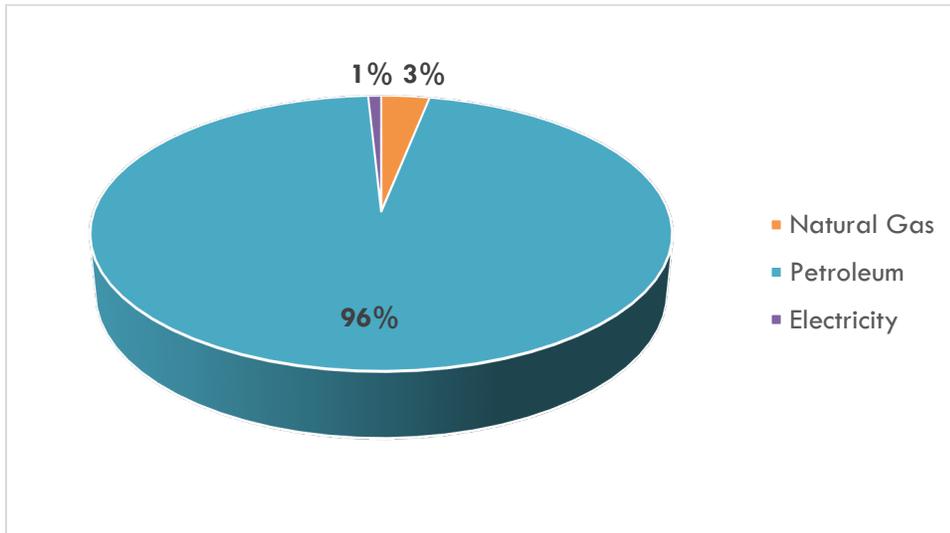
Transportation also accounts for a major portion of the energy consumed in New York, at approximately 31 percent. The commercial sector accounted for 30 percent of energy consumption in New York in 2016, and the residential sector accounted for 28 percent. The industrial sector was the smallest consumer of energy in New York in 2016, at 10 percent (Figure 17-2). As shown in Figure 17-3, petroleum (e.g., gasoline, diesel fuel, jet fuel) was the predominant consumer of transportation energy in New York in 2016, at approximately 96 percent. Natural gas and electric vehicles accounted for the remaining 4 percent of transportation energy consumption.

Figure 17-2. New York Energy Consumption by Sector, 2016



Source: EIA 2019

Figure 17-3. New York's Transportation Energy Consumption by Source, 2016



Source: EIA 2019

New York ranks number 4 of the 50 states in terms of transportation energy consumption, with 1,133 trillion Btu of transportation energy consumed in the year 2016 (EIA 2019). In comparison, the state of Texas ranked number one with the consumption of approximately 3,270 trillion Btu of transportation energy in 2016.

On a per capita basis, New York ranks number 49 of the 50 states in terms of transportation energy consumption, at approximately 57 million Btu consumed per capita in 2016. In comparison, the state of Alaska ranked first at 225 million Btu of transportation energy consumed per capita in 2016. The state of Rhode Island ranked last, with 55 million Btu of transportation energy consumed per capita in 2016.

17.4 FUTURE WITHOUT THE PROPOSED ACTION

The regional direct transportation energy consumption for the No Action condition is estimated to be 38 million Btu per day in 2040, as shown in Table 17-1. As described in Chapter 3, “Socioeconomic Conditions”, the GBNRTC’s regional model includes the Proposed Action. Therefore, a growth adjustment was applied to model the future without the Proposed Action.

17.5 PROPOSED ACTION

17.5.1 Direct Energy

Table 17-1 presents the direct energy use of the roadway network and Metro Rail for the No Action condition and Proposed Action in 2040. The long-term impacts of the Proposed Action are associated with the direct, or operational, energy impacts, which are a result of changes in regional traffic between the No Action condition and Proposed Action. The direct energy was estimated by obtaining energy usage rates from EPA’s MOVES2014b model, using inputs provided by NYSDOT.

Table 17-1. Annual Regional Direct Energy Use of the Roadway and LRT System

Future Condition	Daily VMT	Energy Use (MMBtu/year)
No Action	23,672,100	38,099,954
Proposed Action	23,685,290	38,136,678
% Change from No Action	0.06%	0.10%

As shown in Table 17-1, the Proposed Action is predicted to slightly increase regional energy use by 0.10 percent, as compared to the No Action condition. The slight increase in energy usage is consistent with the increase in regional VMT. The net increase in VMT includes the increased VMT due to future development and growth associated with anticipated transit-oriented development, as well as the decreased VMT from usage of the LRT system. Chapter 3, “Socioeconomics” describes the population and employment growth anticipated with the Proposed Action. Additional sources of energy use from system maintenance are not captured by this analysis.

17.5.2 Indirect Energy

Indirect impacts to energy consumption include upstream activities related to energy production and the materials used to construct the Proposed Action, including raw material extraction, raw materials transportation, materials production, and chemical reactions from materials production.

17.6 MITIGATION MEASURES

Direct energy associated with the Proposed Action is not significant; and therefore, no mitigation is warranted. Conservation of indirect energy could be achieved by use of newer and more fuel-efficient construction equipment, recycling of pavement and other hardware items, as well as employee carpooling to construction sites.

17.7 REFERENCES

U. S. Energy Information Administration (EIA). State Energy Data System: 1960-2017 (complete). Accessed July 24, 2019.

<https://www.eia.gov/state/seds/seds-data-complete.php?sid=US#Consumption>