Appendix A-3

Energy Analysis Report

Prepared for
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Berkeley, California

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ENERGY ANALYSIS REPORT

BAYER CEQA LONG-RANGE DEVELOPMENT PROJECT
BERKELEY, CALIFORNIA

RAMBOLL

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ATCM	Airborne Toxics Control Measure
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
Btu	British Thermal Units
BOE	Board of Equalization
CAFE	Corporate Average Fuel Economy
CalEEMod®	California Emission Estimator Model
CALGreen	California Green Building Standards Code
CAP	Climate Action Plan
CARB	California Air Resources Board
CBSC	California Building Standards Commission
CCE	Community Choice Energy
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CO_2	Carbon Dioxide
CPUC	California Public Utilities Commission
EBCE	East Bay Community Energy
EIA	Energy Information Administration
EIR	Environmental Impact Report
EMFAC	EMission FACtor Model
EV	Electric Vehicle
gal/hp-hr	Gallon per Horsepower-hour
GHG	Greenhouse Gas
GWh	Gigawatt-hours
hp	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
IEPR	Integrated Energy Policy Report
IOUs	Investor-owned Utilities
kW	Kilowatts
KWh	Kilowatt-hours

LCFS	Low Carbon Fuel Standard
LEED	Leadership in Energy and Environmental Design
LEV	Low-Emissions Vehicle
LPG	Liquified Petroleum Gas
MMBtu	Million British Thermal Units
MMcf	Million Cubic Feet
MW	Megawatt
MWh	Megawatt-Hour
NHTSA	National Highway Traffic Safety Administration
OPR	Office of Planning and Research
PG&E	Pacific Gas and Electric
PHEV	Plug-in Hybrid Electric Vehicles
POU	Publicly Owned Utilities
RPS	Renewables Portfolio Standard
SB	Senate Bill
TDM	Transportation Demand Management
US	United States
USEPA	United States Environmental Protection Agency
VMT	Vehicle Miles Travelled
ZEV	Zero-Emission Vehicle
ZNE	Zero Net Energy

1. INTRODUCTION

This report discusses the Proposed Project's energy usage characteristics, describes the California energy profile (i.e., mix of energy resources and consumption characteristics), describes the energy production and transmission profile of Pacific Gas & Electric Company (PG&E; the regional purveyor of natural gas and electricity throughout the Bay Area and much of central and northern California), identifies the regulatory and policy framework that governs the production and consumption of energy resources and determines whether the Proposed Project could result in any significant energy-related environmental impacts during its construction or operation activities. This section also includes an analysis of cumulative energy analysis. Emissions of greenhouse gases (GHGs) and potential impacts on climate change and the City of Berkeley's and California's goals for GHG emissions are discussed in the Greenhouse Gas Chapter. The Proposed Project's air quality impacts are discussed in the Air Quality chapter in order to determine whether the Proposed Project could result in any significant air quality related environmental impacts during its construction or operational activities.

The analysis determines whether the Proposed Project could result in significant effect on the environment, including effects from the wasteful, inefficient, and unnecessary consumption of energy, and to identify mitigation measures to minimize any such significant effects, if required. The goal of this assessment is to evaluate whether the Proposed Project would ensure the wise and efficient use of energy. The analysis is based on a review of existing energy targets set by the United States Environmental Protection Agency (USEPA), the California Energy Commission (CEC), the Bay Area Air Quality Management District (BAAQMD) and the City of Berkeley.

Calculations were prepared to quantitatively assess the energy usage of the Proposed Project. The Proposed Project development is expected to occur in two phases: an initial 10-year phase that is complete in Year 10 (2032 – the "Year 10 Project") followed by a 20-year phase that is complete in Year 30 (2052 – the "Year 30 Project").

The energy estimation methodologies and approaches to the analysis (described under "Approach to Analysis") are based on these two phases of the Proposed Project analyzed in Year 10 and Year 30. Construction for the first phase of the Proposed Project (Year 10 Project) would occur in years 2024 and 2029 and the construction for the second phase of the Proposed Project (Year 30 Project) would occur in years 2034 and 2049.[1] All the demolition activities will take place as a part of Year 10 Project in 2024. The operational impacts for the Year 10 Project and Year 30 Project analyses are conservatively analyzed in the first year of buildout after construction ends (i.e. 2025 for Year 10 Project and 2035 for Year 30 Project). Further details on the energy estimation methodologies and approaches to the analyses are presented below.

[1] See Project Descriptions submitted to the City of Berkeley on October 14, 2020 for a detailed discussion of Proposed Project phasing.

2. ENVIRONMENTAL SETTING

2.1 State Setting

2.1.1 Energy Profile

Total energy usage in California was 7,967 trillion British Thermal Units (Btu) in 2018 (the most recent year for which this specific data is available), which equates to an average of 202 million Btu per capita. These figures place California second among the nation's 50 states in total energy use and 48th in per capita consumption. Of California's total energy usage, the breakdown by sector is roughly 40% transportation, 23% industrial, 19% commercial, and 18% residential. Electricity and natural gas in California are generally consumed by stationary users such as residences and commercial and industrial facilities, whereas petroleum-based fuel consumption is generally accounted for by transportation-related energy use.[2]

California relies on a regional power system composed of a diverse mix of natural gas, renewable, hydroelectric, and nuclear generation resources. Approximately 72% of the electrical power needed to meet California's demand is produced in the state; the balance, approximately 28%, is imported from the Pacific Northwest and the Southwest. In 2019, California's in-state electricity use was derived from natural gas (43%), coal (0.1%), large hydroelectric resources (17%), nuclear sources (8%), and renewable resources that include geothermal, biomass, small hydroelectric resources, wind, and solar (32%).[3]

2.1.2 Electricity

In 2019, total system electric generation for California was 277,704 gigawatt-hours (GWh), down 2.7% from 2018's total generation of 285,488 GWh.[4] Electricity from non-carbon dioxide (CO_2) emitting electric generation categories (i.e., nuclear, large hydroelectric, and renewable generation) accounted for 57% of total in-state generation for 2019, compared to 55% in 2018. California's in-state electric generation increased by 3% in 2019 compared to 2018, while net imports decreased by 15%. The overall decline observed in California's total system electric generation for 2019 is consistent with the recently published California Energy Demand 2018 – 2030 Revised Forecast.[5]

Although total system electric generation for California was slightly down in 2019, it is predicted to increase in coming years. Factors contributing to the increase in total system electric generation include growth in the number of light duty electric vehicles registered in the state, increased manufacturing electricity consumption, and decreases in savings from energy efficiency programs, as

[2] US Energy Information Administration (EIA), 2020. California Electricity Profile 2018, updated January 16, 2020. https://www.eia.gov/electricity/state/california/, accessed October 2020.

[3] CEC, 2020a. 2019 Total System Electric Generation. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2019-total-system-electric-generation, accessed October 2020.

[4] Ibid.

[5] CEC, 2018a. California Energy Demand 2018-2030 Revised Forecast. https://efiling.energy.ca.gov/getdocument.aspx?tn=223244, docketed January 2018, accessed October 2020.

population increases. With regard to total consumption, Californians consumed 255,224 GWh of electricity in 2018.[6]

Increasingly, electricity is used in multiple transportation modes, including light-duty vehicles, transit buses, and light and heavy rail. In California, electricity use is forecast to emerge in battery-electric medium-duty trucks, battery-electric buses, and high-speed rail. The CEC forecasts the statewide annual electricity demand for electricity-powered transportation modes will increase from its current level of 2,000 GWh to between 12,000 and 18,000 GWh by 2030, depending on technology development and market penetration of the various vehicle types.[7]

2.1.3 Natural Gas

One third of energy commodities consumed in California is natural gas. Although natural gas is the most common energy source for electricity generation in California, 90% of the state's natural gas is imported from the Rocky Mountain region, the Southwest, and Canadian basins.[8] Californians consumed 13,158 million therms of natural gas in 2019, which is equal to approximately 1,315,800,000 million Btu (MMBtu).[9] The natural gas market continues to evolve and service options expand, but its use falls mainly into the following four sectors: residential, commercial, industrial, and electric power generation. In addition, natural gas is a viable alternative to petroleum fuels for use in cars, trucks, and buses. Nearly 45% of the natural gas burned in California is used for electricity generation, and most of the remainder is consumed in the residential (21%), industrial (25%), and commercial (9%) sectors. California depends on out-of-state imports for nearly 90% of its natural gas supply. Natural gas has become an increasingly important source of energy since the majority of the state's power plants rely on this fuel.[10]

2.1.4 Transportation Fuels

The energy consumed by the transportation sector accounts for roughly 86% of California's petroleum products demand.[11] Gasoline and diesel, both derived from petroleum (also known as crude oil), are the two most common fuels used for vehicular travel. According to the CEC, the state relies on petroleum-based fuels for 98% of its transportation needs.[12,13] The transportation sector, including on-road and rail transportation (but excluding aviation), accounts for more than 95% of all motor

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[6] US EIA, 2020. California Electricity Profile 2018, updated January 16, 2020. https://www.eia.gov/electricity/state/california/, accessed October 2020.

[7] CEC, 2018d. Revised Transportation Energy Demand Forecast, 2018-2030. Publication Number: CEC-200-2018-003. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-IEPR-05, accessed October 2020.

[8] CEC, 2019a. Supply and Demand of Natural Gas in California. https://www.energy.ca.gov/data-reports/energy-almanac/californias-natural-gas-market/supply-and-demand-natural-gas-california, accessed October 2020.

[9] CEC, 2020b. 2018 Gas Consumption by County. http://www.ecdms.energy.ca.gov/gasbycounty.aspx, accessed October 2020.

[10] CEC, 2019a. Supply and Demand of Natural Gas in California. https://www.energy.ca.gov/data-reports/energy-almanac/californias-natural-gas-market/supply-and-demand-natural-gas-california, accessed October 2020.

[11] US EIA, 2020a. Table F16: Total Petroleum Consumption Estimates, 2018. https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_use_pa.html&sid=US&sid=CA, accessed October 2020.

[12] Ibid.

[13] US EIA, 2020b. California State Energy Profile. https://www.eia.gov/state/print.php?sid=CA, accessed October 2020.

gasoline use in the United States, at roughly 3.28 million barrels consumed in 2018.[14] California has the second highest transportation-sector petroleum fuel consumption rate of any state and the highest motor gasoline consumption rate.[15,16] In 2019, approximately 30% of California's crude oil was produced within the state, about 12% was produced in Alaska, and the remaining 58% was produced in foreign lands.[17]

In 2019, taxable gasoline sales (including aviation gasoline) in California accounted for approximately 15.4 billion gallons of gasoline,[18] and taxable diesel fuel sales accounted for approximately 3.1 billion gallons of diesel fuel.[19]

The CEC forecasts that demand for gasoline in California will range from 12.1 billion to 12.6 billion gallons in 2030, with most of the demand generated by light-duty vehicles. While the models show an increase in light-duty vehicles along population and income growth over the forecast horizon, total gasoline consumption is expected to decline, primarily due to increasing fuel economy (stemming from federal and state regulations) and gasoline displacement from the increasing market penetration of zero emission vehicles (ZEVs). For diesel, demand is forecast to increase modestly by 2030, following the growth of California's economy, but would be tempered by an increase in fleet fuel economy and market penetration of alternative fuels, most prominently by natural gas in the medium- and heavy-duty vehicle sectors.[20]

As of 2019, California's oil fields make it the 7th-largest petroleum-producing state in the United States (federal off-shore excluded), behind Texas, North Dakota, New Mexico, Oklahoma, Colorado, and Alaska.[21] Crude oil is moved from area to area within California through a network of pipelines that carry it from both onshore and offshore oil wells to the refineries that are located in the San Francisco Bay Area, the Los Angeles area, and the Central Valley. As of January 1, 2020, 14 petroleum refineries operate[22] in California, processing approximately 2.0 million barrels per day of crude oil.[23]

Other transportation fuel sources used in California include alternative fuels, such as methanol and denatured ethanol (alcohol mixtures that contain no less than 70% alcohol), natural gas (compressed

[14] US EIA, 2020c. Table F3: Motor gasoline consumption, price, and expenditure estimates, 2018. https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_mg.html&sid=US, accessed October 2020.

[15] Ibid.

[16] US EIA, 2020a. Table F16: Total Petroleum Consumption Estimates, 2018. https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_use_pa.html&sid=US&sid=CA, accessed October 2020.

[17] CEC, 2019b. Oil Supply Sources to California Refineries. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/oil-supply-sources-california-refineries, accessed October 2020.

[18] California State Board of Equalization (CBE), 2020a. Net Taxable Gasoline Gallons, Including Aviation Gasoline. June 2020 – Motor Vehicle Fuel 10 Year Reports. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts.htmhttps://www.cdtfa.ca.gov/taxes-and-fees/MVF-10-Year-Report.pdf, accessed October, 2020.

[19] CBE, 2020b. Taxable Diesel Gallons 10 Year Report. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts.htm, accessed October 2020.

[20] CEC, 2018d. Revised Transportation Energy Demand Forecast, 2018-2030.

[21] US EIA, 2020d. Crude Oil Production, Annual – Thousand Barrels. https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_a.htm, accessed October 2020.

[22] Some refineries have recently been idled or curtailed due to the reduction in gasoline consumption resulting from COVID-19.

[23] US EIA, 2020e. Refinery Capacity Report June 2020, Table 1. https://www.eia.gov/petroleum/refinerycapacity/refcap20.pdf, accessed October 2020.

or liquefied), liquefied petroleum gas (LPG), hydrogen, and fuels derived from biological materials (i.e., biomass).

2.2 Regional Setting

The nine-county Bay Area and the entire City of Berkeley are served by PG&E, an investor-owned utility company that provides electricity and natural gas supplies and services throughout a 70,000-square-mile service area that extends from Eureka in the north, to Bakersfield in the south, and from the Pacific Ocean on the west to the Sierra Nevada on the east. Operating characteristics of PG&E's electricity and natural gas supply and distribution systems are provided below. Also discussed are East Bay Community Energy, and regional consumption of transportation fuels.

2.2.1 Electric Utility Operations

PG&E provides "bundled" services (i.e., electricity, transmission, and distribution services) to most of the six million customers in its service territory, including residential, commercial, industrial, and agricultural consumers. Some customers can also obtain electricity from alternative providers such as municipalities, or community choice aggregators as allowed under Assembly Bill (AB)117 (passed in 2002), as well as from self-generation distributed resources, such as rooftop solar installations. In Alameda County alone, electricity consumption in 2019 was 10,684 GWh.[24]

In December 2014, the California Public Utilities Commission (CPUC) issued Decision D.14-12-079 that permits the California investor-owned electric utilities to own electric vehicle (EV) retail charging equipment in their respective service territories to help meet the state's goal of reducing GHG emissions by promoting cleaner transportation. On February 9, 2015, PG&E filed an application to request that the CPUC approve their proposal to develop, maintain, and operate an EV-charging infrastructure in their service territory. In 2016, the CPUC issued Decision D.16-12-065 establishing a three-year EV program of $130 million to deploy up to 7,500 charging ports.[25] Further deployment of light-duty EV infrastructure was considered and approved in a second phase of the program with a total PG&E budget of over $236 million per CPUC Decision D.18-05-040.[26]

In 2019, PG&E generated and/or procured a total of 35,956 GWh of electricity. [27] **Table 1** shows the percent of bundled retail sales by power generation facility type, reported consistent with the CEC's guidelines.

[24] CEC, 2020c. Electricity Consumption by County. http://www.ecdms.energy.ca.gov/elecbycounty.aspx, accessed October 2020.

[25] Pacific Gas & Electric (PG&E), 2018a. 2018 Corporate Responsibility and Sustainability Report. www.pgecorp.com/sustainability, accessed October 2020.

[26] The EPIC Energy Blog (EPIC), 2018. Update on Electric Vehicle CPUC Decision and Other Related Legislation, Legislative Update, June 2018.

[27] PG&E, 2019a. 2019 Joint Annual Report to Shareholders. http://s1.q4cdn.com/880135780/files/doc_financials/2020/ar/PCG010_PGE_2019-Annual-Report_Web.pdf, accessed October 2020.

Table 1: 2019 PG&E Power Mix Delivered to Retail Customers

Facility Type	Percent of Bundled Retail Sales (Actual Procurement)	Percent of Bundled Retail Sales (Power Content Label)
Eligible Renewable	29.7%	27.4%
Fossil Fuel-Fired	36.6%	0.0%
Nuclear	45.0%	41.7%
Large Hydroelectric	33.3%	30.9%
Others, Net[1,2]	(44.6)%	0.0%
Total	100%	100%

NOTES:

1 The allocation of bundled retail sale amounts and "Others, Net" in the "Power Content Label" column is consistent with current California Energy Commission guidelines, applied to specified electric generation and procurement volumes (i.e., fossil fuel-fired, nuclear, large hydroelectric, and renewable). Total reported generation and procurement volumes equate to actual electric retail sales.

2 Amount is mainly comprised of net California Independent System Operator open market (sales)/purchases

SOURCE: PG&E, 2020. 2020 Corporate Responsibility and Sustainability Report. [28]

2.2.2 Renewable Energy Resources

California law requires load-serving entities, such as PG&E, to gradually increase the amount of renewable energy they deliver to their customers to at least 33% of their total annual retail sales by 2020, 44% by 2024, 52% by 2027, 60% by 2030, and 100% by 2045. This program, known as the Renewables Portfolio Standard (RPS), became effective in December 2011, and has since been enhanced with the passage of Senate Bill (SB) 350 and SB 100 (see Sections 3.2.11 and 3.2.12 for more information). Renewable generation resources, for purposes of the RPS program, include bioenergy such as biogas and biomass, small hydroelectric facilities (30 MW or less), wind, solar, and geothermal energy.[29] As shown in **Table 2**, in 2019 approximately 29.7% of PG&E's energy procurement were from qualifying renewable energy sources. PG&E offers customers rate plans that include higher levels of renewable or carbon-free sources.[30]

[28] PG&E, 2020. Corporate Responsibility and Sustainability Report 2020. Available at: https://www.pgecorp.com/corp_responsibility/reports/2020/bu07_renewable_energy.html, accessed October 2020.

[29] Ibid.

[30] PG&E, 2020. Solar & Renewable Energy Plans. https://www.pge.com/en_US/residential/rate-plans/rate-plan-options/solar-and-renewable-energy-plans/solar-and-renewable-energy-plans.page, accessed October 2020.

Table 2: PG&E Renewable Energy Sources in 2019	
Source	**Percent of Total Energy Portfolio**
Biopower	3.7
Geothermal	1.5
Wind	9.5
RPS-Eligible Hydroelectric	2.3
Solar	12.7
Total	**29.7**
SOURCE: PG&E, 2020, 2019 Joint Annual Report to Shareholders. [31]	

2.2.3 Natural Gas Operations

PG&E receives natural gas from all the major natural gas basins in western North America, including basins in western Canada, the Rocky Mountains, and the southwestern United States. PG&E also is supplied by natural gas fields in California. PG&E provides natural gas transportation services to "core" customers and to "non-core" customers (i.e., industrial, large commercial, and natural gas-fired electric generation facilities) that are connected to the gas system in its service territory. During 2019, PG&E purchased approximately 282,000 million cubic feet (MMcf) of natural gas (net of the sale of excess supply of gas). In 2019, the total consumption of natural gas in Alameda County was 384 million therms, or 38,415,053 MMBtu.[32]

2.2.4 Other Electricity Providers

Electrical power is supplied to Alameda County by PG&E or other suppliers including community choice energy (CCE) suppliers such as East Bay Community Energy (EBCE) or Direct Access providers such as Constellation Energy. In 2002, the State of California passed legislation (AB 117) that permits local agencies to form CCE programs for their communities. Under a CCE program, the utility company (in this case PG&E) continues to operate and service the transmission and delivery system and provides billing and customer service. EBCE provides a 100% carbon-free product at a rate equivalent to PG&E's base offering.[33]

2.2.5 Transportation Fuels

Gasoline and diesel fuel are by far the largest transportation fuels used by volume in Alameda County. According to the CEC, the total estimated 2019 sales of gasoline in Alameda County were 591 million gallons and the total estimated 2019 sales of diesel fuel in Alameda County were 55 million gallons.[34] Note that the CEC only tracks fuel sales at the retail level which allows for data to be collected on a county by county basis. This is in comparison to the Board of Equalization (BOE) which tracks all fuel

[31] PG&E, 2019a. 2019 Joint Annual Report to Shareholders.

[32] CEC, 2020b. 2018 Gas Consumption by County. http://www.ecdms.energy.ca.gov/gasbycounty.aspx, accessed October 7, 2020.

[33] EBCE, 2020. Our Power Mix. https://ebce.org/our-power-mix/, accessed October 2020.

[34] CEC, 2020d. 2019 California Annual Retail Fuel Outlet Report Results (CEC-A15), Energy Assessment Division, September 22, 2020 https://www.energy.ca.gov/media/3874, accessed November 2020.

sales, retail and non-retail, but only at the statewide level (see Section 2.1.3). Thus, the Proposed Project impact calculations presented in Section 4.2.2 rely on separate data sets for comparison to Alameda County and statewide transportation fuel consumption rates.

2.3 Local Setting

2.3.1 Council of the City of Berkeley

The Berkeley City Council passed an ordinance prohibiting natural gas infrastructure (e.g. gas hook-ups) in any new building.[35] This ordinance prohibits natural gas infrastructure that is typically used to provide water and space heating, cooking, and other uses, in buildings of all types including residential and non-residential buildings. The City suggests that Building Electrification is the substitution to gas appliances (furnaces, water heaters, cooking ranges and stoves, dryers, etc.) with lean, safe, and highly efficient all-electric alternatives. The Natural Gas Prohibition Ordinance does not impose an absolute prohibition, and does not apply where "it is not physically feasible to construct the building without Natural Gas Infrastructure." Separately, there is an exception where natural gas usage is in the public interest, and is necessary to the health, safety, and welfare of the public. The Proposed Project envisions natural gas usage only for manufacturing lab facilities and the natural gas boilers, and not for production, administration, maintenance, and warehouse facilities. The prohibition of natural gas usage in the Proposed Project is not technologically feasible in manufacturing and laboratory operations, and requiring its use would materially and adversely affect the biopharmaceutical manufacturing process and the production of medicines. More specifically, an electrically powered alternative is not available that would allow Proposed Project operations to meet the Biosafety Level 2 precautions ("BSL-2") and other strict protocols and contamination performance standards necessary for cell therapy and other biopharmaceutical processes envisioned under the Proposed Project. Manufacturing lab facilities therefore would be exempt under the Natural Gas Prohibition Ordinance (as well as the terms of the Development Agreement, which vests the site into older City ordinances).

2.3.2 Proposed Project Site

The Proposed Project site in the City of Berkeley is located in West Berkeley, approximately 2.5 miles from downtown Berkeley. The site is comprised of approximately 46 acres and is roughly bounded by the Union Pacific Railroad right-of-way to the west, Seventh Street to the east, Grayson Street to the south, and Dwight Way to the North together with a separate parking lot, which is located on a portion of the block between Dwight, Seventh, Parker and Sixth streets. The site houses biopharmaceutical operations with supporting office and other ancillary uses, and includes two primary areas:

- North Properties: 800 Dwight Way, north of Carleton Street, which is the site included in the 1992 Development Agreement, known as the "North Properties," and
- South Properties: 801 Grayson Street, south of Carleton Street, known as the "South Properties."

The site is served by existing infrastructure that provides the electrical power, natural gas, potable water, and wastewater service necessary to sustain on-site operations. Electricity and power are provided by PG&E. The total site level electricity consumption is 45,842,990 kilowatt-hours per year (kWh/year) and the site level natural gas consumption is 237,636 MMBtu/year. Within the site, natural gas lines generally follow service corridors along Parker, Carleton, and Fourth Streets within the site.

[35] The City of Berkeley, 2020. Prohibition of Natural Gas Infrastructure in New Buildings. Ordinance No. 7672-N.S. https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/2019-07-23%20Item%20C%20Prohibiting%20Natural%20Gas%20Infrastructure.pdf, accessed October 2020.

Under the Proposed Project, there would be no changes to the site's electric or gas infrastructure, with the exception that it might be necessary to install electrical transmission feeder lines on the South Properties in order to ensure the site has adequate electrical capacity.

3. REGULATORY SETTING

3.1 Federal

Federal policies and regulations set broad energy efficiency standards and incentives for consumer products, automobile and fuel efficiency, etc. Such requirements, as those listed below, tend to be applicable to the manufacturing sector and not directly applicable to the Proposed Project, but are listed here for informational purposes.

3.1.1 National Energy Policy Act of 2005

The National Energy Policy Act of 2005 sets equipment energy efficiency standards and seeks to reduce reliance on nonrenewable energy resources and provide incentives to reduce current demand on these resources. For example, under the act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products (including hybrid vehicles), constructing energy-efficient buildings, and improving the energy efficiency of commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

Executive Order 13423 (Strengthening Federal Environmental, Energy, and Transportation Management), signed in 2007, strengthens the key energy management goals for the federal government and sets more challenging goals than the Energy Policy Act of 2005. The energy reduction and environmental performance requirements of Executive Order 13423 were expanded upon in Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance), which was signed in 2009.

3.1.2 Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 sets federal energy management requirements in several areas with the goal of moving the United States toward greater energy independency, increasing production of clean renewable fuels, increasing the efficiency of products, buildings, and vehicles, promoting greenhouse gas capture and storage research and deployment and improving the energy performance of the Federal Government. This act also amends portions of the National Energy Policy Conservation Act.

3.1.3 Corporate Average Fuel Economy (CAFE) Standards

Established by the United States (U.S.) Congress in 1975, the CAFE standards reduce energy consumption by increasing the fuel economy of cars and light trucks. The National Highway Traffic Safety Administration (NHTSA) and U.S. EPA jointly administer the Corporate Average Fuel Economy standards. The U.S. Congress has specified that CAFE standards must be set at the "maximum feasible level" with consideration given for: (1) technological feasibility; (2) economic practicality; (3) effect of other standards on fuel economy; and (4) need for the nation to conserve energy.[36]

3.2 State

3.2.1 Warren-Alquist Act

The 1975 Warren-Alquist Act established the California Energy Resources Conservation and Development Commission, now known as the CEC. The Act established a state policy to reduce wasteful, uneconomical, and unnecessary uses of energy by employing a range of measures.

[36] For more information on the Corporate Average Fuel Economy standards. https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy, accessed October 2020.

3.2.2 California Energy Action Plan

California's *2008 Energy Action Plan Update* updates the *2005 Energy Action Plan II,* which is the state's principal energy planning and policy document. The plan maintains the goals of the original *Energy Action Plan*, describes a coordinated implementation plan for state energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. First-priority actions to address California's increasing energy demands are to promote energy efficiency, demand response (i.e., reducing customer energy usage during peak periods to address power system reliability and support the best use of energy infrastructure), and use of renewable power sources. To the extent that these strategies are unable to satisfy increasing energy and capacity needs, the plan supports clean and efficient fossil-fuel fired generation.

3.2.3 State of California Integrated Energy Policy

In 2002, the Legislature passed SB 1389, which required the CEC to develop an integrated energy plan biannually for electricity, natural gas, and transportation fuels, for the California Energy Report. SB 1389 requires the CEC to prepare a biennial Integrated Energy Policy Report (IEPR) that assesses major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety (Public Resources Code Section 25301[a]). The IEPR has replaced the Energy Action Plan as the chief program intended to provide a comprehensive statewide energy strategy to guide energy investments, energy-related regulatory efforts and GHG reduction measures.

A recent update to the IEPR (2019) examines how California's energy system must be transformed to meet the state's 2030 GHG reduction goal, including implementation of SB 350 (De Leon, Chapter 547, Statues of 2015) to double the energy efficiency of existing buildings and SB 100's target of achieving 60% renewables in the electricity supply by 2030. The report also covers policies and trends in integrated resource planning, distributed energy resources, transportation electrification, barriers faced by disadvantaged communities, demand response, transmission and landscape-scale planning, the California Energy Demand Preliminary Forecast, the preliminary transportation energy demand forecast, renewable gas (in response to Senate Bill 1383), the natural gas outlook, and solutions to increase resiliency in the electricity sector. The key strategies identified in the 2019 IEPR Update, are summarized below.[37] CEC staff are currently conducting public workshops for the 2020 IEPR Update, which is expected to be finalized in January 2021, and adopted in February 2021.[38]

3.2.4 IEPR Strategy: Decarbonizing the Electricity Sector

Decarbonizing the electricity sector is part of an integrated approach to reducing emissions from energy use. In 2019, about 36% of the electricity used to serve California was produced from renewable resources such as solar and wind[39]. In fact, the electricity sector is leading the state's efforts to reduce GHG emissions. Although the AB 32 and SB 32 GHG reduction goals are economy-

[37] CEC, 2020e. Adopted 2019 Integrated Energy Policy Report. February 20, 2020. https://efiling.energy.ca.gov/getdocument.aspx?tn=232922, accessed October 2020.

[38] CEC, 2020f. 2020 Integrated Energy Policy Report Update Scoping Order. https://efiling.energy.ca.gov/GetDocument.aspx?tn=232209, accessed October 2020.

[39] CEC, Tracking Progress – Renewable Energy Highlights. July 2020. https://www.energy.ca.gov/sites/default/files/2019-12/renewable_highlights_ADA_0.pdf, accessed October 2020.

wide, in 2017, the electricity sector surpassed AB 32's 2020 goal and met SB 32's 2030 goal. Over the last 10 years, GHG emissions from imported electricity have declined by more than 60%, and emissions from in-state generation have declined by nearly 30%[40]. These gains are largely attributable to advancements in energy efficiency, increased use of renewable energy resources, and reduced use of coal-fired electricity. To further reduce GHG emissions, California is increasingly using renewable resources to produce electricity while planning for increased demand from transportation electrification and other opportunities for electrification.

In 2019, solar accounted for 42% of the state's renewable generation.[41] The increase in solar and other renewables is a California success story in reducing GHG emissions, but also creates operational challenges. Grid operators must manage the ramp-up of solar generation as it peaks midday and then ramps down at sunset while electricity demand remains high.

The 2019 IEPR emphasizes the current challenge the state faces in increasing the state's ability to integrate more renewable energy into the grid. There is an increasing need for energy storage that can balance supply and demand by absorbing excess energy and reinjecting it into the grid when demand increases. There is also a need for transmission investments to link our extensive renewable resources to load centers throughout the grid. The challenges are compounded by increasing numbers of Californians who are generating, and in some cases, storing their own electricity or purchasing electricity from local providers called community choice aggregators.

3.2.5 IEPR Strategy: Energy Efficiency and Building Decarbonization

In 2017, as required in SB 350, the CEC established ambitious annual targets to achieve a statewide doubling of cumulative energy efficiency savings in electricity and natural gas end uses by 2030. The CEC developed the doubling targets in collaboration with the CPUC, investor-owned utilities (IOUs), publicly owned utilities (POUs), and other stakeholders through a public process. Achieving these efficiency targets is one of the primary ways the energy sector can help achieve the state's climate goal of reducing GHG emissions to 40% below 1990 levels by 2030. However, the state will need additional efforts to decarbonize homes and businesses to meet California's goals for 2030 and 2050.

Electrification of space and water heating is one of the state's key strategies to reduce or eliminate GHG emissions from buildings, including the methane emissions associated with natural gas use. GHG reductions will accelerate as the electricity system becomes cleaner with large increases in renewable resources.

As spelled out in the California Energy Efficiency Strategic Plan, the CPUC has set a goal of achieving zero net energy (ZNE) performance for all new low-rise homes constructed in or after 2020, and for all new commercial buildings constructed in or after 2030. While this was not achieved in the most recent Building Energy Efficiency Standards that took effect January 1, 2020, the CPUC, CEC, and California Air Resources Board (CARB) continue to focus on improved energy efficiency and integration of renewable electricity and demand response for new construction with each code update.

3.2.6 IEPR Strategy: Transportation Electrification

California is working to transform the transportation sector away from petroleum to near-zero emission vehicles operating with low-carbon fuels and ZEVs that run on electricity from batteries or hydrogen fuel cells. Including emissions from refineries, the transportation sector accounted for more than 50% of the state's GHG emissions as of 2016. The state is advancing goals, policies, and plans to

[40] CEC, Tracking Progress – Renewable Energy. February 2020. https://www.energy.ca.gov/sites/default/files/2019-12/renewable_ada.pdf, accessed October 2020.

[41] Ibid.

support the proliferation of zero-emission and near-zero-emission vehicles. As described in more detail below, the Governor Brown's Executive Orders have set goals of reaching 1.5 million ZEVs on California's roadways by 2025 and 5 million by 2030, while Governor Newsom's September 2020 Executive Order increased this target to include 100% ZEV sales for new light- and medium-duty automobiles by 2035 and increased penetration of heavy-duty and off-road ZEVs. As usage grows, ZEVs will have an increasing role in grid management and the integration of renewables in particular.

3.2.7 California Energy Efficiency Standards (Title 24, Part 6)

The Energy Efficiency Standards for residential and nonresidential buildings specified in Title 24, Part 6 of the California Code of Regulations were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated approximately every three years to allow for consideration and possible incorporation of new energy-efficiency technologies and methods. The current standards (2019) became effective on January 1, 2020. The 2019 Title 24 standards require solar photovoltaic systems for new homes, encourage demand responsive technologies including battery storage and heat pump water heaters, and improve the building's thermal envelope through high performance attics, walls and windows. In nonresidential buildings, the standards update indoor and outdoor lighting making maximum use of LED technology.[42] The next update to the Title 24 energy efficiency standards (2022 standards) are scheduled to go into effect on January 1, 2023.

3.2.8 California Green Building Standards Code (CALGreen, or Title 24 Part 11)

Part 11 of the Title 24 Building Energy Efficiency Standards is referred to as the California Green Building Standards (CALGreen) Code. CALGreen is intended to encourage more sustainable and environmentally friendly building practices, require low-pollution emitting substances that cause less harm to the environment, conserve natural resources, and promote the use of energy-efficient materials and equipment. Since 2011, the CALGreen Code is mandatory for all new residential and non-residential buildings constructed in the state. Such mandatory measures include energy efficiency, water conservation, material conservation, planning and design, and overall environmental quality. The CALGreen Code was updated in 2016 to include new mandatory measures for residential and nonresidential uses; the new measures took effect on January 1, 2017.[43] Most changes are related to the definitions and to the clarification or addition of referenced manuals, handbooks, and standards. The 2019 CALGreen Code updates, which took effect on January 1, 2020, incorporate amendments to electric vehicle charging spaces, outdoor water use provisions, and clarifications.[44]

3.2.9 Renewables Portfolio Standard (Senate Bills 107 and 1078)

The State of California adopted standards to increase the percentage of energy from renewable resources that retail sellers of electricity, including investor-owned utilities and community choice aggregators, must provide in their portfolio. The Renewables Portfolio Standard was established in 2002 under Senate Bill 1078, accelerated in 2006 under Senate Bill 107, and expanded in 2011 under Senate Bill 2. The standards are referred to as the RPS. Qualifying renewables under the RPS include bioenergy such as biogas and biomass, small hydroelectric facilities (30 MW or less), wind, solar, and

[42] CEC, 2019d. *2019 Building Energy Efficiency Standards*. https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency, accessed October 2020.

[43] California Building Standards Commission (CBSC), 2016. 2016 California Green Building Standards Code (Part 11 of Title 24). https://www.dgs.ca.gov/BSC/Resources/Page-Content/Building-Standards-Commission-Resources-List-Folder/CALGreen, accessed October 2020.

[44] CBSC, 2019. 2019 California Green Building Standards Code, Effective January 1, 2020. https://www.dgs.ca.gov/BSC/Resources/Page-Content/Building-Standards-Commission-Resources-List-Folder/CALGreen, accessed October 2020.

geothermal energy. The CPUC and the CEC jointly implement the RPS program. The CPUC's responsibilities include: (1) determining annual procurement targets and enforcing compliance, (2) reviewing and approving each investor-owned utility's renewable energy procurement plan, (3) reviewing contracts for RPS-eligible energy, and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy.[45]

3.2.10 Executive Order S-14-08 and S-21-09

In November 2008, then-Governor Schwarzenegger signed Executive Order S-14-08, which expanded the state's RPS to 33% renewable power by 2020. In September 2009, then-Governor Schwarzenegger continued California's commitment to the Renewable Portfolio Standard by signing Executive Order S-21-09, which directed the CARB under its AB 32 authority to enact regulations to help the state meet its RPS goal of 33% renewable energy by 2020.

3.2.11 SB 350 - Clean Energy and Pollution Reduction Act of 2015

SB 350, also known as the Clean Energy and Pollution Reduction Act of 2015, was enacted on October 7, 2015 and provides a new set of objectives in clean energy, clean air, and pollution reduction by 2030. The objectives include the following:

1. To increase from 33% to 50% by December 31, 2030, the procurement of California's electricity from renewable sources.
2. To double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation.

3.2.12 Senate Bill 100

On September 10, 2018, then-Governor Brown signed SB 100, establishing that 100% of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also creates new standards for the RPS goals that were established by SB 350 in 2015. Specifically, the bill increases required energy from renewable sources for both IOUs and POUs from 50% to 60% by 2030. Incrementally, these energy providers are also required to have a renewable energy supply of 33% by 2020, 44% by 2024, and 52% by 2027. The updated RPS goals are considered achievable, since many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

On the same day that SB 100 was signed, then-Governor Brown signed Executive Order B-55-18 with a new statewide goal to achieve carbon neutrality (zero-net GHG emissions) by 2045 and to maintain net negative emissions thereafter.

3.2.13 Appliance Efficiency Regulations, California Code of Regulations Title 20

California's Appliance Efficiency Regulations (20 CCR Part 160-1608) contain standards for both federally regulated appliances and non-federally regulated appliances. The regulations are updated regularly to allow consideration of new energy efficiency technologies and methods. The current regulations were adopted by the CEC on November 18, 2009. The standards outlined in the regulations apply to appliances that are sold or offered for sale in California. More than 23 different categories of appliances are regulated, including refrigerators, freezers, water heaters, washing machines, dryers, air conditioners, pool equipment, and plumbing fittings.

[45] CPUC, 2019b. RPS Program Overview, 2018. http://www.cpuc.ca.gov/RPS_Overview/, accessed October 2020.

3.2.14 Transportation Energy

3.2.14.1 AB 1007 (Pavley)-Alternative Fuel Standards

Assembly Bill 1007 (Pavley, Chapter 371, Statutes of 2005) required the CEC to prepare a state plan to increase the use of alternative fuels in California (State Alternative Fuels Plan). The CEC prepared the State Alternative Fuels Plan in partnership with CARB and in consultation with other state, federal, and local agencies. The final State Alternative Fuels Plan, published in December 2007, attempts to achieve an 80% reduction in GHG emissions associated with personal modes of transportation, even as California's population increases.

3.2.14.2 California Assembly Bill 1493 (AB 1493, Pavley)

In response to the transportation sector accounting for more than half of California's CO_2 emissions, AB 1493 (commonly referred to as CARB's Pavley regulations) was enacted on July 22, 2002 and requires CARB to set GHG emission standards for new passenger vehicles, light duty trucks, and other vehicles manufactured in and after 2009 whose primary use is non-commercial personal transportation. Phase I of the legislation established standards for model years 2009 through 2016 and Phase II established standards for model years 2017 through 2025.[46,47] Refer to Ramboll's Greenhouse Gas Environmental Impact Report (October 2020) of this Draft Environmental Impact Report (EIR) for additional details regarding this regulation.

3.2.14.3 Low Carbon Fuel Standard

The Low Carbon Fuel Standard (LCFS), established in 2007 through Executive Order S-1-07 and administered by CARB, requires producers of petroleum-based fuels to reduce the carbon intensity of their products that started with a 0.25% reduction in 2011 and culminated in a 10% total reduction in 2020. In September 2018, CARB extended the LCFS program to 2030, making significant changes to the design and implementation of the Program including a doubling of the carbon intensity reduction to 20% by 2030.

Petroleum importers, refiners, and wholesalers can either develop their own low carbon fuel products or buy LCFS credits from other companies that develop and sell low carbon alternative fuels, such as biofuels, electricity, natural gas, and hydrogen.

3.2.14.4 Executive Order B-16-12 - 2025 Goal for Zero Emission Vehicles

In March 2012, then-Governor Brown issued an executive order establishing a goal of 1.5 million ZEVs on California roads by 2025. In addition to the ZEV goal, Executive Order B-16-12 stipulated that by 2015 all major cities in California will have adequate infrastructure and be 'zero-emission vehicle ready'; that by 2020 the state will have established adequate infrastructure to support 1 million ZEVs; and that by 2050, virtually all personal transportation in the state will be based on ZEVs, and GHG emissions from the transportation sector will be reduced by 80% below 1990 levels.

[46] California Air Resources Board (CARB), 2017a. Clean Car Standards—Pavley, Assembly Bill 1493, last reviewed January 11, 2017. https://ww2.arb.ca.gov/californias-greenhouse-gas-vehicle-emission-standards-under-assembly-bill-1493-2002-pavley, accessed October 2020.

[47] United States Environmental Protection Agency (USEPA), 2012. EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017 through 2025 Cars and Light Trucks. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockey=P100EZ7C.pdf, accessed October 2020.

3.2.14.5 CARB's Advanced Clean Car Program

The Advanced Clean Cars emissions-control program was approved by CARB in 2012 and is closely associated with the Pavley regulations.[48] The program requires a greater number of zero-emission vehicle models for years 2015 through 2025 to control smog, soot, and GHG emissions. This program includes the Low-Emissions Vehicle (LEV) regulations to reduce criteria pollutants and GHG emissions from light- and medium-duty vehicles; and the ZEV regulations to require manufactures to produce an increasing number of pure ZEV's (meaning battery and fuel cell electric vehicles) with the provision to produce plug-in hybrid electric vehicles (PHEV) between 2018 and 2025.[49]

Due to the federal adoption of the Final SAFE Rule, new cars of model years 2021 through 2026 are not currently required to achieve the fuel economy targets set by the Advanced Clean Cars program.[50]

3.2.14.6 CARB's Mobile Source Strategy

The Mobile Source Strategy (2016) includes an expansion of the Advanced Clean Cars program and further increases the stringency of GHG emissions for all light-duty vehicles, and 4.2 million zero-emission and plug-in hybrid light-duty vehicles by 2030. It also calls for more stringent GHG requirements for light-duty vehicles beyond 2025 as well as GHG reductions from medium-duty and heavy-duty vehicles and increased deployment of zero-emission trucks primarily for classes 3 through 7 "last mile" delivery trucks in California. Statewide, the Mobile Source Strategy would result in a 45% reduction in GHG emissions, and a 50% reduction in the consumption of petroleum-based fuels. CARB's Mobile Source Strategy includes measures to reduce total light-duty vehicle miles travelled (VMT) by 15% compared to business-as-usual in 2050.

In 2004, the California Air Resources Board (CARB) adopted an Airborne Toxics Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling in order to reduce public exposure to diesel particulate matter emissions (Title 13 California Code of Regulations Section 2485). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure does not allow diesel-fueled commercial vehicles to idle for more than five minutes at any given location. While the goal of this measure is primarily to reduce public health impacts from diesel emissions, compliance with the regulation also results in energy savings in the form of reduced fuel consumption from unnecessary idling.

In addition to limiting exhaust from idling trucks, CARB also promulgated emission standards for off-road diesel construction equipment of greater than 25 horsepower such as bulldozers, loaders, backhoes and forklifts, as well as many other self-propelled off-road diesel vehicles. The In-Use Off-Road Diesel-Fueled Fleets regulation adopted by CARB on July 26, 2007 aims to reduce emissions by installation of diesel soot filters and encouraging the retirement, replacement, or repower of older,

[48] CARB, 2017a. Clean Car Standards—Pavley, Assembly Bill 1493.

[49] Note that in September 2019, the Trump Administration announced that the U.S. EPA would withdraw the Clean Air Act preemption waiver it granted to the State of California in January 2013, as it relates to California's GHG and ZEV programs. https://www.epa.gov/newsreleases/trump-administration-announces-one-national-program-rule-federal-preemption-state-fuel, accessed October 2020. California and other jurisdictions have filed a lawsuit challenging the USEPA's authority to withdraw the preemption waiver, and that litigation is pending, with the final results unknown, as of the preparation of this analysis.

[50] The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One, which took effect November 2019, revoked California's authority to set its own GHG standards and set zero emission vehicle mandates in California. The SAFE rule freezes new ZEV sales at model year 2020 levels for year 2021 and beyond. In April 2020, the USEPA and the National Highway Traffic Safety Administration (NHTSA) issued the Final SAFE Rule that relaxes federal GHG emissions and CAFÉ standards for model year 2021 through 2026 vehicles.

dirtier engines with newer emission controlled models (13 California Code of Regulations Section 2449). The compliance schedule requires full implementation by 2023 in all equipment for large and medium fleets and by 2028 for small fleets.

3.2.14.7 Executive Order B-48-18

On January 26, 2018, then-Governor Brown issued an executive order establishing a goal of 5 million ZEVs on California roads by 2030 and spur the installation and construction of 250,000 plug-in electric vehicle chargers, including 10,000 direct current fast chargers, and 200 hydrogen refueling stations by 2025.

3.2.14.8 Executive Order N-79-20

In September 2020, Governor Newsom signed Executive Order N-79-20, which sets a new State goal that 100% of in-state sales of new passenger cars and trucks will be zero-emission by 2035; that 100% of medium- and heavy-duty vehicles in the State be zero-emission by 2045 for all operations where feasible; and by 2035 for drayage trucks; and that 100% of off-road vehicles and equipment will be zero emission by 2035 where feasible. This order calls upon state agencies including ARB, the CEC, the CPUC, the Department of Finance, and others to develop and propose regulations and strategies to achieve these goals.

3.3 Local Plans, Ordinances and Policies[51]

3.3.1 City of Berkeley General Plan

The City of Berkeley's General Plan's Environmental Management Element states the following policies and actions to make the City of Berkeley a more environmentally sustainable community. The Plan describes the following relevant policies regarding energy resources:

> Policy EM-4: Develop a green building certification program which would require all City owned buildings to be Green Building Certified and encourage private buildings to be Green Building Certified.
>
> Policy EM-5: Promote and encourage compliance with "green" building standards by encouraging energy efficient landscaping, incorporating renewable energy and energy efficient technologies.
>
> Policy EM-21: Work with the University of California, the Berkeley Unified School District and other agencies to establish natural gas fueling and electric vehicles recharging stations accessible to the public.
>
> Policy EM-35: Promote high-efficiency design and technologies that provide cost-effective methods to conserve energy and use renewable energy sources
>
> Policy EM-36: Continue to implement energy conservation requirements for residential and commercial buildings at the time of sale and at time of major improvements.
>
> Policy EM-37: Support public-private organizations established to implement energy conservation practices within the community.
>
> Policy EM-38: Support efforts to produce energy through local alternative sources.
>
> Policy EM-39: Encourage all businesses to implement energy conservation plans.

[51] The Bayer project site is subject to a 1992 Development Agreement that vests Bayer into many laws as they existed in 1992. Inclusion of local frameworks below is not intended to provide a legal opinion as to whether a given modern ordinance or other regulation is applicable except as expressly noted.

Policy EM-40: Support the market for energy-efficient technologies and services.

Policy EM-41: Encourage and support efforts to reduce use of fossil fuel and other finite, nonrenewable resources.

3.3.2 Green Building Requirements

The City of Berkeley requires that all new buildings meet CALGreen requirements. In addition the city has outlined supplemental policies to ensure additional waste diversion, reductions in energy and water usage and meeting the community Climate Action Goals.[52] All buildings greater than 10,000 square feet are required to use the GreenPoint Rated Checklist and new buildings in the downtown area are required to be Leadership in Energy and Environmental Design (LEED) Gold certified. To reduce energy use, an energy conservation analysis is required for commercial projects greater than 10,000 square feet and owners are required to complete whole-building energy efficiency assessments and publicly report this information prior to sale. To protect water, requirements are in place to manage stormwater runoff, protect creek health, fix leaks in sewer laterals and comply with the Bay Friendly Landscaping Checklist. In order to reduce waste, projects must divert demolition debris away from landfills via reuse, recycling and compost and all businesses and multi-family units must provide on-site recycling services.

3.3.3 Berkeley Natural Gas Prohibition

The Berkeley City council passed an ordinance prohibiting natural gas infrastructure (e.g., gas hook-ups) in any new building.[53] This ordinance prohibits natural gas infrastructure that is typically used to provide water and space heating, cooking, and other uses, in any building of all types including residential and non-residential buildings. The City suggests that Building Electrification is the substitution to gas appliances (furnaces, water heaters, cooking ranges and stoves, dryers, etc.) with lean, safe, and highly efficient all-electric alternatives. The Natural Gas Prohibition Ordinance does not impose an absolute prohibition and does not apply where "it is not physically feasible to construct the building without Natural Gas Infrastructure." Separately, there is an exception where natural gas usage is in the public interest, and is necessary to the health, safety, and welfare of the public. The Proposed Project envisions natural gas usage only for the manufacturing lab facilities and the natural gas boilers, and not for production, administration, maintenance, and warehouse facilities. The prohibition of natural gas usage in the Proposed Project is not technologically feasible in manufacturing and laboratory operations and requiring its ban would materially and adversely affect the biopharmaceutical manufacturing process and the production of medicines. More specifically, an electrically powered alternative is not available that would allow Proposed Project operations to meet the BSL-2 and other strict protocols and contamination performance standards necessary for cell therapy and other biopharmaceutical processes envisioned under the Proposed Project. Manufacturing lab facilities therefore would be exempt under the Natural Gas Prohibition Ordinance (as well as the terms of the Development Agreement, which vests the site into older City ordinances).

[52] Energy and Sustainable Development Green Building Requirements. City of Berkeley. https://www.cityofberkeley.info/Green_Building_Requirements/, accessed October 2020.

[53] City of Berkeley. 2019. Ordinance No. 7, 672-N.S. https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3__Energy_and_Sustainable_Development/2019-07-23%20Item%20C%20Prohibiting%20Natural%20Gas%20Infrastructure.pdf, accessed October 2020.

3.3.4 Berkeley Electric Mobility Roadmap

In April 2020, the City of Berkeley put out the Electric Mobility Roadmap with a vision for creating a fossil-fuel-free public transport system and supports city efforts to increase walking, biking and transit use. The Roadmap outlines several goals, including ensuring equity in access to public transit, improving alternatives to driving and achieving net zero carbon emissions from private vehicles. To achieve this, Berkeley will prioritize walking and transit over electric vehicles, and electric vehicles over private gas vehicles in planning and policy decisions.[54]

3.3.5 Berkeley Climate Action Plan (CAP)

In 2006 Berkeley voters approved ballot Measure G which put forth a mandate to reduce the community's greenhouse gas emissions by 80% below 2000 levels by 2050. In 2009, the City of Berkeley adopted the Climate Action Plan written through a community-wide process as a result of this measure. The community's target is to reduce emissions by 33% below 2000 levels for 2020. The plan outlines the following vision for the city:[55]

- New and existing Berkeley buildings achieve zero net energy consumption through increased energy efficiency and a shift to renewable energy sources such as solar and wind
- Public transit, walking, cycling, and other sustainable mobility modes are the primary means of transportation for Berkeley residents and visitors
- Personal vehicles run on electricity produced from renewable sources or other low-carbon fuels
- Zero waste is sent to landfills
- The majority of food consumed in Berkeley is produced locally
- The community is resilient and prepared for the impacts of global warming
- The social and economic benefits of the climate protection effort are shared across the community

Following the committal by Governor Jerry Brown in 2018 to the more aggressive goal of a carbon-neutral California by 2045, the Berkeley City Council resolved to become a "Fossil Fuel-Free City". In July 2020, staff prepared a report summarizing work done throughout the City to meet Berkeley's climate goals; however, to date an updated Climate Action Plan has not been adopted.[56]

[54] Berkeley Electric Vehicle Roadmap. Published April 2020. https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/City%20of%20Berkeley%20Electric%20Mobility%20Roadmap_2020.pdf, accessed October 2020.

[55] City of Berkeley Climate Action Plan. Published June 2009. https://www.cityofberkeley.info/climate/, accessed October 2020.

[56] City of Berkeley, 2020. Climate Action Plan and Resilience Update. https://www.cityofberkeley.info/Clerk/City_Council/2020/07_Jul/Documents/2020-07-21_Special_Item_05_Climate_Action_Plan_pdf.aspx, accessed October 2020.

4. SIGNIFICANCE CRITERIA

Changes to Appendix G of the State California Environmental Quality Act (CEQA) Guidelines effective in December 2018 were intended to reflect recent changes to the CEQA statutes and court decisions. In the case of energy, the topic was added to the Appendix G checklist, in addition to being discussed in Appendix F of the State CEQA Guidelines. For purposes of this analysis, consistent with the changes to Appendix G of the State CEQA Guidelines, impacts associated with energy are considered to be significant if the Proposed Project would:

1. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation; or
2. Result in energy demand substantially affecting local and regional energy supplies and capacity; or
3. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

4.1 Approach to Analysis

This impact analysis evaluates the potential for the Proposed Project to result in the wasteful use of energy or wasteful use of energy resources during Proposed Project construction and operation, consistent with Public Resources Code 21100(b)(3) and Section 15126.2(b) and Appendices F and G of the State CEQA Guidelines. The analysis provides construction and operational energy use estimates for the Proposed Project and the CEQA baseline. The analysis then uses this information to evaluate whether this energy use would be considered wasteful, inefficient, or unnecessary, taking into account available energy supplies and existing use patterns, the Proposed Project's energy efficiency features, and compliance with applicable standards and policies aimed to reduce energy consumption, including the City of Berkeley's CAP and California's Title 24 Energy Efficiency Standards.

4.1.1 Energy Methodology for Proposed Project

The Proposed Project is seeking to modify Bayer HealthCare LLC's (referred to as "Bayer") long-range development plan for its pharmaceutical manufacturing campus in West Berkeley. The total square feet of development approved by the City of Berkeley in the existing development agreement is 1,886,000 square feet. The total square footage of development for the CEQA Baseline analysis accounts for the approved development contemplated under the 1992 DA on the North Properties, consisting of 1,346,000 sq ft of development, existing development on the South Properties, consisting of 520,000 sq ft of development. The total square footage analyzed in the Baseline scenario is 1,866,000 sq ft. across the entire Bayer Project site.

The Proposed Project contemplates approximately 1,738,000 square feet of development, thereby reducing planned building space by about 148,000 square feet.

The Proposed Project site's building space is divided into six different land uses, including production space, manufacturing labs, warehouse space, administrative offices, utility facilities, and maintenance facilities. Utility buildings are used to house monitored water distillation operations, electrical equipment and steam generation equipment. All the land uses except Production buildings and parking spaces have both electricity and natural gas consumption. Production buildings and parking spaces only use electricity.

The Proposed Project would be constructed in two development stages, each occurring in two phases: the Year 10 Project construction is expected to occur in 2024 and 2029, while the Year 30 Project construction is expected to occur in 2034 and 2049. For the purpose of this analysis and to obtain conservative results, the full buildout operational years are expected to be 2025 and 2035, for Year 10

Project and Year 30 Project, respectively. This approach yields conservative results because energy usage factors are expected to become more efficient in later years due to increasingly stringent appliance and fuel efficiency standards and newer technologies.

This energy analysis includes quantification of electricity, natural gas, gasoline, and diesel fuel that would be required to construct and operate the Proposed Project as compared to the CEQA Baseline (assumed to be year 2020). Construction energy use includes off-road equipment and on-road mobile sources. Sources of operational energy use include building energy use (including boilers), on-road mobile sources, water distribution and treatment, and emergency generators. **Appendix A Table EN-1** contains more details on the energy sources.

The energy analysis is based on default values in latest versions California Emission Estimator Model (CalEEMod®) and Emission Factors Model version 2017 (EMFAC2017), which have not been updated for the most recent executive orders, specifically Executive Order N-79-20 which bans the sale of gasoline-powered cars in California by 2035; and Executive Order B-55-18 which set as a goal carbon neutrality in California by 2045. Both of these Executive Orders, if implemented, will change the energy mix in California for both the Year 10 and Year 30 Projects, decreasing substantially, fossil fuel usage and increasing electricity usage. However, there is insufficient information to incorporate these executive orders into this analysis; to do so would be speculative. Accordingly, this energy analysis has been conducted with the most recent available tools prepared and accepted by the regulatory agencies.

4.1.1.1 Construction Energy Estimates

Construction of the Proposed Project would occur in two stages over a period of twenty-five years or longer, and buildings constructed in a given phase of the construction would be occupied after completion of that stage. All demolition for the Proposed Project will take place as a part of the Year 10 Project construction phase.

Off-Road Equipment

Off-Road equipment is the most significant source of construction fuel usage. Diesel fuel consumption associated with on-site off-road construction equipment has been estimated based on the construction schedule, equipment list, and CARB estimated diesel consumption rate for off-road equipment. The construction schedule was estimated using CalEEMod® default assumptions such that construction is completed on December 31st of the year before operation is expected to occur. Further details on the construction schedule are provided in **Air Quality Appendix A Table CON-2**. The construction equipment list – including equipment type, quantity, hours of use, horsepower, and load factor was based on CalEEMod® default assumptions. A utilization rate of 100% was assumed in this analysis. Further details on the construction equipment are provided in **Air Quality Appendix A Table CON-3** For the purposes of the energy analysis, all equipment was assumed to be diesel-fueled; electricity- or gasoline-fueled equipment would not be expected to substantially affect energy resource demands. Note that engine tier does not affect fuel consumption rates. Fuel consumption rates in gallons per horsepower-hour (gal/hp-hr) were calculated from CARB's "2017 Off-road Diesel Emission Factors" database.[57] Further details on the fuel usage by parcel, year, construction phase and equipment are shown in **Appendix A Table EN-2.**

[57] CARB, 2017b. 2017 Off-road Diesel Emission Factors. https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road, accessed October 2020.

On-Road Vehicles

On-road construction vehicles such as light-duty automobiles and trucks that will be used by workers for commuting to and from the construction site are assumed to be fueled by gasoline; and on-road trucks, such as vendor and haul trucks for demolition debris, soil, and other material hauling, are assumed to be fueled by diesel fuel. This analysis conservatively assumes that no electric on-road vehicles would be used during construction of the Proposed Project; electric vehicles would not be expected to substantially affect energy resource demands. The fuel quantities that would be required for on-road vehicles during construction have been calculated based on fuel efficiency factors estimated for each vehicle type using the EMFAC2017. Fuel efficiency factors are shown in **Appendix A Table EN-3** and energy use calculations are shown in **Appendix A Table EN-4.** Trip counts estimated using CalEEMod® default methods are shown in **Air Quality Appendix A Table CON-4** for details. CalEEMod® defaults were also used for worker, vendor, and haul trip lengths.

Electricity required to supply, treat, and transport water to the Proposed Project site for dust control purposes is assumed to be negligible and is thus not calculated in this analysis. Summaries of the total estimated Proposed Project construction energy use requirements for diesel fuel and gasoline are presented in **Appendix A Table EN-5**, as well as below in **Table 3** under the Impact ENE-1 discussion.

4.1.1.2 Operational Energy Estimates

Building Energy Use

Building electricity and natural gas usage rates for the CEQA Baseline, Year 10 Project, and Year 30 Project buildings are presented in **Appendix A Table EN-6**. CEQA Baseline electricity and natural gas usage rates are based on historical usage data provided by Bayer. These historical rates were converted to energy usage per square foot for each land use type based on existing square footage at the Proposed Project site. The CEQA Baseline energy estimate was calculated based on the energy use per square footage by land use type multiplied by the total square footage (construction area plus additional area under the existing development agreement) of each land use type analyzed in the CEQA Baseline scenario. The energy use rate for the total constructed area that has been constructed does not account for 2019 Title 24 standards, but the additional area under the existing DA incorporates 2019 Title 24 standards. Natural gas usage for the Utility land use alone was calculated based on total natural gas consumption from the existing boilers. Further details on the existing and proposed natural gas usage rates are provided below. Parking lighting energy use rates for CEQA Baseline and the Proposed Project are based on CalEEMod® default estimates since site-level parking energy usage rates were not available.

Year 10 and Year 30 electricity and natural gas usage rates were calculated by assuming a 5% increase in energy use per square foot rates relative to CEQA Baseline (except for the Utility land use which was calculated based on total natural gas consumption from the existing boilers plus expected consumption from a new boiler). This 5% increase in energy usage is over and above the two-year annual energy (purchased electricity and natural gas) usage for 2016 – 2017[58]. This is a conservative basis upon which to estimate increases, as the total energy consumed in 2017 was the highest level of energy consumption recorded in the past 5 years. The energy usage dropped after 2017 due to the demolition of energy-intensive production buildings in 2018. While newer buildings are more energy

[58] The total electricity purchased was 196.9 MMBtu/year in 2016 and 200.2 MMBtu/year in 2017, representing a 1.6% increase in electricity consumption. The total natural gas purchased was 2030 MM Gal/year in 2016 and 2128 MM Gal/year in 2017 representing a 4.8% increase in consumption between the two years. Based on these estimates, the increase in energy usage was conservatively assumed to be about 5%.

efficient as a result of the California Energy Commission (CEC) standards, the 5% increase also reflects the overall site-level increase in energy usage due to an expected increase in number of employees and an increase in production capacity and research intensity without considering efficiencies that would result from new CEC standards [59]. However, factoring in the reductions due to 2019 Title 24 Impact Analysis, consistent with the CEC, we would expect a reduction of 10.7% in electricity usage rates and 1% in natural gas usage, rates even when incorporating the 5% increase from CEQA Baseline usage. As a result, there is a net decrease in building electricity usage for the Year 10 Project and a small increase for the Year 30 Project. Building natural gas usage, excluding boilers, also shows a net decrease for the Year 10 Project and the Year 30 Project. CalEEMod® default enclosed parking structure lighting rates do not incorporate the 2019 Title 24 standards and these rates were reduced by 35% to reflect the 2019 Title 24 Standards.[60,61,62]

Since the City of Berkeley has banned the use of natural gas in any newly constructed commercial or residential building (manufacturing labs are excluded), all the new administration, production, maintenance and warehouse buildings are not expected to have natural gas consumption in the Year 10 Project and Year 30 Project; electric appliances will be installed in all these buildings to supply the required energy. The electricity usage for the Year 10 Project and Year 30 Project account for the increase in electricity use due to switching from natural gas to electric source of energy. The methodology used to account for the electricity increase due to switching from natural gas is approximated by assuming a one-to-one conversion of energy usage from natural gas to electricity. Bayer also proposes to incorporate sustainability design features such as installing energy efficient lighting, solar panels on rooftops and parking areas, and energy efficient energy star appliances for refrigeration systems, electrifying building energy systems and appliances where applicable, and increasing investment in renewable or alternative energy systems. However, the energy analysis presented in this memo conservatively does not take credit for the reduction in energy usage due to implementation of these sustainability features. Total electricity and natural gas usage required for the Year 10 Project and Year 30 Project operations are summarized in **Table 4**, below under Impact ENE-1.

Water Supply, Treatment, and Distribution Energy Use

Additional electricity use is required to supply, treat, and distribute potable water and to treat the resulting wastewater. These calculations are presented in **Appendix A Table EN-7**. Site level water usage was provided by Bayer and the usage is expected to remain constant for CEQA Baseline, the Year 10 Project, and the Year 30 Project. This is a conservative assumption as water use is expected to decrease for the Proposed Project years due to installation of water efficient appliances and

[59] This increase also accounts for the installation of two new gamma irradiation devices. These devices are rated at 1850 W each and Bayer has estimated that each will operate 1000 minutes per year, resulting in far less than 1 MW per year of electricity consumption or less than 0.0001% of Bayer's baseline electricity usage. This negligible increase in electricity demand would be more than accounted for in the 5% increase in energy use as described above.

[60] Reduction in enclosed parking structure lighting rate was calculated based on lighting power density values (in Watts per square foot) for "Parking Garage Building" in Table 140.6-B of the 2016 and 2019 Building Energy Efficiency Standards.

[61] CEC, 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, June 2015. https://ww2.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf, accessed November 2020.

[62] CEC, 2019 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, December 2018. https://ww2.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf, accessed November 2020.

production processes. Electricity usage rates for the supply and treatment of water were calculated using CalEEMod® default factors. The total water-related electricity that would be required for Proposed Project operations are summarized in **Table 4**, below under Impact ENE-1.

Mobile Energy Use

Mobile fuel usage for the CEQA Baseline and the Year 10 and Year 30 Projects are summarized in **Appendix A Table EN-10**. Gasoline, diesel, natural gas, and electricity use rates were calculated based on trip rates provided by Fehr and Peers[63], CalEEMod® default trip lengths, and fuel efficiency rates derived from EMFAC2017 and the US Department of Energy. Fuel efficiency for gasoline, diesel, and natural gas fueled vehicles was calculated from EMFAC2017 daily VMT and fuel consumption data, averaged across all vehicle categories for operational year 2025 for the Year 10 Project and 2035 for the Year 30 Project. Fuel efficiency for electric vehicles was obtained from US Department of Energy data. The total fuel usage that would be required for CEQA baseline and Proposed Project operations is summarized in **Table 4**, below under Impact ENE-1.

Emergency Generator Energy Use

The site currently has six emergency generators ranging in size from 125 kilowatts (kW) to 2,000 kW. Bayer indicated that two of the existing generators would be replaced in Year 10 with two new 2,000 kW diesel generators. The remaining four existing generators would be replaced in Year 30 with three new 2,000 kW diesel generators. BAAQMD has published the Diesel Free By '33 initiative which proposes to eliminate diesel usage by end of 2033. The new generators to be installed in Year 30 were conservatively assumed to be diesel fueled even though Bayer may commit to other sources of backup power.[64] The emergency generator diesel use for CEQA Baseline, Year 10 Project, and Year 30 Project is calculated in **Appendix A Table EN-8**. Annual fuel usage was calculated based on fuel consumption rates (in gallons per hour) and annual operating hours. For existing generators, the fuel consumption rates were obtained from facility data, while the hours of operation were obtained from Bayer's BAAQMD permit. For the proposed generators, the fuel consumption rates were obtained from the manufacturer's specification sheet. A routine proposed maintenance and testing run time of 50 hours per year for each of the emergency generators was assumed,, consistent with the maximum allowed testing time pursuant to the ATCM for Stationary Compression Ignition Engines (17 CCR 93115) was used in the analysis of the Year 10 and Year 30 Projects.

Boiler Natural Gas Usage

As discussed in the Building Energy Use section above, natural gas usage for the Utility land use is exclusively due to boilers. Three existing boilers were included in this analysis: one 350 horsepower (hp) boiler, with a heat input rate of 14.7 MMBtu/hr, housed in Building 44 (B44), and two 900 hp boilers, each with a heat input rate of 37.8 MMBtu/hr, housed in Building 63 (B63). The 350 hp boiler has a utilization rate of 50% and the 900 hp boilers have utilization rates of 25%. Boiler specifications for the existing boilers were obtained from BAAQMD permits for the Bayer facility. CEQA Baseline utilization rates for each of these boilers were provided by Bayer based on historical operations and are expected to remain constant for the Year 10 Project and Year 30 Project. Annual natural gas consumption was calculated by adjusting 8,760 hours of operation per year by the boiler's utilization rate. The site also has two smaller boilers located in B28A that are 0.334 MMBtu/hour and 3.25 MMBtu/hour. These two boilers are exempt from BAAQMD permitting due to their size and capacity. The natural gas consumed by these boilers to supply heating to building B28A is included in the building energy usage calculations as shown in **Appendix A Table EN-6**. Building natural gas

[63] Fehr & Peers, Bayer Berkeley Project – Transportation Findings. September 29, 2020

[64] BAAQMD. Diesel Free by '33. https://dieselfree33.baaqmd.gov/, accessed October 2020.

combustion emissions are estimated based on CalEEMod® default emission factors which are generally more conservative than boiler emissions. The existing boilers will continue to operate through the Year 10 Project and the Year 30 Project and the two smaller boilers will be relocated to building B82 in the Year 10 Project. The steam consumption for the Year 10 Project and the Year 30 Project are projected to increase by roughly 17% compared to CEQA Baseline permitted levels. In order to accommodate this increase in steam consumption, an additional boiler (400 hp, 15.94 MMBtu/hr) located in Building 46 (B46) is expected to become operational in the Year 10 Project. The 17% increase in steam usage is based on the increase in engine horsepower by 400 BHP from the current configuration which operates one 350 HP boiler and two 900 HP boiler to service the site with a boiler efficiency of 80%, plus other ancillary gas usage.[65] The horsepower and capacity of this proposed boiler were calculated based on the expected increase in steam requirements for the Year 10 Project and is assumed to stay constant for the Year 30 Project.

Summaries of the total estimated CEQA Baseline and Proposed Project operational energy use requirements for electricity, gasoline, diesel fuel, and gasoline are presented in **Appendix A Table EN-11**, as well as below in **Table 4** under the Impact ENE-1 discussion.

4.2 Impacts

4.2.1 Impact ENE-1:

Construction and operation of the Project could result in potentially significant environmental impact due to the wasteful, inefficient, and/ or unnecessary use of energy. (Criterion 1.). (*Less than Significant*)

Construction Energy Use

Construction of the Proposed Project would require the use of fuels (primarily gasoline and diesel) for the operation of construction equipment and vehicles to perform a variety of activities, including excavation, hauling, paving, and vendor and construction worker travel.

Table 3 presents total and annual average estimated construction energy consumption by energy source for the Year 10 Project and Year 30 Project.

Total energy consumption would occur over different calendar years and would fluctuate depending on the type of construction activity underway during any particular time period. Construction is expected to take place in 2024 and 2029 for the Year 10 Project and 2034 and 2049 for the Year 30 Project. Gasoline and diesel fuel would be the primary energy source for vehicles driven by construction crews and to power the large trucks used to deliver and retrieve construction equipment, materials, and debris. Total gasoline and diesel fuel usage by the transportation sector in California was expected to be 14.8 billion gallons and 4.5 billion gallons, respectively, in 2019.[66] Project Year 10 construction fuel usage would represent 0.0083% of the state's transportation sector diesel fuel usage and 0.00012% of the state's transportation sector gasoline usage. Project Year 30 construction fuel usage would represent 0.0056% of the state's transportation sector diesel fuel usage and 0.00013% of the state's transportation sector gasoline usage. Off-road construction equipment also consumes fuel while idling.

[65] The 17% increase in natural gas usage is calculated as the increase in BHP rating for all boilers based on the total BHP rating for the existing boilers (2,150 BHP) and proposed increase in rating for Boilers in Year 10 and Year 30 (2,550 BHP) with a boiler efficiency of 80% as ((2550 – 2150)/2150)*0.8 =~15%. The increase in natural gas usage also includes other ancillary gas usage.

[66] CARB, 2020. EMFAC Emissions Inventory: Statewide, Calendar Year 2019. Sum of Onroad and Offroad Emissions. https://arb.ca.gov/emfac/emissions-inventory, accessed October 2020.

CARB implemented The Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling limits idling to five minutes at any one location. This was done to save fuel because CARB estimated that heavy-duty vehicles (off-road equipment) can consume up to one gallon of diesel fuel per hour of idling, which can total to 1,500 gallons of diesel fuel per year per vehicles that could idle for 1,500 hours in a year. By implementing this rule, idling is greatly reduced, and the use of diesel fuel is reduced. The Proposed Project would be compliant with this ATCM. This ATCM has led to fuel savings of approximately 121 million gallons per year statewide since full implementation.[67]

Table 3: Proposed Project Construction Energy Resource Use

Energy Use Type	Unit of Measure	Year 10 Project Construction Energy Usage	Year 30 Project Construction Energy Usage
Diesel			
On-road vehicles[1]	gallons	21,051	18,856
Off-road equipment[2]	gallons	350,208	232,531
Total Diesel Use	**gallons**	**371,259**	**251,387**
Gasoline			
On-road vehicles[1]	gallons	18,310	19,361
Total Gasoline Use	**gallons**	**18,310**	**19,361**

NOTES:

[1] On-road mobile source fuel use is based on vehicle miles traveled (VMT) for all years of construction and fleet-average fuel consumption in gallons per mile from EMFAC2017 for calendar years 2024, 2029, 2034, and 2049 in Alameda County.

[2] Off-road diesel fuel usage based on a fuel usage rate of 0.057 gallons of diesel per horsepower (hp)-hour for equipment up to 100 HP and 0.052 gallons of diesel per horsepower (hp)-hour for equipment greater than 100 HP, consistent with diesel conversion factors provided in CARB 2017 Off-road Diesel Emission Factors database[68].

SOURCE: Ramboll, 2020. Appendix A Table EN-2 to Table EN-5

Operational Energy Use

Proposed Project operations would require long-term consumption of energy in the form of electricity, natural gas, gasoline, and diesel fuel. The electricity, natural gas, and water usage that would be required for operation of the proposed buildings have been estimated based on Proposed Project specific building area estimates, historical data, future projections, and CalEEMod® default factors, as discussed above. Electricity would be used as the primary power source for the proposed buildings, including to operate the heating, ventilation, and air conditioning (HVAC) system etc. In addition, water use for buildings would require the consumption of electricity to supply and distribute potable water to the buildings and to treat wastewater generated at the buildings. Natural gas use for the

[68] CARB, 2017b. 2017 Off-road Diesel Emission Factors. https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road, accessed October 2020.

buildings would primarily be associated with space and water heating. The manufacturing buildings require steam from natural gas-fired boilers at the site. CEQA Baseline and Proposed Project usage of these boilers is based on current records and future usage estimates.

Mobile source fuel use associated with operation of the Proposed Project has been estimated based on VMT and the fleet-average fuel consumption (in gallons per mile) from EMFAC2017 Electricity demand for electric vehicles is based on VMT estimated for the Proposed Project, and estimated EV energy economy (in kWh per mile), assuming 30 kWh/100 miles for CEQA Baseline, Year 10 Project, and Year 30 Project. This is a conservative assumption as EV fuel efficiency is expected to increase in future years, resulting in decreased electricity demand. Furthermore, based on State targets and current trends, EV penetration may increase beyond EMFAC defaults, which would increase electricity consumption and decrease fossil fuel consumption relative to what is presented in **Appendix A Tables EN-10 and EN-11,** as well as **Table 4** below.

The annual energy use requirements estimated for full buildout operations of the Proposed Project (Year 10 and Year 30) relative to CEQA Baseline conditions are summarized in **Table 4** by energy use type.

Based on the energy use analysis, the Proposed Project would utilize energy necessary for on-site construction activities and for transportation of material and workers to and from the site. The Proposed Project operational fuel consumption is also expected to be below the baseline level for all fuel sources except natural gas. The Proposed Project would also implement measures to further reduce energy consumption such as energy efficient lighting, rooftop solar panels, and electrification of building energy systems and appliances where applicable. Furthermore, Section 4.2.1.1 analyzes the factors identified in Appendix F of the CEQA Guidelines relating to whether a project would result in the wasteful, inefficient, or unnecessary consumption of fuel or energy, and concludes the Proposed Project avoids wasteful, inefficient, or unnecessary consumption of fuel or energy. As a result, the Proposed Project construction and operation will not result in the wasteful, inefficient or unnecessary consumption of energy and the impacts would be less than significant.

Table 4: Proposed Project Operational Energy Use (Annual)

Energy Use Type	CEQA Baseline (2020)	Year 10 Project Operations (2025)	Change from CEQA Baseline to Year 10 Project[1]	Year 30 Project Operations (2035)	Change from CEQA Baseline to Year 30 Project[1]
Electricity (MWh/year)					
Building Energy	102,993	72,480	-30,513	105,902	2,909
Water Consumption	293	293	0	293	0
Mobile Sources	87	127	40	265	178
Total Electricity Use	**103,373**	**72,900**	**-30,473**	**106,460**	**3,087**
Gasoline (gallons/year)					
Mobile Sources	688,162	459,602	-228,560	489,003	-199,159
Total Gasoline Use	**688,162**	**459,602**	**-228,560**	**489,003**	**-199,159**
Diesel (gallons/year)					
Generator Testing	23,156	34,690	11,534	34,500	11,344
Mobile Sources	197,455	149,785	-47,670	179,580	-17,875
Total Diesel Use	**220,611**	**184,475**	**-36,136**	**214,080**	**-6,531**
Natural Gas (MMBtu/year)					
Building Energy (excl. natural gas Boilers)	40,446	11,177	-29,270	14,093	-26,354
Natural Gas Boilers	228,386	368,040	139,654	386,040	139,654
Mobile Sources	0.48	0.48	-0.0020	0.71	0.23
Total Natural Gas Use	**268,833**	**379,217**	**110,385**	**382,134**	**113,301**

NOTES:
MMBtu = million British Thermal Unit; MWh = Megawatt-hour

[1] Positive values indicate an increase in energy usage relative to CEQA Baseline, while negative values indicate a decrease in energy usage.

SOURCE: Ramboll, 2020. **Appendix A Table EN-11**

4.2.1.1 Analysis of Factors Identified in CEQA Guidelines Appendix F

Appendix F of the CEQA Guidelines identifies factors relating to whether a project would result in the wasteful, inefficient, or unnecessary consumption of fuel or energy, and conversely whether the project would fail to incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation or other project features. The Appendix F factors are addressed below and used as guidance to evaluate the energy impact of the Proposed Project relative to the identified significance criteria.

Appendix F.II.C.1: Energy Requirements and Energy Use Efficiencies

CEQA Guidelines Appendix F, Section II.C.1, includes the following impact guidance factor:

> *The project's energy requirements and its energy use efficiencies by amount and fuel type for each stage of the project including construction, operation, maintenance and/or removal. If appropriate the energy intensiveness of materials may be discussed.*

The energy estimates in this evaluation include electricity and natural gas, and fuels used for construction and operation of the Proposed Project. These energy use requirements are summarized in **Table 3** for the construction activities and in **Table 4** for CEQA Baseline, Year 10 Project and Year 30 Project operations. As shown in these tables, the amounts of electricity, diesel, and gasoline consumed during the construction and operational of the Proposed Project would be minimal for construction, and lower than the CEQA Baseline for operations with the exception of electricity usage for the Year 30 Project and natural gas usage for the Year 10 Project and Year 30 Project. Despite the overall decrease in non-parking square footage for the Year 30 Project relative to the CEQA Baseline, electricity usage is expected to increase as the electricity increases for the administration, production, and parking land uses outweigh the decreases across the remaining land uses. This electricity increase can also be partially attributed to the elimination of natural gas in favor of electricity for the administration, production, and warehouse land uses. Natural gas usage is expected to increase relative to the CEQA Baseline due to the installation of an additional natural gas boiler during Year 10 Project in order to accommodate increased steam generation requirements. Building natural gas usage (non-boiler) would decrease relative to the CEQA Baseline.

Appendix F.II.C.2: Local and Regional Energy Supplies

CEQA Guidelines Appendix F, Section II.C.2, includes the following impact guidance factor:

> *The effects of the project on local and regional energy supplies and on requirements for additional capacity.*

This factor is further discussed in Section 4.2.2, within the Electricity, Natural Gas, and Transportation Fuels subsections.

Appendix F.II.C.3: Peak and Base Period Demands

CEQA Guidelines Appendix F, Section II.C.3, includes the following impact guidance factor:

> *The effects of the project on peak and base period demands for electricity and other forms of energy.*

This factor is further discussed in Section 4.2.2, within the Peak and Base Period Demand subsection.

Appendix F.II.C.4: Existing Energy Standards

CEQA Guidelines Appendix, Section II.C.4, includes the following impact guidance factor:

The degree to which the project complies with existing energy standards.

This factor is further discussed in section 4.2.3.

Appendix F.II.C.5: Energy Resources

CEQA Guidelines Appendix F, Section II.C.5, includes the following impact guidance factor:

The effects of the project on energy resources.

The Proposed Project's energy use, including electricity, natural gas, gasoline, and diesel consumption, would primarily be associated with construction activities, vehicle travel, building operations, and emergency generator testing and maintenance. Total energy use requirements are shown in **Table 3** for construction activities and in **Table 4** for the operational activities. Refer to Section 4.2.2 (Appendix F.II.C.2 and F.II.C.3 discussions) for the effects that the Proposed Project would have on energy resources. The Proposed Project will limit idling of construction vehicles, limit vehicle travel through the Transportation Demand Management Program, and divest natural gas usage from all land uses other than manufacturing and natural gas boilers. Despite an increase in total VMT due to the additional employees, total gasoline and diesel fuel consumption are expected to decrease from the CEQA Baseline to the Year 30 Project due to the use of vehicles that meet increasingly stringent fuel efficiency standards. Despite the construction of new all-electric buildings, total electricity consumption will barely increase from the CEQA Baseline to the Year 30 Project due to compliance with the Title 24 Energy Efficiency Standards, CalGreen, and improved appliance efficiency standards, among other requirements that conservatively have not been fully incorporated into this analysis. These developments will implement the efficient use of energy. The Proposed Project's use of energy would not have a substantial adverse effect on statewide or regional energy resources relative to wasteful, inefficient, or unnecessary use of energy.

Appendix F.II.C.6: Transportation Energy Use

CEQA Guidelines Appendix F, Section II.C.6, includes the following impact guidance factor:

The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

The Proposed Project's transportation energy use requirements in terms of gasoline, diesel, natural gas, and electricity quantities for construction and operation of the Proposed Project are presented in **Table 3 and Table 4**, respectively. SB 743 requires the Office of Planning and Research (OPR) to identify new metrics for identifying and mitigating transportation impacts within CEQA. OPR has identified net VMT as well as VMT per capita and per employee as metrics for land use project transportation analyses. The quantification of VMT associated with Proposed Project operations, which is used to quantify the total operational transportation-related energy use requirements, is discussed in detail in the Transportation Impact Analysis Memo[69]. Through its Transportation Demand Management (TDM) Program, Bayer currently funds the West Berkeley Bay Area Rapid Transit (BART) Shuttle, which runs from the Ashby BART Station and the Bayer site, and is used by approximately 120 people daily. In addition to shuttle services, the program reduces single-occupancy vehicle use through a combination of pretax benefits, bicycle commuting incentives, and telecommuting options for qualified employment positions. The program would continue to be implemented under the Proposed Project.

[69] Fehr & Peers, Bayer Berkeley Project – Transportation Findings. September 29, 2020.

Based on the above analysis, the Proposed Project avoids wasteful, inefficient, or unnecessary consumption of fuel or energy.

4.2.2 Impact ENE-2:

Construction and operation of the Project could result in potentially significant environmental impact due to energy demand substantially affecting local and regional energy supplies and capacity (Criterion 2.). (*Less than Significant*)

As discussed above, the Proposed Project would result in the consumption of electricity, natural gas, gasoline, and diesel associated with mobile vehicle sources, building energy uses, boiler use, emergency generator operations, and construction activities. The Proposed Project site is currently supplied both electricity and natural gas by PG&E. PG&E has established contracts and commitments to ensure there is adequate electricity generation and natural gas capacity to meet its current and future energy loads. Total energy use requirements are shown in **Table 3** for construction activities and in **Table 4** for the CEQA Baseline, Year 10 and Year 30 Project operations.

Electricity

To put the Proposed Project's operational electricity requirements in context, in 2019 the total generated electricity for California was 277,704 GWh of electricity,[70] of which consumers in Alameda County used 10,684 GWh.[71] The CEC estimates that state-wide energy demand will increase to 320,375 GWh in 2025 based on an average annual mid-energy demand growth rate of 1.32%.[72] As shown in **Table 4**, the Proposed Project's anticipated long-term operational electricity usage reduces from 103,373 MWh per year for the CEQA Baseline in 2020 to 72,900 MWh per year by Year 10 Project full buildout in 2025 reflects a decrease of -30,473 MWh per year in electricity usage. Year 30 Project full buildout electricity usage in 2035 is expected to be 106,460 MWh per year, corresponding to a 3,087 MWh per year increase over CEQA Baseline. This small increase represents approximately 0.001% of the total 2019 state-wide electricity usage and 0.03% of Alameda County electricity usage. There will be no electricity usage associated with Proposed Project construction activities.

Based on a comparison to the state-wide and Alameda County annual energy demand and the projected demand growth rate, the Year 30 Project-related increase in electricity consumption would not cause adverse effects on local and regional energy supplies or require additional generation capacity beyond the state-wide planned increase to accommodate projected energy demand growth. The Year 10 Project-related decrease in electricity will have a neutral, if not beneficial, impact. The Proposed Project's building electricity use can be considered efficient due to compliance with statewide regulations such as California Energy Efficiency Standards and California Green Building Standards Code (Title 24, Parts 6 and 11, respectively). In addition, the Proposed Project's operational electricity demand estimates conservatively exclude a number of energy savings features, such as: future revisions to Title 24 energy standards, construction of energy efficiency buildings, installation of solar panels, installation of energy efficiency appliances, and other developments which would further reduce electricity demand.

[70] CEC, 2020a. 2019 Total System Electric Generation. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2019-total-system-electric-generation, accessed October 2020.

[71] CEC, 2020c. *Electricity Consumption by County*. http://www.ecdms.energy.ca.gov/elecbycounty.aspx, accessed October 2020.

[72] CEC, 2018a. *California Energy Demand 2018-2030 Revised Forecast*. https://efiling.energy.ca.gov/URLRedirectPage.aspx?TN=TN222287_20180120T141708_The_California_Energy_Demand_20182030_Revised_Forecast.pdf, docketed January 2018, accessed October 2020.

Natural Gas

There would be no natural gas consumption associated with Proposed Project construction activities. The Proposed Project's annual operational natural gas consumption is estimated to increase by 110,385 MMBtu from 268,833 MMBtu for the CEQA Baseline in 2020 to 379,217 MMBtu at Year 10 full buildout in 2025 (**see Table 4**). In comparison, state-wide natural gas consumption in 2019 was approximately 1,315,800,000 MMBtu and Alameda County natural gas demand was 38,415,053 MMBtu in 2019.[73] The increase in natural gas usage for Year 10 Project operations is approximately 0.0084% of the total 2019 state-wide natural gas consumption and 0.29% of Alameda County natural gas consumption. Natural gas usage for Year 30 Project operations (2035) is expected to be 382,134 MMBtu per year, corresponding to a 113,301 MMBtu per year increase relative to baseline conditions. The increase in natural gas usage for Year 30 operations is approximately 0.0086% of the total 2019 state-wide natural gas consumption and 0.29% of Alameda County natural gas consumption. The Proposed Project's estimated natural gas consumption rate is not substantial compared to the 2019 countywide consumption and would not cause adverse effects on local and regional energy supplies or require additional transmission capacity beyond the state-wide planned increase in consumption.

The natural gas usage in both the Year 10 Project and Year 30 Project is higher than the CEQA Baseline natural gas usage. This increase is due to the installation of an additional natural gas boiler during the Year 10 Project, which will allow for the expected increase in production capacity and research intensity of the Proposed Project. The prohibition of natural gas usage in the Proposed Project is not technologically feasible in manufacturing and laboratory operations and requiring its use would materially and adversely affect the biopharmaceutical manufacturing process and the production of medicines. More specifically, an electrically powered alternative is not available that would allow Proposed Project operations to meet the Biosafety Level 2 precautions ("BSL-2") and other strict protocols and contamination performance standards necessary for cell therapy and other biopharmaceutical processes envisioned under the Proposed Project. Despite the increase in natural gas consumption from boilers, the Proposed Project would be compliant with the City of Berkeley's natural gas prohibition for all non-exempt buildings, as evidenced by the net decrease in building natural gas usage (non-boiler) for the Year 10 Project and Year 30 Project. Furthermore, natural gas usage may decrease from what is estimated in both the Year 10 Project and Year 30 Project due to future revisions to Title 24 energy standards and installation of even more energy efficient equipment.

Transportation Fuels

Off-road construction equipment and on-road vehicles would consume a total of 371,259 gallons of diesel fuel over the course of the Year 10 Project construction, and a total of 251,387 gallons of diesel fuel over the course of the Year 30 Project construction. On-road worker vehicles would consume a total of 18,310 gallons of gasoline over the course of the Year 10 Project construction, and a total of 19,361 gallons of gasoline over the Year 30 Project construction (see **Table 3**). While construction will likely be occurring over more than one year, for the purposes of this comparison, and to be conservative, it was assumed that all transportation fuel use during construction takes place over one year. For the Year 10 Project, construction diesel consumption is approximately 0.012% of the total 2019 state-wide diesel consumption and 0.68% of 2019 Alameda County diesel consumption. Gasoline consumption is approximately 0.00012% of the total 2019 state-wide gasoline consumption and 0.0031% of 2019 Alameda County gasoline consumption. For the Year 30 Project, construction diesel

[73] CEC, 2020b. 2018 *Gas Consumption by County*. http://www.ecdms.energy.ca.gov/gasbycounty.aspx, accessed 2020.

consumption is approximately 0.0081% of the total 2019 state-wide diesel consumption and 0.46% of 2019 Alameda County diesel consumption. Gasoline usage is approximately 0.00013% of total 2019 state-wide gasoline consumption and 0.0033% of 2019 Alameda County gasoline consumption.[74]

During operations, it is estimated that there will be a net annual decrease in consumption of diesel fuel for the Year 10 Project and Year 30 Project relative to the CEQA Baseline of 36,136 gallons per year and 6,531 gallons per year, respectively. There will be a net annual decrease in gasoline consumption for the Year 10 Project and Year 30 Project relative to the CEQA Baseline of 228,560 gallons per year and 199,159 gallons per year, respectively. The net decrease in gasoline consumption in the Year 30 Project is mainly due to the Proposed Project's TDM program and the increase in the efficiency of gasoline vehicles.

Note that the statewide fuel sales data is from the BOE, while the Alameda County fuel sales data is from the CEC (see sections 2.1.3 and 2.2.5, respectively). The BOE tracks all fuel sales, both retail and non-retail, but only at a statewide level. Thus, Alameda County data had to be obtained from a different source (CEC). The CEC, however, only tracks retail level fuel sales. As a result, the percentage of Alameda County gasoline or diesel consumption that the Proposed Project represents is overestimated relative to the percentage of statewide gasoline or diesel consumption.

Peak and Base Period Demand

Peak period electrical demand is the short period of time during which electrical power is needed when electricity is in highest demand. Base period electrical load is the minimum amount of electrical demand needed over a 24-hour time period. Wasteful, inefficient, or unnecessary consumption or use of energy during the peak period of electrical demand has greater potential to cause adverse environmental effects compared to during the base period because of the higher demand during the peak period. The Proposed Project would not have a substantial impact on the peak and base period demands for electricity or other forms of energy. The Proposed Project's base energy consumption compared to regional and statewide energy consumption is discussed above. Further details and reasoning on the peak demand are described below.

In 2019, California's peak grid demand was 44,301 MW. On that same peak day, PG&E reached a maximum demand of 21,242 MW.[75] In comparison, the Proposed Project's annual electricity usage rates of 103,373 MWh, 72,900 MWh, and 106,460 MWh for the CEQA Baseline, Year 10 Project, and Year 30 Project, respectively, correspond to average hourly electricity demands of 11.8 MW, 8.3 MW, and 12.2 MW, respectively. Annual electricity usage was converted to average hourly electricity usage assuming 8,760 hours per year of operations. The maximum peak demand is anticipated to be no more than twice the hourly average usage, corresponding to 23.6 MW, 16.6 MW, and 24.3 MW for the CEQA Baseline, Year 10 Project, and Year 30 Project, respectively.[76] This also conservatively excludes improvements in demand response due to future updates to the Title 24 energy standards. These future updates would further reduce peak demand through performance standards that are based on

[74] Note that the most recent year for which gasoline and diesel consumption data is available is different for State of California and Alameda County. Data for the State of California is available for 2019 and data for Alameda County is available for 2018.

[75] California Independent System Operator (Cal ISO), 2020. 2019-2020 Transmission Plan, March 25, 2020. http://www.caiso.com/Documents/ISOBoardApproved-2019-2020TransmissionPlan.pdf, accessed October 2020.

[76] Since the peak energy demand for the Proposed Project was not available, Ramboll used a factor of 2 to estimate the peak demand based on historic CAISO peak-to-average demand ratio. Peak-to-average electricity demand ratio rising in California. https://www.eia.gov/todayinenergy/detail.php?id=15051#tabs_SpotPriceSlider-7, accessed October 2020.

the time dependent valuation of energy, which utilizes the value of the electricity or natural gas used during every hour of the year to incentivize load shifting off of the peak use periods.

The overall energy use requirements would not be substantial relative to the current total sales of transportation fuels in Alameda County. Operational energy requirements for the Year 10 Project and the Year 30 Project represent a net decrease in energy resource use relative to baseline, with the exception of the Year 30 Project electricity and the Year 10 Project and Year 30 Project natural gas use which results in a negligible net increase over the CEQA Baseline compared to statewide and Alameda electricity consumption rates. Additionally, the Year 10 Project and Year 30 Project peak demand represent approximately 0.08% and 0.11% of PG&E's peak demand, respectively, and with proper planning of the PG&E power generation inventory, would have a relatively minor effect on PG&E's system-wide peak demands. As a result, the Proposed Project construction and operation will not result in energy demand substantially affecting local and regional energy supplies and capacity and the impacts would be less than significant.

4.2.3 Impact ENE-3:

Construction and operation of the Project could conflict with or obstruct adopted energy conservation plans or violate energy efficiency standards. (Criterion 3). (*Less than Significant*)

Discussion of whether construction and operation of the Proposed Project would result in a conflict with adopted energy conservation plans or violate energy efficiency standards are discussed below relative to construction vehicles and equipment, building efficiency, and transportation.

Appendix F.II.C.4: Existing Energy Standards

CEQA Guidelines Appendix, Section II.C.4, includes the following impact guidance factor:

> *The degree to which the project complies with existing energy standards.*

The Proposed Project would comply with existing energy standards, including state and local standards designed to minimize use of fuel in construction vehicles, ensure that buildings employ strict energy efficiency techniques, and operate comprehensive transportation demand management programs, as described above. For a full list of relevant state and local standards, see Sections 3.2 and 3.3. In fact, the Proposed Project would remove older energy inefficient buildings and replace them with buildings compliant with the most recent Title 24 standards.

Construction Vehicles and Equipment

Proposed Project construction would require use of on-road trucks for soil and debris hauling and material deliveries, and off-road equipment such as excavators, cranes, forklifts, and pavers. The Proposed Project would comply with state and local requirements designed to minimize idling and associated emissions, which also minimizes use of fuel. In accordance with BAAQMD's Basic Construction Mitigation Measures, idling times for heavy duty trucks and vehicles shall be minimized by turning off the engine or reducing idling to a maximum of 5 minutes.[77] In accordance with CARB emissions standards, all construction equipment with a model year of 2012 or later will comply with the engine standards of 13 California Code of Regulations Section 2449.

[77] BAAQMD, 2017. California Environmental Quality Act Guidelines. May 2017. https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/baaqmd-ceqa-guidelines-may-2011.pdf, accessed October 2020.

Building Efficiency

The Proposed Project's anticipated electricity and natural gas use in buildings are discussed above. New building construction is subject to California's Title 24 by law, as discussed in Section 3.2.7, above. California's Title 24 reduces energy use in residential and commercial buildings through progressive updates to both the Green Building Standards Code (Title 24, Part 11) and the Energy Efficiency Standards (Title 24, Part 6). Provisions added to Title 24 over the years include consideration and possible incorporation of new energy efficiency technologies and methods for building features such as space conditioning, water heating, lighting, as well as construction waste diversion goals. Additionally, some standards focus on larger energy saving concepts such as reducing loads at peak periods and seasons, improving the quality of energy-saving installations, and performing energy system inspections. Past updates to the Title 24 standards have proven very effective in reducing building energy use, with the 2013 update to the energy efficiency standards estimated to reduce energy consumption in residential buildings by 25% and energy consumption in commercial buildings by 30%, relative to the 2008 standards.[78] The 2019 standards further reduce non-residential electricity consumption by approximately 10.7% and natural gas consumption by 1%[79] and have been incorporated into this analysis. By law, the Proposed Project will comply with these standards.

Because the Proposed Project construction is proposed to occur in 2024 and 2029 for the Year 10 Project and in 2034 and 2049 for the Year 30 Project, further reductions can be anticipated from future Title 24 code revision cycles if building permits are issued at future dates corresponding to those updates.

As discussed above, manufacturing lab facilities are the only use of natural gas in the Proposed Project and would be exempt under the Natural Gas Prohibition Ordinance.

Transportation

The Proposed Project's anticipated transportation fuel usage are discussed above. As mentioned previously, Bayer will continue to fund the West Berkeley BART Shuttle program, which runs from the Ashby BART Station and the Bayer site. In addition to shuttle services, the program reduces single-occupancy vehicle use through a combination of pretax benefits, bicycle commuting incentives, and telecommuting options for qualified employment positions. The site provides EV chargers for its employees and currently includes 17 charging stations. The Proposed Project is expected to install five more chargers in the future. These programs and site features will support state goals to reduce emissions from personal transport and promote zero emission vehicles.

Impact Conclusion Summary

Based on the above analysis, the Proposed Project is expected to have a less than significant impact.

4.2.4 Cumulative Impacts

Impact ENE-1.CU: The Project, combined with cumulative development in the Project vicinity and citywide, could result in significant cumulative energy impacts. (Less than Significant)

[78] CEC, 2012. Energy Commission Approves More Efficient Buildings for California's Future. https://planning.lacity.org/eir/CrossroadsHwd/deir/files/references/C17.pdf, accessed October 2020.

[79] CEC, 2018c. 2019 Title 24 Impact Analysis, Update to the California Energy Efficiency Standards for Residential and Non-Residential Buildings, December 2018.

Geographic Context

The geographic scope of potential cumulative effects with respect to energy resources includes PG&E's electric grid and natural gas transmission system that would serve the Proposed Project, areas from which transportation fuels would be provided (for this EIR, publicly available fuel sources in the vicinity of the Proposed Project site), and the cumulative projects nearby.

Cumulative Impact and Project Contribution

There is no significant cumulative condition to which the Proposed Project could contribute related to the use of large amounts of fuel or energy in a wasteful or inefficient manner. The CEC is planning to meet 2050 statewide energy demands in a low-carbon and efficient manner.[80] Given the relatively small percentage of the Proposed Project's fuel and energy use compared to existing fuel and energy use in the region, the Proposed Project's less-than-significant incremental impacts related to the use of fuel or energy in a wasteful or inefficient manner are not expected to combine with the incremental impacts of other projects to cause an adverse cumulative impact. Moreover, the estimated consumption rates are not substantial compared to the 2018 countywide consumption. In addition, the Year 10 Project and Year 30 Project are expected to consume less energy than the CEQA Baseline (with the exception of electricity for the Year 30 Project and natural gas for the Year 10 Project and Year 30 Project), meaning any contribution to a cumulative impact, if it even existed, would not be considerable. Despite the overall decrease in non-parking square footage for the Year 30 Project relative to the CEQA Baseline, electricity usage is expected to increase as the electricity increases for the administration, production, and parking land uses outweigh the decreases across the remaining land uses. This electricity increase can also be partially attributed to the elimination of natural gas in favor of electricity for the administration, production, and warehouse land uses. Natural gas usage is expected to increase relative to the CEQA Baseline due to the installation of an additional natural gas boiler during Year 10 Project in order to accommodate increased steam generation requirements. Building natural gas usage (non-boiler) would decrease relative to the CEQA Baseline. The Proposed Project's incremental cumulative impact relating to the consumption of energy would be less than significant.

Proposed Project-related transportation fuel impacts could overlap with the transportation needs (including fuel needs) of previously approved past projects, as well as other present or future projects that occur during the Proposed Project's construction and operation. However, there is no significant cumulative condition to which the Proposed Project could contribute. In addition, implementation of sustainability features and BAAQMD's Basic Construction Mitigation Measures would help avoid wasteful or inefficient use of energy during construction. VMT associated with operations of the Proposed Project would be reduced based on the TDM features described above, and transportation fuel demand would continue to be reduced through increased vehicle fuel efficiency and electrification. Therefore, the Proposed Project's incremental impact associated with its energy use would result in less-than-significant cumulative impacts.

The nearby cumulative projects could require increased peak and base energy demands and, therefore, could cause or contribute to adverse cumulative conditions. However, the cumulative projects would be subject to the same applicable federal, state, and local energy efficiency requirements (e.g., the State's Title 24 requirements and Berkeley's Green Building Requirements) that would be required of the Proposed Project, which would result in efficient energy use during their construction and operation. As discussed in Section 4.2.2, the Year 10 Project's net decrease in

[80] CEC. 2019. Building a Healthier and More Robust Future: 2050 Low-Carbon Energy Scenarios for California. Available at: https://ww2.energy.ca.gov/2019publications/CEC-500-2019-033/CEC-500-2019-033.pdf. Accessed: October 2020.

electricity usage will have a small benefit and the Year 30 Project's small increase in electricity usage is negligible compared to Alameda and statewide demand and will not cause adverse effects. Furthermore, peak demand for both the Year 10 Project and Year 30 Project is expected to be approximately 0.1% of PG&E's peak demand during 2019. These estimates do not account for the Proposed Project's energy saving features, and are conservative. Thus, adverse Proposed Project-related impacts to electricity demand would be negligible, would not significantly impact peak or base power demands during construction, operation, or maintenance. Accordingly, the Proposed Project's less-than-considerable incremental contribution to cumulative peak and base demands would not be cumulatively significant.

Conclusion

Therefore, potential energy-related impacts that would result from construction and operation of development of the Proposed Project will have a less than significant cumulative impact.

APPENDIX A

Table EN-1
Energy Sources for the Project
Bayer CEQA Long-Range Development
Berkeley, California

Type	Source	Description
Construction	Off-Road Equipment	Diesel fuel and electricity use of off-road equipment
	On-Road Mobile Sources	Diesel hauling and vendor vehicle fuel use, and gasoline worker vehicle fuel use
Operations	Building Energy Use	Electricity and natural gas used in buildings
	On-Road Mobile Sources	Diesel, gasoline, electricity, and natural gas fuel used for vehicles
	Water	Electricity use for water supply, distribution, and treatment
	Standby Emergency Generators	Diesel fuel used by generators
	Natural Gas Boilers	Natural gas used by boilers

Table EN-2
Project Construction Off-Road Energy Usage
Bayer CEQA Long-Range Development
Berkeley, California

Year 10 Equipment Usage[1]

Location	Construction Subphase	Equipment	CalEEMod Equipment	Fuel[2]	Number	Horsepower	Load Factor	Number of Days[3]	Hours per Day[3]	Utilization[3]	Fuel Usage (gal diesel)[4]
A-North	Demolition	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	20	8	100%	816
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	20	8	100%	543
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	20	8	100%	659
C-North	Demolition	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	10	8	100%	408
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	10	8	100%	271
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	10	8	100%	330
A-South	Demolition	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	20	8	100%	816
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	20	8	100%	543
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	20	8	100%	659
A-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	226	8	100%	7,156
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	100%	3,724
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	226	8	100%	9,222
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	226	8	100%	6,136
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	226	8	100%	7,448
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	226	8	100%	6,253
		Forklifts	Forklifts	Diesel	2	89	0.2	226	8	100%	3,694
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	226	8	100%	7,448
		Air Compressors	Air Compressors	Diesel	1	78	0.48	226	8	100%	3,885
	Paving	Pavers	Pavers	Diesel	1	130	0.42	226	8	100%	5,096
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	226	8	100%	2,092
		Rollers	Rollers	Diesel	1	80	0.38	226	8	100%	3,154
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	100%	3,724
	Site Preparation	Graders	Graders	Diesel	1	187	0.41	113	8	100%	3,578
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	113	8	100%	4,611
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	113	8	100%	3,068
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	100%	3,724
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	113	8	100%	3,126
		Forklifts	Forklifts	Diesel	2	89	0.2	113	8	100%	1,847
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	100%	3,724
		Air Compressors	Air Compressors	Diesel	1	78	0.48	113	8	100%	1,942
	Paving	Pavers	Pavers	Diesel	1	130	0.42	113	8	100%	2,548
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	113	8	100%	1,046
		Rollers	Rollers	Diesel	1	80	0.38	113	8	100%	1,577
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862
B-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	113	8	100%	3,578
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	113	8	100%	4,611
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		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862

Table EN-2
Project Construction Off-Road Energy Usage
Bayer CEQA Long-Range Development
Berkeley, California

Year 10 Equipment Usage (continued)[1]

Location	Construction Subphase	Equipment	CalEEMod Equipment	Fuel[2]	Number	Horsepower	Load Factor	Number of Days[3]	Hours per Day[3]	Utilization[3]	Fuel Usage (gal diesel)[4]
C-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	113	8	100%	3,578
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	113	8	100%	4,611
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	113	8	100%	3,068
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	100%	3,724
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	113	8	100%	3,126
		Forklifts	Forklifts	Diesel	2	89	0.2	113	8	100%	1,847
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	100%	3,724
		Air Compressors	Air Compressors	Diesel	1	78	0.48	113	8	100%	1,942
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		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	100%	3,724
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	226	8	100%	9,222
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	226	8	100%	6,136
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	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	226	8	100%	6,253
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		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	226	8	100%	7,448
		Air Compressors	Air Compressors	Diesel	1	78	0.48	226	8	100%	3,885
	Paving	Pavers	Pavers	Diesel	1	130	0.42	226	8	100%	5,096
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	226	8	100%	2,092
		Rollers	Rollers	Diesel	1	80	0.38	226	8	100%	3,154
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	100%	3,724
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		Rollers	Rollers	Diesel	1	80	0.38	226	8	100%	3,154
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	100%	3,724
A-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	113	8	100%	3,578
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	113	8	100%	4,611
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	113	8	100%	3,068
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	100%	3,724
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	113	8	100%	3,126
		Forklifts	Forklifts	Diesel	2	89	0.2	113	8	100%	1,847
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	100%	3,724
		Air Compressors	Air Compressors	Diesel	1	78	0.48	113	8	100%	1,942
	Paving	Pavers	Pavers	Diesel	1	130	0.42	113	8	100%	2,548
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	113	8	100%	1,046
		Rollers	Rollers	Diesel	1	80	0.38	113	8	100%	1,577
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	100%	1,862

Table EN-2
Project Construction Off-Road Energy Usage
Bayer CEQA Long-Range Development
Berkeley, California

Year 30 Equipment Usage[1]

Parcel Name	Construction Subphase	Equipment	CalEEMod Equipment	Fuel[2]	Number	Horsepower	Load Factor	Number of Days[3]	Hours per Day[3]	Utilization[3]	Fuel Usage (gal diesel)[4]
A-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	113	8	1	3,578
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	1	1,862
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	113	8	1	4,611
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	113	8	1	3,068
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	1	3,724
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	113	8	1	3,126
		Forklifts	Forklifts	Diesel	2	89	0.2	113	8	1	1,847
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	1	3,724
		Air Compressors	Air Compressors	Diesel	1	78	0.48	113	8	1	1,942
	Paving	Pavers	Pavers	Diesel	1	130	0.42	113	8	1	2,548
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	113	8	1	1046
		Rollers	Rollers	Diesel	1	80	0.38	113	8	1	1,577
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	1	1,862
B-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	249	8	1	7,884
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	249	8	1	4,103
		Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	249	8	1	10,160
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	249	8	1	10,160
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	249	8	1	4,103
		Graders	Graders	Diesel	1	187	0.41	249	8	1	7,884
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	249	8	1	6,889
		Forklifts	Forklifts	Diesel	1	89	0.2	249	8	1	2,035
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	249	8	1	4,103
		Welders	Welders	Diesel	3	46	0.45	249	8	1	7,100
		Generator Sets	Generator Sets	Diesel	1	84	0.74	249	8	1	7,106
		Air Compressors	Air Compressors	Diesel	1	78	0.48	249	8	1	4,280
	Paving	Pavers	Pavers	Diesel	1	130	0.42	249	8	1	5,615
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	1	9	0.56	249	8	1	576
		Rollers	Rollers	Diesel	1	80	0.38	249	8	1	3,475
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	249	8	1	4,103
		Paving Equipment	Paving Equipment	Diesel	1	132	0.36	249	8	1	4,887
D-North	Site Preparation	Graders	Graders	Diesel	1	187	0.41	226	8	1	7,156
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	1	3,724
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	226	8	1	9,222
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	226	8	1	6,136
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	226	8	1	7,448
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	226	8	1	6,253
		Forklifts	Forklifts	Diesel	2	89	0.2	226	8	1	3,694
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	226	8	1	7,448
		Air Compressors	Air Compressors	Diesel	1	78	0.48	226	8	1	3,885
	Paving	Pavers	Pavers	Diesel	1	130	0.42	226	8	1	5,096
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	226	8	1	2,092
		Rollers	Rollers	Diesel	1	80	0.38	226	8	1	3,154
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	226	8	1	3,724
A-South	Site Preparation	Graders	Graders	Diesel	1	187	0.41	113	8	1	3,578
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	1	1,862
	Grading	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	0.4	113	8	1	4,611
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	113	8	1	3,068
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	1	3,724
	Building Construction	Cranes	Cranes	Diesel	1	231	0.29	113	8	1	3,126
		Forklifts	Forklifts	Diesel	2	89	0.2	113	8	1	1,847
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	113	8	1	3,724
		Air Compressors	Air Compressors	Diesel	1	78	0.48	113	8	1	1,942
	Paving	Pavers	Pavers	Diesel	1	130	0.42	113	8	1	2,548
		Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	0.56	113	8	1	1046
		Rollers	Rollers	Diesel	1	80	0.38	113	8	1	1,577
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	113	8	1	1,862

Table EN-2
Project Construction Off-Road Energy Usage
Bayer CEQA Long-Range Development
Berkeley, California

Notes:

1. Construction equipment assumptions, number of construction equipment, equipment horsepower, and load factor are obtained from Table CON-3.
2. All equipment are assumed to be diesel-fueled.
3. Number of days of equipment usage is obtained from Table CON-2. Construction activity for Year 10 is expected to occur in 2024 and 2039, with operational full buildout modeled in 2025. Construction activity for Year 30 is expected to occur in 2034 and 2049, with operational full buildout modeled in 2035. Construction is assumed to occur 8 hours per day at 100% equipment utilization.
4. Fuel use from off-road construction equipment is estimated using data from CARB 2017 Off-road Diesel Emission Factors database, which cites average brake-specific fuel consumption (BSFC) of 0.408 lb/hp-hr for equipment less than or equal to 100 HP and 0.367 lb/hp-hr for equipment greater than 100 HP, and a diesel density of 7.109 lb/gal. This results in diesel consumption rates of 0.057 gal/hp-hr and 0.052 gal/hp-hr for equipment up to 100 HP and greater than 100 HP, respectively. Fuel usage was calculated with the following equation:

   Fuel Usage = Σ(N * HP * LF * Day * Hr * U * F)

   N: number of Equipment Pieces
   HP: equipment horsepower
   LF: Load Factor
   Day: duration of equipment usage
   Hr: hours per day of equipment usage
   U: Utilization

Abbreviations:

CalEEMod® - California Emissions Estimator Model
CARB - California Air Resources Board
gal - gallons
HP - horsepower
hr - hour
lb - pounds
LF - load factor

References:

California Air Resources Board. 2017 Off-road Diesel Emission Factors. Accessed September 2020. Available online at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road

Table EN-3
Fuel Efficiency Derivation for On-Road Construction Equipment
Bayer CEQA Long-Range Development
Berkeley, California

Year[1]	Fuel Consumption (gallons/day)[2]					VMT (miles/day)[3]					Fuel Efficiency (miles/gallon)[4]					Fuel Efficiency by Category (miles/gallon)		
	LDA	LDT1	LDT2	MHDT	HHDT	LDA	LDT1	LDT2	MHDT	HHDT	LDA	LDT1	LDT2	MHDT	HHDT	Worker	Vendor	Hauling
2024	718,698	84,195	287,002	96,818	288,915	24,107,385	2,421,121	7,734,914	989,523	2,027,557	34	29	27	10	7.0	31	8.6	7.0
2029	657,095	77,598	249,695	99,383	285,578	25,008,727	2,516,389	7,859,271	1,098,898	2,248,014	38	32	31	11	7.9	35	9.5	7.9
2034	630,292	74,499	231,411	100,786	280,300	25,933,314	2,614,616	8,073,695	1,180,636	2,427,581	41	35	35	12	8.7	38	10	8.7
2049	653,031	76,052	231,717	107,496	308,545	28,473,603	2,881,224	8,832,879	1,366,043	2,926,560	44	38	38	13	9.5	41	11	9.5

Notes:

1. As shown in Table CON-2, construction activity is expected to occur in 2024 and 2029 for Year 10 and 2034 and 2049 for Year 30.
2. Fuel consumption and VMT from EMFAC2017 for Alameda County. HHDT and MHDT are assumed to be diesel. LDA, LDT1 and LDT2 are assumed to be gasoline.
3. Fuel efficiency calculated based off of EMFAC data: [Fuel Consumption]/ [VMT]
4. Consistent with CalEEMod®, Hauling assumes 100% HHDT, Vendor assumes 50% HHDT and 50% MHDT, and Worker assumes 50% LDA, 25% LDT1, and 25% LDT2 vehicles.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
EMFAC2017 - California Air Resources Board EMission FACtor model
LDA - light duty auto
LDT - light duty truck
MHDT - medium-heavy duty truck
HHDT - heavy-heavy duty truck
VMT - vehicle miles traveled

Table EN-4
Project Construction On-Road Vehicle Energy Usage
Bayer CEQA Long-Range Development
Berkeley, California

Phase	Subphase	Year[1]	Trips (one way trips/subphase)[2]			Annual VMT[3] (mi/yr)			Fuel Consumption[4] (gallons)		
			Worker Trips	Vendor Trips	Hauling Trips	Worker	Vendor	Hauling	Worker (Gasoline)	Vendor (Diesel)	Hauling (Diesel)
Demolition											
A-North Demolition	Demolition	2024	200	--	559	2,160	--	11,175	70	--	1,592
C-North Demolition	Demolition	2024	100	--	101	1,080	--	2,011	35	--	287
A-South Demolition	Demolition	2024	200	--	586	2,160	--	11,713	70	--	1,669
Year 10 Construction											
A-North Construction (2025)	Site Preparation	2024	10	--	--	108	--	--	3.5	--	--
	Grading	2024	40	--	--	432	--	--	14	--	--
	Building Construction	2024	12,200	5,000	--	131,760	36,500	--	4,292	4,235	--
	Paving	2024	180	--	--	1,944	--	--	63	--	--
	Architectural Coating	2024	120	--	--	1,296	--	--	42	--	--
A-North Construction (2030)	Site Preparation	2029	5.0	--	--	54	--	--	1.5	--	--
	Grading	2029	20	--	--	216	--	--	6.2	--	--
	Building Construction	2029	400	200	--	4,320	1,460	--	123	154	--
	Paving	2029	90	--	--	972	--	--	28	--	--
	Architectural Coating	2029	5.0	--	--	54	--	--	1.5	--	--
B-North Construction	Site Preparation	2029	5.0	--	--	54	--	--	1.5	--	--
	Grading	2029	20	--	--	216	--	--	6.2	--	--
	Building Construction	2029	3,400	1,300	--	36,720	9,490	--	1,049	1,003	--
	Paving	2029	90	--	--	972	--	--	28	--	--
	Architectural Coating	2029	35	--	--	378	--	--	11	--	--
C-North Construction	Site Preparation	2024	5.0	--	--	54	--	--	1.8	--	--
	Grading	2024	20	--	--	216	--	--	7.0	--	--
	Building Construction	2024	100	100	--	1,080	730	--	35	85	--
	Paving	2024	90	--	--	972	--	--	32	--	--
	Architectural Coating	2024	--	--	--	--	--	--	--	--	--
A-South Construction	Site Preparation	2024	10	--	--	108	--	--	3.5	--	--
	Grading	2024	40	--	--	432	--	--	14	--	--
	Building Construction	2024	7,600	3,800	--	82,080	27,740	--	2,674	3,218	--
	Paving	2024	180	--	--	1,944	--	--	63	--	--
	Architectural Coating	2024	80	--	--	864	--	--	28	--	--
C-South Construction	Site Preparation	2024	10	--	--	108	--	--	3.5	--	--
	Grading	2024	40	--	--	432	--	--	14	--	--
	Building Construction	2024	26,800	10,400	--	289,440	75,920	--	9,429	8,808	--
	Paving	2024	180	--	--	1,944	--	--	63	--	--
	Architectural Coating	2024	270	--	--	2,916	--	--	95	--	--
Year 30 Construction											
A-North Construction (2035)	Site Preparation	2034	5.0	--	--	54	--	--	1.4	--	--
	Grading	2034	20	--	--	216	--	--	5.7	--	--
	Building Construction	2034	4,600	1,900	--	49,680	13,870	--	1,305	1,361	--
	Paving	2034	90	--	--	972	--	--	26	--	--
	Architectural Coating	2034	45	--	--	486	--	--	13	--	--
A-North Construction (2050)	Site Preparation	2049	5.0	--	--	54	--	--	1.3	--	--
	Grading	2049	20	--	--	216	--	--	5.3	--	--
	Building Construction	2049	4,000	1,600	--	43,200	11,680	--	1,059	1,053	--
	Paving	2049	90	--	--	972	--	--	24	--	--
	Architectural Coating	2049	40	--	--	432	--	--	11	--	--
B-North Construction	Site Preparation	2049	24	--	--	259	--	--	6.4	--	--
	Grading	2049	48	--	--	518	--	--	13	--	--
	Building Construction	2049	22,220	8,580	--	239,976	62,634	--	5,881	5,645	--
	Paving	2049	130	--	--	1,404	--	--	34	--	--
	Architectural Coating	2049	200	--	--	2,160	--	--	53	--	--
D-North Construction	Site Preparation	2034	10	--	--	108	--	--	2.8	--	--
	Grading	2034	40	--	--	432	--	--	11	--	--
	Building Construction	2034	34,800	13,600	--	375,840	99,280	--	9,873	9,745	--
	Paving	2034	180	--	--	1,944	--	--	51	--	--
	Architectural Coating	2034	350	--	--	3,780	--	--	99	--	--
A-South Construction	Site Preparation	2049	5.0	--	--	54	--	--	1.3	--	--
	Grading	2049	20	--	--	216	--	--	5.3	--	--
	Building Construction	2049	3,200	1,600	--	34,560	11,680	--	847	1,053	--
	Paving	2049	90	--	--	972	--	--	24	--	--
	Architectural Coating	2049	30	--	--	324	--	--	7.9	--	--

Notes

1. As shown in Table CON-2, construction activity is expected to occur in 2024 and 2029 for Year 10 and 2034 and 2049 for Year 30.
2. Total number of worker, vendor and haul trips for each construction phase and location are obtained from Table CON-4.
3. Annual VMT calculated using CalEEMod default trip rates for Alameda County (10.8 mi/worker trip, 7.3 mi/vendor trip, 20 mi/hauling trip).
4. Annual fuel usage is calculated using the fuel consumption rates in Table EN-3 and the annual VMT.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
mi - mile
VMT - vehicle miles traveled
yr - year

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Table EN-5
Project Construction Energy Use Summary
Bayer CEQA Long-Range Development
Berkeley, California

Year 10[1]

Source[2,3]	Diesel Usage (gal)	Gasoline Usage (gal)
Off-Road Construction Equipment	350,208	--
On-Road Construction Trips	21,051	18,310
Total	371,259	18,310

Year 30[4]

Source[2,3]	Diesel Usage (gal)	Gasoline Usage (gal)
Off-Road Construction Equipment	232,531	--
On-Road Construction Trips	18,856	19,361
Total	251,387	19,361

Notes:

1. Year 10 fuel usage is for all construction activity occuring in 2024 and 2029.
2. Off-Road fuel usage is calculated in Table EN-2.
3. On-Road fuel usage is calculated in Table EN-4.
4. Year 30 fuel usage is for all construction activity occuring 2034 and 2049.

Abbreviations:

gal - gallons

Table EN-6
Energy Usage for CEQA Baseline and Project Operations
Bayer CEQA Long Range Development Project
Berkeley, California

Land Use	CalEEMod® Land Use	Total Constructed Area (sf)[1]	Additional Area Under DA (sf)	Annual Electricity Use (MWh/yr)	Annual Natural Gas Use (MMBtu/yr)
CEQA Baseline					
Administration	General Office Building	231,770	12,455	2,488	10,221
Manufacturing Labs	Research & Development	281,377	134,455	16,974	23,256
Maintenance	General Light Industry	36,500	455	309	774
Production	Manufacturing	760,143	33,455	55,418	0
Warehouse	Refrigerated Warehouse - No Rail	295,194	455	3,816	6,195
Utility[2]	General Heavy Industry	79,288	455	23,720	228,386
Parking	Parking Lot	767,120	0	268	0
			CEQA Baseline Usage[1]	102,993	268,832

Land Use	CalEEMod® Land Use	Total Area (sf)	Annual Electricity Use (MWh/yr)	Annual Natural Gas Use[4] (MMBtu/yr)
Project - Year 10[3]				
Administration	General Office Building	214,000	4,785	0
Manufacturing Labs	Research & Development	180,000	7,136	10,498
Maintenance[5]	General Light Industry	18,000	256	678
Production	Manufacturing	548,000	36,044	0
Warehouse	Refrigerated Warehouse - No Rail	157,000	2,903	0
Utility[2]	General Heavy Industry	71,000	19,814	368,040
Parking	Parking Lot	165,020	61	0
Parking	Enclosed Parking with Elevator	370,180	1,481	0
		Total Project - Year 10 Usage[3,6]	72,480	379,217

Land Use[1]	CalEEMod® Land Use	Total Area (sf)	Annual Electricity Use (MWh/yr)	Annual Natural Gas Use[4] (MMBtu/yr)
Project - Year 30[4]				
Administration	General Office Building	284,000	6,350	0
Manufacturing Labs	Research & Development	230,000	9,119	13,415
Maintenance[5]	General Light Industry	18,000	256	678
Production	Manufacturing	978,000	64,327	0
Warehouse	Refrigerated Warehouse - No Rail	157,000	2,903	0
Utility[2]	General Heavy Industry	71,000	19,814	368,040
Parking	Parking Lot	31,220	11	0
Parking	Enclosed Parking with Elevator	780,500	3,122	0
		Total Project - Year 30 Usage[3,6]	105,902	382,133

Table EN-6
Energy Usage for CEQA Baseline and Project Operations
Bayer CEQA Long Range Development Project
Berkeley, California

Notes:

1. Current site-level energy and natural gas usage rates were provided by Bayer. Energy use rates per square feet by land use type were calculated by dividing the total energy usage rate per land use type by the square footage of existing building area for each land use category. The CEQA baseline usage was then calculated as the product of energy usage per square feet multiplied by the total square footage by land use type analyzed in the CEQA baseline. Energy usage rate for the total constructed area does not account for 2019 Title 24 reductions, but the additional area under the existing DA incorporates 2019 Title 24 reductions. Parking energy use rates alone were are based on CalEEMod® defaults.

2. The CEQA Baseline annual natural gas usage rate for the Utility land use type was calculated based on the total natural gas consumption from the existing boilers based on utilization rates provided by Bayer. The existing natural gas boilers will continue to operate through Year 10 and Year 30. See Table EN-9 for natural gas energy usage calculations. The boilers are housed in Buildings B63 and B44 which are the only utility buildings that consume natural gas. All other utility buildings have zero natural gas usage. The Project will include an additional Boiler of size 400 BHP included as a part of Year 10 operations, installed in building B46.

3. We would expect natural gas usage for Year 10 and Year 30 to increase by 5% for all land use types except Utility, all things being equal. The increase in energy usage is applied to the energy use rate per square footage. However, factoring in the reductions due to 2019 Title 24 Impact Analysis, consistent with the California Energy Commission (CEC), we would expect a reduction of 1% in natural gas usage, above the 105% increase from baseline usage. As a result, the there is a net decrease in natural gas usage for Year 10 and Year 30.

4. The City of Berkeley has banned the use of natural gas in any newly constructed commercial or residential building (manufacturing is excluded). All the new administration, maintenance and warehouse buildings are not expected to have natural gas consumption in Year 10 and Year 30, and all the natural gas devices will be replaced with electric appliances.
5. The existing B47 maintenance building alone will continue to use natural gas usage. All new maintenance buildings are replacing natural gas with electricity.
6. Two new gamma irradiation devices are expected to be installed in Year 10 and operate through Year 30. These devices are rated as 1850 W each and Bayer has estimated that each will operate 1000 minutes per year, resulting in far less than 1 MW per year of electricity consumption, or less than 0.0001% of Bayer's baseline electricity usage. Thus, these devices were not explicitly included in the above table and are expected to be more than accounted for in the land-use specific energy use rates.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
CEC - California Energy Commission
CEQA - California Environmental Quality Act
MWh - megawatt-hour
MMBtu - million British Thermal Units
sf - square feet

References:

CalEEMod® Version 2016.3.2 Available Online at: http://www.caleemod.com

California Energy Commission. 2019. Building Energy Efficiency Standards for Residential and Nonresidential Buildings. Available online at: https://www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf

California Energy Commission. 2019. Impact Analysis for 2019 Energy Efficiency Standards. Available online at: https://www.energy.ca.gov/title24/2019standards/post_adoption/documents/2019_Impact_Analysis_Final_Report_2018-06-29.pdf

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Table EN-7
Water Supply, Treatment, and Distribution Electricity Usage for CEQA Baseline and Project Operations
Bayer CEQA Long Range Development Project
Berkeley, California

Water Usage[1]

Land Use	CalEEMod® Land Use Subtype	Indoor Water (million gal/year)	Outdoor Water[2] (million gal/year)
CEQA Baseline			
Manufacturing Labs (B57)	Research & Development	0.10	1.4
Production (B60)	Manufacturing	24	2.7
Production (B66)	Manufacturing	2.2	0.88
Production (B81)	Manufacturing	7.0	1.2
Rest of Facility	Mixed	4.7	19
Project - Year 10[3]			
Manufacturing Labs (B57)	Research & Development	0.10	1.4
Production (B60)	Manufacturing	24	2.7
Production (B66)	Manufacturing	2.2	0.88
Production (B81)	Manufacturing	7.0	1.2
Rest of Facility	Mixed	4.7	19
Project - Year 30[3]			
Manufacturing Labs (B57)	Research & Development	0.10	1.4
Production (B60)	Manufacturing	24	2.7
Production (B66)	Manufacturing	2.2	0.88
Production (B81)	Manufacturing	7.0	1.2
Rest of Facility	Mixed	4.7	19

Water Electricity Intensity[4]

County	Electricity to Supply Water (kWh/million gal)	Electricity to Treat Water (kWh/million gal)	Electricity to Distribute Water (kWh/million gal)
Alameda	2,117	111	1,272

Wastewater Electricity Intensity[4]

County	Wastewater Treatment (kWh/million gal)
Alameda	1,911

Water Electricity Usage[5]

Scenario	Electricity Usage (MWh/year)
CEQA Baseline	292.9
Project - Year 10	292.9
Project - Year 30	292.9

Notes:

1. Water usage was provided by Bayer.
2. All buildings are expected to use water for landscaping. Outdoor water use includes water used for landscaping and water that is evaporated.
3. Water usage for Year 10 and Year 30 are assumed to be same as Baseline water usage even though water usage will reduce for the two Project years.
4. Water Electricity Intensity from Table 9.2 of Appendix D of the CalEEMod® User's Guide.
5. Indoor water use is assumed to be processed as wastewater. Outdoor water use is assumed to not be processed as wastewater.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
gal - gallon
kWh - kilowatt-hours

References:

CalEEMod® Version 2016.3.2 Available Online at: http://www.caleemod.com

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Table EN-8
Generator Diesel Fuel Usage for CEQA Baseline and Project Operations
Bayer CEQA Long Range Development Project
Berkeley, California

Name	Generator Size Range		Generator Building	Fuel Consumption[1] (gal/hr)	Operating Hours[2] (hr/yr)	Diesel Consumption (gal/yr)
	kW	bhp				
CEQA Baseline						
9098X01	125	192	B54	8.0	20	160
9098X05	600	890	B57	44.8	20	896
9098X06	2,000	2,841	B61	145.4	50	7,270
9098X07	2,000	2,682	B61	136	50	6,790
9098X14	2,000	2,848	B61	133	50	6,670
9098X17	350	519	B28/B28A	27	50	1,370
					Total	23,156
Year 10						
9098X01	125	192	B54	8.0	20	160
9098X06	2,000	2,841	B61	145	50	7,270
9098X07	2,000	2,682	B61	136	50	6,790
9098X14	2,000	2,848	B61	133	50	6,670
Proposed Gen 1	2,000	2,937	B82	138	50	6,900
Proposed Gen 2	2,000	2,937	B82	138	50	6,900
					Total	34,690
Year 30						
Proposed Gen 3	2,000	2,937	B82	138	50	6,900
Proposed Gen 4	2,000	2,937	B82	138	50	6,900
Proposed Gen 5	2,000	2,937	B61	138	50	6,900
Proposed Gen 6	2,000	2,937	B61	138	50	6,900
Proposed Gen 7	2,000	2,937	B61	138	50	6,900
					Total	34,500

Notes

1. Fuel consumption values are for CEQA baseline are obtained from facility data and represent fuel consumption at 100% load. Fuel consumption rates for the proposed generators are based on equipment manufacture sheets.
2. Annual operating hours for the existing generators are obtained from the BAAQMD permit for the Bayer facility. Operating hours for the proposed generators are based on BAAQMD's permit limit of 50 hours per year for testing and maintenance operations.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
gal - gallon
bhp - brake horsepower
hr - hour
kW - kilowatts
yr - year

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Table EN-9
Natural Gas Boiler Fuel Consumption Calculations
Bayer CEQA Long Range Development Project
Berkeley, California

Name	HP[1]	Capacity[1] (MMBTU/hr)	Utilization[2] (%)	Operating Hours (hr/yr)	Natural Gas Consumption (MMBTU/yr)
CEQA Baseline					
S34	350	14.7	50%	8,760	64,386
S10	900	37.8	25%	8,760	82,000
S11	900	37.8	25%	8,760	82,000
				Total	228,386
Project - Year 10					
S34	350	14.7	50%	8,760	64,386
S10	900	37.8	25%	8,760	82,000
S11	900	37.8	25%	8,760	82,000
NEW	400	15.94	100%	8,760	139,654
				Total	368,040
Project - Year 30					
S34	350	14.7	50%	8,760	64,386
S10	900	37.8	25%	8,760	82,000
S11	900	37.8	25%	8,760	82,000
NEW	400	15.94	100%	8,760	139,654
				Total	368,040

Notes:

1. The capacity and size of each existing boiler was obtained from the BAAQMD permits for the Bayer facility. The capacity and size of the proposed boiler (NEW) was estimated by Bayer based on steam production requirements for Year 10 and Year 30. The site also currently includes two smaller boilers (3.25 MMBTU/hour and 0.334 MMBTU/hour) to supply heating to building B28. The natural gas consumed by these boilers to supply heating to building B28 is included in the building energy usage calculations as shown in Table EN-6. Building natural gas combustion emissions are estimated based on CalEEMod default emission factors which are generally more conservative. These two boilers will be relocated to building B82 in Year 10.
2. Baseline utilization rates provided by Bayer are based on historical operations and are assumed to remain constant for Year 10 and Year 30 for S34, S10 and S11. The additional steam requirements for Year 10 and Year 30 will be met through a new ~400 hp boiler located in B46. This new boiler will generate 13,352 lb/hr of steam, and is modeled as a 15.94 MMbtu/hr boiler operating at 100% utilization.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District

HP - horsepower

hr - hour

MMBTU - million British Thermal Units

yr - year

Table EN-10
Mobile Fuel Consumption for CEQA Baseline and Project Operations
Bayer CEQA Long Range Development Project
Berkeley, California

EMFAC2017 Onroad Data[1]

Scenario	Year	Fleet Type	Fuel Consumption[2]				VMT[3]			
			Gasoline	Diesel	Natural Gas	Electric	Gasoline	Diesel	Natural Gas	Electric
			gal/day	gal/day	DGE/day	--	miles/day			
CEQA Baseline	2020	All	1,532,920	439,843	8.3	--	38,717,446	3,715,691	23,420	645,282
Project - Year 10	2025	All	1,369,579	446,349	11	--	40,103,798	4,276,605	34,070	1,259,056
Project - Year 30	2035	All	1,199,482	440,495	14	--	42,896,745	5,055,113	45,694	2,165,106

Project Fleet Mix and Fuel Efficiency Data

Scenario	Year	Fleet Type	Fuel Efficiency[4]				VMT by Vehicle Fuel Type[5]			
			Gasoline	Diesel	Natural Gas	Electric	Gasoline	Diesel	Natural Gas	Electric
			mi/gal	mi/gal	mi/DGE	mi/kWh	Percentage (%)			
CEQA Baseline	2020	All	25	8.4	2,817	3.3	90%	8.6%	0.054%	1.5%
Project - Year 10	2025	All	29	10	3,076	3.3	88%	9.4%	0.075%	2.8%
Project - Year 30	2035	All	36	11	3,371	3.3	86%	10%	0.091%	4.3%

Fuel Consumption

Scenario	Year	Fleet Type	Trip Rate (trips/day)[6]	Trip Length (mi/trip)[7]	Annual VMT (mi/yr)[8]	Fuel Consumption[9,10]			
						Gallons of Gasoline	Gallons of Diesel	MMBTU of Natural Gas	MWh of Electricity
CEQA Baseline	2020	All	4,570	11.6	19,349,380	688,162	197,455	0.48	87
Project - Year 10	2025	All	3,620	11.6	15,327,080	459,602	149,785	0.48	127
Project - Year 30	2035	All	4,830	11.6	20,450,220	489,003	179,580	0.71	265

Table EN-10
Mobile Fuel Consumption for CEQA Baseline and Project Operations
Bayer CEQA Long Range Development Project
Berkeley, California

Notes:

1. Data obtained from EMFAC2017 for Alameda County using the following inputs: emission rates mode, annual time period, EMFAC2007 vehicle classes, aggregated model year, aggregated speed.
2. Fuel consumption rates summed across all vehicle classes for given year. EMFAC2017 outputs gasoline and diesel fuel consumption rates in 1000 gallons per day and natural gas fuel consumption rates in diesel gallon equivalents (DGE) per day. Electricity consumption rates for electric vehicles are not provided by EMFAC.
3. Daily VMT summed across all vehicle classes for given year.
4. Fuel efficiency for gasoline, diesel, and natural gas calculated as daily fuel consumption rate divided by daily VMT. This fuel efficiency value represents an average across all vehicle classes. Electricity fuel efficiency consistent with the current range of fuel efficiencies of electric cars from US Department of Energy, though fuel efficiency may improve over time.
5. Percentage of gasoline, diesel, natural gas, or electric vehicle miles calculated by taking the ratio of vehicle miles driven by a specific fuel-type vehicle over total miles for that vehicle classification (for all fuel types) in EMFAC. Based on State targets and current trends, electric vehicle penetration may increase beyond the EMFAC defaults, which would increase electricity consumption and decrease fossil fuel consumption relative to what is presented here.
6. Trip rates provided by Fehr & Peers, as outlined in the Transportation Memo.
7. Trip length based on CalEEMod default estimates for Alameda County.
8. Annual VMT for CEQA Baseline and Project calculated from daily trip rate and trip length assuming 365 days of operation per year.
9. Annual energy usage rate calculated as follows: (Annual VMT) * (% of VMT attributed to fuel type) / (Fuel Efficiency).
10. Natural gas usage rates were converted from DGE to MMBTU using US Department of Energy Alternative Fuel Data Center conversion factor of 1 DGE of CNG = 128,488 Btu.

Abbreviations:

CNG - compressed natural gas	gal - gallons	mi - mile	MWh - megawatt-hour
DEG - diesel equivalent gallons	kWh - kilowatt-hour	MMBTU - million British Thermal Units	VMT - vehicle miles traveled

References:

US Department of Energy (DOE), Fuel Economy Guide. Electric. Available at: https://www.fueleconomy.gov/feg/evsbs.shtml. Accessed September 2020.

DOE. 2017. Alternative Fuels Data Center, Gasoline and Diesel Gallon Equivalency Methodology, Compressed Natural Gas. Available online at: https://afdc.energy.gov/fuels/equivalency_methodology.html. Accessed May 2019.

Table EN-11
Summary of CEQA Baseline and Project Operational Energy Use
Bayer CEQA Long Range Development Project
Berkeley, California

Source[1]		CEQA Baseline	Project - Year 10	Change from CEQA Baseline to Project - Year 10[2]	Project - Year 30	Change from CEQA Baseline to Project - Year 30[2]
Electricity						
Building Energy	MWh/year	102,993	72,480	-30,513	105,902	2,909
Water Consumption	MWh/year	293	293	0	293	0
Mobile	MWh/year	87	127	40	265	178
Total Electricity	**MWh/year**	**103,373**	**72,900**	**-30,473**	**106,460**	**3,087**
Gasoline						
Mobile	gallons/year	688,162	459,602	-228,560	489,003	-199,159
Total Gasoline	**gallons/year**	**688,162**	**459,602**	**-228,560**	**489,003**	**-199,159**
Diesel						
Generator Testing	gallons/year	23,156	34,690	11,534	34,500	11,344
Mobile	gallons/year	197,455	149,785	-47,670	179,580	-17,875
Total Diesel	**gallons/year**	**220,611**	**184,475**	**-36,136**	**214,080**	**-6,531**
Natural Gas						
Building Energy	MMBTU/year	40,446	11,177	-29,270	14,093	-26,354
Boilers	MMBTU/year	228,386	368,040	139,654	368,040	139,654
Mobile	MMBTU/year	0.48	0.48	-0.0020	0.71	0.23
Total Natural Gas	**MMBTU/year**	**268,833**	**379,217**	**110,385**	**382,134**	**113,301**

Notes:

1. See Tables EN-6 through EN-10 for detailed energy usage calculations by source.
2. Positive values indicate an increase in energy usage relative to CEQA Baseline, while negative values indicate a decrease in energy usage relative to CEQA Baseline.

Abbreviations:

MMBTU - million British Thermal Units
MWh - megawatt-hour

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