14. Energy

MTA quantified the direct and indirect energy expenditures associated with implementing the Proposed Project in comparison with the No Action Alternative. Transportation energy is typically categorized as direct and indirect energy. Direct energy expenditures are associated with the fuel consumption of vehicles as they operate on the roadways within the study area and the vicinities surrounding the proposed new stations, as well as the propulsion requirements for the new train service. Indirect energy expenditures are associated with the energy used during the construction of the new stations. The direct and indirect energy analyses compared the anticipated energy consumption levels with the Proposed Project against consumption levels in the future with no planned action (No Action Alternative).

14.1 KEY CONCLUSIONS

This chapter describes the effect of the Proposed Project on energy consumption during operations and compared with the No Action Alternative. The Proposed Project would result in a beneficial impact on energy consumption compared to the No Action Alternative. Key conclusions from this analysis include the following:

- While energy would be consumed to provide the additional train service under the Proposed Project, it would be offset by the reduction in energy use from the reduced auto vehicle-miles travelled as motorists divert to transit.
- The Proposed Project's operational energy consumption would not adversely affect the electric utility's power availability.

14.2 METHODOLOGY

Transportation accounts for a large portion of the energy consumed in the United States. Energy is commonly measured in terms of British thermal units (Btu). A Btu is defined as the amount of heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit. Transportation energy usage is influenced predominantly by the amount of fuel used, including consumption of electricity by electric rail. The average Btu content of fuels is the heat value (or energy content) per quantity of fuel.

Transportation energy is typically categorized as direct and indirect energy. Direct energy comprises energy consumed by transportation systems, mostly for propulsion. The analysis of direct energy associated with the Proposed Project considered two factors:

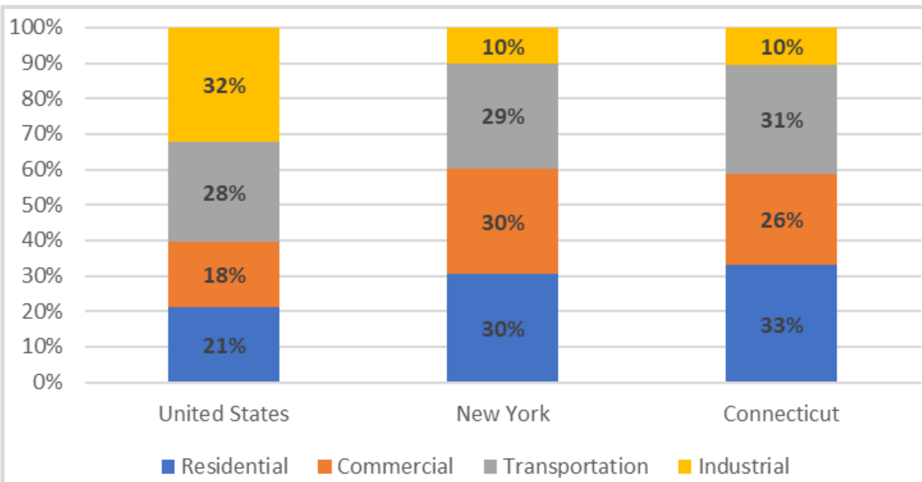
- The energy used to power the new transit service
- The change in auto-related travel as vehicular trips divert from long-distance travel to short station trips

The amount of energy used by vehicles is a function of traffic characteristics such as volume, speed, distance traveled, vehicle mix, and thermal value of the fuel used. The analysis of indirect energy consumption addressed in this and Chapter 19, "Construction and Construction Impacts" considered non-recoverable, one-time energy expenditures involved in construction of the Proposed Project's rail infrastructure improvements and for maintenance required following initiation of Penn Station Access service.

14.3 EXISTING CONDITIONS

According to the Energy Information Administration's latest report, based on 2018 data, transportation is the second-largest source of energy consumption in the United States (Figure 14-1). In New York, the transportation sector is the third-largest energy consumer. On a per capita basis, New York's transportation energy consumption was 58.1 million Btu in 2018, which is one of the lowest in the country and well below the United States per capita average of 87.1 million Btu. Petroleum (e.g., gasoline, diesel fuel, jet fuel) is the predominant source of energy for transportation in New York. Electricity used for transportation is more energy efficient and less polluting. Connecticut is also well below the Unites States average of per capita consumption for the transportation sector (65.3 million Btu).[1]

Figure 14-1. Energy Consumption by Sector (2018)



Source: U.S. Energy Information Administration, State Energy Data System, 2020

Passenger-rail electricity use is split between powering the rail system and providing a power supply at the stations. A variety of sources that originate both within and outside New York City and Westchester supply the electrical energy in New York. These include non-renewable sources (e.g., oil, natural gas, coal fuel, and uranium) and renewable sources (e.g., hydroelectricity and to a much lesser extent, biomass fuels, solar power, and wind power). In 2018, 52 percent of net electricity generation in Connecticut came from nuclear power. Other renewable sources constituted approximately 6 percent.

14.4 NO ACTION ALTERNATIVE

Although new Metro-North service to Penn Station New York will not be initiated under the No Action Alternative, annual traffic growth is expected to result in an increase in energy consumption compared to

[1] https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_sum/html/rank_use_capita.html&sid=US, 2020

existing conditions. Table 14-1 and Table 14-2 summarize the energy that will be consumed by vehicular and rail under the No Action Alternative.

14.5 PROPOSED PROJECT

14.5.1 Direct Energy Analysis

Table 14-1 presents the direct energy expenditures associated with the No Action Alternative and with Proposed Project-related vehicular traffic in New York City, Westchester, and suburban Connecticut (Fairfield and New Haven Counties). As a result of the Proposed Project, energy expenditure by vehicular traffic would decrease since vehicular vehicle-miles travelled would decrease while train miles would increase.

Table 14-1. Annual Vehicular Energy Consumption: No Action Alternative and Proposed Project (2025)

Measurement	No Action Alternative	Proposed Project	Difference	Percentage Difference
Vehicle-Miles Traveled	42,523,503,434	42,500,141,768	-23,361,667	-0.05%
Million British Thermal Units	280,297,512	280,143,411	-154,102	-0.05%

Source: WSP, 2020

MTA based energy consumption for the new rail service on the New Haven Line under the No Action Alternative versus the Proposed Project on the projected number of additional train-car miles traveled by electric trains with the Proposed Project (Table 14-2). Some Grand Central Terminal-bound trains could be diverted to Penn Station New York, resulting in a longer travel distance as compared to Grand Central Terminal-bound trains under the No Action Alternative. The additional energy required to run the new service shown in Table 14-2 includes both new and diverted trains.

Table 14-2. Annual Train Energy Consumption: No Action Alternative and Proposed Project (2025)

Measurement	No Action Alternative	Proposed Project	Difference
Train-Car Miles	58,115,268	65,505,924	7,390,656
Million British Thermal Units	1,090,591	1,229,284	138,693

Source: WSP, 2020

However, the net annual energy use with the Proposed Project, including auto-related reductions and rail-related expenditures, would decrease by 15,409 million Btu or 0.01 percent as shown in Table 14-3.

Table 14-3. Annual Energy Consumption: No Action Alternative and Proposed Project (2025)

Alternative	Vehicle Energy (million Btu)	Train Energy (million Btu)	Total Energy (million Btu)
No Action Alternative	280,297,512	1,090,591	281,388,103
Proposed Project	280,143,411	1,229,284	281,372,695
		Difference	-15,409 (-0.01%)

Source: WSP, 2020

14.5.2 Indirect Energy Analysis

Indirect energy use comprises energy used for construction and maintenance. Construction-related energy (also described in Chapter 19, "Construction and Construction Impacts") is used for production and transportation of construction materials, powering of on-site equipment, worker transportation, and other activities. Energy required for rail and station maintenance relates to cleaning, maintenance of lighting, operation of vending machines, and support for track maintenance. New construction with the Proposed Project would comprise the elements identified in Chapter 2, "Project Alternatives." According to research studies,[2] energy use for construction and maintenance could be expected to equal 1 to 2 years of operational energy, of which 75 percent would account for materials production. As the operational energy expenditure for the Proposed Project's constructed elements would not be substantial compared to the No Action Alternative, the indirect energy expenditure for construction and maintenance of these elements is also not expected to be substantial.

14.6 CONCLUSION

Operating electric trains with the Proposed Project would decrease energy consumption compared to the No Action Alternative. Vehicle-miles travelled would decrease while train miles would increase. As a result, the Proposed Project would see a net decrease in energy consumption.

The Proposed Project's operational energy consumption would not adversely affect the electric utilities' power availability and energy consumption for construction and maintenance activities would not be substantial. While none of these energy expenditures would be recoverable, MTA will employ measures during project construction to lessen energy consumption; such measures will include maximizing the use of energy-efficient and sustainable methods of construction and using construction materials produced with energy-efficient methods.

[2] Stephen T. Muench. 2010. Roadway Construction Sustainability Impacts: Review of Life-Cycle Assessments. https://doi.org/10.3141/2151-05