

3.6 ENERGY

This section was prepared pursuant to CEQA Guidelines Section 15126 and Appendix F of the CEQA Guidelines, which require that EIRs include a discussion of the potential energy impacts of projects, with particular emphasis on considering if the West Village Expansion component of the 2018 LRDP would result in inefficient, wasteful, and unnecessary consumption of energy.

Energy related to land use is primarily associated with direct energy consumption for space heating and on-site electricity/heating/cooling facilities at residential and commercial uses, industrial plant energy consumption, and indirect energy consumed in generation of electricity at power plants. Transportation energy use is related to the efficiency of cars, trucks, and public transportation; choice of travel modes (e.g., automobile, carpool, vanpool, and transit); and miles traveled by these modes. Energy is also consumed with construction and routine operation and maintenance of the West Village Expansion component.

Comments received in response to the NOP included concerns regarding energy demand in student housing and vehicle commuting. As they pertain to implementation of the West Village Expansion component of the 2018 LRDP, these impacts are described and addressed within this section.

For an analysis of greenhouse gas production and West Village Expansion impacts on climate change, please see Section 3.8, “Greenhouse Gas Emissions and Climate Change.”

3.6.1 Regulatory Setting

Plans, policies, regulations, and laws (applicable to and/or considered for the 2018 LRDP) are provided in Volume 1 of this EIR. As the regulatory setting provided in Volume 1 considers potential development, including the West Village Expansion, within the entirety of the UC Davis campus as envisioned through the 2018 LRDP, no additional regulatory setting is provided for the West Village Expansion.

3.6.2 Environmental Setting

Refer to Section 3.6, “Energy,” in Volume 1 of this EIR for a discussion of the regional environmental setting for the UC Davis campus, including the West Village Expansion site. Thus, the West Village Expansion component, including the remote parking area, has the same environmental setting as for the entire UC Davis campus. No additional environmental setting is provided.

3.6.3 Environmental Impacts and Mitigation Measures

SIGNIFICANCE CRITERIA

Refer to Section 3.6, “Energy,” in Volume 1 of this EIR for a discussion of applicable Significance Criteria.

ANALYSIS METHODOLOGY

Construction

Regarding energy use (e.g., fuel use) during construction, it is assumed that only diesel fuel would be used in construction equipment and a mix of diesel and gasoline fuel in on-road vehicles for hauling materials and worker commute trips. The same assumptions of construction equipment numbers, horsepower ratings, and load factors used to estimate construction emissions (see Section 3.3, “Air Quality”) were used to calculate construction-related fuel use. Diesel fuel use from construction was estimated based on a factor of 0.05 gallons of diesel fuel per horsepower-hour available from the South Coast Air Quality Management District’s CEQA Air Quality Handbook (SCAQMD 1993:Table A9-3E).

Operation

Operation of the West Village Expansion would require electricity usage for lighting, space and water heating, appliances, and landscaping maintenance equipment. The West Village Expansion would not use natural gas in any of the design elements. Indirect energy use would include wastewater treatment and solid waste removal. Project operation would include consumption of diesel and gasoline fuel from on-road vehicles.

To estimate the electricity usage at the West Village Expansion, a comparison was made between the annual electricity use per unit at the current West Village development and the default energy use per unit for mid-rise apartment land uses under UC Davis’s sustainability requirements. UC Davis requires that new buildings be 20 percent more efficient than the 2016 Building Energy Efficiency Standards under California Code of Regulations (CCR) Title 24 according to the UC Sustainable Practices Policy (UC Office of the President [UCOP] 2016). The comparison between energy usage rates was made to determine which approach would result in the least electricity used per unit. The lowest electricity usage rates would then be applied to the residential land uses in the West Village Expansion.

To estimate the potential electricity usage rates of West Village Expansion under UC Davis’s sustainability requirements, a 20 percent reduction was applied to the eligible energy usage defaults modeled in CalEEMod version 2016.3.2 (SCAQMD 2017). CalEEMod estimates that, for a mid-rise apartment complex in Yolo County built to the 2016 Building Energy Efficiency Standards, each apartment unit would use 4,256 kilowatt hours kWh of electricity and 97 therms of natural gas per year. Of these energy default usages 461 kWh of electricity and 71 therms of natural gas per year are considered to be from Title 24-eligible applications, such as heating, ventilation, and cooling. Energy usage associated with “plug-in” devices, such as electronics and small appliances, are exempt from the state’s Building Energy Efficiency Standards. Thus, under UC Davis’ sustainability requirements, an average mid-rise apartment unit, as modeled by CalEEMod, would use 4,164 kWh of electricity per year and 83 therms of natural gas per year. This energy demand profile is approximately equivalent to 6,607 kWh of electricity per unit per year, assuming electric appliances are used in place of natural gas ones.

By contrast, current student apartments at the West Village development use an average of 9,619 kWh per unit, inclusive of all sources of energy demand including those in shared common areas within the apartment buildings, according to the UC Davis West Village Energy Initiative Annual Report 2013-2014 (UC Davis 2014). Thus, the residential energy usage rates of the current West Village development (9,619 kWh/unit/year) would be higher than if similar land uses were to meet the minimum UC Davis sustainability requirements for energy efficiency (6,607 kWh/unit/year). As such, the West Village Expansion is assumed to use 6,607 kWh per year for each of the proposed apartment units. Energy use in other non-residential areas within the project, such as outdoor

lighting, was estimated using defaults in CalEEMod. See Appendix C of Volume 1 for further details on this calculation.

The estimated energy efficiency rate of the project is assumed to help UC Davis implement its Green Building practices under the U.S. Green Building Council's Leadership in Energy and Environmental Design program (LEED). UC Davis is targeting to achieve LEED Gold Certification for all renovated and new buildings, including the West Village Expansion component. A variety of measures can be applied to achieve LEED Gold status, including increased energy efficiency standards over state requirements.

Transportation fuel-use estimates were calculated by applying average fuel usage rates per vehicle mile to VMT data specific to the 2018 LRDP provided by Fehr and Peers, the project traffic consultant. The California Air Resources Board (CARB) emission factor model (EMFAC) 2017 includes average fuel usage rates by vehicle class, fuel type (e.g., diesel, gasoline, electric, and natural gas), speed bin, calendar year, and county. Fehr and Peers provided daily VMT, by speed bin and vehicle class, attributable to the trips entering and exiting the Davis campus cordon. EMFAC 2017 also accounts for improving vehicle fuel economy standards, as described in the Regulatory Settings discussion in Section 3.6, "Energy" of Volume 1. Fuel usage rates representing Yolo County in 2016 and 2030 were applied to the 2017 LRDP VMT data. (Behrens pers. comm., 2018; CARB 2017). See Section 3.16, "Transportation, Circulation, and Parking," for an explanation of the assumptions behind the VMT modeling. Daily VMT were adjusted to annual VMT using a conversion factor of 287 which accounts for UC Davis's academic schedule, holidays, and enrollment levels during summer and regular academic quarters. See Appendix C of Volume 1 for calculation details.

On-site solar electricity generation anticipated as part of the West Village Expansion was based off generation rates typical to the Sacramento region using default values in the National Research Energy Laboratory's (NREL) PV Watts Calculator web tool (NREL 2018). Assuming a standard module type, fixed array, a 20 percent tilt, and a commercial-type array, a 1 megawatt (MW) solar system would generate 1,535 megawatt-hours (MWh) per year on a 1.45-acre footprint. This result was scaled to the West Village Expansion's available rooftop and parking canopy space assuming 20 percent of the space is taken up by solar thermal water heating and other rooftop structures or utilities, excluding the 20.4-acre remote parking area south of I-80. Assuming 400 square feet (sf) per parking space and 800 spaces dedicated to installing canopy solar, a total of 320,000 sf would be available for solar installation from parking canopies. For rooftop solar space, the projected square footage (1,323,000 sf) was divided by the maximum number of stories (6) to give a total of 176,400 sf of available rooftop space for solar. Although solar panels may be installed on the remote parking area, the decision to install solar panels there has not been finalized; therefore, potential solar energy generation at the remote parking area is excluded from this analysis.

ISSUES NOT EVALUATED FURTHER

The following impacts were identified as part of the analysis of the 2018 LRDP, and are either (1) adequately evaluated at the program level of analysis of the 2018 LRDP, or (2) not applicable to the West Village Expansion component.

Conflicts with Applicable Plans, Policies, or Regulations Adopted for the Purpose of Avoiding or Mitigating Environmental Effects Related to Energy

As noted in the programmatic analysis provided for the 2018 LRDP in Volume 1, by adhering to the increasingly stringent building and vehicle efficiency standards as well as 2018 LRDP design features consistent with UC Carbon Neutrality goals and Sustainable Practices Policy would reduce energy consumption to be consistent with applicable plans, policies, and regulations adopted for avoiding or mitigating environmental effects related to energy. No additional project-level analysis is necessary.

PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

Impact 3.6-1: Result in unnecessary, inefficient, and wasteful use of energy.

Although development of new student housing at the West Village Expansion site would result in energy consumption during construction and operation, the proposed development would exceed the most current energy-efficient standard (i.e., Title 24) by over 20 percent and result in the net generation of 793 kWh per year per resident through on-site solar photovoltaic panels. Therefore, the West Village Expansion would not result in wasteful, inefficient, and unnecessary consumption of energy. Thus, the impact would be **less than significant**.

Appendix F of the State CEQA Guidelines requires the consideration of the energy implications of a project. CEQA requires mitigation measures to reduce “wasteful, inefficient and unnecessary” energy usage (Public Resources Code Section 21100, subdivision (b)(3)). Neither the law nor the State CEQA Guidelines establish criteria that define wasteful, inefficient, or unnecessary use. Exceedance of CCR Title 24 Energy Efficiency Standards would result in energy-efficient buildings. However, compliance with building codes does not adequately address all potential energy impacts during construction and operation. For example, energy would be required to transport people and goods to and from the West Village Expansion site.

Construction-Related Energy

Energy would be required to construct the new student housing, operate and maintain construction equipment, and transport construction materials. The one-time energy expenditure required to construct the physical buildings and infrastructure associated with the West Village Expansion would be nonrecoverable. Most energy consumption would result from operation of construction equipment and vehicle trips associated with commutes by construction workers and haul trucks trips. An estimated 237,505 gallons of gasoline and 336,843 gallons of diesel would be consumed during construction. The energy needs for construction would be temporary and not require additional capacity or increase peak or base period demands for electricity or other forms of energy. Construction equipment use and associated energy consumption would be typical of that associated with construction of new residential land use.

Operational Building Energy

The West Village Expansion, as new development proposed under the 2018 LRDP, would increase electricity consumption in the region relative to existing conditions. However, the West Village Expansion would also generate electricity via on-site rooftop and/or parking-lot solar PV panels. Table 3.6-1 summarizes the levels of energy consumption accounting for electricity generation from solar for the first full year of operation during the buildout year of 2021.

Table 3.6-1 Operational Energy Consumption

Operation	Electricity (MWh/year)
Apartments	8,589
Outdoor Lighting	448
Total Energy Consumption without Solar	9,037
Electricity Generation from On-site Solar	12,052
Net Electricity Generation with Solar	3,015
Percent of Electricity Demand met by Solar	93%

Table 3.6-1 Operational Energy Consumption

Operation	Electricity (MWh/year)
Net Electricity Generated use per resident ¹	0.793

Notes: MWh/year = megawatt-hours per year

¹ Based on 3,800 proposed student beds.

Source: Data provided by Ascent Environmental, Inc. in 2018 based on modeling using CalEEMod 2016.3.2 and the National Renewable Energy Laboratory's PV Watts Calculator.

As shown in Table 3.6-1, on average, each new resident would generate a net of 793 kWh (0.8 MWh) of electricity per year, for a total of 3,015 MWh generated per year based on the proposed 3,800 student beds. Although the West Village Expansion would result in an increase in electricity consumption, this amount would be offset by the electricity generated from on-site solar panels. This is largely due to the high rates of energy efficiency planned for the West Village Expansion and the combines rooftop and parking canopy areas space available for solar PV installations. Although the West Village Expansion component would be subject to attainment of UC requirement to exceed applicable CCR Title 24 requirements by 20 percent, the West Village Expansion would likely exceed the UC requirement slightly through implementation of additional energy efficiency measures (UCOP 2016). The current 2016 Title 24 standards are anticipated to reduce residential electricity and natural gas consumption by 28 percent over the 2013 Title 24 standards. These measures may include:

- ▲ demand reduction through research, monitoring, and quantifying occupant needs;
- ▲ passive strategies including high-performance building envelope, daylighting, natural ventilation and cooling;
- ▲ high efficiency building designs and equipment;
- ▲ control strategies that optimize equipment operational efficiencies;
- ▲ alternative energy sources - roof areas would support solar thermal panels to generate hot water for washing and building heating with remaining roof space reserved for on-site photovoltaic (PV) panels and conduit pathways connect them to the main electrical room;
- ▲ capturing waste energy (recover heating and cooling from exhaust); and
- ▲ use of recycled and regional building materials to reduce transportation energy use and minimize embodied energy.

The West Village Expansion component would also meet the U.S. Green Building Council's LEED standards, achieving a Gold rating or higher, in alignment with UCOP's and UC Davis requirements.

Operational Transportation Energy

Table 3.6-2 summarizes the gasoline, diesel, natural gas, and electricity used for transportation generated by the West Village Expansion in 2021. The West Village Expansion would result in the consumption of 1,282,254 gallons of gasoline per year, 18,021 gallons of diesel per year, 164 diesel equivalent gallons of natural gas, and 46,664 kWh per year of transportation fuels.

Table 3.6-2 Transportation Energy Consumption in 2021

Vehicle Category	Gasoline (gal/year)	Diesel (gal/year)	Natural Gas (DEG/year)	Electricity (kWh/year)
Passenger Vehicles	374,570	1,828	0	42,257
Trucks with 2 axles	441,727	10,594	0	4,408
Trucks with 3 axles or more	465,957	5,599	164	0

Table 3.6-2 Transportation Energy Consumption in 2021

Vehicle Category	Gasoline (gal/year)	Diesel (gal/year)	Natural Gas (DEG/year)	Electricity (kWh/year)
Total (All Vehicle Types)	1,282,254	18,021	164	46,664

Notes: gal/year = gallons per year; DEG = diesel equivalent gallons; kWh = kilowatt-hours

Source: Data provided by Ascent Environmental, Inc. in 2018 based on modeling using vehicle miles travelled data from Fehr and Peers and EMFAC2017 emission factors.

As shown in Table 3.6-2, trucks with two or more axles make up 71 percent of total transportation-related gasoline and diesel use during operation. This is likely due to the low percentage of trips taken with passenger vehicles that would occur at the West Village Expansion site as most trips generated by residents are taken by transit or bicycle for commuting trips. Due to the proximity of the West Village Expansion site to the central campus, less than 5 percent of commuting trips to campus use a passenger vehicle while most other trips are either taken via bicycle or transit, as reported in UC Davis's 2015-2016 Campus Travel Report (UC Davis 2016). In comparison, 28 percent of total commuting trips to campus, including West Village, are associated with persons taking passenger vehicles. Given that the West Village Expansion would be like the existing West Village development in terms of proximity, transit accessibility, and bicycle connectivity to the campus, the majority of trips associated with the West Village Expansion would not result in a substantial use of transportation fuels. Thus, trips generated by the West Village Expansion would not be considered inefficient, wasteful, and unnecessary.

Summary

According to Appendix F of the State CEQA Guidelines, the means to achieve the goal of conserving energy include decreasing overall per capita energy consumption, decreasing reliance on natural gas and oil, and increasing reliance on renewable energy sources.

As discussed above, energy would be required during construction and operational phases. Construction-related energy would be used during construction activities and would not represent a long-term increase in energy demand. Construction cost is directly linked to the time and materials consumed to complete the work. Thus, construction would progress in an efficient manner such that costs and associated fuel/energy needs are reduced. Operational-related energy demand would result from building energy use and increases in vehicular traffic. The West Village Expansion would exceed the energy-efficient standard under UC Davis's sustainability requirements (i.e., 20 percent more efficient than 2016 Title 24 standards) and is committed to achieving LEED Gold, which is also designed to reduce the wasteful use of materials (through recycling building materials) and increase building energy efficiently. Further, the West Village Expansion result in the net generation of approximately 3,015 MWh per year. In addition, the West Village Expansion would continue to offer transit and bicycle infrastructure similar to the existing West Village development in which only five percent of trips are taken with a passenger vehicle. These project design features, in combination with State energy efficiency requirements, would reduce overall energy use. The West Village Expansion's energy consumption through construction, building operation, or transportation would not be considered wasteful, inefficient, or unnecessary. This impact would be **less than significant**.

Mitigation Measures

No mitigation measures are necessary.