4.8 ENERGY

4.8.1 INTRODUCTION

The FEIR includes information and analysis considering the long-term energy consumption effects of the Project alternatives. The following energy analysis focuses on the long-term energy requirements of the BART Extension Project and design changes.

4.8.2 EXISTING CONDITIONS

This section is updated with new information or data that have become available since certification of the FEIR.

4.8.2.1 Existing State Electricity Generation and Demand

In-state electricity generation, which accounted for 78 percent of the 2005 total electrical supply, is fueled by natural gas (40.8 percent); nuclear sources (12.8 percent); coal (21.3 percent); large hydroelectric resources (14.9 percent); petroleum (0.5 percent); and renewable resources, including wind, solar, and geothermal (6.6 percent). Electricity imports in 2005 were 21.67 percent of total production. Imports from the Pacific Northwest and the Desert Southwest accounted for 7.04 percent and 14.63 percent respectively (California Energy Commission [CEC] 2005). In 2004, statewide consumption was about 270,927 gigawatt hours (CEC 2005).

4.8.3 REGULATORY SETTING

The Regulatory Setting presented in the FEIR has not changed. Please refer to Section 4.8.2 of the FEIR for this discussion.

4.8.4 PROJECT IMPACTS AND MITIGATION MEASURES

Design Change 40. Downtown San Jose Station and Design Change 57. Station Boardings. The FEIR included seven stations plus one future station. The SEIR includes six stations plus one future station. The elimination of the one station and the resulting changes in the operating plan would affect the long-term energy consumption as discussed below.

The direct energy requirements of the SEIR and FEIR projects were estimated based on the vehicle miles traveled (VMT) forecast for each major transportation mode in 2030. The travel demand model (see Section 4.2, *Transportation and Transit*) generates projections of hourly/weekday vehicle trips and corresponding VMT for five modes: bus, LRT, BART, commuter rail, and auto (including trucks). VMT was annualized for each mode using expansion factors derived from, in the case of transit modes, conceptual service plans, and, in the case of autos, historical relationships of weekday and annual vehicle trips. (Annual VMT were estimated by multiplying average weekday VMT by 300.)

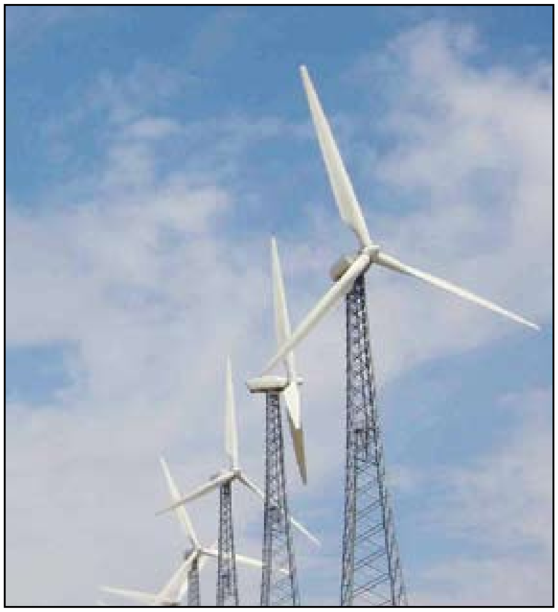

Table 4.8-1 summarizes the estimated annual VMT for Without Project and the SEIR and FEIR projects by mode. The Without Project Alternative is projected to generate the most VMT in 2030, while the FEIR 7 Stations + South Calaveras Future Station would generate the least. At the transportation system level, however, the differences are not great. This is because of the very high VMT associated with auto travel in a large travel study area, which was increased to include additional counties in the region for the SEIR. VMT was converted to energy use using fuel efficiency factors (e.g., gallons of gasoline or diesel fuel, or kilowatt hours [kWh] of electricity consumed per vehicle mile). These factors are listed in Table 4.8-2. Because transit and auto modes consume different types of energy, to provide for a common measure of comparison, kWh of electricity or gallons of fossil fuels consumed (or saved) were converted to their British thermal unit (BTU) equivalents. Energy use is expressed at two levels: in terms of the direct energy content of electricity and fuels consumed (or saved), and as the total energy content of each energy unit. The former is the specific energy available at the point of use, while the latter also includes the energy required to generate/refine and transmit/transport the energy unit to the final point of use. For instance, a kWh has a final or direct energy content of 3,416 BTUs, but an additional approximately 4,600 BTUs of energy was required to generate and transmit the kWh to its point of use. Therefore, the total energy content of a kWh is estimated at approximately 8,000 BTUs.

Direct and total energy use for vehicle operations,by mode, was converted to direct and total energy use by multiplying energy use in BTUs per vehicle mile by the annual VMT by mode.

Annual direct and total energy for vehicle operations is shown in Table 4.8-3. The FEIR Project with 7 Stations + South Calaveras Future Station is estimated to require 447.5 billion fewer BTUs per year in direct energy and 135.3 billion fewer BTUs in total energy to operate than Without Project. (One gallon of gasoline has a direct energy content of 110,400 BTUs.) The SEIR Project with 6 Stations + Calaveras is estimated to require 404.8 billion fewer BTUs per year in direct energy and 84.2 billion fewer BTUs in total energy to operate than Without Project.

In addition to energy for vehicle operations, energy for facility operations was estimated for each transportation mode and the SEIR and FEIR projects. This "other" energy requirement was calculated on a percentage basis. For example, about 25 percent of BART's existing power requirements are for station and other facilities operations (the other 75 percent is for vehicle propulsion). It was assumed that this relationship would apply to the BART Extension Project as well. The facilities and other energy requirements for other transit modes were estimated at 10 percent of the total power requirements for a mode. No facilities or other energy requirements were estimated for auto. This was because the change in auto VMT for all Project alternatives was marginal relative to total transportation system auto VMT. The relatively small change was determined not to have a measurable effect on the annual energy required to operate and maintain the road and highway system. Like the analysis of propulsion energy impacts, the energy requirements for facilities and other operations were estimated in terms of both direct and total energy.

TABLE 4.8-1: Annual VMT for Vehicle Operations By Mode and Project (2030) (MILLIONS OF VMT)

MODE	WITHOUT PROJECT	FEIR PROJECT		SEIR PROJECT	
		7 STATIONS	7 STATIONS + CALAVERAS	6 STATIONS	6 STATIONS + CALAVERAS
Bus	22.8	23.3	23.3	23.3	23.3
LRT	6.5	6.5	6.5	6.5	6.5
BART	108.2	134.0	134.0	134.0	134.0
Commuter Rail	2.7	2.7	2.7	2.7	2.7
SUBTOTAL	140.2	166.5	166.5	166.5	166.5
Auto/Truck	68,451.5	68,275.2	68,267.9	68,279.7	68,277.6
TOTAL	68,591.7	68,441.7	68,434.4	68,446.2	68,444.1
DIFFERENCE FROM WITHOUT PROJECT	0.0	-150.0	-157.3	-145.5	-147.6
PERCENT CHANGE	0.00%	-0.22%	-0.23%	-0.21%	-0.22%

Source: Connetics Transportation Group, 2006; Hexagon Transportation Consultants, 2006.

TABLE 4.8-2: Direct and Total Energy Use by Transit and Auto Modes (2030) (MILLIONS OF VMT)

MODE	ENERGY UNIT[1]	DIRECT ENERGY BTUs PER ENERGY UNIT[2]	TOTAL ENERGY BTUs PER ENERGY UNIT[3]	RATIO TOTAL TO DIRECT	MODAL ENERGY VEHICLE USE PER MILE[4]	DIRECT BTUs	TOTAL BTUs
Bus	Gal. diesel equiv.	125,000	143,750	1.15	0.17 gal	20,875	24,006
LRT	Kilowatt-hour	3,416	8,000	2.34	8.50 kWh	29,036	68,000
BART	Kilowatt-hour	3,416	8,000	2.34	4.00 kWh	13,664	32,000
Commuter Rail	Gal. diesel	125,000	143,750	1.15	0.62 gal	76,875	88,406
Auto/Truck	Gal. gasoline equiv.	110,400	132,480	1.20	0.04 gal	3,864	4,637

[1] *Primary form of energy used. For bus and auto, various energy sources may be in use in 2025. These could include electric, hybrid gas-electric, fuel cell, and gasoline. These have been expressed in one energy type and in the energy content equivalent for that type.*

[2] *BTU = British thermal unit. The net energy content of energy unit at its point of use.*

[3] *The total energy content of energy unit, including energy used to refine/generate and transport to point of use.*

[4] *Assumes bus fuel economy of 6 miles per gallon (mpg), commuter rail of 1.6 vehicle mpg, and combined auto/truck economy of 28.5 mpg.*

Source: Parsons Corp., 2003; Energy and Transportation Systems, Caltrans, 1983; PG&E.

TABLE 4.8-3:

Annual Direct and Total Energy Use for Vehicle Operations By Mode and Project (2030) (MILLIONS OF BTUs)

MODE	WITHOUT PROJECT		FEIR PROJECT				SEIR PROJECT			
	DIRECT BTUs	TOTAL BTUs	7 STATIONS		7 STATIONS + CALAVERAS		6 STATIONS		6 STATIONS + CALAVERAS	
			DIRECT BTUs	TOTAL BTUs	DIRECT BTUs	TOTAL BTUs	DIRECT BTUs	TOTAL BTUs	DIRECT BTUs	TOTAL BTUs
Bus	484,134	556,754	495,095	569,359	495,095	569,359	495,094	569,358	495,095	569,359
LRT	187,750	439,695	187,750	439,695	187,750	439,695	187,695	439,695	187,750	439,695
BART	1,478,442	3,462,394	1,830,627	4,287,183	1,830,627	4,287,183	1,830,627	4,287,183	1,830,627	4,287,183
Commuter Rail	212,985	244,932	212,984	244,932	212,984	244,932	212,984	244,932	212,984	244,932
SUBTOTAL	2,363,311	4,703,775	2,726,456	5,541,168	2,726,456	5,541,168	2,726,455	5,541,168	2,726,456	5,541,168
Auto/Truck	302,281,854	362,738,225	301,503,496	361,804,196	301,471,222	361,765,446	301,522,954	361,827,545	301,513,887	361,816,655
TOTAL	304,645,165	367,442,000	304,299,952	367,345,364	304,197,678	367,306,635	304,249,410	367,368,713	304,240,343	367,357,833
DIFFERENCE FROM WITHOUT PROJECT	0.0	0.0	-415,213	-96,636	-447,484	-135,366	-395,755	-73,287	-404,822	-84,167
PERCENT CHANGE	0.00%	0.00%	-0.14%	-0.03%	-0.15%	-0.04%	-0.13%	-0.02%	-0.13%	-0.02%

Source: Jones & Stokes, 2006.

The estimates of energy consumed in vehicle propulsion and in facilities operation were combined to yield a net energy requirement for the SEIR and FEIR projects. Table 4.8-4 shows the net annual direct and total energy use, with a further breakdown by mode. The FEIR Project with 7 Stations + South Calaveras Future Station is estimated to require 385.3 billion fewer BTUs per year in direct energy than Without Project. The SEIR Project with 6 Stations + Calaveras is estimated to require 315.7 billion fewer BTUs per year in direct energy than Without Project.

Without Project is the most energy intensive and the FEIR Project with 7 Stations + South Calaveras Future Station is the least energy intensive. The SEIR Project with 6 Stations + Calaveras is slightly (by approximately 0.01 percent) more energy intensive than the FEIR Project. This relationship reflects the fact that the BART Extension Project operations result in an annual energy savings from reduced auto travel that more than offsets the additional energy requirements of operating more transit service.

Design Change 56. Operating Plan. The foll-owing updates the energy supply and demand discussion since the FEIR.

■ IMPACT:

Since the Final EIR was approved, the slow to flat growth in the demand for electricity that occurred after the 2000 - 2001 energy crisis has changed. In addition to population and economic growth, higher-than-average summer temperatures and decreased consumer conservation efforts have increased electricity consumption in California from 250,241 gigawatt hours (GWh) in 2001 to 270,927 GWh in 2004. The California Energy Commission forecasts that consumption will grow between 1.2 to 1.5 percent annually, from 270,927 GWh in 2004 to between 310,716 and 323,372 GWh by the end of 2016.1

At the same time, the electricity generation and transmission network in California is under increasing

[1] California Energy Commission. 2005 Integrated Energy Policy Impact. November 2005. Page 47.

TABLE 4.8-4:

Net Annual Direct and Total Energy Use by Mode and Project (2030)

(MILLIONS OF BTUs)

MODE	WITHOUT PROJECT		FEIR PROJECT				SEIR PROJECT			
	DIRECT BTUs	TOTAL BTUs	7 STATIONS		7 STATIONS + CALAVERAS		6 STATIONS		6 STATIONS + CALAVERAS	
			DIRECT BTUs	TOTAL BTUs	DIRECT BTUs	TOTAL BTUs	DIRECT BTUs	TOTAL BTUs	DIRECT BTUs	TOTAL BTUs
Bus	532,547	612,429	544,604	626,295	544,604	626,295	544,604	626,295	544,604	626,295
LRT	206,525	483,664	206,525	483,664	206,525	483,664	206,525	483,664	206,525	483,664
BART	1,848,053	4,327,992	2,288,284	5,358,978	2,288,284	5,358,978	2,288,284	5,358,978	2,288,284	5,358,978
Commuter Rail	234,283	269,426	234,283	269,425	234,283	269,425	234,283	269,425	234,283	269,425
SUBTOTAL	2,821,408	5,693,511	3,273,696	6,738,362	3,273,696	6,738,362	3,273,696	6,738,361	3,273,696	6,738,362
Auto/Truck	302,281,854	362,738,225	301,503,496	361,804,196	301,471,222	361,765,466	301,522,954	361,827,545	301,513,887	361,816,665
TOTAL	305,103,262	368,431,736	304,77,192	368,542,558	304,744,918	368,503,828	304,796,650	368,565,906	304,787,583	368,555,027
DIFFERENCE FROM WITHOUT PROJECT	0.0	0.0	326,070	-110,822	385,344	-72,091	306,612	-134,169	315,679	-123,290
PERCENT CHANGE	0.00%	0.00%	0.25%	0.25%	0.26%	0.26%	0.25%	0.25%	0.25%	0.25%

Source: SVRTC Final EIR, 2004.

strain to meet the growing demand, especially during peak periods. Peak period demand can be significantly higher than off-peak demand. The retirement of aging power plants, the slow pace of new plant construction, the limitations of the transmission network to supply surplus electricity from other regions, and inadequate infrastructure for the delivery and storage of natural gas, which provides 40% of the fuel for California's power plants, may affect the ability of California's energy infrastructure to generate and deliver electricity to where it is needed.

In general, the project will have a beneficial effect on overall energy use by reducing vehicle miles traveled (VMT) and generating a relatively small increase in total electricity demand. However, new information from the California Energy Commission seems to suggest that any project that will increase the demand for electricity will have a significant energy impact due to constraints on electricity supply, especially during peak periods.

The project would increase demand2 for electricity. Since forecasts indicate that existing and planned resources will not meet demand , surplus energy will need to be imported from other generators, particularly in the southwest and Pacific Northwest. Due to the availability of imported energy from neighboring states, the impact of the project on the electrical power generation system would not be significant.

However, according to the 2005 Integrated Energy Report, congestion and bottlenecks along the state's transmission lines has worsened causing serious disruptions in service, especially on hot summer days. Until the recommended improvements in transmission infrastructure are implemented, reliability cannot be assured. Since the project will increase demand on the statewide electrical transmission grid, the impact is potentially significant.

[2] California Energy Commission. 2005 Integrated Energy Policy Impact. November 2005. Page 54.

MITIGATION:

The required mitigation would be to implement recommended improvements in the statewide transmission infrastructure. Since the Project has no control over these improvements and there is no guarantee that these improvements will be implemented, electricity demand by the Project, especially during peak periods, is considered significant and unavoidable.

CONCLUSION

The design changes made since the certification of the FEIR result in no new significant impacts related to the Project's total energy demand. However, there is no cost effective feasible mitigation for ensuring that the demand for electricity by the project can be accommodated during peak periods without disruptions recognizing the deficiencies in the statewide transmission infrastructure. As a result, this impact is considered potentially significant and unavoidable.