APPENDIX 3.6-B: EXISTING PLUS PROJECT CONDITIONS ENERGY ANALYSIS

METHODOLOGY

Per California Environmental Quality Act (CEQA) requirements, an environmental impact report (EIR) must include a description of the existing physical environmental conditions in the vicinity of the project. Those conditions, in turn, "will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant" (CEQA Guidelines Cal. Code Regs., tit. 14, § 15125(a)).

For a project such as the high-speed rail (HSR) project that would not commence operation for almost 10 years and would not reach full operation for almost 25 years, use of only existing conditions as a baseline for energy impacts would be misleading. It is more likely that existing background traffic volumes (and background roadway changes from other programmed traffic improvement projects) and vehicle emission factors would change between today and 2040 than it is that existing conditions would remain unchanged over the next 25 years. For example, regional transportation plans (RTP) include funded transportation projects that are programmed to be constructed by 2040. To ignore that these projects would be in place before the HSR project reaches maturity (i.e., the year at which HSR-related traffic emissions reach their maximum) and to evaluate the HSR project's energy impacts ignoring that these RTP improvements would change the underlying background conditions to which HSR project traffic would be added, would be misleading because it would represent a hypothetical comparison.

Therefore, the energy analysis uses a dual baseline approach. That is, the HSR system's energy impacts are evaluated both against existing conditions and against background (i.e., No Project) conditions as they are expected to be in 2040. This approach complies with CEQA (see Woodwark Park Homeowners Assn v. City of Fresno (2007), 150 Cal.App.4th 683, 707 and Sunnyvale West Neighborhood Assn. v. City of Sunnyvale (2010), 190 Cal.App.4th 1351). Results for both baselines are presented. The results comparing the project with the future expected baseline are presented in detail in the main text of the Appendix 3.6-D, Energy Analysis Memorandum. The results comparing the project with existing conditions are presented in the main text in summary format; details are presented in this attachment. This analysis informs the public of potential project impacts under both baselines, but focuses the analysis on the baseline analysis more likely to occur.

Using the methodologies described in the Appendix 3.6, the impacts of the proposed project have been evaluated and are discussed in the following sections.

Electrical Requirements of the HSR

The electrical demand for the propulsion of the trains, the operation of the trains at terminal stations, and in storage depots and maintenance facilities etc., has been conservatively estimated by the project's engineers. As shown in Table 1, this electrical demand is equivalent to an increase in energy use of approximately 172,495 million British thermal units (MMBtu) per year for the medium ridership scenario and 189,745 MMBtu per year for the high ridership scenario for all alternatives. This change is predicted to occur in both the Existing Plus Project conditions and the 2040 Plus Project conditions.

Table 1 Power Plant Energy Changes due to the Project

Scenario	Change in Energy due to HSR (MMBtu/year)
Medium Ridership	172,495
High Ridership	189,745

Source: HNTB 2017; Authority 2017
GWh = gigawatt hour
HSR = high-speed rail
MMBtu = million British thermal units

The HSR system's electrical requirements would be met through the state's electrical grid, and no one generation source for the electrical power requirements can be positively identified. Energy changes from power generation can therefore be predicted on a statewide level only.

On-Road Vehicle Travel

Estimated vehicle miles traveled (VMT) for the Existing and Existing Plus Project conditions are provided in Table 2. These values, together with associated average daily speed estimates, were developed on a county-by-county basis and then summed for the state as a whole. As shown, the HSR is predicted to reduce roadway VMT by over 3.4 billion miles annually statewide due to travelers choosing to use the HSR rather than drive for the medium ridership scenario, resulting in an energy reduction of 15.6 million MMBtu per year. Under the high ridership scenario, HSR would reduce roadway VMT by over 4.7 billion miles annually statewide, resulting in an energy reduction of 21 million MMBtu per year.

Table 2 Existing Plus Project On-Road Vehicle Energy Changes (2015)

County	Existing VMT	Existing Plus Project VMT	Change in VMT with HSR	Change in Energy with HSR (MMBtu/Year)
Medium Ridership Scenario				
Santa Clara	10,312,374,118	10,146,971,563	-165,402,555	-795,428
San Benito	620,032,419	497,463,094	-122,569,325	-583,615
Merced	1,239,904,084	1,095,973,335	-143,930,749	-668,410
Regional Total	**12,172,310,621**	**11,740,407,991**	**-431,902,630**	-2,047,452
Statewide Total	**205,015,920,154**	**201,584,933,649**	**-3,430,986,505**	-15,564,001
High Ridership Scenario				
Santa Clara	10,283,778,970	10,060,102,631	-223,676,339	-1,075,669
San Benito	613,186,473	444,285,228	-168,901,245	-804,224
Merced	1,217,771,426	1,023,513,300	-194,258,127	-902,129
Project Section Total	**12,114,736,869**	**11,527,901,159**	**-586,835,711**	-2,782,021
Statewide Total	**203,997,417,634**	**199,280,213,986**	**-4,717,203,648**	-21,398,682

Source: Authority 2017
VMT = vehicle miles traveled
HSR = high-speed rail
MMBtu = million British thermal units

Aircraft Travel

As shown in Table 3, the number of plane flights statewide is anticipated to decrease with the HSR due to travelers choosing to use the HSR rather than fly to their destination. An average fuel consumption rate was calculated for the aircraft based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips removed due to the HSR was estimated using the travel demand modeling analysis conducted for the project. As shown in Table 3, the Existing Plus Project condition is estimated to reduce the number of statewide air trips by over 80,000 trips statewide, resulting in an energy reduction of approximately 9.6 million MMBtu per year for the medium ridership scenario and 9.2 million MMBtu per year for the high ridership scenario, as compared to the existing conditions.

Table 3 Aircraft Energy Changes due to HSR (2015)

Origin	Number of Flights Removed	Change in Energy due to HSR (MMBtu/Year)
Medium Ridership Scenario		
San Francisco Bay Area	-31,662	-3,798,621.8
Statewide Total	-80,137	-9,614,376.6
High Ridership Scenario		
San Francisco Bay Area	-30,303	-3,635,622.1
Statewide Total	-77,100	-9,250,003.0

Source: Authority 2017
MMBtu = million British thermal units

SUMMARY OF RESULTS

As, shown in Table 4, for the medium ridership scenario, the existing plus project scenario is estimated to reduce roadway energy by approximately 2 million MMBtu per year, reduce energy due to plane travel by approximately 3.8 million MMBtu per year, and increase electrical energy demand by approximately 172,495 MMBtu per year, resulting in an overall regional energy savings of approximately 5.7 million MMBtu per year over existing conditions. For the high ridership scenario, the Existing Plus Project conditions are estimated to reduce roadway energy by approximately 2.8 million MMBtu per year, reduce energy due to plane travel by approximately 3.6 million MMBtu per year, and increase electrical energy demand by approximately 189,745 MMBtu per year, resulting in an overall regional energy savings of approximately 6.2 million MMBtu per year over existing conditions.

The analysis conducted for the project estimated the changes in regional energy use anticipated with and without the HSR. The analysis estimated the energy changes from reduced on-road VMT, reduced intrastate plane travel, and increased electrical demand. Although the HSR system would result in an increase in electricity demand, it is predicted to reduce the energy demands from automobile and plane travel, resulting in an overall beneficial effect on statewide energy use.

Table 4 Estimated Regional Energy Changes due to Existing Plus Project compared to Existing Conditions (2015)

Project Element	Change in Energy due to HSR (MMBtu/Year)	
	Medium Ridership Scenario	High Ridership Scenario
Roadways (VMT)	-2,047,452.0	-2,782,021.4
Airplane Flights	-3,798,621.8	-3,635,622.1
Project Energy	172,495	189,745
Total	-5,673,578.4	-6,227,898.7

Source: Authority 2017
VMT = vehicle miles traveled
HSR = high-speed rail
MMBtu = million British thermal units

REFERENCES

California High Speed Rail Authority (Authority). 2017. *California High-Speed Rail Statewide Criteria Pollutant and GHG Analysis Memorandum*. Prepared by Alice Lovegrove and Eddie Tadross. March 14, 2017.