3.2.8 Energy

Regulatory Setting

The National Environmental Policy Act (42 U.S.C. Part 4332) (NEPA) requires identification of all potentially significant impacts to the environment, including energy impacts. For the California Environmental Quality Act (CEQA), Appendix F, Energy Conservation, in the CEQA Guidelines, states that environmental impact reports must 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.

Affected Environment

Information presented in the section of the environmental document is obtained from the HDC Energy Technical Report (TAHA, 2014).

Energy is currently consumed in the study area for the construction of public and private projects; operation of motor vehicles; and to power a variety of existing land use functions. According to the California Energy Commission (CEC), California is the tenth largest worldwide energy consumer, and the state is ranked second in consumption in the United States. Of the overall energy consumed, the transportation sector represents the largest portion, as energy use in California continues to be dominated by growth in passenger vehicles. As such, consumption associated with vehicular movement is almost entirely fossil fuel (i.e., gasoline and diesel) based. It is important to note that the population of California is estimated to exceed 44 million by 2020, which could result in substantial increases in the State’s transportation fuel demand.

As discussed in the HDC Energy Technical Report, California contains abundant sources of renewable and nonrenewable energy sources. Nonrenewable resources include large crude oil and natural gas deposits that are located in the Central Valley and along the coast. Additionally, California’s renewable energy sources include hydroelectric; geothermal and wind power resources found along the coastal mountain ranges and the eastern border with Nevada; and solar energy potential concentrated in the southeast deserts. Existing energy resources pertinent to this project and market conditions are described below.

Petroleum

California is one of the top producers of crude oil in the country, accounting for approximately 8 percent of the country’s total production in 2012. Foreign suppliers currently provide more than 40 percent of the crude oil refined in California. California refineries are capable of processing a wide variety of crude oil types and are designed to yield a high percentage of light products such as motor gasoline. Fuel is distributed across metropolitan southern California by many methods, including pipelines, railroads, and trucks.

Vehicles traversing the study area are primarily powered by gasoline and diesel fuel, with natural gas- and electric-powered vehicles representing a very small percentage of overall vehicular operations. California's gasoline and diesel markets are characterized by increasing demands. As of 2013, California imports more than 60 percent of its crude oil. The State's dependence on this increasingly expensive energy resource continues to grow.

Energy consumption in California continues to be dominated by growth in passenger vehicles. According to the Indicators of Climate Change in California, published by the California Environmental Protection Agency, Office of Environmental Hazard Health Assessment (April 2009), California is the second largest consumer of transportation fuels in the world (behind the United States as a whole). More than 16 billion gallons of gasoline and 4 billion gallons of diesel fuel are consumed each year (California Environmental Protection Agency, 2009).

Electricity

Due to high electricity demand, California imports more electricity than any other States. States in the Pacific Northwest deliver power to California markets primarily from hydroelectric sources, while States in the Desert Southwest deliver power primarily from coal- and natural gas-fired sources. The major sources of electricity in California are from natural gas-powered plants, hydroelectric, and nuclear. Natural gas-fired power plants generate more than 50 percent of the State's electricity. California is one of the largest hydroelectric power producers in the country, producing approximately 12 percent of the State's electricity. California has one remaining nuclear power plant (Diablo Canyon in Central California), accounting for approximately 9 percent of the State's electricity. Only a few small coal-fired power plants operate in California.

Renewable Energy

California is second in the country in electricity generation from nonhydroelectric renewable energy sources. California is the top producer of electricity from geothermal energy in the country, generating 6.4 percent of its electricity in 2012. Approximately 5 percent of the electricity generated in the state is produced by wind energy, which is ranked third in the country. Solar power represents about 1 percent of electricity generated in California (CEC, 2013). The California Energy Action Plan includes incentives that encourage the installation of individual solar power systems on rooftops to further increase renewable energy usage.

In 2006, California amended its renewable portfolio standard to require investor-owned utilities, electric service providers, small and multijurisdictional utilities, and community choice aggregators to provide at least 33 percent of retail sales from renewable sources by the end of 2020. California has also adopted other policies to promote energy efficiency and renewable energy, including energy standards for public buildings, power source disclosure requirements for utilities, and net metering.

Environmental Consequences

This section addresses potential energy impacts during long-term operation of the HDC Project. Short-term energy impacts associated with construction of the project are addressed in Section 3.6, Construction Impacts. The analysis of operational impacts is at the regional level; therefore, by its nature, it is an analysis of cumulative impacts.

Transportation energy consumption reflects the types and number of vehicles in use, the extent of their use (vehicle miles traveled [VMT]), and their fuel economy (miles per gallon). Energy consumed in the operation of transportation systems is typically referred to as direct energy, which includes the fuel required for passenger vehicles (i.e., automobiles, vans, and light trucks), heavy trucks (i.e., three or more axles), and transit buses. Energy used to operate facilities, such as gas stations and station amenities, maintenance shops, and yards, is also part of direct energy, but it is a small percentage compared to the overall fuel consumption by automobiles.

Energy consumed in construction and maintenance is referred to as indirect energy. Indirect energy consumption includes three main components: (1) energy required to build the project; (2) energy required to manufacture vehicles that use the roads; and (3) energy required for maintenance/periodic rehabilitation of the infrastructure.

Implementation of the HDC Project would affect the use of energy resources in Los Angeles and San Bernardino counties. This analysis compares the energy consumption associated with the project in build-out year 2040 with the energy consumption for the No Build Alternative in 2040, as shown in Table 3.2.8-1. This comparison generally allows for an analysis of the relative impact of the project on energy consumption based on like assumptions about technology, fuels, and vehicles.

Table 3.2.8-1 Annual Projected Operational Energy Consumption by Alternative

Alternative[1]	VMT (millions)	BTU[2] (trillions)	Barrels (millions)	% Change from No Build Alternative
2020				
No Build	158,824	871.8	150.3	--
Freeway/Expressway	159,369	874.8	150.8	0.34
Freeway/Tollway	159,429	875.1	150.9	0.38
Freeway/Expressway with HSR Feeder Service	158,967	872.6	150.4	0.09
Freeway/Tollway with HSR Feeder Service	159,010	872.8	150.5	0.12
2040				
No Build	181,941	998.7	172.19	--
Freeway/Expressway	182,734	1,003.0	172.94	0.44
Freeway/Tollway	182,782	1,003.3	172.98	0.46
Freeway/Expressway with HSR Feeder Service	182,156	999.9	172.4	0.12
Freeway/Tollway with HSR Feeder Service	182,247	1000.3	172.5	0.17

[1] The alignment variations for the alternatives would also have no significant impact on energy usage.
[2] British Thermal Units

Source: High Desert Corridor Energy Study, 2014.

No Build Alternative

As shown in Table 3.2.8-1, the No Build Alternative would result in fewer VMT in comparison with each build alternative. However, these VMT numbers are considered worst-case because the calculations did not take into consideration the fact that the build alternatives would decrease travel times of delay by creating a shorter, more direct route with faster travel speeds (see Section 1.2.2, Need, *Travel Time*). Without the capacity improvements proposed in the build alternatives, congested traffic conditions and limitations on mobility would be more prevalent throughout the study area. These conditions would contribute to inefficient energy consumption because vehicles would use extra fuel while idling in stop-and-go traffic or moving at slow speeds through congested roadways.

Build Alternatives

As stated above, local energy demand for transportation projects typically is dominated by vehicle fuel consumption. Energy use calculations for roadway operations of each alternative are based on study area annual VMT (Table 3.2.8-1) for the 2020 opening year and the build-out year 2040. To calculate the propulsion energy generated for powering transit vehicles, the VMT for High-Speed Rail (HSR) was back-calculated using an energy consumption factor for rail transit from an estimated energy usage that was calculated through a Load Flow Simulation and Modeling run.

Table 3.2.8-1 shows that the VMT would increase for each of the build alternatives compared to the No Build Alternative. These increases could be interpreted to indicate that the project would create trips, when in fact, it would primarily redistribute trips. However, this increase in VMT represents a worst-case scenario because the project would decrease travel times of delay by creating a shorter direct route with faster travel speeds; therefore, the model reflects an increase in VMT due to the following reasons:

- The increased capacity for vehicles with implementation of the proposed project. Vehicles from outside the area would be attracted to the shorter route provided by the proposed project, resulting in less regional VMT.
- The mode shift from automobiles to transit with the provision of HSR service.
- The trip lengths for individual vehicles within the study area is held constant when, in actuality, the more direct route provided by the proposed alternatives would result in shorter trip lengths and an associated reduction in VMT.

However, for project consistency, the VMT was analyzed as output by the model.

Freeway/Expressway and Freeway/Tollway Alternatives

As shown in Table 3.2.8-1, compared to the No Build Alternative, the Freeway/Expressway Alternatives would result in a 0.34 and 0.44 percent increase in energy consumption in 2020 and 2040, respectively, while the Freeway/Tollway alternative would increase the energy consumption slightly higher than the Freeway/Expressway Alternatives (0.36 and 0.46 percent in 2020 and 2040, respectively). This increase represents a nominal change and would not substantially deplete supplies. Vehicle speeds would be increased, travel times would be reduced, and the increased energy would be used efficiently. Therefore, a less-than-significant energy impact related to operation of the Freeway/Expressway Alternative would occur.

Freeway/Expressway and Freeway/Tollway with HSR Alternatives

The Freeway/Expressway with HSR Feeder Service Alternative would result in a 0.37 percent increase in energy consumption in 2020 and a 0.46 percent in 2040 compared to the No Build Alternative, while the Freeway/Tollway with HSR Feeder Service Alternative would increase the energy consumption over the No Build Alternative by 0.40 percent in 2020 and 0.49 percent in 2040. This increase represents a nominal change and would not substantially deplete supplies.

The traffic analysis prepared for the proposed project indicates that approximately 81 percent of the projected HSR ridership would be diverted from automobiles. When subtracting HSR annual energy requirements, this would result in an energy reduction of approximately 641 and 833 billion British Thermal Units (BTUs) in 2020 and 2040, respectively. Over a 26-year span of the project, an approximate 15.9 trillion BTU reduction would occur as a result of automobile diversion to HSR feeder service. Therefore, a less-than-significant energy impact related to operation of the Freeway/Expressway with HSR Feeder Service Alternative would occur.

Avoidance, Minimization, and/or Mitigation Measures

While the energy consumption of various build alternatives would not be substantially increased over the No Build Alternative as discussed above, Metro and Caltrans have planned to incorporate the green and sustainable technologies as part of the project components. Based on the *Green Energy Feasibility Study* prepared for this project (June 2014), the following technologies are being recommended for further detailed study: photovoltaic solar highways; non-fossil fuel refueling stations; and opportunity for utility utilization of highway ROW. Inclusion of the green energy component into the proposed project would further improve energy efficiency. Once the specific site for the solar array is identified, additional environmental review would likely be required to analyze the site-specific effects.

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