



TIER 1 FINAL ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1 (PREFERRED ALTERNATIVE)



7.14 Energy

7.14 ENERGY

7.14.1 Introduction

Energy is an important resource for the nation’s economy, and the conservation of energy is vital to the U.S. Department of Transportation’s and the Federal Railroad Administration’s (FRA) goals of environmental sustainability, clean air, and the reduction of greenhouse gases (GHG). Transportation uses energy to move people and goods, and accounts for a large portion of the total energy consumed within the NEC FUTURE Study Area (Study Area). A new executive order that promotes energy efficiencies in federal agencies was issued since the publication of the Tier 1 Draft Environmental Impact Statement (Tier 1 Draft EIS): Executive Order 13693, Planning for Federal Sustainability in the Next Decade (EOP 2015)

This chapter reflects the analysis prepared by the FRA to understand energy usage associated with the Preferred Alternative. The FRA calculated potential regional energy usage of the trains based on changes in train vehicle-miles and average energy requirements of passenger trains, as detailed in the Transportation Energy Data Book (Edition 33). The energy impacts caused by changes in air travel and construction are discussed qualitatively. Volume 2, Appendix E.14, provides the effects-assessment methodology to assess energy usage.

7.14.2 Resource Overview

Under the Preferred Alternative, roadway energy would decrease, whereas the energy for electric trains would increase. The Preferred Alternative exhibits a greater decrease in overall energy use compared to the decreases of the Action Alternatives analyzed in the Tier 1 Draft EIS (Volume 2). Changes in energy use of diesel trains would be much smaller in scale than the changes in energy use from autos and electric trains, as shown by the relatively small change that would be caused by the Preferred Alternative. The shifts in energy usage are related to the following:

- ▶ Predicted changes in vehicle-miles traveled (VMT) with travelers switching from automobiles to trains
- ▶ Changes in train service associated with the Preferred Alternative

The FRA has updated the data provided for the Tier 1 Draft EIS (see Volume 2, Chapter 7.14) to reflect the latest energy information collected by the United States Energy Information Administration (EIA).

7.14.3 Affected Environment

Energy information is updated yearly by the EIA. As such, the data in the following tables and pie charts have been updated to the latest available information (2013). Therefore, the data may be different from that presented in Volume 2, which reflects 2012 energy data.

Energy consumption per capita varies among the states and districts within the Study Area. In 2013, Delaware and Pennsylvania tied for the highest energy consumption per capita for states along the NEC (although 28th in the nation), and Rhode Island and New York tied for the lowest consumption for states along the NEC (Table 7.14-1).

Table 7.14-1: Energy Consumption per Capita (2013)

Geography	Consumption per Capita (million Btu)	Consumption per Capita, Rank (out of 50 states and Washington, D.C.)	Consumption per Capita, Rank (out of 8 states and Washington, D.C.)
D.C.	263	36	2
MD	236	40	4
DE	297	28	1
PA	297	28	1
NJ	260	37	3
NY	184	50	7
CT	208	46	5
RI	184	50	7
MA	215	43	6

Source: United States Energy Information Administration, 2016.

Transportation accounts for a significant portion of the energy consumed in the Study Area. Energy usage for transportation accounts for approximately 11–37 percent of the states' energy consumption within the Study Area (Figure 7.14-1).

Table 7.14-2 indicates that in 2013 in the United States, light vehicles (cars, light trucks, and motorcycles) accounted for the largest percentage of transportation energy use (58.0 percent). Medium- and heavy-duty trucks accounted for the next largest percentage of total transportation energy use (22.7 percent). When including buses (0.8 percent of total transportation energy use), on-road vehicles accounted for over 80 percent of total transportation energy. Of the remaining non-roadway modes of transportation, aircrafts accounted for 7.8 percent of the total, watercrafts accounted for 4.0 percent, pipelines accounted for 4.4 percent, and rail accounted for 2.3 percent.

Table 7.14-2: U.S. Transportation Energy Use by Mode (2013)

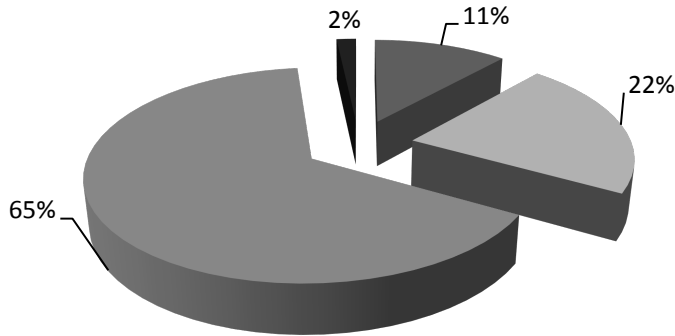
Mode	Consumption (trillion Btu)	Percentage of Total
Light Vehicles	15,182.0	58.0%
Buses	204.1	0.8%
Medium/Heavy Trucks	5,923.8	22.7%
Aircraft	2,037.0	7.8%
Watercraft	1,054.9	4.0%
Pipeline	1,140.8	4.4%
Rail	610.8	2.3%

Source: Oak Ridge National Laboratory. (2015, August). *Transportation Energy Data Book*. Accessed April 2016 from Transportation Research Board: <http://cta.ornl.gov/data/index.shtml>

Figure 7.14-1: Energy Consumption by Sector

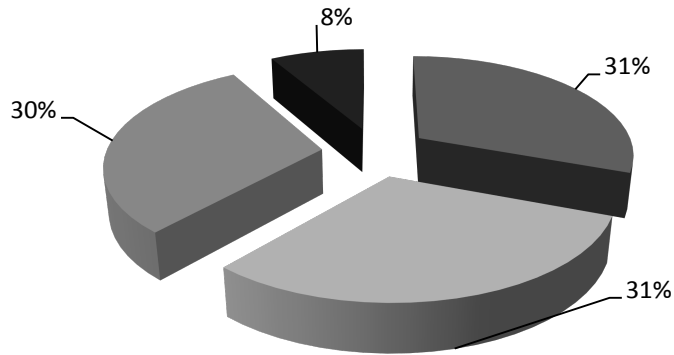
District of Columbia

■ Transportation ■ Residential ■ Commercial ■ Industrial



Maryland

■ Transportation ■ Residential ■ Commercial ■ Industrial



Delaware

■ Transportation ■ Residential ■ Commercial ■ Industrial

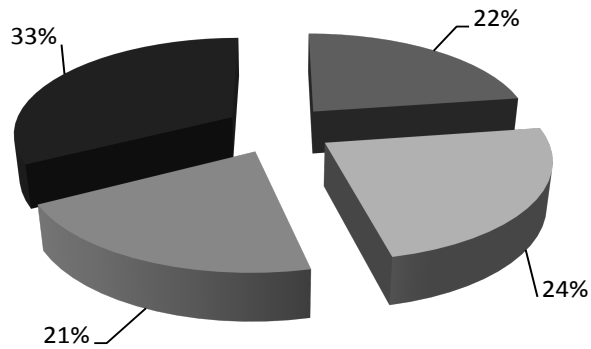
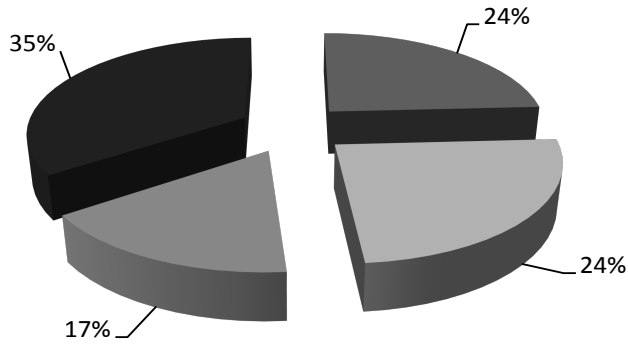


Figure 7.14-1: Energy Consumption by Sector (continued)

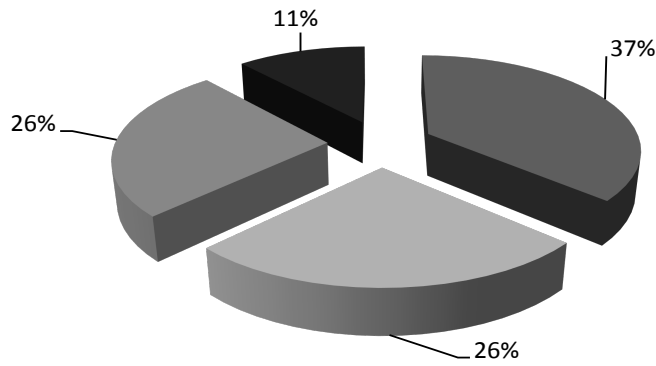
Pennsylvania

■ Transportation ■ Residential ■ Commercial ■ Industrial



New Jersey

■ Transportation ■ Residential ■ Commercial ■ Industrial



New York

■ Transportation ■ Residential ■ Commercial ■ Industrial

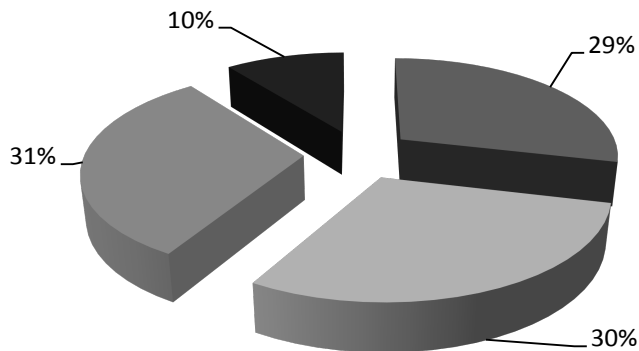
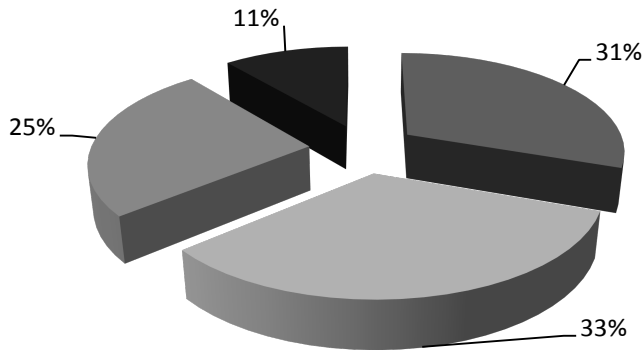


Figure 7.14-1: Energy Consumption by Sector (continued)

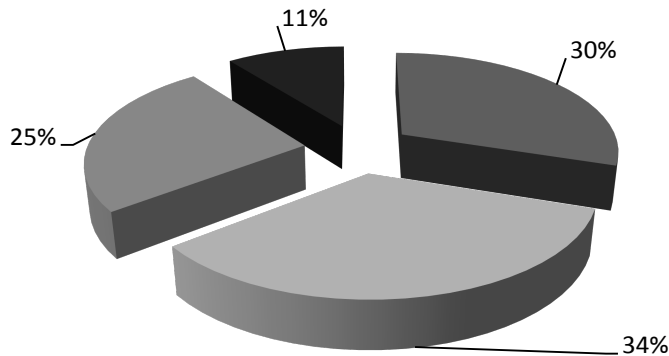
Connecticut

■ Transportation ■ Residential ■ Commercial ■ Industrial



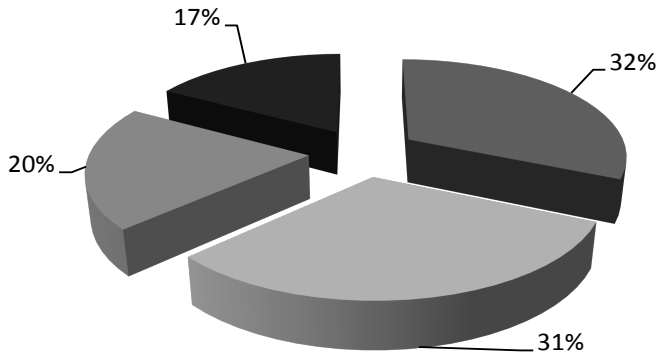
Rhode Island

■ Transportation ■ Residential ■ Commercial ■ Industrial



Massachusetts

■ Transportation ■ Residential ■ Commercial ■ Industrial



Source: U.S. Energy Information Administration. Accessed April 2016 at http://www.eia.gov/beta/state/seds/data.cfm?incfile=sep_sum/html/rank_use.html

7.14.4 Environmental Consequences

Table 7.14-3 presents the changes in energy use for roadways, diesel trains, and electric trains for the Study Area in the year 2040 under the Preferred Alternative as compared to the No Action Alternative. The results are also presented in terms of tons of oil equivalent. The analysis of energy use will be affected by a later decision as to the type of trainsets that will be used. Table 7.14-5 presents the energy intensities of Amtrak trains currently operating within the Study Area.

Table 7.14-3: 2040 Changes in Energy Use – Preferred Alternative

Project Element	MMBtu/Year
Roadways*	-11,688,940
Diesel Trains	28,455
Electric Trains	2,285,455
TOTAL (MMBtu/year)	-9,375,030
TOTAL** (Tons of Oil Equivalent/year)	-236,250

Source: NEC FUTURE team, 2016

* Roadways represent changes in vehicle-miles traveled from personal vehicles (autos) on the roadway network; this does not include potential changes in intercity buses and trucks.

** Conversion based upon U.S. Department of Energy's *Transportation Energy Data Book: Edition 34*, Table B.7.

MMBtu = million Btu

As shown in Table 7.14-3, for the Preferred Alternative, roadway energy would decrease, whereas the energy for electric trains would increase. The Preferred Alternative exhibits a greater decrease in overall energy use compared to the decreases of the Action Alternatives analyzed in the Tier 1 Draft EIS (Volume 2). Changes in energy use of diesel trains would be much smaller in scale than those from autos and electric trains, as shown by the relatively small change that would be caused by the Preferred Alternative.

The decreases in roadway energy use are attributed to decreases in VMT under the Preferred Alternative, as compared to the No Action Alternative, caused by passengers choosing to use the train rather than drive. The increases in electric train energy are attributed to the increases in train service associated with the Preferred Alternative. The changes in diesel trains are also attributed to changes in service associated with the Preferred Alternative.

As discussed in Chapter 5, Transportation, investment in the NEC FUTURE passenger rail infrastructure would create a shift in demand from aircraft and bus trips servicing the corridor to rail trips, when comparing the Preferred Alternative to the No Action Alternative. As such, the shift in travel mode choice would likely result in a decrease in energy use from aircraft and buses under the Preferred Alternative; however, it was not within the scope of this analysis to make quantitative predictions regarding the level of decrease in energy use.

Table 7.14-4 presents energy intensities—or the energy required to move a passenger per mile for each mode of transportation—for various modes of transportation. Intercity rail has a lower energy intensity (2,118 Btu per passenger-mile) than transit buses (4,071 Btu per passenger-mile) or aircraft (2,406 Btu per passenger-mile). As such, the expected mode shifts from buses and aircraft to intercity passenger rail would result in an overall decrease in energy use. As shown in the table, the energy intensities of cars, personal trucks, and motorcycles would also be higher than for Intercity rail.

Table 7.14-5 presents possible energy intensities for each type of Amtrak train operating along the corridor in Btu per seat-mile.

Table 7.14-4: Energy Intensities by Mode (2013)

Mode	Energy Intensities (Btu per passenger-mile)
Transit Buses	4,071
Personal Trucks	3,503
Cars	3,144
Commuter Rail	2,737
Aircraft	2,406
Motorcycles	2,475
Transit Rail	2,404
Intercity Rail	2,118

Source: Oak Ridge National Laboratory. (2015, August). *Transportation Energy Data Book*. Accessed April 2016 from Transportation Research Board: <http://cta.ornl.gov/data/index.shtml>.

Table 7.14-5: Energy Intensities by Train Type

Train	Possible Energy Intensities (Btu per seat-mile)
AEM7 and Six Amfleet Coaches	226
Swedish X2000 (1L-5C trainset)*	183
German ICE (L-6C-L trainset)*	241

Source: National Cooperative Rail Research Program. (2015). *Comparison of Passenger Rail Energy Consumption With Competing Modes*. Accessed April 2016 at <http://www.trb.org/Main/Blurbs/173718.aspx>

* These are integrated trainsets (L = power car, C = coach)

Refer to Volume 2, Chapter 7.14, for the discussion on new equipment and a brief overview of potential effects on energy due to construction activities for the Preferred Alternative.

7.14.5 Comparison to the Action Alternatives

The Preferred Alternative performs better than the Action Alternatives in total energy reduction. The increase in diesel energy use under the Preferred Alternative would be offset by a greater reduction in roadway energy use.

7.14.6 Potential Mitigation Strategies

The Preferred Alternative would decrease operational energy use, resulting in beneficial energy effects and therefore no need for mitigation. To further reduce energy use, measures that include using alternative energy sources, creating renewable energy plans, and increasing fuel efficiency will be considered during later phases of project development and construction.

7.14.7 Subsequent Tier 2 Analysis

Elements of the U.S. Department of Transportation’s Strategic Plan that are applicable to energy usage, sustainability, and reliability will be incorporated as part of subsequent Tier 2 project-level analysis. Depending upon the Tier 2 action, further analysis of operational energy effects may not be required.