4.11 Energy Resources

This section summarizes the energy resources in the project area, usage associated with construction and operation of the proposed Regional Connector Transit Corridor project alternatives, and the net energy demand associated with changes to the regional transportation network under each of the proposed alternatives. Information in this section is based on the Energy Resources Technical Memorandum prepared for the project contained in Appendix W of this EIS/EIR.

This section has been updated since publication of the Draft EIS/EIR based on refinements to the Locally Preferred Alternative (LPA). Minor changes have also been made to this section in order to maintain consistency with other Metro projects. A vertical line in the margin is used to show where revisions have occurred to this section since publication of the Draft EIS/EIR, excluding minor edits for consistency and correction of formatting and minor typographical errors.

Minor changes were made to the numerical values stated in this section. Average weekday values were calculated in the Draft EIS/EIR for vehicle miles traveled (VMT) and other measures based on VMT. In order to report annual values for VMT in the Draft EIS/EIR, a multiplier (annualization factor) was used to convert the daily values. This annualization factor has been updated for this Final EIS/EIR to maintain consistency with other Metro projects, and has caused annual VMT and other annualized measures based on VMT to change slightly for all of the alternatives. Construction-related energy impacts were estimated by applying a highway construction energy factor to the total estimated construction cost for the LPA. Other minor modifications that have been made to this section since publication of the Draft EIS/EIR include the summary in this section of some information from Appendix W, Energy Resources Technical Memorandum. Since publication of the Draft EIS/EIR, refinements to the LPA have lowered the associated construction costs, which have reduced the projected temporary energy demand during construction of the LPA. No changes to the NEPA impact findings or CEQA impact determinations were identified as a result of refinements to the LPA or other developments since publication of the Draft EIS/EIR.

The analysis of potential energy resource impacts associated with the LPA is detailed below in Section 4.11.3.5.

4.11.1 Regulatory Framework

Energy and energy use within the project area is governed by several federal, state, and local laws and policies, such as:

- The Energy Policy and Conservation Act of 1975
- The Alternative Fuels Act of 1988
- Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)
- Senate Bill 1389

- Executive Order S-3-05
- Metro's Energy and Sustainability Policy

Electricity and transportation are the major energy use sectors analyzed by the California Energy Commission (CEC). Federal and state policies and regulations are gradually transforming electricity generation to cleaner sources and away from reliance on petroleum sources (CEC 2007a). More information regarding these laws and policies is available in Appendix W, Energy Resources Technical Memorandum.

The Council on Environmental Quality (CEQ) dictates requirements for reporting environmental consequences under NEPA. While there are no specific NEPA criteria for analyzing impacts to energy resources, 40 CFR § 1502.16(e) directs that environmental impact statements (EISs) include a discussion of the "energy requirements and conservation potential of various alternatives," "natural or depletable resource requirements and conservation potential of various alternatives," and potential mitigation measures.

The following significance criteria are based on Appendix G of the state CEQA Guidelines and the *L.A. CEQA Thresholds Guide* (2006). The proposed project alternatives would result in a significant impact to energy resources if they would:

- Require new (off-site) energy supply facilities and distribution infrastructure or capacity enhancing alterations to existing facilities
- Conflict with adopted energy conservation plans
- Use nonrenewable resources in a wasteful and inefficient manner
- Result in a need for new systems or substantial alterations to power or natural gas

4.11.2 Affected Environment

Transportation in Los Angeles County continues to be dominated by single-occupancy automobiles. In 2005, 74.7 percent of all people in the Southern California region drove alone to work (Los Angeles County 2008). High percentages of single-occupancy vehicles result in higher VMT throughout the state. In turn, high VMT translate into high energy use and increased air pollutants in the SCAG region. The CEC's Integrated Energy Policy Report concludes that the transportation sector is the largest contributor of greenhouse gases in the state (CEC 2007a).

Table 4.11-1 summarizes baseline (2009) annual transportation energy usage in the Los Angeles region. The most recent available data for Metro bus and light rail energy consumption in the project region are from 2007. In that year, light rail and buses consumed approximately 900 billion British Thermal Units (BTUs), the equivalent of approximately 160,000 barrels of oil. The most recent data for annual automobile energy consumption in the region comes from the transportation model. Automobiles in the region consumed approximately 600,000 billion BTUs in 2009, the equivalent of over 103 million barrels of oil.

Table 4.11-1. Regional Annual Transportation Energy Usage, Existing Conditions (2009)[a]

Vehicle Class	Consumption Factors[1,2] (BTU/mi)	Miles Traveled (Annual)	Total BTU Consumption (Billions)	Total Barrels of Oil
Light Rail[2]	77,327	3,925,583	304	52,337
Bus[2]	6,255	101,930,386	638	109,927
Automobiles[3]	6,213	96,739,543,200	601,043	103,628,066
Annual Total	N/A	96,845,399,169	601,985	103,790,330

Sources:
[1] DOE, 2008
[2] RY2007 (Database: http://www.ntdprogram.gov/ntdprogram/data.htm)
[3] CDM, 2009
Note:
[a] Existing conditions are reported from data sources dated 2007 and 2009. The 2007 data are the most recent available data from the National Transportation Data Program for Metro-reported light rail and bus miles traveled annually.

Metro's electricity use is split between powering the rail system and transit facilities (LACMTA 2009b). For both rail and facility electricity requirements, Metro buys power from Los Angeles Department of Water and Power (LADWP), Southern California Edison (SCE), and Pasadena Water and Power (LACMTA 2009b). In 2008, Metro rail consumed 175 million kilowatt hours (kWh) of electricity (approximately 597 billion BTUs) and Metro facilities consumed 69 million kWh (approximately 235 thousand BTUs) (LACMTA 2009b). Metro would purchase additional electricity from its current providers to facilitate the proposed project. Metro's 2009 Baseline Sustainability Report presents goals and recommendations for tracking and improving these performance measures. Please refer to Appendix W, Energy Resources Technical Memorandum, for more information regarding existing energy supplies and usage.

4.11.3 Environmental Impacts/Environmental Consequences

The following sections summarize the evaluation of potential energy resource impacts for each alternative. Impact conclusions for all of the alternatives are based on the thresholds identified above in Section 4.11.1. Table 4.11-2 summarizes the results of the analysis.

Analysis of potential energy resource impacts included consideration of the following elements:

- Construction-related energy
- Energy operating costs
- Direct energy consumption (measured in BTUs per vehicle mile for cars, trucks, buses, and light rail operating in the project area)
- Net project operating energy savings or costs

Table 4.11-2. Summary of Potential Impacts to Energy Resources

Alternative	Energy Consumption – Construction (NEPA/CEQA)	Energy Consumption – Operation (NEPA/CEQA)	Adverse NEPA Effects After Mitigation	Significant CEQA Impacts After Mitigation
No Build	None	None (increase associated with projected growth)	None	None
TSM	Not Substantially Adverse/Less Than Significant Impact	None (some beneficial impacts)	None	None
At-Grade Emphasis LRT	Not Substantially Adverse/Less Than Significant Impact	Beneficial long-term impacts (overall net benefit to energy)	None	None
Underground Emphasis LRT	Not Substantially Adverse/Less Than Significant Impact	Beneficial long-term impacts (overall net benefit to energy)	None	None
LPA	Not Substantially Adverse/Less Than Significant Impact	Beneficial long-term impacts (overall net benefit to energy)	None	None

Construction-related impacts were estimated by applying a highway construction energy factor to the total estimated construction cost of the Regional Connector project. The California Department of Transportation (CALTRANS) derived energy consumption for different light rail transit (LRT) facilities in Energy and Transportation Systems, and these factors are still widely used in the industry today (CALTRANS 1983).

Consumption factors are reported in BTUs per dollar of construction spending. Given the date of this data source, the energy consumption factors were adjusted to account for the change in construction costs. The California Construction Cost Index was used to adjust the factors to 2009 dollars.

Analysis of the operational energy impact of proposed stations for the build alternatives, including the LPA, was determined following the same methodology used in the Climate Change analysis, following Chester and Horvath's electricity usage factors used for the San Francisco Municipal Railway (Muni) in San Francisco (Chester and Horvath 2008).

Table 4.11-3 summarizes annual changes in energy consumption associated with regional highway VMT for each of the action alternatives compared to the No Build Alternative. Calculations were based on data from the transportation model that projected changes in daily VMT throughout the region. As shown in Table 4.11-3, all of the alternatives would result in a net decrease in VMT throughout the region when compared to the No Build Alternative. This decrease in VMT would result in a net decrease in energy consumption, with the LPA having the greatest decrease. Table 4.11-4 summarizes total operational energy demands under all of the proposed alternatives. Table 4.11-4 compares BTUs and barrels of oil under each alternative as well as the percent change in BTUs between each build alternative and the No Build Alternative.

As discussed below, none of the alternatives would result in a significant impact to energy resources. Therefore, no new (off-site) energy supply facilities, distribution infrastructure, capacity enhancing alterations to existing facilities, or new systems or substantial alterations to power or natural gas would be required under any of the alternatives. The impact analysis for each alternative, based on the remaining thresholds identified in Section 4.11.1, is included below.

Table 4.11-3. Estimated Regional Highway VMT and Energy Consumption Comparisons

Comparison	Annual Change in Automobile VMT	Annual Change in Energy Consumption (BTU in billions)	Annual Change in Barrels of Oil
TSM Alternative vs. No Build Alternative	(87,195,600)	(542)	(93,404)
At-Grade Emphasis LRT Alternative vs. No Build Alternative	(95,972,400)	(596)	(102,806)
Underground Emphasis LRT Alternative vs. No Build Alternative	(99,311,400)	(617)	(106,383)
LPA vs. No Build Alternative	(102,268,800)	(635)	(109,551)

Note:
Parentheses indicate a reduction compared to the No Build Alternative.

4.11.3.1 No Build Alternative

Since construction would not be performed under the No Build Alternative, this alternative would not result in construction-related impacts to energy use or resources. Under the No Build Alternative, energy consumption would not be associated with the operation of new light rail lines or stations. Increased energy consumption that would occur under the No Build Alternative (an increase of almost 400,000 billion BTUs from the 2009 baseline) is a result of projected growth in traffic that is expected to occur in the region without the project (Table 4.11-4). Direct impacts to energy resources would not occur as a result of this alternative.

Since construction would not occur with this alternative, and project-level impacts would not occur in energy consumption, this alternative would not contribute to cumulative impacts with respect to energy consumption.

4.11.3.1.1 NEPA Finding

The No Build Alternative would not have adverse effects with respect to energy resources in the region.

4.11.3.1.2 CEQA Determination

The No Build Alternative would not have significant impacts with respect to energy resources in the region.

Table 4.11-4. Estimated Annual Operational Energy Consumption for Each Alternative

VMT[1] (billions)	BTU[2] (billions)	Barrels of Oil	Total BTU (billions)	Percent Change in BTU from No Build[3]	Total Barrels of Oil
Baseline (2009)					
Highway – 96.74	601,043	103,628,066	601,043	--	103,628,066
No Build (2035)					
Highway – 160.47	997,019	171,899,963	997,019	--	171,899,963
TSM					
Highway – 160.39	996,478	171,806,558	996,484	(0.054)	171,807,658
Bus – .000994	6.2	1,100			
At-Grade Emphasis LRT					
Highway – 160.38	996,423	171,797,157	996,456	(0.056)	171,802,757
Light Rail – .000383	29.7	5,100			
Stations – --	3.1	500			
Underground Emphasis LRT					
Highway – 160.37	996,403	171,793,580	996,436	(0.058)	171,799,180
Light Rail – .000380	29.4	5,000			
Stations – --	3.4	600			

Table 4.11-4. Estimated Annual Operational Energy Consumption for Each Alternative (continued)

VMT[1] (billions)	BTU[2] (billions)	Barrels of Oil	Total BTU (billions)	Percent Change in BTU from No Build[3]	Total Barrels of Oil
LPA					
Highway – 160.37	996,384	171,790,412	996,416	(0.060)	171,796,012
Light Rail – .000362	28.0	4,800			
Stations[4] – --	4.5	800			

Notes:
[1] *Calculation of VMT describes changes in highway VMT within the project area projected by the transportation model for the 2035 horizon year under each alternative. Added bus VMT are included in the TSM Alternative and added light rail VMT are included in the three LRT build alternatives. Operations of buses and light rail outside of the proposed alternatives are assumed to remain unchanged.*
[2] *Operational BTUs include the energy required to operate additional stations under the LRT build alternatives.*
[3] *This percentage represents percent change in operational BTUs and does not include construction.*
[4] *The energy consumption is based on the Fully Underground LRT Alternative (which included four stations). The estimated energy consumption associated with the LPA (which only includes three stations) would be similar to the estimated energy consumption associated with the Fully Underground LRT Alternative.*

4.11.3.2 TSM Alternative

The TSM Alternative would involve minimal construction, which would include the installation of bus stops. Construction associated with the TSM Alternative would not consume energy resources in a wasteful or inefficient manner. Therefore, construction impacts on energy resources would be less than significant.

Operation of the TSM Alternative would reduce highway VMT in the project area by approximately 87 million vehicle miles per year (Table 4.11-3). Correspondingly, automobile energy consumption would decrease and total net savings from operations of the TSM Alternative would be annually greater than 500 billion BTUs. Therefore, operation of the TSM Alternative would result in potential beneficial impacts. Cumulative impacts would not occur to energy resources since the TSM Alternative would not result in construction or operational-related impacts.

4.11.3.2.1 NEPA Finding

The TSM Alternative would not have adverse effects with respect to energy resources. The overall net energy effects would be beneficial.

4.11.3.2.2 CEQA Determination

The TSM Alternative would not have significant impacts with respect to energy resources. The overall net energy impacts would be beneficial.

4.11.3.3 At-Grade Emphasis LRT Alternative

To determine construction-related energy consumption, capital cost data were used per the methodology described in Section 4.11.3. Construction energy impacts are summarized in Table 4.11-5.

Construction of the At-Grade Emphasis LRT Alternative would result in a temporary energy demand of 3,457 billion BTUs (Table 4.11-5). This would be a temporary impact to energy resources. The air quality construction mitigation measures identified in Chapter 8, Mitigation Monitoring and Reporting Program (MMRP) for the LPA, under air quality, would ensure that this alternative would not consume energy resources in a wasteful or inefficient manner. In addition, the project would result in long-term, beneficial decreases in energy use in the region. The potential construction-related impacts would be less than significant, given the long-term, beneficial decreases in energy use from implementation of this alternative.

Total annual BTU consumption associated with the At-Grade Emphasis LRT alternative would be approximately 996,456 billion BTUs (Table 4.11-4). Total energy use is compared to the No Build Alternative (2035) to identify adverse effects under NEPA. Total energy use of the alternative is compared to current total energy usage (2009) to determine significance under CEQA.

Table 4.11-5. Estimated Energy Consumption from Construction – At-Grade Emphasis LRT Alternative

Project Component	Base Year Dollars (thousands)	Energy Consumption Factor (BTU/2009 $)	Total BTU Consumption (billions)
Track Elements	105,506	6,012	634
Stations, Stops, Terminals	230,850	6,012	1,388
Maintenance Facilities	8,625	7,394	63
Site work	165,378	6,012	994
Systems	40,950	9,240	378
Total	**551,309**	**N/A**	**3,457**

Total operational energy consumption at build out of the At-Grade Emphasis LRT Alternative would be greater than that of existing conditions. However, this increase results from increased regional traffic unrelated to this alternative. Compared to the No Build Alternative, this alternative would reduce VMT and result in an annual decrease in energy consumption (Table 4.11-3). Total annual net savings from operations under this alternative would be approximately 596 billion BTUs (equivalent to an annual savings of approximately 102,000 barrels of oil) (Table 4.11-3). This potential impact to energy resources in the region would be beneficial.

Construction of the At-Grade Emphasis LRT Alternative would result in less than significant impacts to energy resources. The proposed project, in conjunction with other reasonably foreseeable renovation, new construction, and transportation projects in the vicinity of the proposed project, would comply with federal, state, and local regulations to conserve and reduce energy usage. Construction would require energy from both transportation fuels and LADWP's electricity supply.

The LADWP is working to develop new renewable energy and energy efficient resources. This project alternative, and other potential projects in the area, would be consistent with applicable energy efficiency guidance set by the LADWP. Therefore, this project and other potential projects in the area would not conflict with adopted energy conservation plans or use nonrenewable resources in a wasteful or inefficient manner. Potential cumulative impacts related to construction would be less than significant.

LADWP predicts increases in electricity demand over the next decade. LADWP has increased its ability to serve the area by adding new facilities and increasing and diversifying its energy supplies. LADWP is committed to increasing electricity generation from renewable energy sources and ensuring a reliable flow of electricity to users in its service area. Potential cumulative impacts related to operation would be less than significant, given that operation of the At-Grade Emphasis LRT Alternative would result in a beneficial energy impact.

4.11.3.3.1 NEPA Finding

The At-Grade Emphasis LRT Alternative would not have adverse effects with respect to energy resources. The overall net energy effects would be beneficial.

4.11.3.3.2 CEQA Determination

The At-Grade Emphasis LRT Alternative would not have significant impacts with respect to energy resources. The overall net energy impact would be beneficial.

4.11.3.4 Underground Emphasis LRT Alternative

Construction energy impacts are summarized in Table 4.11-6.

Construction of the Underground Emphasis LRT Alternative would consume a one-time energy amount of approximately 4,955 billion BTUs (Table 4.11-6). This would be a temporary impact to energy resources. The air quality construction mitigation measures identified in Chapter 8, MMRP for the LPA, under air quality, would ensure that this alternative would not consume energy resources in a wasteful or inefficient manner. Overall, a net beneficial impact to energy resources would occur given the long-term reduction in energy use from implementation of this alternative. Therefore, potential construction-related impacts would be less than significant, given the long-term, beneficial decreases in energy use from implementation of this alternative.

Table 4.11-6. Estimated Energy Consumption from Construction – Underground Emphasis LRT Alternative

Project Component	Base Year Dollars (thousands)	Energy Consumption Factor (BTU/2009$)	Total BTU Consumption (billions)
Track Elements	161,921	6,012	973
Stations, Stops, Terminals	388,140	6,012	2,333
Maintenance Facilities	8,625	7,394	63
Site work	201,937	6,012	1,214
Systems	40,285	9,240	372
Total	**800,908**	**N/A**	**4,955**

Annual operation of this alternative would require approximately 996,436 billion BTUs (Table 4.11-4). Total energy use is compared to the No Build Alternative (2035) to identify adverse effects under NEPA. Total energy use of the alternative is compared to current total energy usage (2009) to determine significance under CEQA.

Total operational energy consumption at build out of the Underground Emphasis LRT Alternative would be greater than that of existing (2009) conditions. However, this increase results from increased regional traffic unrelated to this alternative. Compared to the No Build Alternative, this alternative would reduce VMT and result in an annual decrease in energy consumption (Table 4.11-3). Total annual net savings from operations under this alternative would be approximately 617 billion BTUs (equivalent to an annual energy savings of approximately 106,000 barrels of oil) (Table 4.11-3). This potential impact to energy resources in the region would be beneficial.

Construction of the Underground Emphasis LRT Alternative would result in less than significant impacts to energy resources. The proposed project, in conjunction with reasonably foreseeable renovation, new construction, and transportation projects in the vicinity of the proposed project would comply with federal, state, and local regulations to conserve and reduce energy usage. Construction would require energy from both transportation fuels and LADWP's electricity supply.

The LADWP is working to develop new renewable energy and energy efficient resources. This project alternative, and other potential projects in the area, would be consistent with applicable energy efficiency guidance set by the LADWP. Therefore, this project and other potential projects in the area would not conflict with adopted energy conservation plans or use nonrenewable resources in a wasteful and inefficient manner. Potential cumulative impacts related to construction would be less than significant.

LADWP predicts increases in electricity demand over the next decade. LADWP has increased its ability to serve the area by adding new facilities and increasing and diversifying its energy supplies. As indicated above, LADWP is working to develop new renewable energy and energy efficient resources. Potential cumulative impacts related to operation would be less than significant, given that operation of the Underground Emphasis LRT Alternative would result in a beneficial energy impact.

4.11.3.4.1 NEPA Finding

The Underground Emphasis LRT Alternative would not have adverse effects with respect to energy resources. The overall net energy effects would be beneficial and greater than the At-Grade Emphasis LRT Alternative, but less than the LPA.

4.11.3.4.2 CEQA Determination

The Underground Emphasis LRT Alternative would not have significant impacts with respect to energy resources. The overall net energy impacts would be beneficial and greater than the At-Grade Emphasis LRT Alternative, but less than the LPA.

4.11.3.5 Locally Preferred Alternative

Construction of the LPA would result in a temporary energy demand of approximately 4,292 billion BTUs, as presented in Table 4.11-7. This would be a temporary impact to energy resources. The air quality construction mitigation measures identified in Chapter 8, MMRP for the LPA, under air quality, would ensure that this alternative would not consume energy resources in a wasteful or inefficient manner. In addition, the project would result in long-term, beneficial decreases in energy use in the region. Given the long-term, beneficial decreases in energy use from implementation of the LPA, potential construction-related impacts would be less than significant.

Total annual BTU consumption associated with the LPA would be approximately 996,416 billion BTUs (Table 4.11-4). Total energy use is compared to the No Build Alternative (2035) to identify adverse effects under NEPA. Total energy use of the alternative is compared to current total energy usage (2009) to determine significance under CEQA.

Total operational energy consumption at build out of the LPA would be greater than that of existing (2009) conditions. However, this increase results from increased regional traffic unrelated to this alternative. Compared to the No Build Alternative, the LPA would reduce VMT and result in an annual decrease in energy consumption (Table 4.11-3). Total annual net savings from operations under the LPA would be approximately 635 billion BTUs (equivalent to an annual energy savings of approximately 109,500 barrels of oil) (Table 4.11-3). This potential impact to energy resources in the region would be beneficial.

Given that the alternative would result in a beneficial energy impact, the LPA would not require new (off-site) energy supply facilities, distribution infrastructure, capacity enhancing alterations to existing facilities, or result in a need for new systems or substantial alterations to power or natural gas. Therefore, impacts to these facilities would be less than significant.

Table 4.11-7. Estimated Energy Consumption from Construction – Locally Preferred Alternative

Project Component	Base Year Dollars (thousands)	Energy Consumption Factor (BTU/2009$)	Total BTU Consumption (billions)
Track Elements	233,008	6,012	1,401
Stations, Stops, Terminals	271,325	6,012	1,631
Maintenance Facilities	2,138	7,394	16
Site work	138,699	6,012	834
Systems	44,406	9,240	410
Total	**689,576**	**N/A**	**4,292**

Cumulative impacts would be similar to those described for the Underground Emphasis LRT Alternative. Construction of the LPA would result in less than significant impacts to energy resources. The proposed project, in conjunction with other reasonably foreseeable renovation, new construction, and transportation projects in the vicinity of the proposed project, would comply with federal, state, and local regulations to conserve and reduce energy usage. Construction would require energy from both transportation fuels and LADWP's electricity supply.

The LADWP is working to develop new renewable energy and energy efficient resources. This project alternative, and other potential projects in the area, would be consistent with applicable energy efficiency guidance set by the LADWP. Therefore, this project and other potential projects in the area would not conflict with adopted energy conservation plans or use nonrenewable resources in a wasteful and inefficient manner. Potential cumulative impacts related to construction would be less than significant.

LADWP predicts increases in electricity demand over the next decade. LADWP has increased its ability to serve the area by adding new facilities and increasing and diversifying its energy supplies. LADWP is committed to increasing electricity generation from renewable energy sources and ensuring a reliable flow of electricity to users in its service area. The LPA would not contribute to a potential cumulative impact during operation, given that operation of the LPA would result in a beneficial energy impact.

4.11.3.5.1 NEPA Finding

The LPA would not have adverse effects with respect to energy resources. The overall net energy effects would be beneficial and greater than any of the other build alternatives.

4.11.3.5.2 CEQA Determination

The LPA would not have significant impacts with respect to energy resources. The overall net energy impacts would be beneficial and greater than any of the other build alternatives. Potential cumulative impacts related to construction would be less than significant. Given that operation of the LPA would result in a beneficial energy impact, the LPA would not contribute to potential cumulative impacts during operation.

4.11.4 Mitigation Measures

Mitigation measures would not be required because potential impacts to energy resources under the TSM and build alternatives, including the LPA, would be beneficial. The air quality construction mitigation measures identified in Section 4.5, Air Quality, and Chapter 8, MMRP for the LPA, under air quality, will ensure that the LPA would not consume energy resources in a wasteful or inefficient manner.