M. ENERGY

1. Introduction

This section describes the energy consumption setting and existing conditions as they relate to the BART to Livermore Extension Project; discusses the applicable federal, State of California (State), and local regulations; and assesses the potential impacts to energy from construction and operation of the Proposed Project and Alternatives.

Energy use includes energy consumption associated with construction and operation of the Proposed Project and Alternatives. Energy consumption can be categorized as either direct or indirect. For the purposes of this analysis, direct energy consumption includes energy consumed for activities such as the propulsion of BART trains, buses, DMU trains, or EMU trains, and for powering facilities. Indirect energy consumption includes energy use by passenger vehicles and treatment of water and wastewater.

While energy resources are defined at the state and regional levels, impacts are evaluated at the project level. The study area for energy impacts during construction includes the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative—as well as the construction staging areas and roads in the vicinity of the construction sites on which vehicle trips (by workers and vendors and for hauling) would occur. Additionally, construction of the bus infrastructure improvements for the Enhanced Bus Alternative, as well as for the feeder buses for the Proposed Project and other Build Alternatives, which are anticipated to extend within existing street rights-of-way, are addressed programmatically in this analysis, as described in Chapter 2, Project Description.

The study area for energy impacts during operation of the Proposed Project or one of the Build Alternatives is the area of transit operations for the respective trains (BART, DMU, or EMU) and buses. Energy use from station and maintenance area operations, taking into account the reduction in energy demand from off-site sources of energy due to on-site solar photovoltaic electricity generation, is analyzed at each facility's respective location. Changes in energy use by passenger vehicles are analyzed for the nine San Francisco Bay Area (Bay Area) counties as well as for San Joaquin County.

No comments related to energy were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for the EIR.

2. Existing Conditions

This subsection describes the existing conditions for energy consumption, including statewide energy sources and consumption, regional energy consumption, and BART's energy consumption.

a. Overview

This analysis describes energy consumption for electricity, gasoline, diesel, and total energy (the sum of all sources used). The units of measurement used in this analysis are as follows:

- Electricity: kilowatt-hours (kWh)
- Gasoline and diesel: gallons
- Total energy: British thermal unit (BTU)

For this analysis, the approximate content of energy forms are assumed to be as follows: electricity at 3,414 BTU per kWh; gasoline at 124,240 BTU per gallon; and diesel at 138,490 BTU per gallon.[1]

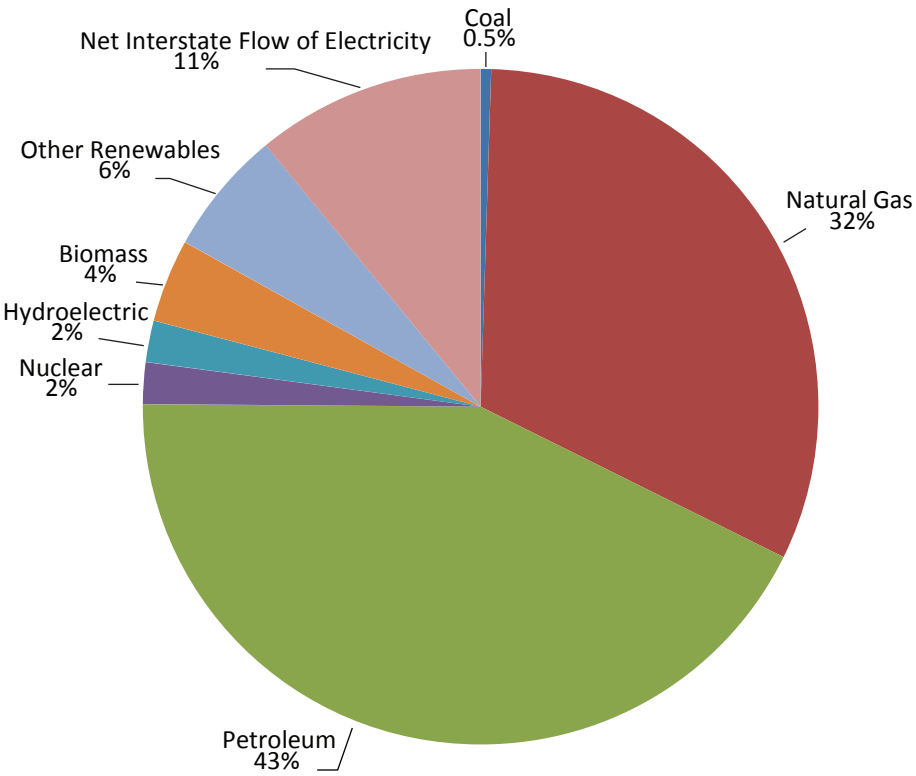
b. Statewide Energy Sources and Consumption

California's energy sources includes electric power, natural gas, hydroelectric, nuclear, and petroleum. Although California is the second largest energy consumer in the United States (U.S.) overall—with 7,620 trillion BTU consumed in 2014—the state has one of the lowest energy consumption rates per capita in the nation (196 million BTU [MMBTU] in 2014). This is due in part to the mild climate and the widespread implementation of energy efficiency programs.[2]

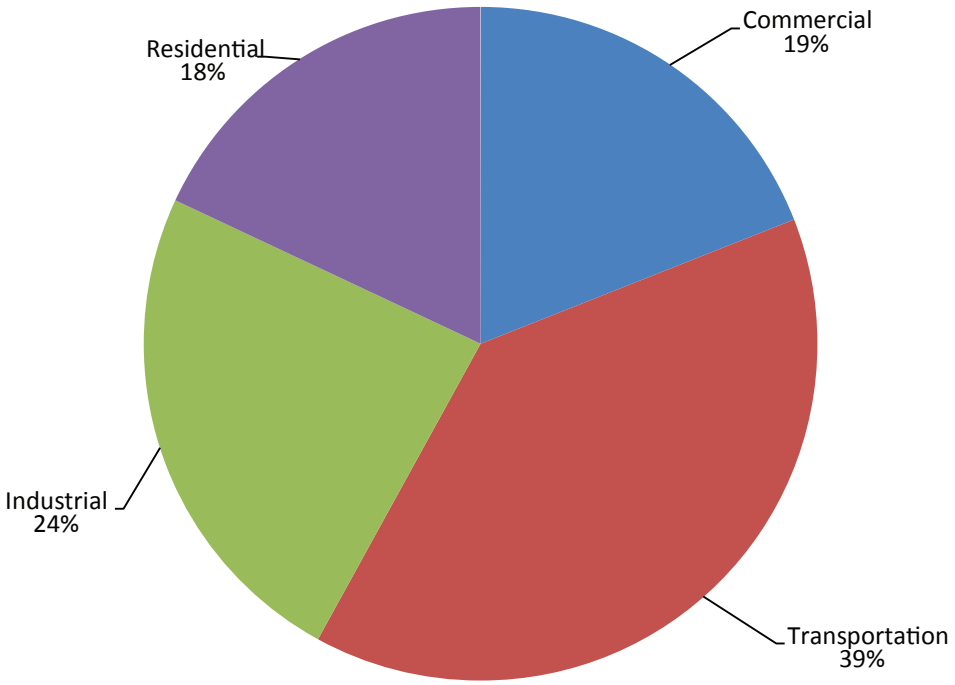
Figure 3.M-1 presents California's energy consumption by source and sector. The leading energy source in the state is petroleum, providing approximately 43 percent of the energy consumed and mostly supplying the transportation sector. Natural gas use constitutes 32 percent of the energy consumed in California. Nuclear makes up 2 percent, and solar, hydroelectric, biomass, and other renewables account for approximately 12 percent of the energy consumed on an annual basis. Energy consumed from the net interstate flow of electricity is approximately 11 percent of the total.[3] Coal accounts for 0.5 percent of the energy consumed in California.

[1] United States Department of Energy (DOE), 2014. Fuel Properties Comparison. Available at: http://www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf, accessed March 27, 2017.
[2] United States Energy Information Administration (USEIA), 2016a. California State Energy Profile. Available at: https://www.eia.gov/state/print.cfm?sid=CA, accessed January 27, 2017.
[3] Net interstate flow of electricity is the difference between the amount of electricity generated within that the state and the sum of electricity sales and losses at the state level.

Production By Source in 2014



Consumption By Sector in 2014



Source: USEIA, 2016a,b.

Figure 3.M-1
Energy
Energy Sources and Uses in California

The transportation sector uses the greatest amount of energy in California compared to other sectors of the economy, consuming over one-third of the total energy demand (approximately 39 percent). Consumption by other sections is as follows: industry uses approximately 24 percent; commercial uses 19 percent; and residential uses approximately 18 percent.

Energy originates from both in-state and out-of-state sources. As shown in Table 3.M-1, the state depends on imports of petroleum, natural gas, and electricity. Approximately 91 percent of natural gas, 64 percent of petroleum, and 34 percent of electricity are from out-of-state sources. Approximately 66 percent of electricity, 36 percent of petroleum, and 9 percent of natural gas are provided from in-state sources.

TABLE 3.M-1 ORIGIN OF CALIFORNIA ENERGY SUPPLY

	Percentage of Total Energy		
Origin	**Petroleum**	**Natural Gas**	**Electricity**
In-State	36	9	66
Out-of-State	64	91	34
Total	**100**	**100**	**100**

Notes: Petroleum and electricity numbers for calendar year 2015. Natural gas values for calendar year 2012.
Sources: CEC, 2016a; CEC, 2016b; CPUC 2016.

(1) Petroleum and Natural Gas Supply and Demand

California is the second largest state consumer of natural gas, consuming 2,352 billion cubic feet in 2014. As shown in Table 3.M-2, approximately 37 percent of the natural gas consumed in California is used for heat and power in manufacturing, mining, or agriculture. Approximately 32 percent is used in electricity generation. Residential consumption of natural gas (i.e., for direct use in cooking and heating, not including natural gas used for electricity generation) is approximately 19 percent of the total used in California. The commercial sector (e.g., hotels, restaurants, etc.) consumes approximately 11 percent, and natural gas for vehicle fuel use is approximately 1 percent of the total used in California.[4]

[4] United States Energy Information Administration (USEIA), 2016a. California State Energy Profile. Available at: https://www.eia.gov/state/print.cfm?sid=CA, accessed January 27, 2017.

TABLE 3.M-2 NATURAL GAS USE IN CALIFORNIA BY SECTOR

Sector	2016 (Percent of Total)
Industrial	37
Electric power generation	32
Residential	19
Commercial	11
Vehicle fuel	1
Total	**100**

Source: United States Energy Information Administration (USEIA), 2017a.

Table 3.M-3 shows that 52.3 percent of California's petroleum is consumed as gasoline, followed by distillate (16.6 percent), jet fuel (17.7 percent), other petroleum fuels (10.9 percent), and residual fuel (2.5 percent).

TABLE 3.M-3 PETROLEUM USE IN CALIFORNIA BY END USE FUEL TYPE

Fuel Type	2014 (Percent of Total)
Motor Gasoline	52.3
Distillate	16.6
Jet Fuel	17.7
Liquid Petroleum Gas	1.5
Residual Fuel	2.5
Other Petroleum	9.4
Total	**100.0**

Source: United States Energy Information Administration (USEIA), 2016c.

As shown in Figure 3.M-1, the transportation sector consumes 39 percent of all energy used in the state, primarily from gasoline and diesel fuel. However, due to fuel efficiency standards and displacement by alternative fuels, the California Energy Commission (CEC) predicts that total demand for gasoline in California will decline by up to 3.7 percent annually through 2025. The CEC also predicts that total California transportation electricity demand will increase from approximately 11 percent in 2015 to 59 percent in

2026.[5] This increase is anticipated due to the rising use of plug-in electric vehicles and the anticipated operation of high-speed rail.

Annual gasoline use for transportation in California in 2016 is estimated at 15.2 billion gallons and annual diesel use is estimated at 3.6 billion gallons.[6]

(2) Electricity Supply and Demand

California is the second-largest user of electricity among all of the states, using approximately 282,173 million kWh in 2014, but the 49th on a per capita basis—just 7,273 kWh per person in 2014.[7, 8, 9] Electricity consumption is expected to increase 1.22 percent annually, driven mostly by the anticipated increase in population.[10]

In California, electricity is generated from a variety of sources, with natural gas being the largest source, providing approximately 44 percent of the state's electricity, as shown in Figure 3.M-2. Renewables such as small hydroelectric, solar, wind, geothermal, and biomass make up 22 percent of California's electricity mix, while large hydroelectric sources provide 5 percent. Nuclear power provides 9 percent of the state's electricity. Coal and oil account for 6 percent of the state's electricity mix, combined. Unspecified sources of power provide 14 percent of the state's power.

Table 3.M-4 shows California electricity consumption by end-use sector in 2015. Electrical use by commercial buildings and residential constitutes 69.8 percent of California's total annual electricity use. Industry, agricultural and water pumping, mining and construction, and street lighting combined account for the remaining 30.2 percent of California's electricity demand.

---

[5] California Energy Commission (CEC), 2015. 2015 Integrated Energy Policy Report. Publication Number: CEC-100-2015-001-CMF. Available at: http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-01/TN212018_20160629T154356_2015_Integrated_Energy_Policy_Report_Full_File_Size.pdf, accessed January 30, 2017.

[6] California Air Resources Board (CARB), 2016. EMFAC2014 Mobile Source Emissions Model. February 3.

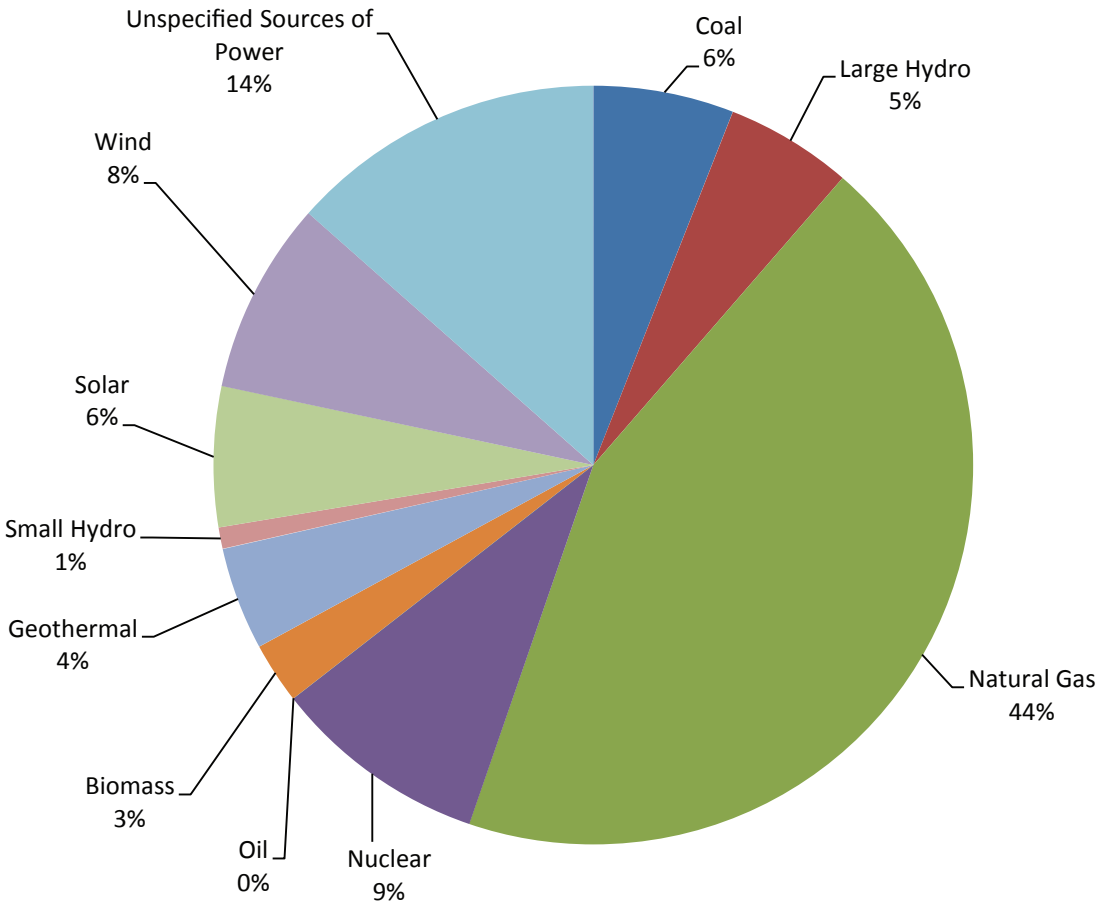
[7] California Energy Commission (CEC), 2016b. Electricity Consumption by County. Available at: http://www.ecdms.energy.ca.gov/elecbycounty.aspx, accessed October 25, 2016.

[8] United States Energy Information Administration (USEIA), 2016d. Rankings: Total Energy Consumed per Capita, 2014 (million BTU). Available at: http://www.eia.gov/state/rankings/?sid=CA#series/12, accessed October 25, 2016.

[9] United States Census Bureau, 2016. American FactFinder. Available at: http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk, accessed October 25, 2016.

[10] California Energy Commission (CEC), 2009. California Energy Demand 2010-2020 Adopted Forecast. CEC-200-2009-012-CMF. Available at: http://www.energy.ca.gov/2009publications/CEC-200-2009-012/CEC-200-2009-012-CMF.PDF, accessed April 26, 2017.

Production By Source in 2015



Source: CEC, 2016a.

Figure 3.M-2
Energy
Electricity Generation by Source in California

TABLE 3.M-4 ELECTRICITY END USE IN CALIFORNIA BY SECTOR

Sector	2015 (Percent)
Commercial Buildings	38.0
Residential	31.8
Industry	14.4
Agriculture and Water Pumping	6.7
Commercial Other	5.4
Mining and Construction	3.2
Streetlights	0.5
Total	**100.0**

Note: Construction energy use for the above categories are accounted for in the Mining and Construction sector.
Source: California Energy Commission (CEC), 2017.

Within the Bay Area, Pacific Gas and Electric Company (PG&E) provides electricity to consumers. In 2015, 29.5 percent of PG&E's energy mix came from renewable energy sources that include wind, solar, biomass, small hydropower, and geothermal.[11] The remaining 70.5 percent of PG&E's energy mix came from non-renewable energy sources.

Electricity demand is described as both electricity consumed over time (measured in gigawatt hours) and peak electricity supply and demand (measured in gigawatts or megawatts [MW]). The energy consumed over time must be met by the generating capacity of the regional energy supply. In addition, during hours of peak operation, the transmission capacity and reliability must be sufficient to carry the electricity from generator to consumer. Transmission capacity and reliability can limit the supply of electricity even if the generating capacity is sufficient.

Peak demand statewide typically occurs in the late afternoon during hot summer months when air conditioning units are in greatest use. In 2015, peak load was 47,358 megawatts.[12] In California, peak electricity demand is anticipated to increase by 0.54 to

[11] California Public Utilities Commission (CPUC), 2017. California Renewables Portfolio Standard (RPS) Homepage. Available at: http://www.cpuc.ca.gov/RPS_Homepage/, accessed April 13, 2017.

[12] California Independent System Operator (Cal-ISO), 2016. California ISO Peak Load History 1998 through 2015. Available at: https://www.caiso.com/Documents/CaliforniaISOPeakLoadHistory.pdf, accessed October 18, 2016.

1.27 percent annually.[13] Concerns about the long-term ability to meet this demand exist partly because of the uncertainty in the peak demand during the summer when air conditioning use is driven by high temperatures, which vary from year to year. There are also concerns about the aging transmission infrastructure and its ability to accommodate high electricity demands. To reduce the likelihood of demand exceeding supply, investor-owned utilities, such as PG&E, are required to maintain a 15 to 17 percent planning reserve margin (in excess of peak load obligations). Furthermore, the continuing addition of renewables in energy portfolios is predicted to increase the need for planning reserve margin to as much as 27 percent by 2020.[14]

c. Regional Energy Consumption

Sources of energy consumption considered in the region include electricity use, diesel fuel use, and gasoline fuel use. In 2015, Alameda County consumed a total of 10,245.7 million kWh of electricity, accounting for approximately 3.6 percent of the total electricity consumed in California (282,896.3 million kWh).[15]

Gasoline and diesel fuel are used primarily in transportation. The primary means of transportation in Alameda County are cars and trucks on roadways and highways. Approximately 75 percent of workers in Alameda County commute using a private car or truck, while about 13 percent use public transit.[16] In 2016, the estimated annual vehicle fuel usage for gasoline was 633,831,226 gallons, and the estimated annual fuel usage for diesel-fueled vehicles was 168,071,882 gallons.[17]

Therefore, based on the energy content conversion factors for electricity, gasoline, and diesel, the total annual energy consumed in Alameda County annually would be

[13] California Energy Commission (CEC), 2016c. Tracking Progress. Available at: http://www.energy.ca.gov/renewables/tracking_progress/documents/statewide_energy_demand.pdf, accessed October 18, 2016.

[14] Haringa, G.E., 2010. Final Report to California Independent System Operator for Planning Reserve Margin (PRM) Study—2010-2020. General Electric Energy Applications & Systems Engineering. April 13. Available at: http://www.caiso.com/279d/279ded0337f20.pdf, accessed August 27, 2013.

[15] California Energy Commission (CEC), 2016b. Electricity Consumption by County. Available at: http://www.ecdms.energy.ca.gov/elecbycounty.aspx, accessed October 25, 2016.

[16] United States Census Bureau, 2015. 2010-2014 American Community Survey 5-Year Estimates. Available at: http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B08301&prodType=table, accessed October 18, 2016.

[17] California Air Resources Board (CARB), 2016. EMFAC2014 Mobile Source Emissions Model. February 3.

approximately 137,002,286 MMBTU. This represents approximately 1.8 percent of the total energy used in California.[18]

d. BART Energy Consumption

Energy is required for the operation and maintenance of the existing BART system, as the trains and facilities are powered by electricity. BART's annual electric energy requirement is approximately 400,000 MWh (approximately 1.4 billion BTU). Approximately 79 percent of this is for train traction power, including on-board lighting; heating, ventilation, and air conditioning; and other needs. The remainder of BART's consumption (approximately 21 percent) is for stations, parking lots, maintenance facilities, track-side electronics, and other miscellaneous sources.

BART's systemwide peak electric load is approximately 80 MW. Typically, peak load for BART occurs in the late afternoon around 5:00 p.m. to 6:00 p.m. Peak load, and overall traction power consumption, is reduced due to the regenerative braking systems on each car, which feeds electricity back into the system when BART cars are slowing down, as described below.

Train cars are powered by four 150-horsepower, air-cooled, electric traction motors—one per axle. Energy for the electric traction power (referred to as tractive energy) is furnished via the third rail operating at 1,000 volts direct current. As stated above, the train cars are designed with a regenerative braking system that generates energy that is fed back to the third rail when the electric brakes are applied. Mechanical brakes operated via a hydraulic disc brake system operating on each axle operate together with the electric brake system.[19]

Approximately 90 percent of BART's electricity portfolio needs are met from low- and zero-carbon sources imported from the Pacific Northwest. Approximately 5 percent of BART's needs are met through long-term federal hydroelectric power purchases from the Western Area Power Administration. The remaining 5 percent of BART's needs are primarily met with long-term renewable power contracts, as follows:

- 2.5-MW Gridley solar farm in the city of Gridley, California
- 4.3-MW Lake Nacimiento hydroelectric project in Central California

[18] Unites States Energy Information Administration, 2016b. Total Energy Consumption, Price, and Expenditure Estimates, 2014. Available at: http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_te.html&sid=US, accessed October 20, 2016.

[19] BASE Energy, Inc. 2007. Energy Efficiency Assessment of BART Train Cars, San Francisco Bay Area. November. Available at: http://www.bart.gov/sites/default/files/docs/BARTenergyreport.pdf, accessed October 18, 2016.

- Several on-site solar projects on BART property—at the Richmond and Hayward maintenance facilities, the Union City and Warm Springs BART Stations, and two new solar projects scheduled for completion in 2017 at the Lafayette and Antioch (eBART) Stations.

Due to the variable production that renewable resources provide, between 0 percent and 3 percent of BART's supply comes from unspecified system power to ensure a daily balanced power schedule.

Currently, BART is seeking to purchase renewable energy to meet a significant portion of its electric energy needs. BART seeks to purchase between 15,000 megawatt hours (MWh) and 350,000 MWh of off-site power per year, with deliveries beginning between 2019 and 2024. This off-site power would equal 3.8 to 87.5 percent of BART's current annual electric energy requirement.[20]

3. Regulatory Framework

This subsection describes the federal, State, and local environmental laws and policies relevant to energy.

a. Federal Regulations

(1) Corporate Average Fuel Economy Standards

At the federal level, the Energy Policy and Conservation Act of 1975 established a program to regulate fuel economy of passenger automobiles and light-duty trucks, including the development of the Corporate Average Fuel Economy Standards (CAFE) by the National Highway Traffic Safety Administration. The National Highway Traffic Safety Administration regulates the CAFE standards, and the U.S. Environmental Protection Agency (EPA) measures vehicle fuel efficiency. The U.S. Congress specifies that CAFE standards must be set at the "maximum feasible level" with consideration to the following:

- Technological feasibility
- Economic practicality
- Effect of other standards on fuel economy
- Need of the nation to conserve energy

The CAFE standards require that manufacturers maintain a fleet average fuel economy standard for their passenger automobiles and light-duty trucks with a gross vehicle weight

[20] San Francisco Bay Area Rapid Transit District (BART), 2017a. BART 2017 Renewable Energy Request for Proposals. Available at: https://www.bart.gov/sustainability/renewable-RFP/2017, accessed June 16, 2017.

rating of less than 8,500 pounds. The CAFE standard for passenger automobiles and light-duty trucks in the first phase (model years 2011 through 2016) is 35.5 miles per gallon. On August 28, 2012, the Obama Administration finalized the second phase of CAFE standards that increase fuel economy to the equivalent of 54.5 miles per gallon for cars and light-duty trucks by model year 2025. When combined with previous standards, this action will nearly double the fuel efficiency of model year 2025 vehicles compared to current vehicles. In March 2017, the Trump Administration ordered the EPA to review the CAFE standard.

(2) Federal Transportation Planning and Energy Conservation

MAP-21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), was signed into law by President Obama on July 6, 2012. MAP-21 funded surface transportation programs at over $105 billion for fiscal years 2013 and 2014. MAP-21 created a performance-based surface transportation program and builds on many of the highway, transit, bicycle, and pedestrian programs and policies first established in 1991 under the Intermodal Surface Transportation Efficiency Act (ISTEA).

On December 4, 2015, President Obama signed the Fixing America's Surface Transportation Act (FAST Act) into law. The 5-year, $305-billion bill replaced MAP-21. The FAST Act builds upon the changes made by MAP-21 in improving safety, maintaining infrastructure condition, reducing traffic congestion, improving efficiency of the system, improving freight movement, protecting the environment, and reducing delays in project delivery. These laws require that energy conservation be considered during the planning of transportation systems, such as the BART to Livermore Extension Project.

b. State Regulations

The State regulations pertaining to energy consumption and conservation are presented in chronological order below.

(1) California Energy Planning and Efficiency Standards

The CEC is the primary state agency responsible for developing energy policy. The five major responsibilities of the agency are as follows:

- Forecasting future energy needs and maintaining historical energy data
- Licensing thermal power plants that are 50 MW or larger
- Promoting energy efficiency through appliance and building standards
- Developing energy technologies and supporting renewable energy
- Planning for and directing State response to any energy emergency

In 1978, the CEC established the Building Energy Efficiency standards (Title 24, Part 6 of the California Code of Regulations) to help reduce the State's energy consumption. The

CEC updates these standards on approximately a 3-year cycle. The current standards are the 2016 standards, which went into effect on January 1, 2017. The 2016 standards continue to improve upon the 2013 standards for construction of, and additions and alterations to, residential and nonresidential buildings.[21]

(2) Renewables Portfolio Standard

To reduce dependence on fossil fuels, Governor Arnold Schwarzenegger signed California Executive Order S-21-09 requiring an increase in the share of renewable resources (not including large hydroelectric resources) to 33 percent by 2020. In April 2011, Governor Jerry Brown signed SB X1-2, which created a legislative mandate codifying the 33 percent Renewables Portfolio Standard into law.

The Clean Energy and Pollution Reduction Act of 2015 (Senate Bill 350) put into law a requirement to serve 50 percent of California's electricity use with renewable resources by 2030. Retail sellers and publicly owned utilities must procure half of the state's electricity from renewable sources by 2030. While it is not subject to the California's Renewables Portfolio Standard, BART prioritizes maintaining a supply portfolio that is nearly 100 percent low- and zero-carbon, and increasing its renewable content in line with state climate and renewables policies.[22]

(3) California Public Utilities Code 701.8 and Senate Bill 502

Originally created through Senate Bill 184 (passed in 1995), and most recently amended by Senate Bill 502, (passed in 2015), California Public Utilities Code 701.8 gives BART wide latitude to design its electricity portfolio. With this legislation, BART has the option to purchase wholesale electricity directly from an approved list of sources, including federal power marketing agencies, electricity supplied by one or more direct transactions, electricity supplied by any electric utility regulated by the commission that owns or operates transmission, and distribution facilities that deliver electricity at one or more locations to the BART system. Eligible renewable resources were added to the approved list of sources since the signing of Senate Bill 502.

[21] California Energy Commission (CEC), 2016d. 2016 Building Energy Efficiency Standards. Available at: http://www.energy.ca.gov/title24/2016standards/, accessed October 18, 2016.

[22] San Francisco Bay Area Rapid Transit District (BART), 2017b. Wholesale Electricity Portfolio Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Wholesale%20Electricity%20Portfolio%20Policy%204.27.17.pdf, accessed May 30, 2017.

c. Local

(1) BART's Strategic Plan Framework

Although not a regulation per se, BART's Strategic Plan Framework (adopted October 2015) identifies goals and strategies related to energy conservation and sustainability. Consistent with its goal to advance regional sustainability, BART is committed to continuously improving its operating practices to preserve the environment of the Bay Area. This includes adopting feasible practices to conserve energy, such as the following:

- Prevent pollution and preserve natural resources
- Build partnerships to sustain and enhance our environment
- Meet or exceed environmental, health, and safety requirements
- Address and responsibly correct conditions that hinder a sustainable environment
- Create and achieve environmental objectives and targets that are measurable and meaningful
- Communicate this policy to all employees and to the communities BART serves

(2) Wholesale Electricity Portfolio Policy

BART's Wholesale Electricity Portfolio Policy was adopted by the BART Board on April 27, 2017.[23] The policy goals are to support low and stable BART operating costs and maximize the use of low-carbon, zero-carbon, and renewable electricity. To maximize the use of this type of energy, BART will support State climate policies by prioritizing purchases from supply sources with very low or zero greenhouse gas (GHG) emissions factors and support state renewable policies by prioritizing purchases from supplies that qualify as renewable under criteria set by state law. Performance measures include maintaining a long-term cost advantage compared to rates that BART would otherwise pay as a bundled utility customer, maintain per unit energy costs within BART's Short Range Transit Plan projections, and achieve the following portfolio:

- Average emission factor no greater than 100 pounds of carbon dioxide equivalent per MWh from 2017 through 2024 (inclusive)
- From at least 50 percent eligible renewable sources and from at least 90 percent low- and zero-carbon sources by 2025
- 100 percent from zero-carbon sources by 2035
- 100 percent from eligible renewable sources by 2045

[23] Ibid.

(3) Sustainability Policy

BART updated its Sustainability Policy on April 27, 2017.[24] The goals of the Sustainability Policy are as follows:

1. Advance smart land use, livable neighborhoods, and sustainable access to transit
2. Choose sustainable materials, construction methods, and operations practices
3. Use energy, water, and other resources efficiently
4. Reduce harmful emissions and waste generation
5. Respond to risks from extreme weather, earthquakes, and other potential disruptions
6. Improve patron and employee health and experience
7. Serve as a leader in sustainability for transit agencies and the communities that BART serves by reducing BART's environmental footprint and encouraging other organizations and institutions to act similarly

BART plans to meet these goals by implementing these energy consumption and conservation methods: (1) minimize ongoing maintenance and reduce waste; (2) consider net embodied energy; (3) incorporate efficient construction, deconstruction, and recycling practices; (4) achieve 100 percent renewable energy; (5) reduce energy use, water use, and consumption of other resources; (6) design new facilities to be resource efficient; (7) power non-electric facilities and vehicles with sources generating the lowest feasible greenhouse gas emissions and criteria air pollutants; (8) reduce, reuse, and recycle materials; (9) manage wastewater and stormwater comprehensively; and (10) implement programs for BART employees to decrease their environmental impact, among others.

4. Impacts and Mitigation Measures

This subsection lists the standards of significance used to assess impacts, discusses the methodology used in the analysis, describes the analysis scenarios, summarizes the impacts, and then provides an in-depth analysis of the impacts with mitigation measures identified as appropriate.

a. Standards of Significance

CEQA requires that EIRs include a discussion of the potential energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy (see Public Resources Code section 21100(b)(3)).

[24] San Francisco Bay Area Rapid Transit District (BART), 2017c. Sustainability Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Sustainability%20Policy%204.27.17.pdf, accessed June 15, 2017.

Appendix F of the CEQA Guidelines provides guidance for assessing energy impacts of projects with the following three goals:

- Decreasing overall per capita energy consumption
- Decreasing reliance on fossil fuels such as coal, natural gas, and oil
- Increasing reliance on renewable energy sources

The Governor's Office of Planning and Research has proposed a new Energy section for the CEQA Guidelines Appendix G checklist, to better integrate the checklist with Appendix F.[25] For the purpose of this EIR, impacts on energy consumption are considered significant if the Proposed Project or one of the Alternatives would result in the following:

- Wasteful, inefficient, or unnecessary consumption of energy during project construction or operation

However, if the Proposed Project or one of the Alternatives would result in wasteful, inefficient, or unnecessary consumption, the Proposed Project or one of the Alternatives would have a less-than-significant impact on energy if it would involve the following:

- Incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation, or other project features

Consistent with Appendix F of the CEQA Guidelines, elements evaluated in this analysis are as follows:

a) The energy requirements by amount and fuel type for each stage of the project, including construction, operation, and maintenance

b) The effects of the project on local and regional energy supplies and on requirements for additional capacity

c) The effects of the project on peak and base-period demands for electricity and other forms of energy

d) The degree to which the project complies with existing energy standards

e) The effects of the project on energy resources

f) The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives

[25] Office of Planning and Research, 2015. Proposed Updates to the CEQA Guidelines, Preliminary Discussion Draft. August 11. Available at: https://www.opr.ca.gov/docs/Preliminary_Discussion_Draft_Package_of_Amendments_to_the_CEQA_Guidelines_Aug_11_2015.pdf, accessed April 26, 2017.

b. Impact Methodology

The methodology used to evaluate the significance of energy resources impacts is described below. The EMU Option would result in different energy requirements than the DMU Alternative and is therefore discussed separately for each impact.

The Proposed Project and Build Alternatives would consume energy both directly and indirectly. Direct energy consumption would occur from sources that are included in the Proposed Project or a Build Alternative (i.e., consumption by BART, DMU/EMU, or buses, including feeder buses that are part of the Proposed Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative). Indirect changes in energy consumption would occur when energy is consumed by sources that are not themselves part of the Proposed Project or a Build Alternative (i.e., reductions in energy use by passenger vehicles due to drivers and passengers switching to transit or increases in energy use related to water and wastewater treatment).

This energy analysis addresses the changes in energy consumption and the incorporation of renewable energy or energy efficiency measures that would result from the construction and operation of the Proposed Project and the Build Alternatives. Energy consumed during construction and operation is estimated for electricity, gasoline, and diesel. Natural gas used for electricity generation is accounted for under electricity use. To provide a comparison of energy use between the Proposed Project and the Build Alternatives, total energy use (which includes electricity, gasoline, and diesel) is quantified in terms of millions of BTU (MMBTU).

GHG emissions estimates used in this analysis for the Proposed Project and Alternatives are based on data provided in Appendix H, Air Quality Technical Tables, and Appendix I.2, Energy and GHG Calculations.

Assumptions used in estimating energy use and reductions are described below.

(a) Construction

Energy consumption from construction includes on-road vehicles and off-road equipment. Defaults from the California Emissions Estimator Model (CalEEMod) for trip lengths and project-specific assumptions for vendor, hauling, and worker trips were used to estimate on-road vehicle energy consumption. Worker trips were adjusted to account for a percentage of workers that would use carpools and public transportation. Energy consumption from off-road equipment was calculated using anticipated equipment usage hours. Diesel demand for off-road trucks is derived from EMFAC2014.

(b) Operation

Under the Proposed Project and Build Alternatives, energy would be consumed during the operation and maintenance of trains, stations, and associated infrastructure and support facilities. Operation energy use includes both transit operations and station and maintenance operations. Energy use is described below.

In addition, the Proposed Project and Build Alternatives would result in the reduction of energy use from passenger vehicles due to decreased passenger vehicle miles traveled (VMT) as more people take transit. Also, for the Proposed Project, DMU Alternative, and EMU Option, generation of renewable energy via a solar photovoltaic system at the proposed Isabel BART Station (Isabel Station) would help offset energy use from electricity generation from off-site sources to meet project operational demand. These reductions are also described below.

Transit Operations

Transit operations include BART trains, DMU vehicles, EMU vehicles, and bus operations as identified for the Proposed Project and Build Alternatives below.

- **BART Car Miles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).** BART train use would result in direct energy use, associated with the electricity use for train operations. BART traction power electricity demand is calculated from annual total BART car miles traveled and an electricity demand factor of 4.51 kWh per car mile, based on 2006 data.[26] The use of this electricity demand factor is conservative, as the current BART traction electricity demand factor is lower—4.30 kWh per car mile (as of 2015). The annual total BART car miles traveled is the sum of the distance traveled for every BART car per year.

  The Proposed Project would result in additional BART car miles associated with (1) the approximately 5.5-mile extension of BART service to the proposed Isabel Station; and (2) the increased BART car miles systemwide due to the increased ridership anticipated under the Proposed Project. The DMU Alternative, EMU Option, and Express Bus/BRT Alternative would only have increased BART car miles associated with increased systemwide ridership due to implementation of the alternatives. Under the Enhanced Bus Alternative, the number of BART car miles traveled for BART operations would be equivalent to the number of BART car miles for No Project Conditions; therefore, there would be no change in BART car miles.

[26] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf, accessed April 26, 2017.

- **DMU Vehicle Miles (DMU Alternative).** Operation of the DMU vehicles would be a direct source of energy use. DMU diesel demand was calculated from annual revenue DMU car miles. A two-car DMU train would consume 9 kWh per mile traveled (running) and 1.25 kWh per idle minute, plus approximately 0.725 gallons of diesel per mile traveled.[27] The DMU energy use rates were modified to account for the project-specific assumption of four rail cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. Based on these project-specific parameters, the DMU energy use rates are estimated to be 0.478 gallon of diesel per car mile and 2.5 kWh per idle minute. The DMU is expected to utilize electricity for idling energy needs.
- **EMU Vehicle Miles (EMU Option).** Operation of the EMU vehicles would be a direct source of energy use. EMU vehicle traction power electricity is calculated from annual revenue EMU car miles and round trips. The EMU vehicle would have an electricity demand factor of 8.6 kWh per mile traveled (running) and 0.88 kWh per idle minute.[28] The EMU energy use rates were modified to account for the project-specific assumptions of four EMU cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. EMU energy use rates are estimated to be 4.3 kWh per car mile and 1.8 kWh per idle minute.
- **Bus Miles (Proposed Project and Build Alternatives).** Bus use would be a direct source of energy use, associated with diesel fuel use. Operational bus energy use is calculated based on total bus trips and vehicle miles for service to the proposed Isabel Station. The analysis assumed that each bus trip includes 5 minutes of idling. Diesel demand for buses is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. The portion of the buses operated by the Livermore-Amador Valley Transit Authority (LAVTA) are hybrid-diesel models and consume 15 percent less fuel than standard diesel buses (per manufacturer specifications).[29, 30] Therefore, the diesel demand for buses were reduced by 15 percent to account for the hybrid-diesel bus models operated by LAVTA.

[27] LTK Engineering Services, 2008. eBART Phase I Project to Hillcrest Terminal: DMU and LRV Comparison. May 14.

[28] Ibid.

[29] Peterson, Lee, Gillig, LLC, 2017. Personal communication with Aubrey Jones of Ramboll Environ. April 21.

[30] Approximately 90 percent of the buses in the model are assumed to be LAVTA buses under the Proposed Project and DMU Alternative, and 100 percent are assumed to be LAVTA buses under the Express Bus/BRT Alternative and Enhanced Bus Alternative.

Table 3.M-5 presents the net change in miles from transit operations listed above.

TABLE 3.M-5 NET CHANGE IN BART CAR MILES, DMU/EMU MILES, AND BUS MILES FOR 2025 AND 2040 PROJECT AND CUMULATIVE CONDITIONS

	BART Car Miles	DMU/EMU Miles	Bus Miles
2025			
Conventional BART Project	2,895,844	--	379,117
DMU Alternative (EMU Option is the same)	558,771	776,400	379,117
Express Bus/BRT Alternative	111,839	--	354,876
Enhanced Bus Alternative	--	--	235,016
2040			
Conventional BART Project	3,561,913	--	379,117
DMU Alternative (EMU Option is the same)	1,150,063	864,100	379,117
Express Bus/BRT Alternative	479,770	--	354,876
Enhanced Bus Alternative	--	--	235,016

Notes: -- = Not applicable or no change.
Change in BART car miles, DMU/EMU miles, and bus miles is the net change between the Proposed Project (or Alternative) and No Project Conditions for the specified year (2025 or 2040).
Source: Connetics Transportation Group, 2017.

Station and Maintenance Operations

Station and maintenance area operational energy use includes station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, maintenance of BART vehicles and DMU/EMU vehicles, and other activities at the storage and maintenance facility (including the use of maintenance trucks and forklifts and employee shuttle vans).

- **Proposed Isabel Station Electricity (Proposed Project, DMU Alternative, and EMU Option).** Electricity use at the proposed Isabel Station would be a direct source of energy use. Electricity consumption at the proposed Isabel Station was conservatively assumed to be similar to the electricity use at the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) and station parking lot, an existing and comparable BART station.[31] This represents a conservative estimate of electricity use as the proposed Isabel Station is anticipated to be more energy efficient than the Dublin/Pleasanton Station due to current building codes that require greater energy conservation (e.g.,

[31] Electricity use is based on a 3-year annual average (2012 to 2014) for the Dublin/Pleasanton Station (Ramboll Environ, 2017).

Title 24). Energy use is calculated based on the gross electricity produced prior to electricity losses from the grid. Specifically, the U.S. Energy Information Administration estimates that electricity transmission and distribution losses average about 5 percent of the electricity that is transmitted and distributed in the U.S.[32]

- **Emergency generators (Proposed Project, DMU Alternative, and EMU Option).** Use of diesel fuel for the emergency generators would be a direct source of energy use. An approximately 2,500-kilowatt emergency generator would be located at the Isabel Station, and an approximately 500-kilowatt emergency generator would be located at the storage and maintenance facility. This analysis assumes that operation for routine maintenance and testing for the emergency generator at Isabel Station would not exceed 24 hours per year. For the emergency generator at the storage and maintenance facility, this analysis assumes that operation for routine maintenance and testing for the emergency generator would not exceed 50 hours per year.
- **Water and Wastewater (Proposed Project and Build Alternatives).** Water use and wastewater generation are an indirect source of energy use. Energy use related to water and wastewater consists of upstream electricity to supply, treat, and distribute water and downstream electricity to treat wastewater. Water use and wastewater generation would result from the stations (Dublin/Pleasanton Station and proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities, as outlined in Section 3.P, Utilities (see **Impact UTIL-5**).[33] For this analysis, water use and wastewater generation are conservatively assumed to be the same in 2025 as 2040.
- **Maintenance of BART Cars and DMU/EMU Vehicles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).** Electricity use is anticipated from the maintenance of BART, DMU, and EMU vehicles, and would be a direct energy use. A maintenance factor of 7,060 BTU per car/vehicle mile was applied to the annual miles to determine total electricity usage for maintenance activities.[34] Maintenance of BART cars would occur at the storage and maintenance facility under the Proposed Project. For the other alternatives, maintenance of the BART cars

[32] United States Energy Information Administration (USEIA), 2017a. Frequently Asked Questions: How much electricity is lost in transmission and distribution in the United States? Available: https://www.eia.gov/tools/faqs/faq.php?id=105&t=3, accessed June 15, 2017.

[33] In addition to the water use described in Section 3.P, Utilities for water consumption in the study area, this analysis accounts for use of water outside the study area related to maintenance/cleaning of the additional BART cars required for the DMU Alternative and Express Bus/BRT Alternative that would be maintained at existing BART maintenance facilities, under these alternatives.

[34] California Department of Transportation (Caltrans), 1983. Energy and Transportation Systems. July. Available at: http://www.dot.ca.gov/hq/env/air/documents/energytranssystems_ocr.pdf, accessed June 15, 2017.

associated with the increase in BART car miles traveled would occur at existing BART maintenance facilities.

- **Other Activities at the Storage and Maintenance Facility (Proposed Project, DMU Alternative, and EMU Option.** Activities associated with the storage and maintenance facility, specifically maintenance truck and forklift use, as well as shuttle vans for transporting BART employees to the proposed Isabel Station (under the Proposed Project only), would result in both direct and indirect sources of energy use (direct energy use from diesel fuel and electricity use). Off-road maintenance trucks would be used at the storage and maintenance facility. Project-specific assumptions for the trucks are as follows: approximately 8,030 annual VMT and 10 minutes of idling per day, per vehicle. Diesel demand for off-road trucks is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. Two electric forklifts are assumed to be used at the storage and maintenance facility 365 days a year for 8 hours a day. Horsepower and load factors used are industrial averages and air quality model defaults from CalEEMod, respectively. In addition, one shuttle van would be used at the maintenance yard for the Proposed Project and is assumed to travel 20 miles per day and idle for 40 minutes per day.

Energy Reductions

Reductions in energy use during operation would result from reduced passenger VMT associated with increased transit ridership, as well as on-site electricity generation from a solar photovoltaic system at the proposed Isabel Station, as identified for the Proposed Project and Build Alternative below.

- **Reduced Passenger VMT (Proposed Project and Build Alternatives).** Reductions in regional passenger VMT would occur as a result of the mode switch from passenger vehicles to transit, as shown in Table 3.M-5. Gasoline and diesel demand for passenger vehicles is derived from EMFAC2014 for daily fuel use in Alameda County for 2025 and 2040. A gallon-per-mile use factor was determined and applied to project-specific VMT estimates. Electricity used in passenger vehicles was derived from the U.S. Department of Energy's 2016 Fuel Economy Guide.[35] The net change in passenger VMT is presented in Table 3.M-6.

[35] Department of Energy (DOE), 2017. Model Year 2016 Fuel Economy Guide. April 25. Available at: https://www.fueleconomy.gov/feg/pdfs/guides/FEG2016.pdf, accessed April 26, 2017.

TABLE 3.M-6 NET CHANGE IN PASSENGER VEHICLE MILES TRAVELED

	Annual VMT		Average Daily VMT	
	2025	2040	2025	2040
Project Conditions				
Conventional BART Project	-38,250,574	-73,770,403	-128,000	-246,000
DMU Alternative (EMU Option is the same)	-28,578,215	-42,745,966	-95,000	-142,000
Express Bus/BRT Alternative	-13,357,023	-28,586,697	-45,000	-95,000
Enhanced Bus Alternative	-75,668	-2,722,388	-300	-9,000
Cumulative Conditions				
Conventional BART Project	-32,649,225	-82,390,212	-109,000	-275,000
DMU Alternative (EMU Option is the same)	-21,858,079	-49,924,896	-73,000	-166,000
Express Bus/BRT Alternative	-19,509,613	-34,691,838	-65,000	-116,000
Enhanced Bus Alternative	-8,705,948	-8,834,264	-29,000	-29,000

Notes: VMT = vehicle miles traveled
Change in annual VMT or average daily VMT is the difference between No Project Conditions and Project Conditions (or Cumulative Conditions). Negative values represent a decrease in VMT.
Source: Cambridge Systematics, 2017.

- **Solar Photovoltaic (Proposed Project, DMU Alternative, and EMU Option).** A solar photovoltaic system with a capacity of 1,000 kilowatts is assumed for the Isabel Station; it is assumed to start operation in 2025, with a 1 percent annual degradation in performance for every year thereafter. Solar photovoltaic power generated on site would reduce demand for electricity generated at off-site power plants. Electricity generation was estimated using the National Renewable Energy Laboratory's PVWatts calculator.[36] Electricity generation is based on a rooftop array using default assumption and weather conditions typical of Livermore, California.

c. No Project Conditions

2025 No Project Conditions and 2040 No Project Conditions are described below. Under 2025 and 2040 No Project Conditions, the Proposed Project and Build Alternatives would not be built. Energy consumption in the study area would continue to result from new development and existing infrastructure. This would include the use of passenger vehicles

[36] National Renewable Energy Laboratory (NREL), 2016. PVWatts Calculator. Available at: http://pvwatts.nrel.gov/, accessed November 7, 2016.

and a continued increase in annual VMT in the study area and associated consumption of diesel fuel, gasoline, and electricity.

For 2025 and 2040, the project impacts are evaluated against No Project Conditions. Thus, the 2025 Proposed Project and Build Alternatives are evaluated against 2025 No Project Conditions, and the 2040 Proposed Project and Build Alternatives are evaluated against 2040 No Project Conditions. See Section 3.B, Transportation, for additional details related to No Project Conditions.

(1) 2025 No Project Conditions

2025 No Project Conditions for energy assume the growth-induced traffic volumes between existing conditions and 2025 as determined in the transportation modeling.

(2) 2040 No Project Conditions

2040 No Project Conditions for energy assume the growth-induced traffic volumes between existing conditions and 2040 as determined in the transportation modeling.

d. Summary of Impacts

Table 3.M-7 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.M-7 SUMMARY OF ENERGY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact EN-1: Result in wasteful, inefficient, or unnecessary consumption of energy, during construction	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact EN-2(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, during construction under Cumulative Conditions	NI	LS	LS	LS	LS

TABLE 3.M-7 SUMMARY OF ENERGY IMPACTS

Impacts	Significance Determinations[a]				
	No Project Alternative	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative	Enhanced Bus Alternative
Operational					
Project Analysis (2025 and 2040)					
Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions	NI	B	B	B	SU
Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions	S	B	B	B	SU
Cumulative Analysis (2025 and 2040)					
Impact EN-5(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Cumulative Conditions	NI	B	B	B	B
Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions	S	B	B	B	B

Notes: NI=No impact; B=Beneficial impact; LS=Less-than-Significant impact, no mitigation required; S= Significant impact of No Project Alternative (mitigation is inapplicable); SU=Significant and unavoidable, even with mitigation or no feasible mitigation available.
DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit.
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.

e. Environmental Analysis

Impacts pertaining to project construction are described below, followed by operations-related impacts.

(1) Construction Impacts

Potential energy impacts pertaining to project construction are described below, followed by cumulative construction impacts.

(a) Construction – Project Analysis

Impact EN-1: Result in wasteful, inefficient, or unnecessary consumption of energy, during construction.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

Although construction-related energy consumption would represent the irreversible consumption of finite fossil fuel energy resources, the consumption of energy would be short-term in duration, ranging from approximately 2 months (for the Enhanced Bus Alternative) to approximately 5 years (for the Proposed Project and other alternatives). In addition, as described further below, the amount of energy required would represent a very limited amount of the total energy consumed annually in Alameda County. Furthermore, for the Proposed Project and several of the alternatives, the reduction in energy consumption during operations (described in **Impact EN-3** below) would offset consumption of energy during construction.

Construction-related energy use would include the consumption of electricity, diesel, and gasoline. Petroleum fuels would be used for operation of construction vehicles and electricity would power other construction equipment, such as welding machines and power tools. Energy consumed by power equipment used during construction would be relatively minimal, as would the energy necessary for any required lighting and operation of ancillary electrical equipment. Gasoline and electricity would be used for on-road vehicles, while diesel would be used during construction by either off-road or on-road vehicles. Off-road vehicles are used on construction sites (such as bulldozers) and on-road vehicles are all vehicles that travel over roads. Energy use during construction of the Proposed Project and Build Alternatives are presented in Table 3.M-8.

TABLE 3.M-8 ENERGY USE DURING CONSTRUCTION

	Electricity (kWh)	Diesel (Gallons)	Gasoline (Gallons)	Total Energy Use (MMBTU)
Conventional BART Project	10,293	1,050,849	107,641	159,023
DMU Alternative (same for EMU Option)	10,293	877,046	109,991	135,245
Express Bus/BRT Alternative	10,913	221,151	102,552	43,491
Enhanced Bus Alternative	383	25,464	3,979	4,025

Notes: kWh = kilowatt hours; MMBTU = million British thermal units.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes in the environment associated with construction of the Proposed Project or any of the Build Alternatives. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, Altamont Corridor Express, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including both residential and commercial. Construction of these improvements and development projects could result in wasteful, inefficient, or unnecessary consumption of energy from construction. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to energy use during construction. **(NI)**

Conventional BART Project. As presented in Table 3.M-8, construction of the Proposed Project would consume approximately 159,023 MMBTU in the form of 10,293 kWh of electricity, 1,050,849 gallons of diesel (of which 482,395 gallons would be for use in on-road vehicles and 568,454 gallons for off-road vehicles), and 107,641 gallons of gasoline. For purposes of comparison, total energy use for construction of the Proposed Project would represent approximately 0.12 percent of Alameda County's annual energy use (137,002,286 MMBTU annually). Therefore, the anticipated amount of energy that would be consumed during construction of the Proposed Project would not result in wasteful, inefficient, or unnecessary consumption of energy. In addition, construction activities would not reduce existing electrical or natural gas services due to insufficient supply. Further, the energy consumed to construct the Proposed Project would be offset from the energy reductions that would occur during operation of the Proposed Project, described in **Impact EN-3** below. Therefore, construction of the Proposed Project would result in a less-than-significant impact on energy resources. **(LS)**

DMU Alternative (same for EMU Option). As Table 3.M-8 shows, construction of the DMU Alternative would consume approximately 135,245 MMBTU, which is less energy than required for construction of the Proposed Project. The EMU Option would require the same amount of energy and same sources of energy as the DMU Alternative. Of the total energy consumed, construction of the DMU Alternative would require 10,293 kWh of electricity, 877,046 gallons of diesel (of which 572,498 gallons would be for use in on-road vehicles and 304,547 gallons for off-road vehicles), and 109,991 gallons of gasoline. Therefore, the anticipated amount of energy that would be consumed during construction of the DMU Alternative would not result in wasteful, inefficient, or unnecessary consumption of energy. Construction of the DMU Alternative would represent

0.10 percent of Alameda County's annual energy use. In addition, construction activities would not reduce existing electrical or natural gas services due to insufficient supply. Further, the energy consumed to construct the DMU Alternative would be offset from the energy reductions that would occur during operation of the DMU Alternative, described in **Impact EN-3** below. Therefore, construction of the DMU Alternative (or EMU Option) would result in a less-than-significant impact on energy resources. **(LS)**

Express Bus/BRT Alternative. As Table 3.M-8 shows, construction of the Express Bus/BRT Alternative would consume approximately 43,491 MMBTU, which is less energy than required for construction of the Proposed Project. Of the total energy consumed, construction of the Express Bus/BRT Alternative would require 10,913 kWh of electricity, 221,151 gallons of diesel (of which 145,425 gallons would be for use in on-road vehicles and 75,726 gallons for off-road vehicles), and 102,552 gallons of gasoline. Construction of the Express Bus/BRT Alternative would represent 0.03 percent of Alameda County's annual energy use. Therefore, the anticipated amount of energy that would be consumed during construction of the Express Bus/BRT Alternative would not result in wasteful, inefficient, or unnecessary consumption of energy. Further, the energy consumed to construct the Express Bus/BRT Alternative would be offset from the energy reductions that would occur during operation of the Express Bus/BRT Alternative, described in **Impact EN-3** below. Therefore, construction of the Express Bus/BRT Alternative would have a less-than-significant impact on energy consumption. **(LS)**

Enhanced Bus Alternative. As Table 3.M-8 shows, construction of the Enhanced Bus Alternative would require approximately 4,025 MMBTU. Of the total energy consumed, construction of the Enhanced Bus Alternative would require 383 kWh of electricity; 25,464 gallons of diesel (of which 15,652 gallons would be for use in on-road vehicles and 9,811 gallons for off-road vehicles); and 3,979 gallons of gasoline. Construction of the Enhanced Bus Alternative would represent 0.003 percent of Alameda County's annual energy use. Thus, anticipated amount of energy that would be consumed during construction of the Enhanced Bus Alternative would not result in wasteful, inefficient, or unnecessary consumption of energy. Therefore, construction of the Enhanced Bus Alternative would have a less-than-significant impact on energy consumption. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant construction impacts related to consumption of energy, and no mitigation measures are required.

(b) Construction – Cumulative Analysis

Impact EN-2(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, during construction under Cumulative Conditions.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

No Project Alternative. As described in **Impact EN-1** above, the No Project Alternative would have no impacts related to energy consumption during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The Proposed Project and Build Alternatives, in combination with past, present, or probable future projects, would result in a temporary increase in energy consumption over the respective construction periods of the various projects. If undertaken within the same time period, construction energy impacts from other transportation, residential, and commercial projects undertaken in the study area could combine with those associated with the Proposed Project and Build Alternatives. However, it is expected that construction would be implemented in conjunction with numerous measures to maximize energy efficiency and conservation, which include minimizing the number of material deliveries required, maintaining equipment in good condition, and minimizing equipment idling. Thus, construction of the Proposed Project or any Alternative, in combination with past, present, or probable future projects, would not contribute to significant cumulative impacts related to energy use. Therefore, cumulative energy impacts during construction would be less than significant. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives, in combination with past, present, or probable future projects, would not result in significant cumulative construction impacts related to consumption of energy, and no mitigation measures are required.

(2) Operational Impacts

Potential impacts pertaining to the opening year of 2025 are described first, followed by impacts pertaining to the horizon year of 2040.

(a) Operations – Project Analysis

Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: B; DMU Alternative: B; EMU Option: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: SU)

The change between 2025 No Project Conditions and 2025 Project Conditions represents the net energy increase or decrease attributed to the Proposed Project or Alternative. Table 3.M-9 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives in 2025. Tables 1 through 5 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives in 2025, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts related to energy use. **(NI)**

Conventional BART Project. In 2025, the Proposed Project would result in a net decrease of 73,163 MMBTU annually compared to 2025 No Project Conditions. While energy use from the Proposed Project would increase by 78,998 MMBTU annually in 2025, this would be offset from reductions in annual energy use of 152,161 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

Sources of energy use for the Proposed Project include BART operations, bus operations (for feeder bus service to the Isabel Station), station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources are described below in the order presented in Table 3.M-9. Table 1 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** Annually, net new BART car miles would increase by 2,895,844 in 2025 due to implementation of the Proposed Project. This increase in BART car miles comes from the increase in the number and distance that BART cars travel with the extended line. As a result of this increase, energy use due to electricity demand for operation of BART would be 13,060,256 kWh annually (equivalent to 44,588 MMBTU per year).

TABLE 3.M-9 CHANGE IN ANNUAL ENERGY USE UNDER 2025 PROJECT CONDITIONS

	MMBTU				
Energy Use Component	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Sources					
Transit Operations					
BART Operations[a]	44,588	8,603	8,603	1,722	--
DMU Operations	--	41,565	--	--	--
EMU Operations	--	--	13,219	--	--
Bus Operations	16,689	16,689	16,689	20,453	18,309
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	6,751	1,303	1,303	261	--
DMU/EMU Car Maintenance	--	1,810	1,810	--	--
Employee Shuttle Vans	56	--	--	--	--
Maintenance Trucks	61	61	61	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*78,998*	*80,850*	*52,504*	*22,461*	*18,322*
Reductions					
Passenger Vehicles (Reduced VMT)	-146,843	-109,711	-109,711	-51,277	-291
Solar Photovoltaic Electricity Generation	-5,318	-5,318	-5,318	--	--
Subtotal Reductions	*-152,161*	*-115,029*	*-115,029*	*-51,277*	*-291*
Total	**-73,163**	**-34,179**	**-62,525**	**-28,816**	**18,031**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

- **Bus Miles.** Annually, net new bus VMT would increase by 379,117 in 2025. Due to this increase, energy use from bus operations would increase by 120,505 gallons of diesel per year (16,689 MMBTU annually).
- **Proposed Isabel Station Electricity.** Annual electricity use at Isabel Station would be 2,847,609 kWh annually (9,722 MMBTU).
- **Emergency Generators.** During testing and maintenance, the emergency generator at Isabel Station would consume approximately 4,109 gallons of diesel per year (equal to 569 MMBTU) and the emergency generator at the maintenance station would consume approximately 1,712 gallons of diesel per year (equal to 237 MMBTU). Combined, the generators would use 5,821 gallons of diesel per year (806 MMBTU).
- **Water and Wastewater.** Water consumption is expected to be 5,488,117 gallons per year and energy use from water use and wastewater treatment would be 29,696 kWh per year (101 MMBTU) in 2025 annually.
- **Maintenance of BART Cars.** Maintenance of BART cars is based on the number of miles traveled under the Proposed Project. Energy use from the maintenance of BART cars would be 1,977,431 kWh per year (6,751 MMBTU annually) in 2025.
- **Other Activities at the Storage and Maintenance Facility.** Other activities at the storage and maintenance facility would include (1) employee shuttle vans, which would use 401 gallons of diesel annually, equivalent to 56 MMBTU; (2) energy use from the use of maintenance trucks, which would use 442 gallons of diesel per year (61 MMBTU annually); (3) and energy use from electric forklifts, which would use 65,650 kWh per year (224 MMBTU annually).

In 2025, the Proposed Project would also result in a reduction in energy use as described below.

- **Reduced Passenger VMT.** Annually, the Proposed Project would replace 38,250,574 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 146,843 MMBTU. Of that total energy use, electricity usage would be reduced by 699,054 kWh, diesel usage by 8,038 gallons, and gasoline usage by 1,152,834 gallons per year.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation on site would reduce the electrical demand at Isabel Station from off-site sources by 1,557,588 kWh annually in 2025 (5,318 MMBTU).

As described above, in 2025 the Proposed Project would reduce energy consumption by approximately 73,163 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, the Proposed Project would increase the amount of electricity and diesel consumed in bus operations (while reducing gasoline consumption by automobiles). While electricity use would increase with the

Proposed Project, this increase represents 0.15 percent of current electricity use in Alameda County. Similarly, diesel use would increase; this increase represents 0.07 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and are not anticipated to require additional capacity. Overall, in 2025, the Proposed Project would decrease per capita energy consumption, decrease reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Thus, in 2025, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025, the DMU Alternative would result in a net decrease of 34,179 MMBTU annually compared to 2025 No Project Conditions. While energy use from the DMU Alternative would increase by 80,850 MMBTU annually in 2025, this would be offset from reductions in annual energy use of 115,029 MMBTU associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall decrease in energy use. Table 2 in Appendix I.1 shows the annual estimated change in energy use from the operation of the DMU Alternative in 2025 in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

Sources of energy use for the DMU Alternative include BART operations, DMU operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART and DMU car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources are described below in the order presented in Table 3.M-9.

- **BART Car Miles.** Annually, net new BART car miles from operation of BART would increase by 558,771 due to implementation of the DMU Alternative. BART car miles will increase to accommodate riders transferring from the DMU train. Due to this increase, energy use from electricity demand for the operation of BART would be 2,520,059 kWh per year (8,603 MMBTU total).
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2025 would be 776,400. These new DMU car miles would increase diesel usage by 281,445 gallons and electricity usage by 757,935 kWh per year (41,565 MMBTU annually) in 2025.
- **Bus Miles.** Energy use by buses and net new bus miles traveled under the DMU Alternative are expected to be the same as under the Proposed Project in 2025 (120,505 gallons of diesel annually, or 16,689 MMBTU).

- **Proposed Isabel Station Electricity and Emergency Generators.** Annual energy use from electricity use at the proposed Isabel Station and emergency generator testing and maintenance would be the same as in 2025 for the Proposed Project.
- **Water and Wastewater.** Water use and wastewater treatment would be 3,636,758 gallons per year under the DMU Alternative in 2025. Energy use from water use and wastewater treatment would be 19,678 kWh per year (67 MMBTU annually).
- **Maintenance of BART Cars and DMU Vehicles and Other Maintenance Activities.** Maintenance of BART cars would occur under the DMU Alternative. Due to the number of BART car miles traveled under the DMU Alternative, energy use from the maintenance of BART cars would be 381,558 kWh per year (1,303 MMBTU annually) in 2025. Energy use due to DMU car maintenance would be 530,166 kWh per year (1,810 MMBTU annually). In addition, maintenance of DMU cars would require the use of electric forklifts/maintenance trucks; energy use from maintenance trucks would be 442 gallons of diesel per year (61 MMBTU annually), and energy use from electric forklifts would be 65,650 kWh per year (224 MMBTU annually).

In 2025, the DMU Alternative would also result in a reduction in energy use as described below.

- **Reduced Passenger VMT.** Annually, the DMU Alternative in 2025 would replace 28,578,215 net new passenger VMT. Furthermore, the DMU Alternative would result in reductions of 95,000 VMT per average weekday. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 109,711 MMBTU in 2025. Of that total energy use, electricity usage would be reduced by 522,286 kWh, diesel usage by 6,005 gallons, and gasoline usage by 861,318 gallons per year due to the DMU Alternative in 2025.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation on site would offset the electrical demand at Isabel Station from off-site sources by 1,557,588 kWh annually in 2025 (5,318 MMBTU).

As described above, in 2025, the DMU Alternative would reduce energy consumption by approximately 34,179 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, in 2025, the DMU Alternative would increase the amount of electricity and diesel consumed in DMU and bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase under the DMU Alternative in 2025, this increase represents 0.05 percent of current electricity use in Alameda County. Similarly, diesel use would increase under the DMU Alternative; however, this increase represents 0.24 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and are not anticipated to require additional capacity. In 2025, the DMU Alternative would decrease overall per

capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, the DMU Alternative in 2025 would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2025, the EMU Option would result in a net decrease of 62,525 MMBTU annually compared to 2025 No Project Conditions. While energy use from the EMU Option would increase by 52,504 MMBTU annually, this would be offset by reductions in annual energy use of 115,029 MMBTU associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the Isabel Station, thus resulting in an overall net decrease in energy use.

Sources of energy use for the EMU Option include BART operations, EMU operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART and EMU car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources would be similar to those described above for the DMU Alternative, with the following differences described below in the order presented in Table 3.M-9. Table 3 in Appendix I.1 presents the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **EMU Vehicle Miles.** Annually, new net EMU car miles in 2025 for the EMU Option would be the same amount as the increase in net new DMU car miles for the 2025 DMU Alternative. These new EMU car miles would increase electricity usage by 3,872,106 kWh per year (13,219 MMBTU annually) in 2025.
- **Maintenance of EMU Vehicles.** Energy use due to EMU car maintenance would be 530,166 kWh per year (1,810 MMBTU annually).

In 2025, the EMU Option would also result in a reduction in energy use. The reduction in energy use due to passenger vehicles and solar photovoltaic electricity generation would be the same as for the DMU Alternative described above.

As described above, in 2025, the EMU Option would reduce energy consumption by approximately 62,525 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, in 2025 the EMU Option would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase under the EMU Option, this increase represents 0.08 percent of current electricity use in Alameda County. Similarly, diesel use would increase; however, this increase represents

0.07 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and are not anticipated to require additional capacity. In 2025, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2025, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2025, the Express Bus/BRT Alternative would result in a net decrease of 28,816 MMBTU annually compared to 2025 No Project Conditions. While energy use from the Express Bus/BRT Alternative would increase by 22,461 MMBTU annually, this would be offset by a reduction in annual energy use of 51,277 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

Sources of energy use for the Express Bus/BRT Alternative include increased BART operations due to increases in ridership, bus operations, water use, wastewater treatment, and BART car maintenance. Sources are described below in the order presented in Table 3.M-9. Table 4 in Appendix I.1 presents the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** Annually, net new BART car miles would increase by 111,839 miles due to implementation of the Express Bus/BRT Alternative in 2025 (BART car miles will increase to accommodate riders transferring from buses). Due to this increase, energy use due to operation of BART would be 504,396 kWh per year (equivalent to 1,722 MMBTU annually).
- **Bus Miles.** Annual net new bus miles traveled under the Express Bus/BRT Alternative are expected to increase by 354,876 per year in 2025. Energy use from bus operation for the 2025 Express Bus/BRT Alternative would be 147,684 gallons of diesel per year (20,453 MMBTU annually).
- **Water and Wastewater.** Water usage under the Express Bus/BRT Alternative in 2025 would be 1,326,426 gallons per year. Energy use related to water use and wastewater treatment would be 7,177 kWh per year (equal to 25 MMBTU).
- **Maintenance of BART Cars.** Maintenance of BART cars would occur under the Express Bus/BRT Alternative. Based on the number of BART car miles traveled under the Express Bus/BRT Alternative, energy use from the maintenance of BART cars would be 76,370 kWh per year (261 MMBTU annually) in 2025.

In 2025, the Express Bus/BRT Alternative would also result in a reduction in energy use, as described below.

- **Reduced Passenger VMT.** Annually, the Express Bus/BRT Alternative would replace 13,357,023 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 51,277 MMBTU per year in 2025. Of that total energy use, electricity usage would be reduced by 244,108 kWh, diesel usage by 2,807 gallons, and gasoline usage by 402,567 gallons per year due to the Express Bus/BRT Alternative in 2025.

As described above, in 2025, the Express Bus/BRT Alternative would reduce energy consumption by approximately 28,816 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, the Express Bus/BRT Alternative would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase in 2025 under the Express Bus/BRT Alternative, this increase represents 0.003 percent of current electricity use in Alameda County. Similarly, diesel use would increase; however, this increase represents 0.09 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2025, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2025, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2025, the Enhanced Bus Alternative would result in a net increase of 18,031 MMBTU annually compared to 2025 No Project Conditions. Energy use from the Enhanced Bus Alternative would increase by 18,322 MMBTU annually. While there would be a reduction of 291 MMBTU per year associated with the reduced passenger VMT associated with increased BART ridership, this reduction is not enough to completely offset the increase in energy use (18,322 MMBTU) under the Enhanced Bus Alternative, thus resulting in an overall net increase in energy use.

Sources of energy use for the Enhanced Bus Alternative include bus operations and water use and wastewater treatment, as shown in Table 3.M-9. Table 5 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Bus Miles.** Net new bus miles traveled under the Enhanced Bus Alternative are expected to increase by 235,016 per year in 2025. Energy use from bus operation for the Enhanced Bus Alternative would be 132,202 gallons of diesel per year (equivalent to 18,309 MMBTU annually).
- **Water and Wastewater.** Water usage under the Enhanced Bus Alternative in 2025 would be 688,715 gallons per year. Energy use related to water use and wastewater treatment would be 3,727 kWh per year (equal to 13 MMBTU).

In 2025, the Enhanced Bus Alternative would also result in a reduction in energy use.

- **Reduced Passenger VMT.** Annually, the Enhanced Bus Alternative would replace 75,668 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 291 MMBTU per year in 2025. Of that total energy use, electricity usage would be reduced by 1,383 kWh, diesel usage by 16 gallons, and gasoline usage by 2,281 gallons per year due to the Enhanced Bus Alternative in 2025.

As described above, in 2025, the Enhanced Bus Alternative would increase energy consumption by approximately 18,031 MMBTU annually compared to 2025 No Project Conditions. The Enhanced Bus Alternative would increase the amount of diesel consumed in bus operation (while reducing electricity and gasoline consumption by automobiles). While diesel use would increase under the Enhanced Bus Alternative in 2025, this increase represents 0.07 percent of current diesel use in Alameda County. This increase in diesel use would not have an effect on peak and base-period demand for diesel and is not anticipated to require additional capacity.

However, total energy use for the Enhanced Bus Alternative in 2025 would increase. While it would not result in wasteful, inefficient, or unnecessary consumption of energy, the Enhanced Bus Alternative does not incorporate renewable energy and would potentially result in a significant impact with regard to energy conservation. This impact would be reduced with implementation of **Mitigation Measure EN-3,** which requires renewable energy or energy efficiency measures. However, **Mitigation Measure EN-3** would be required to be implemented by bus operators and is not under BART's control. Given the uncertainty of the type of vehicles LAVTA or other bus operators may deploy in the future, the effectiveness of mitigation is uncertain. Accordingly, this impact is conservatively assumed to remain significant and unavoidable. **(SU)**

Mitigation Measures. As described above, in 2025, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required. However, the Enhanced Bus Alternative in 2025 would have potentially significant impacts with regard to energy conservation because total energy use would be

increased and this alternative does not incorporate renewable energy measures. **Mitigation Measure EN-3**, which would incorporate renewable energy measures, would reduce impacts. As described above, given the uncertainty of the type of vehicles LAVTA or other bus operators would use in the future, this impact is conservatively assumed to remain significant and unavoidable.

> **Mitigation Measure EN-3: Incorporate Renewable Energy Features (Enhanced Bus Alternative).**
>
> Renewable energy or energy efficiency measures shall be incorporated into building design, equipment use, transportation, and/or other project features. Diesel buses shall be converted to biodiesel-electric or all-electric buses. Solar photovoltaic panels shall be incorporated to the extent feasible.

Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions.

(No Project Alternative: S; Conventional BART Project: B; DMU Alternative: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: SU)

The change between 2040 No Project Conditions and 2040 Project Conditions represents the net energy increase or decrease attributed to the Proposed Project or an Alternative. Table 3.M-10 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives in 2040. Tables 6 through 10 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives in 2025, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. Under the 2040 No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes in the environment associated with construction of the Proposed Project or any of the Build Alternatives. The purpose of the No Project Alternative analysis under CEQA is to enable decision-makers and the public understand the consequences of not adopting a project. CEQA Guidelines 15126.6(e)(2) provides that the No Project Alternative must include "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." VMT and associated energy consumption are reasonably expected to increase in 2040 under No Project conditions, consistent with projections based continued regional land use development and planned and programmed transportation improvements.

TABLE 3.M-10 CHANGE IN ANNUAL ENERGY USE UNDER 2040 PROJECT CONDITIONS

	MMBTU				
Energy Use Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	54,843	17,708	17,708	7,387	--
DMU Operations	--	46,190	--	--	--
EMU Operations	--	--	14,664	--	--
Bus Operations	14,671	14,671	14,671	17,980	16,095
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	8,304	2,681	2,681	1,118	--
DMU/EMU Car Maintenance	--	2,014	2,014	--	--
Employee Shuttle Vans	52	--	--	--	--
Maintenance Trucks	58	58	58	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*88,781*	*94,141*	*62,615*	*26,510*	*16,108*
Reductions					
Passenger Vehicles (Reduced VMT)	-214,996	-124,579	-124,579	-83,313	-7,934
Solar Photovoltaic Electricity Generation	-4,573	-4,573	-4,573	--	--
Subtotal Reductions	*-219,569*	*-129,152*	*-129,152*	*-83,313*	*-7,934*
Total	**-130,788**	**-35,011**	**-66,538**	**-56,803**	**8,174**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

Operation of the planned and programmed transportation improvements and continued land use development under the No Project Alternative would consume energy from various sources. At the same time, if the BART Board of Directors selects the No Project Alternative, the reductions in energy use due to the reduced passenger VMT anticipated under the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative (associated with increased transit ridership) would not occur. Therefore, the No Project Alternative is anticipated to result in significant impacts in 2040 related to energy use, without the benefit of VMT reductions attributable to Proposed Project or Build Alternatives off-setting a portion of the VMT growth, as a consequence of BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have a significant impact related to energy use. **(S)**

Conventional BART Project. In 2040, the Proposed Project would result in a net decrease of 130,788 MMBTU annually compared to 2040 No Project Conditions. While the Proposed Project would increase energy use by 88,781 MMBTU annually, this would be offset by a reduction in annual energy use of 219,569 MMBTU associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station (reducing the need for off-site energy), thus resulting in an overall net decrease in energy use.

Sources of energy use for the Proposed Project in 2040 would be the same as in 2025. Energy use for the station, emergency generators, and water use and wastewater treatment would be the same for the Proposed Project in 2040 as in 2025. The differences in energy use in 2040 compared to 2025 are described below in the order presented in Table 3.M-10. Table 6 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** For the Proposed Project in 2040, energy use from BART operation and BART car maintenance would increase compared to 2025 due to an increase in net new annual BART car miles. Net new annual BART car miles would be 3,561,913, which is a slight increase compared to 2025 (2,895,844 net new annual BART car miles). This would increase energy use from 44,588 MMBTU in 2025 to 54,843 MMBTU in 2040.
- **Bus Miles.** Bus operations for the Proposed Project would use 105,934 gallons of diesel annually over 2040 No Project Conditions (equivalent to 14,671 MMBTU), which is a decrease of 14,571 gallons of diesel compared to the Proposed Project in 2025. Net new annual VMT are expected to remain the same from 2025 and 2040 for the Proposed Project; however, a more fuel-efficient bus fleet would decrease energy use over time.
- **Maintenance of BART Cars and Other Activities at the Storage and Maintenance Facility.** Energy use from maintenance of BART cars would increase due to more

annual BART car miles traveled. For BART car maintenance, energy use in 2040 would be 8,304 MMBTU annually, an increase from 2025 (6,751 MMBTU). Energy from the use of maintenance trucks would reduce to 416 gallons of diesel per year (58 MMBTU annually). Employee shuttle vans would use 378 gallons of diesel annually, equivalent to 52 MMBTU, which is a reduction from the Proposed Project in 2025 (401 gallons of diesel per year, equivalent to 56 MMBTU).

In 2040, the Proposed Project would also result in a reduction in energy use, as described below.

- **Reduced Passenger VMT.** Net new annual passenger VMT would be reduced even further for the Proposed Project in 2040 compared to 2025 due to increased transit ridership. Energy use for the Proposed Project in 2040 would be reduced by 214,996 MMBTU annually compared to 2040 No Project Conditions, which is an additional reduction of 68,153 MMBTU compared to the Proposed Project in 2025. Of the total energy use, electricity usage would be reduced by 2,621,456 kWh, diesel usage by 12,537 gallons, and gasoline usage by 1,643,157 gallons per year.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation would offset the electrical demand at Isabel Station and decrease the need for off-site electricity by 1,339,617 kWh annually in 2040 (4,573 MMBTU). This is a decrease from 2025 (1,557,588 kWh annually) due to degradation of the solar panels and less efficient electrical generation capability.

As described above, in 2040, the Proposed Project would reduce energy consumption by approximately 130,788 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, the Proposed Project would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase, this increase represents 0.17 percent of current electricity use in Alameda County. Similarly, diesel use would increase under the 2040 Proposed Project; this increase represents 0.06 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity.

In 2040, the Proposed Project would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, the DMU Alternative would result in a net decrease of 35,011 MMBTU annually compared to 2040 No Project Conditions. While energy use from the DMU Alternative would increase by 94,141 MMBTU annually, this would be offset by reductions in annual energy use of 129,152 MMBTU associated with reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall decrease in energy use.

Sources of energy use for the DMU Alternative in 2040 would be the same as in 2025. Sources are described below in the order presented in Table 3.M-10. Table 7 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** Annually, net new BART car miles would increase by 1,150,063 due to implementation of the DMU Alternative. BART car miles would increase to accommodate riders transferring from the DMU train. Due to this increase, energy use from electricity demand for the operation of BART would be 5,186,786 kWh per year (17,708 MMBTU total).
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2040 for the DMU Alternative would be 864,100. These new DMU car miles would increase diesel usage by 313,236 gallons and electricity usage by 823,155 kWh per year (46,190 MMBTU annually) in 2040.
- **Bus Miles.** Energy use by buses and net new bus miles traveled under the DMU Alternative are expected to be the same as under the Proposed Project in 2040 (105,934 gallons of diesel annually, or 14,671 MMBTU).
- **Proposed Isabel Station Electricity, Emergency Generators.** Annual energy use from electricity use at the proposed Isabel Station and emergency generator testing and maintenance would be the same as the Proposed Project in 2040.
- **Water and Wastewater.** Annual energy use from water use and wastewater treatment would be the same as the DMU Alternative in 2025.
- **Maintenance of BART Cars and DMU Vehicles and Other Maintenance Activities.** Due to the number of BART car miles traveled under the DMU Alternative, energy use from the maintenance of BART cars would be 785,322 kWh per year (2,681 MMBTU annually) in 2040. Energy use due to DMU car maintenance would be 590,052 kWh per year (2,014 MMBTU annually). In addition, maintenance of DMU cars would require use of electric forklifts/maintenance trucks; energy use from maintenance trucks would be 416 gallons of diesel per year (58 MMBTU annually), and energy use from electric forklifts would be 65,650 kWh per year (224 MMBTU annually).

In 2040, the DMU Alternative would also result in a reduction in energy use as described below.

- **Reduced Passenger VMT.** Annually, the DMU Alternative in 2040 would replace 42,745,966 net new passenger VMT. Furthermore, the DMU Alternative in 2040 would result in VMT reductions of 142,000 VMT per average weekday. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 124,579 MMBTU in 2040. Of that total energy use, electricity usage would be reduced by 1,518,992 kWh, diesel usage by 7,265 gallons, and gasoline usage by 952,121 gallons per year due to the DMU Alternative in 2040.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation on site would offset the need for electricity from off-site at Isabel Station by 1,339,617 kWh annually in 2040 (4,573 MMBTU).

As described above, the DMU Alternative in 2040 would reduce energy consumption by approximately 35,011 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, the DMU Alternative in 2040 would increase the amount of electricity and diesel consumed in DMU and bus operation (while reducing gasoline consumption by automobiles). While electricity use increases for the DMU Alternative in 2040, this increase represents 0.07 percent of current electricity use in Alameda County. Similarly, diesel use would increase in 2040 under the DMU Alternative; however, this increase represents 0.25 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2040, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, the DMU Alternative in 2040 would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, the EMU Option would result in a net decrease of 66,538 MMBTU annually compared to 2040 No Project Conditions. While energy use from the EMU Option would increase by 62,615 MMBTU annually, this would be offset by reductions in annual energy use of 129,152 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed on the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

Sources of energy use for the EMU Option include BART operations, EMU operations, bus operations, station electricity use, emergency generator testing and maintenance, water

use, wastewater treatment, BART and EMU car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources would be similar to those described above for the DMU Alternative, with the following differences described below in the order presented in Table 3.M-10. Table 8 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **EMU Vehicle Miles.** Annually, net new EMU car miles in 2040 for the EMU Option would be the same as the net new DMU car miles for the DMU Alternative. These new EMU car miles would increase electricity usage by 4,295,131 kWh per year (14,664 MMBTU annually) in 2040.
- **Maintenance of EMU Vehicles.** Energy use due to EMU car maintenance for the EMU Option in 2040 would be 590,052 kWh per year (2,014 MMBTU annually).

In 2040, the EMU Option would also result in a reduction in energy use. The reduction in energy use due to the decrease in VMT for passenger vehicles due to increased BART ridership and the increased solar photovoltaic electricity generation from the Isabel Station installation would be the same as for the DMU Alternative described above.

Net new annual passenger VMT for the EMU Option in 2040 would be the same as under the DMU Alternative in 2040. Associated energy use from passenger vehicles would be the same for the EMU Option in 2040 as for the DMU Alternative in 2040.

As described above, in 2040, the EMU Option would reduce energy consumption by approximately 66,538 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, the EMU Option in 2040 would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use increases in 2040 under the EMU Option, this increase represents 0.11 percent of current electricity use in Alameda County. Similarly, diesel use would increase under the EMU Option in 2040; however, this increase represents 0.06 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2040, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040, the Express Bus/BRT Alternative would result in a decrease of 56,803 MMBTU annually compared to 2040 No Project Conditions. While energy use from the Express Bus/BRT Alternative would increase by 26,510 MMBTU annually, this would be offset by a reduction in energy use of 83,313 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall decrease in energy use.

Sources of energy use for the Express Bus/BRT Alternative in 2040 would remain the same as in 2025. Sources are described below in the order presented in Table 3.M-10. Table 9 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles**. Annually, net new BART car miles would increase by 479,770 due to implementation of the Express Bus/BRT Alternative in 2040. Due to this increase, energy use due to operation of BART in 2040 under the Express Bus/BRT Alternative would be 2,163,762 kWh per year (7,387 MMBTU annually).
- **Bus Miles.** Net new annual bus VMT is expected to remain the same from 2025 and 2040 for the Express Bus/BRT Alternative (354,876 and 16,432, respectively). However, a cleaner and more fuel-efficient bus fleet would decrease energy use.
- **Water and Wastewater.** Energy use due to water usage and wastewater treatment under the Express Bus/BRT Alternative in 2040 would be the same as in 2025 for the Express Bus/BRT Alternative.
- **Maintenance of BART Cars.** Maintenance of BART cars would occur under the Express Bus/BRT Alternative. Based on the number of BAR car miles traveled under the Express Bus/BRT Alternative, energy use from the maintenance of BART cars would be 327,612 kWh per year (1,118 MMBTU annually) in 2040.

In 2040, the Express Bus/BRT Alternative would also result in a reduction in energy use, as described below.

- **Reduced Passenger VMT.** Annually, the Express Bus/BRT Alternative in 2040 would replace 28,586,697 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 83,313 MMBTU per year in 2040. Of that total energy use, electricity usage would be reduced by 1,015,838 kWh, diesel usage by 4,858 gallons, and gasoline usage by 636,738 gallons per year.

As described above, in 2040, the Express Bus/BRT Alternative would reduce energy consumption by approximately 56,803 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, in 2040 the Express Bus/BRT Alternative would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity

use increases in 2040 under the Express Bus/BRT Alternative, this increase represents 0.01 percent of current electricity use in Alameda County. Similarly, diesel use would increase in 2040 under the Express Bus/BRT Alternative; however, this increase represents 0.07 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2040, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040, the Enhanced Bus Alternative would result in a net increase of 8,174 MMBTU annually compared to 2040 No Project Conditions. While there would be a reduction of 7,934 MMBTU per year associated with the reduced passenger VMT associated with increased BART ridership, this reduction is not enough to completely offset the increase in energy use (16,108 MMBTU) under the Enhanced Bus Alternative, thus resulting in an overall net increase in energy use.

Sources of energy use for the Enhanced Bus Alternative in 2040 would be the same as in 2025. Sources are described below in the order presented in Table 3.M-10. Table 10 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Bus Miles.** Energy use from bus operation for the Enhanced Bus Alternative would be 116,216 gallons of diesel per year (equivalent to 16,095 MMBTU annually). Net new bus miles traveled under the Enhanced Bus Alternative are expected to remain the same as in 2025. However, a more fuel-efficient bus fleet would decrease energy use.
- **Water and Wastewater.** Energy use due to water usage and wastewater treatment under the Enhanced Bus Alternative in 2040 would be the same as in 2025.

In 2040, the Enhanced Bus Alternative would also result in a reduction in energy use.

- **Reduced Passenger VMT.** Annually, the Enhanced Bus Alternative would replace 2,722,388 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 7,934 MMBTU annually in 2040. Of that total energy use, electricity usage would be reduced by 96,741 kWh, diesel usage by 463 gallons, and gasoline usage by 60,638 gallons per year due to the Enhanced Bus Alternative in 2025.

As described above, in 2040, the Enhanced Bus Alternative would increase energy consumption by approximately 8,174 MMBTU annually compared to 2040 No Project Conditions. In 2040, the Enhanced Bus Alternative would increase the amount of diesel consumed in bus operation (while reducing electricity and gasoline consumption by automobiles). While diesel use increases in 2040 under the Enhanced Bus Alternative, this increase represents 0.07 percent of current diesel use in Alameda County. This increase in diesel use would not have an effect on peak and base-period demand for diesel and is not anticipated to require additional capacity.

However, total energy use under the Enhanced Bus Alternative in 2040 would increase. While it would not result in wasteful, inefficient, or unnecessary consumption of energy, the Enhanced Bus Alternative does not incorporate renewable energy and would potentially result in a significant impact with regard to energy conservation. This impact would be reduced with implementation of **Mitigation Measure EN-3** above, which requires renewable energy or energy efficiency measures. However, **Mitigation Measure EN-3** would be required to be implemented by bus operators and is not under BART's control. Given the uncertainty of the type of vehicles LAVTA or other bus operators may deploy in the future, the effectiveness of this mitigation measure is uncertain. Accordingly, this impact is conservatively assumed to remain significant and unavoidable. **(SU)**

Mitigation Measures. As described above, in 2040, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required. However, the Enhanced Bus Alternative in 2040 would have potentially significant impacts with regard to energy conservation because total energy use would be increased and this alternative does not incorporate renewable energy measures. **Mitigation Measure EN-3** above, which would incorporate renewable energy measures, would reduce impacts. As described above, given the uncertainty of the type of vehicles LAVTA or other bus operators would use in the future, this impact is conservatively assumed to remain significant and unavoidable.

(b) Operations – Cumulative Analysis

Consistent with CEQA requirements, this Draft EIR considers the direct impacts on energy use of the Proposed Project and Alternatives, together with the effects of past, present, and probable future projects that cause or contribute cumulatively to energy use. For the purposes of the energy conservation analysis, as described in Section 3.A, Introduction to Environmental Analysis, these cumulative projects include both the Isabel Neighborhood Plan and the Dublin/Pleasanton Station Parking Expansion (for the Proposed Project and DMU Alternative) or the Dublin/Pleasanton Station Parking Expansion alone (for the

Express Bus/BRT and Enhanced Bus Alternatives), in addition to the projections provided in Plan Bay Area.[37]

Impact EN-5(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Cumulative Conditions.

(No Project Alternative: NI; Conventional BART Project: B; DMU Alternative: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: B)

The change between 2025 No Project Conditions and 2025 Cumulative Conditions represents the net energy increase or decrease attributed to the Proposed Project or an alternative. Table 3.M-11 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives under 2025 Cumulative Conditions. Tables 11 through 15 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives under 2025 Cumulative Conditions, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. As described in **Impact EN-3** above, the No Project Alternative would have no impacts associated with energy use during operations under 2025 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project. Under 2025 Cumulative Conditions, the Proposed Project would result in a net decrease of 51,659 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 78,998 MMBTU annually under Cumulative With Proposed Project, this would be offset by a reduction in annual energy use of 130,657 MMBTU, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under 2025 Cumulative Conditions as for the Proposed Project in 2025, except that energy use associated with passenger VMT would change compared to the Proposed Project in 2025, as described below (see Table 3.M-11). Table 11 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

[37] Association of Bay Area Governments (ABAG), 2013. Plan Bay Area Projections 2013.

TABLE 3.M-11 CHANGE IN ANNUAL ENERGY USE UNDER 2025 CUMULATIVE CONDITIONS

	MMBTU				
Energy Use Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	44,588	8,603	8,603	1,722	--
DMU Operations	-	41,565	--	--	--
EMU Operations	-	--	13,219	--	--
Bus Operations	16,689	16,689	16,689	20,453	18,309
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	6,751	1,303	1,303	261	--
DMU/EMU Car Maintenance	-	1,810	1,810	--	--
Employee Shuttle Vans	56	--	--	--	--
Maintenance Trucks	61	61	61	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*78,998*	*80,850*	*52,504*	*22,461*	*18,322*
Reductions					
Passenger Vehicles (Reduced VMT)	-125,339	-83,913	-83,913	-74,897	-33,421
Solar Photovoltaic Electricity Generation	-5,318	-5,318	-5,318	--	--
Subtotal Reductions	*-130,657*	*-89,231*	*-89,231*	*-74,897*	*-33,421*
Total	**-51,659**	**-8,381**	**-36,727**	**-52,436**	**-15,099**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the Proposed Project would reduce passenger VMT by approximately 32,649,225 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 125,339 MMBTU. This represents an increase in energy use compared to the Proposed Project in 2025 (which would have a reduction of 143,343 MMBTU per year). Of that total energy use, electricity usage would be reduced by 596,686 kWh, diesel usage by 6,861 gallons, and gasoline usage by 984,015 gallons per year due to the Proposed Project in 2025.

As described above, under 2025 Cumulative Conditions, the Proposed Project would reduce energy consumption by approximately 51,659 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Proposed Project would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025 under Cumulative Conditions, the DMU Alternative would result in a net decrease of 8,381 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 80,850 MMBTU, this would be offset from a reduction in energy use of 89,231 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2025 Cumulative Conditions as for the DMU Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-11). Table 12 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 21,858,079 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 83,913 MMBTU. This represents an increase in energy use from the DMU Alternative in 2025. Of that total energy use, electricity usage would be reduced by 399,471 kWh, diesel usage by 4,593 gallons, and gasoline usage by 658,780 gallons per year due to the DMU Alternative in 2025.

As described above, under 2025 Cumulative Conditions, the DMU Alternative would reduce total energy consumption by approximately 8,381 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the DMU Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. Under 2025 Cumulative Conditions, the EMU Option would result in a net decrease of 36,727 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 52,504 MMBTU, this would be offset by a reduction in energy use of 89,231 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under 2025 Cumulative Conditions as for the EMU Option in 2025, except for energy use associated with passenger VMT. As described above for the DMU Alternative, passenger VMT reductions would be less than under 2025 Project Conditions (see Table 3.M-11). Table 13 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

As described above, under 2025 Cumulative Conditions, the EMU Option would reduce energy consumption by approximately 36,727 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 52,436 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 22,461 MMBTU, this would be offset by a reduction in energy use of 74,897 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall decrease in energy use.

All sources of energy use would be the same under 2025 Cumulative Conditions as for the Express Bus/BRT Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-11). Table 14 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 19,509,613 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 74,897 MMBTU. This represents a decrease in energy use from the Express Bus/BRT Alternative in 2025. Of that total energy use, electricity usage would be reduced by 356,551 kWh, diesel usage by 4,100 gallons, and gasoline usage by 588,000 gallons per year due to the Express Bus/BRT Alternative in 2025.

As described above, under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would reduce total energy consumption by approximately 52,436 MMBTU. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 15,099 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 18,322 MMBTU annually, this would be offset by a reduction in annual energy use of 33,421 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2025 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-11). Table 15 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by 8,705,948 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 33,421 MMBTU. This represents a decrease in energy use from the Enhanced Bus Alternative in 2025. Of that total energy use, electricity usage would be reduced by 159,107 kWh,

diesel usage by 1,829 gallons, and gasoline usage by 262,388 gallons per year due to the Enhanced Bus Alternative in 2025.

As described above, under 2025 Cumulative Conditions, the Enhanced Bus Alternative would reduce energy consumption by approximately 15,099 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the Enhanced Bus Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, under 2025 Cumulative Conditions, the Proposed Project and Alternatives would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required.

Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions.

(No Project Alternative: S; Conventional BART Project: B; DMU Alternative: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: B)

The change between 2040 No Project Conditions and 2040 Cumulative Conditions represents the net energy increase or decrease attributed to the Proposed Project or an alternative. Table 3.M-12 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives under 2040 Cumulative Conditions. Tables 16 through 20 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives in 2040 under Cumulative Conditions, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. As described in **Impact EN-4** above, the 2040 No Project Alternative would have significant impacts associated with energy use during operations because the reductions in energy use due to the reduced passenger VMT anticipated under the Proposed Project or Build Alternatives (associated with increased transit ridership) would not occur. Under 2040 Cumulative Conditions, without the benefit of the Proposed Project or the Build Alternatives, cumulative energy use would be significant and the No Project Alternative would have a cumulatively considerable contribution to energy-related impacts. **(S)**

Conventional BART Project. In 2040 under Cumulative Conditions, the Proposed Project would result in a net decrease of 155,910 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 88,781 MMBTU, this would be offset by a reduction in energy use of 244,690 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the Proposed Project in 2025, except that energy use associated with passenger VMT would change compared to the Proposed Project in 2040, as described below (see Table 3.M-12). Table 16 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under the 2040 Cumulative Conditions, the Proposed Project would replace 82,390,212 net new passenger VMT. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 240,117 MMBTU. This represents a further reduction in energy use compared to the 2025 Proposed Project under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 2,927,763 kWh, diesel usage by 14,002 gallons, and gasoline usage by 1,835,154 gallons per year due to the Proposed Project in 2040.

As described above, in 2040 under Cumulative Conditions, the Proposed Project would reduce total energy consumption by approximately 155,910 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Proposed Project would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040 under Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, under Cumulative Conditions, the DMU Alternative would result in a net decrease of 55,933 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 94,141 MMBTU, this would be offset by a reduction in energy use of 150,074 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

TABLE 3.M-12 CHANGE IN ANNUAL ENERGY USE UNDER 2040 CUMULATIVE CONDITIONS

	MMBTU				
Energy Use Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	54,843	17,708	17,708	7,387	--
DMU Operations	--	46,190	--	--	--
EMU Operations	--	--	14,664	--	--
Bus Operations	14,671	14,671	14,671	17,980	16,095
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	8,304	2,681	2,681	1,118	--
DMU/EMU Car Maintenance	--	2,014	2,014	--	--
Employee Shuttle Vans	52	--	--	--	--
Maintenance Trucks	58	58	58	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*88,781*	*94,141*	*62,615*	*26,510*	*16,108*
Reductions					
Passenger Vehicles (Reduced VMT)	-240,117	-145,501	-145,501	-101,106	-25,747
Solar Photovoltaic Electricity Generation	-4,573	-4,573	-4,573	--	--
Subtotal Reductions	*-244,690*	*-150,074*	*-150,074*	*-101,106*	*-25,747*
Total	**-155,910**	**-55,933**	**-87,460**	**-74,596**	**-9,639**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the DMU Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-12). Table 17 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, in 2040 under Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 49,924,896 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 145,501 MMBTU. This represents decreases in energy use from the 2025 DMU Alternative under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 1,774,098 kWh, diesel usage by 8,485 gallons, and gasoline usage by 1,112,024 gallons per year due to the DMU Alternative in 2040.

As described above, in 2040 under Cumulative Conditions, the DMU Alternative would reduce total energy consumption by approximately 55,933 MMBTU annually compared to 2040 No Project Conditions.

In 2040 under Cumulative Conditions, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the DMU Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040 under Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, under Cumulative Conditions, the EMU Option would result in a net decrease of 87,460 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 62,615 MMBTU, this would be offset by a reduction in energy use of 150,074 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the EMU Option in 2025, except for energy use associated with passenger VMT. Energy use associated with passenger VMT would be the same as in 2040 under Cumulative Conditions for the DMU Alternative (see Table 3.M-12). Table 18 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

As described above, in 2040 under Cumulative Conditions, the EMU Option would reduce total energy consumption by approximately 87,460 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, under Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040, under Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 74,596 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 26,510 MMBTU, this would be offset by a reduction in energy use of 101,106 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the Express Bus/BRT Alternative in 2040, except for energy use associated with passenger VMT, as described below (see Table 3.M-12). Table 19 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 34,691,838 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 101,106 MMBTU. This represents decreases in energy use compared to the 2025 Express Bus/BRT Alternative under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 1,232,786 kWh, diesel usage by 5,896 gallons, and gasoline usage by 772,724 gallons per year due to the Express Bus/BRT Alternative in 2040.

As described above, in 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would reduce energy consumption by approximately 74,596 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In

2040 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 9,639 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 16,108 MMBTU, this would be offset by a reduction in energy use of 25,747 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-12). Table 20 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by approximately 8,834,264 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 25,747 MMBTU. This represents decreases in energy use compared to the 2025 Enhanced Bus Alternative under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 313,929 kWh, diesel usage by 1,501 gallons, and gasoline usage by 196,774 gallons per year due to the Enhanced Bus Alternative in 2040.

As described above, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce energy consumption by approximately 9,639 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, in 2040 under Cumulative Conditions, the Proposed Project and Build Alternatives would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required. However, in 2040 under Cumulative Conditions, without the benefit of the Proposed Project or the Build Alternatives the No Project Alternative would result in significant impacts related to energy use.