Appendix F

Methods for Estimating Greenhouse Gas Emissions

Methods for Estimating Greenhouse Gas Emissions and Emissions Reductions

March 2026

Prepared for the City of Encinitas

Prepared by the Energy Policy Initiatives Center

About EPIC

The Energy Policy Initiatives Center (EPIC) is a non-profit research center of the University of San Diego School of Law that studies energy policy issues affecting California and the San Diego region. EPIC's mission is to increase awareness and understanding of energy- and climate-related policy issues by conducting research and analysis to inform decision makers and educate law students.

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1 OVERVIEW

This Appendix provides a summary of the 2016 greenhouse gas (GHG) emissions inventory for the City of Encinitas (referred to as “Encinitas” or “the City”), the business-as-usual (BAU) emissions projections through 2045, and the methods used to calculate the GHG emissions reductions from the measures included in the city’s Climate Action Plan (CAP) Update.

This Appendix includes the following sections:

- Section 2 describes the background data sources used for this Appendix;
- Section 3 provides the 2016 GHG emissions inventory results summary;
- Section 4 provides a summary of the emissions projections for 2030 and 2045, and the methods used to prepare projections for each emissions category;
- Section 5 describes this CAP Update’s 2030 and 2045 targets;
- Section 6 provides a summary of emissions impacts from federal, State (California), and local CAP strategies; and
- Section 7 details the common data sources and methods used to estimate emissions reductions, and the methods used to estimate emissions reductions from federal, State, and CAP Update strategies.

Unless stated otherwise, all activity data, GHG emissions, and GHG emissions reductions reported in this Appendix are annual values for the calendar year, and all emission factors reported in this document are annual average values for the calendar year.

Rounding is used for the final GHG values within the tables and figures throughout the document. Values are not rounded in the intermediary steps in any calculation. Because of rounding, some totals may not equal the values summed in any table or figure.

2 BACKGROUND

2.1 Greenhouse Gases

The primary GHGs included in the City’s emissions estimates are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Each GHG has a different capacity to trap heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO_2 and expressed in carbon dioxide equivalents (CO_2e). In general, the 100-year GWPs reported by the Intergovernmental Panel on Climate Change (IPCC) are used to estimate GHG emissions. The GWPs used in this appendix are from the IPCC Fourth Assessment Report (AR4),[1] provided in Table 1. The 100-year GWPs from AR4 are used in this appendix to be consistent with the GWPs used in the California statewide GHG inventory.[2] The latest IPCC climate assessment is the Six Assessment Report (AR6) with an updated set of GWPs.[3]

[1] IPCC Fourth Assessment Report: Climate Change 2007: Direct Global Warming Potentials (2013).
[2] CARB: Current California GHG Emission Inventory Data. 2000-2022 GHG Inventory (2024 Edition).
[3] IPCC: Six Assessment Report.

Table 1 Global Warming Potentials

Greenhouse Gas	Global Warming Potential
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298
IPCC 2013.	

2.2 Demographics

The San Diego Association of Governments (SANDAG) estimates and forecasts population, housing, and jobs for all jurisdictions in the San Diego region. However, a city-specific transportation modeling was performed in 2023 that supported both the City's CAP Update and the General Plan Mobility Element Update. The demographic estimates and forecasts used in the 2023 modeling are used for the CAP Update to be consistent with the transportation data.

The 2023 modeling was based on the SANDAG Activity Based Model 2+ (ABM2+) and 2021 San Diego Regional Plan scenarios that factored in regional transportation network investments and policies but adjusted to align with the City's land use assumptions. The 2016 baseline year estimates include (1) the City's adopted Housing Elements housing sites and (2) recently approved development projects in the past few years. The 2050 estimates include (1) additional housing expected to be built by 2050, (2) the Housing Element land use data, (3) potential development projects outside the Housing Element projects set to be completed by 2050, and (4) additional roadway network adjustments aligning with the Mobility Element.[4] 2050 was the only projection year included in the 2023 modeling effort, estimates between 2016 and 2050 were linearly interpolated.

The population, housing units, and jobs estimates for 2016, 2030, and 2045 are provided in Table 2.[5]

Table 2 Population, Housing, and Jobs Estimates

Year	Population	Jobs	Housing Units*
2016	76,408	29,260	30,545
2030	78,987	27,154	31,625
2045	81,751	24,897	32,782
Based on Encinitas specific land use assumptions including recently approved development projects and the adopted Housing Elements. *Housing unit types include single detached units, single attached units, two to four units, five plus or apartment units, and mobile homes. Fehr & Peers 2023, Energy Policy Initiatives Center, University of San Diego 2024			

[4] Fehr & Peers (January 9, 2024), *City of Encinitas Transportation Modeling Considerations and Results* [Memorandum].
[5] 2016 and 2050 population, housing units, and jobs estimates were provided by Fehr & Peers to EPIC (September 13, 2023). No interim year models were analyzed, therefore, 2030 and 2045 estimates were interpolated linearly between 2016 and 2050 estimates.

3 BASELINE 2016 GREENHOUSE GAS EMISSIONS INVENTORY

SANDAG created the *Regional Climate Action Planning Framework* (ReCAP) to guide CAP development and support consistent CAP implementation across the San Diego region.[6] SANDAG has supported CAP implementation monitoring through ReCAP Snapshots, the biannual reports of GHG inventory, and climate monitoring data. Encinitas received a 2016 GHG inventory (released in 2019), a 2018 GHG inventory (released in 2021), and a partial 2020 GHG inventory (released in 2023, transportation emissions were omitted due to data availability during the COVID pandemic).[7] Data year 2016 was chosen as the CAP Update baseline year, even though more recent GHG inventories are available (e.g., the 2018 GHG inventory) because 2016 has the best available vehicle miles traveled (VMT) data.

The ReCAP *Technical Appendix I: GHG Inventories, Projections, and Target Selection* document provides the GHG inventory calculation method used for all GHG inventories in the Snapshots, based on U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol), developed by ICLEI USA.[8] The U.S. Community Protocol requires a minimum of five basic emissions-generating activities to be included in a Protocol-compliant community-scale GHG inventory. These categories are electricity, natural gas, on-road transportation, water and wastewater, and solid waste. GHG emissions are calculated by multiplying activity data (e.g., kilowatt-hours of electricity) by an emission factor (e.g., pounds of CO_2e per unit of electricity). The activity data and emissions factors are regional- or city-specific data when available. The overall method and data sources for estimating activity and emissions factors are provided in Table 3.

Table 3 2016 Greenhouse Gas Emissions inventory Calculation Methods and Data Sources

Emission Category	Category Detail	Data Source for Estimating Activity and Emissions Factor
Electricity	Power plant emissions associated with generating electricity used within the City	Activity: Electricity sales data from San Diego Gas & Electric (SDG&E) based on customer class, rate schedule, and electric service provider (MWh) Emissions factor: Weighted average emission factor based on the electric service provider (lbs CO_2e/MWh)
Natural Gas	Combustion emissions associated with fuel end-use for heating and cooling (mostly residential and non-residential, excusing fuels used for grid use electricity production)	Activity: Sales data from SDG&E based on customer class (therms) Emissions factor: Natural gas emission factor in California from CARB statewide inventory (00545 MT CO_2e/ therm)

[6] SANDAG: Climate Action Planning Framework for Local Governments.
[7] The GHG inventories and CAP monitoring data are in SANDAG Climate Action Data Portal.
[8] SANDAG: Climate Action Planning Framework for Local Governments. ReCAP Technical Appendix I: GHG Inventories, Projections, and Target Selection (Version 1.1: October 2020). ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019).

Emission Category	Category Detail	Data Source for Estimating Activity and Emissions Factor
On-Road Transportation	Tailpipe emissions from on-road vehicles (passenger cars, light-duty trucks, heavy-duty trucks, buses, motorcycles, etc)	Activity: City-specific VMT using the origin-destination method (miles) Emissions factor: San Diego region emission factor by vehicle class from latest approved CARB EMFAC model (currently EMFAC2021) converted to average vehicle emission factor using VMT distribution by vehicle class (g CO_2e/mile)
Water	Emissions from energy use to deliver water to end-use customers	Activity: City-specific water use by water source (imported, local surface, and recycled water) from water districts (gallons) Emissions factor: energy intensity (kWh/gallon) and electricity emissions factor (lbs CO_2e/MWh) from water districts for each of the water cycle (supply, treatment, and distribution)
Wastewater	Fugitive and process emissions from wastewater treatment	Activity: City-specific wastewater generation from wastewater collection agency (gallons) Emissions factor: emission factor based on treatment process (MT CO_2e/gallon)
Solid Waste	End-of-life emissions associated with community waste disposal	Activity: City-specific waste disposal from CalRecycle (tons) Emissions factor: Based on regional composition study and methane recovery factor at landfills obtained from the landfill (MT CO_2e/ton)
Detailed methods and GHG emissions calculation equations are provided in SANDAG Climate Action Planning Framework for Local Governments. *ReCAP Technical Appendix I: GHG Inventories, Projections, and Target Selection* (Version 1.1: October 2020). Energy Policy Initiatives Center, University of San Diego 2024		

A few revisions were made to the original ReCAP 2016 GHG inventory due to newly available data and data sources since 2019: (1) updated VMT estimates based on the 2023 modeling,[9] (2) updated vehicle miles emission rates and off-road transportation emissions from the statewide transportation latest models, and (3) updated water emissions based on latest local water energy intensity data.

The revised GHG emissions from Encinitas in 2016 were approximately 381,000 metric tons carbon dioxide equivalent (MT CO_2e), distributed into categories as shown in Table 4 and Figure 1.

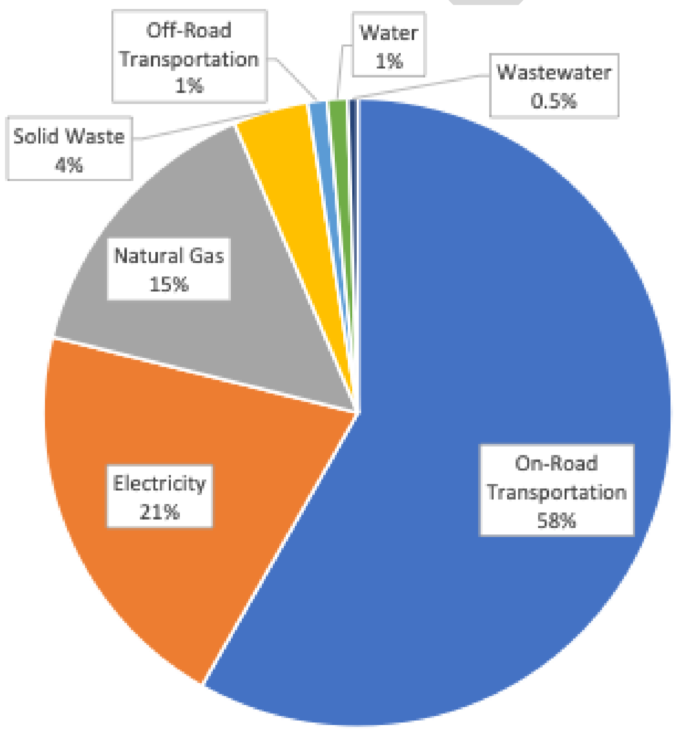
[9] 2016 and 2050 VMT estimates were provided by Fehr & Peers to EPIC (December 15, 2023). The VMT estimates were based on SANDAG ABM2+ model DS41 (ABM2+ Version 14.2.2, Series 14 Forecast, Scenario ID 469, September 2021) and city-specific land use assumptions, including Mobility Element.

Table 4 2016 Greenhouse Gas Emissions in Encinitas

Emissions Category	2016 Inventory GHG Emissions (MT CO_2e)	2016 Inventory Distribution (%)
On-Road Transportation	222,000	58%
Electricity	79,000	21%
Natural Gas	56,000	15%
Solid Waste	15,000	4%
Off-Road Transportation	4,000	1%
Water	4,000	1%
Wastewater	2,000	0.5%
Total	**381,000**	**100%**

Sums may not add up to totals due to rounding. GHG emissions for each category are rounded to the nearest thousand. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

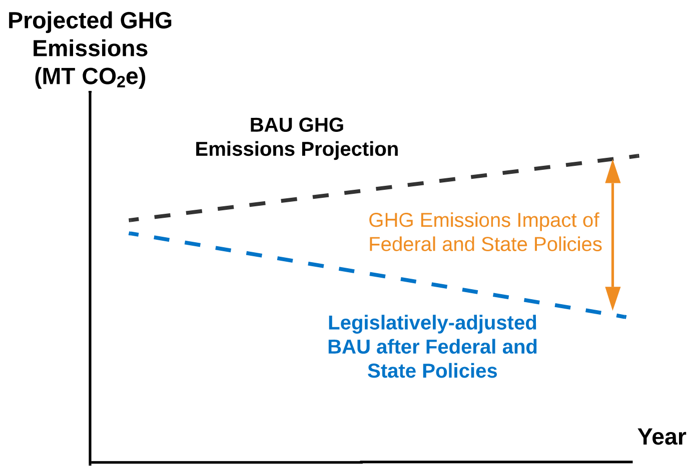


Percentage may not add to totals due to rounding.
Energy Policy Initiatives Center, University of San Diego 2024

Figure 1 2016 Greenhouse Gas Emissions in Encinitas

4 BUSINESS-AS-USUAL EMISSIONS PROJECTION

To inform the development of GHG reduction strategies within the CAP Update, GHG emissions are projected using the 2016 baseline year GHG inventory, as well as estimates for population, housing, and job growth discussed in Section 2. This is used to develop a "business-as-usual" (BAU) projection, which demonstrates emissions growth in the absence of any new policies and programs. Next, future emissions reductions expected from applicable federal and State policies and programs are applied, creating a legislatively-adjusted BAU. Figure 2 provides an illustrative example of the difference between a BAU and a legislatively-adjusted BAU.



Energy Policy Initiatives Center, 2024

Figure 2 Example of Business-As-Usual and Legislatively-Adjusted Business-As-Usual Emissions Projections

The methods used to project activity level and emission factors for each emissions category are described in Table 5.

Table 5 Method to Project Business-as-usual Emissions

Emissions Category	Activity	Method to Project Activity Level	Emission Factor	Method to Project Emission Factor
On-Road Transportation	VMT	Direct results from 2023 transportation modeling	Average vehicle emission factor	All new vehicles have the same emission rate as new vehicles in baseline year

Emissions Category	Activity	Method to Project Activity Level	Emission Factor	Method to Project Emission Factor
Electricity	Net energy for load	Residential: Population increase Non-Residential: Jobs increase	City-specific emission factor	Fixed at the latest year with data available (2020)
Natural Gas	Natural gas end-use	Residential: Population increase Non-Residential: Jobs increase	Natural gas emission factor	0.00545 MT CO_2e/ therms
Solid Waste	Waste disposal	Population Increase	Mixed waste emission factor	0.98 MT CO_2e/short ton
Off-Road Transportation	All adopted rules included in the CARB OFFROAD2021 Model			
Water	Potable and recycled water supply	Potable water: Population increase Recycled water: Fixed at the latest year with data available (2020)	Energy intensity and electricity emission factor	Fixed at the latest year with data available (2020)
Wastewater	Wastewater generation	Population increase	Wastewater emission factor	1.37 MT CO_2e/ million gallon

Method to project business-as-usual emissions only
Population, jobs, and service population are provided in Table 2

Energy Policy Initiatives Center, University of San Diego 2024

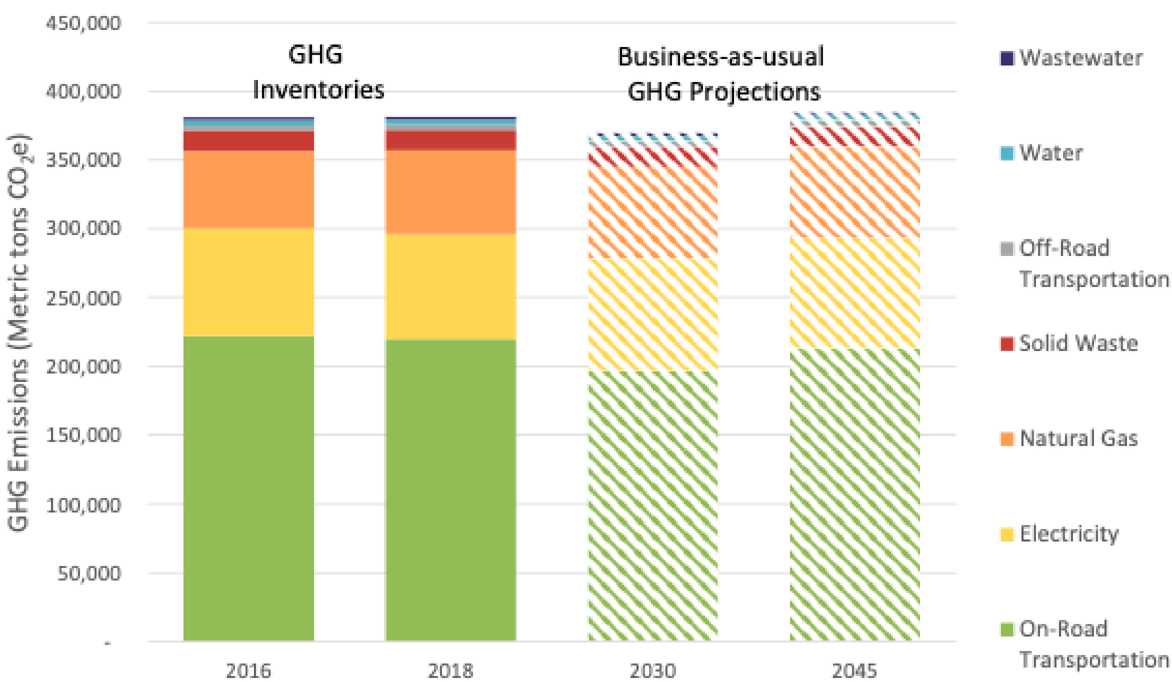
The total BAU projected emissions are presented in Table 6 and Figure 3.

Table 6 Business-As-Usual Emissions Projections

Emissions Category	2030 Projected GHG Emissions (MT CO_2e)	2045 Projected GHG Emissions (MT CO_2e)
On-Road Transportation	197,000	213,000
Electricity	82,000	80,000
Natural Gas	67,000	67,000
Solid Waste	14,000	15,000
Off-Road Transportation	4,000	5,000
Water	4,000	4,000
Wastewater	2,000	2,000
Total	**370,000**	**385,000**

Sum may not add up to totals due to rounding.
Projected GHG emissions for each category are rounded. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024



Business-as-usual GHG emissions projection with population, jobs, and housing units growth from the Encinitas Housing Element + Mobility Element Modeling, not including future impacts of adopted federal, state, or regional policies.
Energy Policy Initiatives Center, University of San Diego 2024

Figure 3 Greenhouse Gas Inventory and Business-As-Usual Emissions Projections

5 2030 AND 2045 REDUCTION TARGETS

Table 7 shows the BAU emissions projections and the 2030 and 2045 reduction targets.

As directed by Senate Bill (SB) 32 and Assembly Bill (AB) 1279, California aims to reduce annual statewide GHG emissions to (1) 40 percent below 1990 levels by 2030; and (2) 85 percent below 1990 levels by 2045, with net-zero emissions achieved through carbon dioxide removal. While the statewide targets are based on 1990 statewide GHG emissions levels, Encinitas, like most jurisdictions in California, does not have an emissions inventory from the year 1990 and must correlate a more recent inventory to 1990 levels using statewide GHG emissions data. In 2016, the California GHG emissions inventory showed that total statewide GHG emissions levels were nearly equivalent to 1990 levels. As such, it is assumed local GHG emissions have evolved on a similar trend, and 1990 total GHG emissions levels in Encinitas may be similar to those estimated in the 2016 community GHG inventory.

In alignment with the State targets, and estimating equivalent reductions needed from the 2016 baseline, the City aims to reduce emissions to: (1) 40 percent below 2016 levels by 2030 (aligned with the 2030 target in SB 32); and 85 percent below 2016 levels by 2045 (aligned with the 2045 target in AB 1279).

Table 7 Emissions Projections, Reduction Targets, and Emissions Reductions Needed

Year	Business-as-usual Projection* (MT CO_2e)	Target Emissions Level (% below baseline)	Target Emissions Level (MT CO_2e)
2016	381,000	-	-
2030	370,000	40%	229,000
2045	385,000	85%	57,000

Emissions projections and targets are rounded.
*BAU projection without impact of federal, State, regional, and local CAP Update strategies.

Energy Policy Initiatives Center, University of San Diego 2024

6 SUMMARY OF EMISSIONS REDUCTION ESTIMATES

This section summarizes the GHG emissions reductions identified for each strategy and measure included in the CAP Update. The methods used to estimate GHG emissions reductions are described in Section 7. Table 8 below presents a summary of emissions reductions from each strategy including the reductions from federal and State regulations.

Table 8 2030 and 2045 GHG Emissions Reductions by Strategy

CAP Strategies	2030 Emissions Reductions (MT CO_2e)	2045 Emissions Reductions (MT CO_2e)
Building Decarbonization	8,000	41,700
Renewable Energy	18,500	1,000

CAP Strategies	2030 Emissions Reductions (MT CO_2e)	2045 Emissions Reductions (MT CO_2e)
Water Efficiency	1,000	900
Clean and Efficient Transportation	7,500	15,100
Zero Emission Equipment	300	1,300
Zero Waste	10,400	12,700
Carbon Sequestration	4,300	5,300
Federal and State Regulations	92,100	250,300
Total Reduction*	**142,000**	**328,000**

Emissions reduction values in 2030 and 2045 are rounded. Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
*The total includes values from federal, State, regional, and local CAP Update strategies.
Energy Policy Initiatives Center, University of San Diego 2026

Each strategy has several measures. Table 9 presents a detailed summary of the emissions reductions from each CAP Update measure, including each federal and State action.

Table 9 2030 and 2045 GHG Emissions Reductions by Measure

CAP Strategies	Federal and State Regulations and CAP Measures	2030 Emissions Reductions (MT CO_2e)	2045 Emissions Reductions (MT CO_2e)
Building Decarbonization	BD-1: Require Existing Residential Development Energy Efficiency	46	183
Building Decarbonization	BD-2: Require New Residential Development Decarbonization	276	733
Building Decarbonization	BD-3: Require Existing Nonresidential Development Energy Efficiency	Not Quantified	Not Quantified
Building Decarbonization	BD-4: Require New Nonresidential Development Decarbonization	591	2,540
Building Decarbonization	BD-5: Decarbonize Existing Buildings	7,001	38,085
Building Decarbonization	MBD-1: Implement Energy Efficiency and Decarbonization Projects at Existing Municipal Facilities	81	135
Building Decarbonization	MBD-2: Require New Municipal Facilities be All-Electric	Not Quantified	Not Quantified
Renewable Energy	RE-1: Maintain Membership in San Diego Community Power	18,267	0
Renewable Energy	RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems	239	665
Renewable Energy	MRE-1: Install Microgrids with On-site Renewable Generation and Battery Storage at Existing Municipal Facilities	0	341
Renewable Energy	MRE-2: Require New Municipal Facilities to Install Microgrids with On-Site Solar and Battery Storage	Not Quantified	Not Quantified

CAP Strategies	Federal and State Regulations and CAP Measures	2030 Emissions Reductions (MT CO_2e)	2045 Emissions Reductions (MT CO_2e)
Water Efficiency	WE-1: Support Local Water Districts' Water Conservation Efforts	955	879
Water Efficiency	WE-2: Require New Single-Family Homes to be Pre-Plumbed for Greywater Systems	8	20
Water Efficiency	MWE-1: Convert City-Owned Landscape to Drought Tolerant or Native Species	2	7
Clean and Efficient Transportation	CET-1: Implement the Active Transportation Plan	382	536
Clean and Efficient Transportation	CET-2: Implement a Microtransit Program	150	62
Clean and Efficient Transportation	CET-3: Require Transportation Demand Management Programs for New Residential, Nonresidential, and Major Redevelopment Projects	1,556	3,430
Clean and Efficient Transportation	CET-4: Reduce Vehicle Miles Traveled	0	3,451
Clean and Efficient Transportation	CET-5: Improve traffic flow	1,902	1,136
Clean and Efficient Transportation	CET-6: Require Residential Electric Vehicle Charging Stations	650	1,798
Clean and Efficient Transportation	CET-7: Require Nonresidential Electric Vehicle Charging Stations	529	1,983
Clean and Efficient Transportation	MCET-1: Transition to Zero Emission Vehicle Municipal Fleet	265	288
Clean and Efficient Transportation	MCET-2: Implement a Municipal Employee Transportation Demand Management Program	62	26
Clean and Efficient Transportation	MCET-3: Install Public Electric Vehicle Charging Stations	2,035	2,427
Zero Emission Equipment	ZE-1: Limit Use of Gas-Powered Leaf Blowers	250	247
Zero Emission Equipment	ZE-2: Limit Use of Gas-Powered Landscape Equipment	0	1,043
Zero Waste	ZW-1: Implement a Zero Waste Program	10,357	12,694
Carbon Sequestration	CS-1: Establish a Tree Canopy Goal for the City	4,096	4,841
Carbon Sequestration	CS-2: Enforce Landscape Tree Requirements at New Developments	117	242

CAP Strategies	Federal and State Regulations and CAP Measures	2030 Emissions Reductions (MT CO_2e)	2045 Emissions Reductions (MT CO_2e)
Carbon Sequestration	CS-3: Incentivize Tree Planting on Private Property	18	71
Carbon Sequestration	CS-4: Adopt and Implement a Mature Tree Ordinance	Not Quantified	Not Quantified
Carbon Sequestration	MCS-1: Plant and Maintain City Trees	66	119
Federal and State Regulations	Federal and California Vehicle Efficiency Standards	29,035	135,660
Federal and State Regulations	California Energy Efficiency Programs	2,833	2,203
Federal and State Regulations	Renewables Portfolio Standard	34,137	76,716
Federal and State Regulations	California Solar Policies and Programs	26,106	35,745
Total from Federal and State Regulations		92,112	250,325
Total from CAP Update Measures		49,901	77,979
Total Reduction*		**142,000**	**328,000**

*Total emissions reductions values in 2030 and 2045 are rounded. The total includes reductions from federal, State, and CAP Update measures.
Certain measures are not quantified because information on how the policies or the programs would be implemented is unknown as of the CAP development stage.

Energy Policy Initiatives Center, University of San Diego 2026

Figure 4 provides a visualization of the emissions trends through 2045.

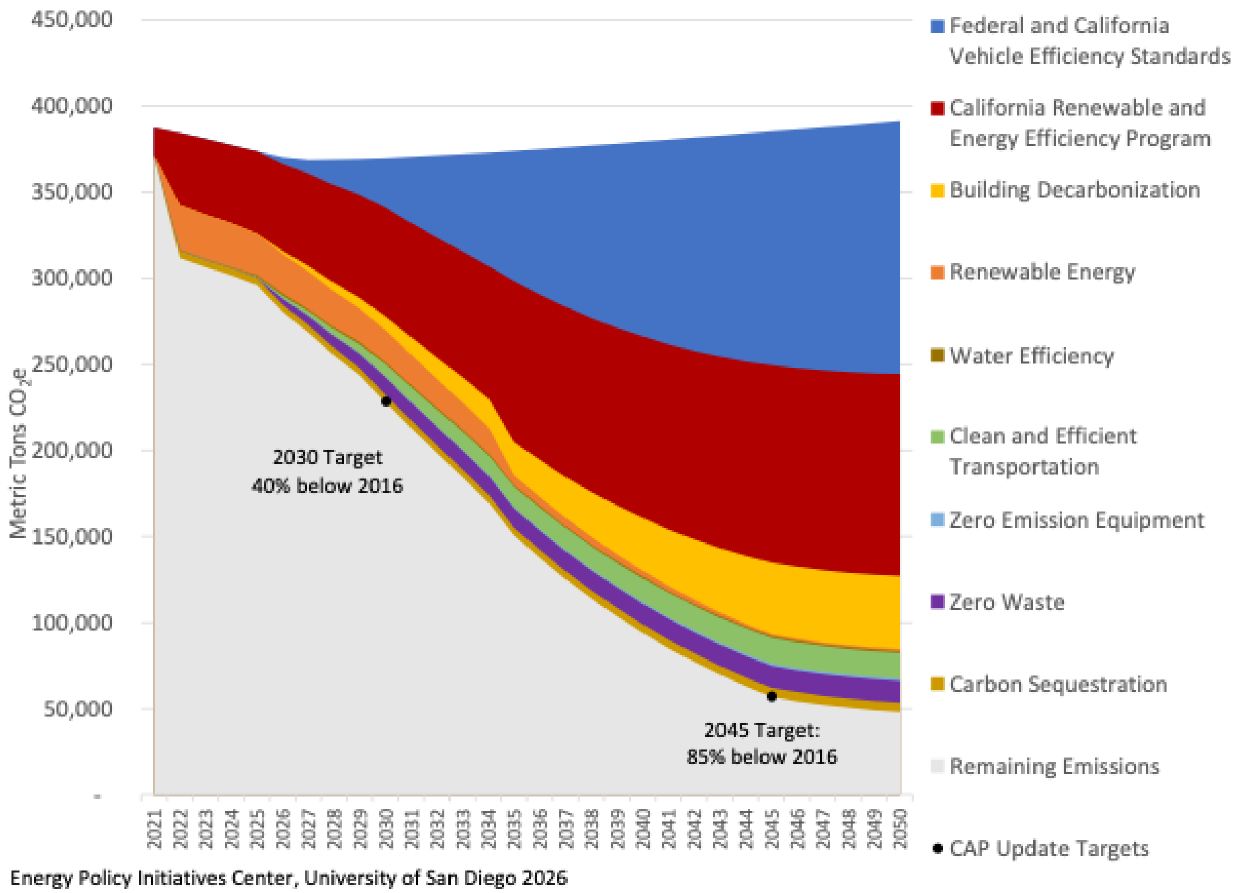


Figure 4 Greenhouse Gas Emissions Trend (2021–2045)

In Figure 4, the colored wedges represent the reduction from each CAP Update strategy and from federal and State actions. Each wedge represents the cumulative GHG reduction from through 2045. The grey area beneath the colored wedges represents the remaining emissions after all the actions have taken place.

7 METHODS TO ESTIMATE GREENHOUSE GAS EMISSIONS REDUCTIONS

The following sub-sections describe the methods to estimate GHG emissions reductions:

- Section 7.1 through Section 7.3 discuss a set of common assumptions and sources used to calculate emissions reductions in energy and on-road transportation categories;
- Section 7.4 describes the emissions reductions from federal and State actions; and
- Section 7.5 describes the emissions reductions from the CAP Update measures.

7.1 Common Assumptions and Methods for Calculating Electricity Emissions Reductions

The following overall assumptions and methods are used in the calculation of emissions reductions related to electricity, including those from federal and State actions as well as CAP Update measures.

7.1.1 GHG Emission Factor for Electricity

The electricity emission factors in Encinitas (i.e., citywide electricity emission factors) are the weighted average emission factors of gross generation from four sources of supply: (1) San Diego Gas & Electric (SDG&E) bundled customers, the customers whom receive both electric generation and electric delivery service from SDG&E (bundled service);[10] (2) the Electric Service Providers (ESPs) for SDG&E's Direct Access (DA) customers;[11] (3) San Diego Community Power (SDCP), a Community Choice Energy program launched in 2021; and (4) behind-the-meter photovoltaic (PV) systems, the PV systems that are located on the customer's side of the utility meter.

The citywide electricity emission factors are different from the emission factors used in the GHG inventory because the electricity generated from behind-the-meter PV systems are assumed to be zero emissions and not accounted for in the GHG inventory. However, all sources are considered to estimate the effects of State actions and CAP Update measures that increase the grid-supply of renewable and zero-carbon electricity. Considering behind-the-meter PV as a source that contributes to the citywide electricity emission factor reflects the effects of energy efficiency programs that may reduce behind-the-meter electricity use, or the effects from additional electric vehicle (EV) charging load, which may come from behind-the-meter electricity sources and not just from grid supply.

The citywide electricity emission factor is calculated based on the percentage of renewable content in and the percentage of gross generation from each supply source as described below. This method is applied to 2020 onward when the projection from electricity category starts. As the percentage of renewable and zero-carbon supply in the mix increases, the citywide electricity emission factor decreases.

7.1.1.1 Supply from San Diego Gas & Electric

As of 2020, SDG&E's bundled power mix is 31% renewable.[12] It is assumed SDG&E will meet the 60% renewable by 2030, 90% renewable and zero-carbon by 2035, and 100% renewable and zero-carbon by 2045 as required by the Renewables Portfolio Standard (RPS) under SB 100 (de León) and SB 1020 (Laird).[13] Estimates in this Appendix assume that 100% renewable and zero-carbon means supplying every hour of the year with renewable and carbon-free electricity resources. The legislative mandates are discussed in detail in Section 7.4.1.

7.1.1.2 Supply from Electric Service Providers of San Diego Gas & Electric Direct Access Customers

Like SDG&E, ESP of SDG&E DA customers are required to meet RPS targets.

7.1.1.3 Supply from San Diego Community Power

SDCP, the Community Choice Energy program launched in 2021, would increase its renewable and zero-carbon electricity supply beyond the current RPS mandates. This is discussed in detail in Section 7.5.2.1.

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[10] SDG&E's bundled customers are those who receive both electric generation and electric delivery service from SDG&E (bundled service). SDG&E: Customer Choice Service Types.

[11] Direct Access customers receive electric generation from Electric Service Providers (not SDG&E), but electricity is delivered by SDG&E. SDG&E: Customer Choice Service Types.

[12] SDG&E: 2020 Power Content Label.

[13] SB 100 (de León) California Renewables Portfolio Standard Program: emissions of greenhouse gases (2017–2018). The interim RPS targets are 44% by 2024 and 52% by 2027 from eligible renewable energy resources. SB 1020 (Laird) Clean Energy, Jobs, and Affordability Act of 2022 (2021-2022).

Because all of California's electricity retail sellers need to meet the RPS requirement, a portion of the emissions reduction from RPS compliance is credited to State actions. The remaining portion of reductions is attributed to CAP Update Measure RE-1: Maintain Membership in San Diego Community Power.

7.1.1.4 Supply from Behind-the-Meter Photovoltaic Systems

Electricity generation from behind-the-meter PV systems, including residential and non-residential PV, is considered part of the overall electricity supply. Electricity generation from PV is considered 100% zero-carbon (i.e., GHG-free). The State's solar policies, programs, and mandates are discussed in Section 7.4.1.1.

7.1.1.5 Citywide Electricity Emissions Factors

The citywide electricity emission factor is based on the percentage of gross generation from each supply, as well as the percentage of renewable and zero-carbon content in each supply, as shown in Equation 1.

Equation 1 Citywide Electricity Emission Factors Calculation

$$EF_{electricity,n} = \sum_{supply} \left(P_{supply,n} * \frac{\left(1 - RE_{supply,n}\right)}{\left(1 - RE_{SDG\&E,starting\ year}\right)} * EF_{SDG\&E,starting\ year}\right)$$

Where

$EF_{electricity,n}$ = Emissions factor of the electricity (gross generation) in a city in a given year, in lbs CO_2e per megawatt hour (MWh)

$P_{supply,n}$ = Gross generation supplied by an electricity supply in a given year, %

$RE_{SDG\&E,starting\ year}$ = renewable content of SDG&E supply in CAP projection starting year (2020 here), in percent.

$EF_{SDG\&E,starting\ year}$ = Electricity emission factor of SDG&E supply in CAP projection starting year (2020 here), in lbs CO_2e per MWh

With,

supply = all electricity supplies, including but not limited to SDG&E, behind-the-meter PV, San Diego Community Power

n = a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 10 shows the contribution from each supply to gross generation, its renewable and zero-carbon content, and the overall citywide electricity emission factors for 2020, 2030, and 2045 calculated based on Equation 1.

Table 10 Encinitas Citywide Electricity Emissions Factors

Year		2020	2030	2045
San Diego Community Power	% of Gross Generation Supplied	-*	55%	54%
San Diego Community Power	Renewable and Zero-Carbon Content in Supply	-*	100%	100%
Other Electric Service Providers	% of Gross Generation Supplied	12%	9%	9%

Year		2020	2030	2045
Other Electric Service Providers	Renewable and Zero-Carbon Content in Supply	33%	60%	100%
SDG&E	% of Gross Generation Supplied	72%	4%	4%
SDG&E	Renewable and Zero-Carbon Content in Supply	31%	60%	100%
Behind-the-meter PV	% of Gross Generation Supplied	15%	32%	33%
Behind-the-meter PV	Renewable and Zero-Carbon Content in Supply	100%	100%	100%
Citywide	Renewable and Zero-Carbon Content in Supply	42%	95%	100%
Citywide	Electricity Emissions Factor (lbs CO_2e/MWh)	538	50	0

*San Diego Community Power was launched in 2021.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation. The overall citywide emission factors here are different from the emission factors used in the GHG inventories. The emission factors used in GHG inventories do not include behind-the-meter supplies.
2020 is the latest year with utility data available. 2030 and 2045 data are projections based on CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

In 2020, SDG&E and other electric retail suppliers supplied 85% of the projected gross generation, and behind-the-meter PV systems supplied the remainder. In 2030, the projected electricity supply from behind-the-meter PV systems is estimated to be 32% of gross generation. To comply with the mandated renewable and zero-carbon targets for 2030, the renewable content in electricity from both SDG&E and other ESPs will increase to 60%. This Appendix assumes the renewable and zero-carbon supplies from SDG&E and ESPs are fixed at the RPS mandate level to avoid overestimating the emissions reductions.

Based on the target for CAP Measure RE-1, it is assumed SDCP will have 100% renewable and zero-carbon sources by 2030. Based on these supply contributions, the citywide annual weighted electricity emission factor in 2030 is projected to be 50 lbs CO_2e/MWh (95% renewable and zero-carbon) and zero lbs CO_2e/MWh in 2045 (100% renewable and zero-carbon).

The citywide electricity emission factors are used to calculate the emissions reductions from electricity savings, as well as State actions and CAP Update measures that increase renewable supply.

7.1.2 GHG Emissions Reductions from Actions that Increase Renewables in Electricity

The projected citywide electricity emission factor is used to estimate the GHG emissions reductions from any actions that increase the overall renewable and zero-carbon supply. The total reduction from State and local CAP Update measures that increase renewable supply is given in Table 11, calculated using the projected gross generation in target years and the difference in the 2030 and 2045 citywide emissions and BAU emission factors, as shown in Equation 2.

Equation 2 GHG Emissions Reductions from Actions Increasing Renewable and Zero-Carbon Supply

$$\Delta E_{electricity,RE,n} = Elec_n * \Delta EF_{electricity,n} * 0.000453$$

Where

$\Delta E_{electricity,RE,n}$ = total emissions impact from increasing renewable and zero-carbon electricity supply in a given year, in MT CO_2e

$Elec_n$ = electricity gross generation, including all suppliers in a given year, MWh

$\Delta\, EF_{electricity,n}$	= difference in the projected emission factor of the electricity (gross generation) in a city in a given year compared with BAU emission factor, in pounds CO_2e per MWh
0.000453	= conversion factor, MT CO_2e in a pound

With,

n	= a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 11 GHG Emissions Reductions from Actions Increasing Renewable and Zero-Carbon Supply

Year	Gross Generation (GWh)	BAU Projection - Electricity Emission Factor (lbs CO_2e/MWh)	BAU Projection Emissions from Electricity (MT CO_2e)	Projections with State and Local CAP Update Actions in Increasing Renewable and Zero-Carbon Supply - Electricity Emission Factor (lbs CO_2e/MWh)	Projections with State and Local CAP Update Actions in Increasing Renewable and Zero-Carbon Supply - Emissions from Electricity (MT CO_2e)	GHG Emissions Reductions from Increased Renewable and Zero-Carbon Supply (MT CO_2e)
2030	355	538	86,766	50	8,017	78,749
2045	455	538	110,991	0	0	110,991

The projections with increasing renewable and zero-carbon supply are based on CAP Update assumptions and State policies and programs, including the additional electric load from electric vehicles due to California's Advanced Clean Cars II regulations.

Energy Policy Initiatives Center, University of San Diego 2024

The BAU emission factor for 2020 (Table 10) is kept constant through the year 2045. The total emissions reductions from increasing renewable supply, as calculated above (Table 11), is attributed to each supply based on its renewable and zero-carbon content compared to the total renewable and zero-carbon content. This is shown in Equation 3 and Table 12.

Equation 3 Attributing Emissions Reduction to Each Supply

$$\Delta\, E_{electricity,supply,n} = \Delta\, E_{electricity,RE,n} * \left(\frac{P_{supply,n} * RE_{supply,n}}{RE_{electricity,n}}\right)$$

Where

$\Delta\, E_{electricity,supply,n}$	= emissions impact of an electricity supply from increasing renewable and zero-carbon content in a given year, in MT CO_2e
$\Delta\, E_{electricity,RE,n}$	= total emissions impact from increasing renewable and zero-carbon electricity supply in a given year, in MT CO_2e;
$P_{supply,n}$	= gross generation supplied by an electricity supply in a given year, %
$RE_{supply,n}$	= renewable and zero-carbon content of an electricity supply in a given year, %
$RE_{electricity,n}$	= overall renewable and zero-carbon content of the electricity supply (gross generation) in a given year (%);

With,

supply	= all electricity supplies, including but not limited to: SDG&E, Behind-the-meter PV, CCA

n = a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 12 GHG Emissions Reductions by Supply

Year	Electricity Supply	Total	San Diego Community Power	Other Electric Retail Suppliers	SDG&E	Behind-the-meter PV
2030	% of Gross Generation Supplied by Renewables Sources	95%	55%	6%	2%	32%
2030	Emissions Reduction from Increased Renewables Supply (MT CO_2e)	78,749	45,667	4,675	2,062	26,345
2045	% of Gross Generation Supplied by Renewables Sources	100%	54%	9%	4%	33%
2045	Emissions Reduction from Increased Renewables Supply (MT CO_2e)	110,991	60,188	9,522	4,530	36,751
2030 and 2045 data are the projections based on CAP Update assumptions and the future impact of State policies and programs. Energy Policy Initiatives Center, University of San Diego 2024						

7.2 Common Assumptions and Methods for Calculating Natural Gas Emissions Reductions

As described in Section 4, the natural gas emission factor of 0.00545 MT CO_2e per therm is used for all years to estimate the emissions reductions for the CAP Update measures that reduce natural gas use.

7.3 Common Assumptions and Methods for Calculating On-Road Transportation Emissions Reductions

The following assumptions and methods are used to calculate emissions reductions for strategies related to on-road transportation, including federal and State actions and local CAP Update measures.

7.3.1 GHG Emission Factor for On-Road Transportation

The GHG emission factor for on-road transportation is used in several ways throughout the Appendix: to estimate the effect of (1) federal and State actions that increase the vehicle fuel efficiency standard and increase zero-emission vehicles (ZEVs); (2) local actions to increase electric vehicle charging stations (EVCS); and (3) local actions to reduce VMT.

7.3.1.1 Impact of Federal and State Actions on Average Vehicle Emission Rates

The latest CARB EMFAC2021 model includes the effects of federal and State regulations related to tailpipe GHG emissions reductions that were adopted by the end of 2020.[14] In August 2022, CARB adopted the Advanced Clean Cars II (ACCII) regulations that established standards for new post-2026 model year light-duty vehicles. ACCII amended: (1) the low-emission vehicle (LEV) regulations to strengthen standards for light-duty vehicles and trucks to reduce smog-forming emissions; and (2) the ZEV regulations to require an increasing number of ZEVs to meet air quality and climate change emissions standards.[15] The ZEV amendments support Governor Newsom's Executive Order N-79-20 that requires all new passenger vehicles sold in California to be ZEVs by 2035.[16]

[14] CARB: EMFAC2021 Volume III Technical Document, Version 1.0.1 (April 2021). Section 1.3.5 Regulations and Policies includes a list of polices and regulations covered in EMFAC2021.
[15] CARB: Advanced Clean Cars II.
[16] CARB: Advanced Clean Cars II.

Starting in 2026, ACCII will have a significant impact on the percentage of new ZEVs and plug-in hybrid electric vehicles (PHEVs). However, EMFAC2021 default outputs do not include the effect of ACCII. The newly released EMFAC version, EMFAC2025, which is not yet approved by EPA, includes the impact of ACCII and other light-duty and heavy-duty vehicle regulations passed after the adoption of EMFAC2021.[17] Even though EPA granted waivers for California's ACCII regulations in 2024, Congress adopted resolutions late 2025 revoking EPA's actions to grant California waivers for several regulations including ACCII, and other heavy-duty vehicle regulations (e.g., Advanced Clean Trucks). CARB is currently contesting the federal actions in court.

Figure 5 shows the differences in projected ZEV and PHEV sales as required by ACCII and in EMFAC2021.

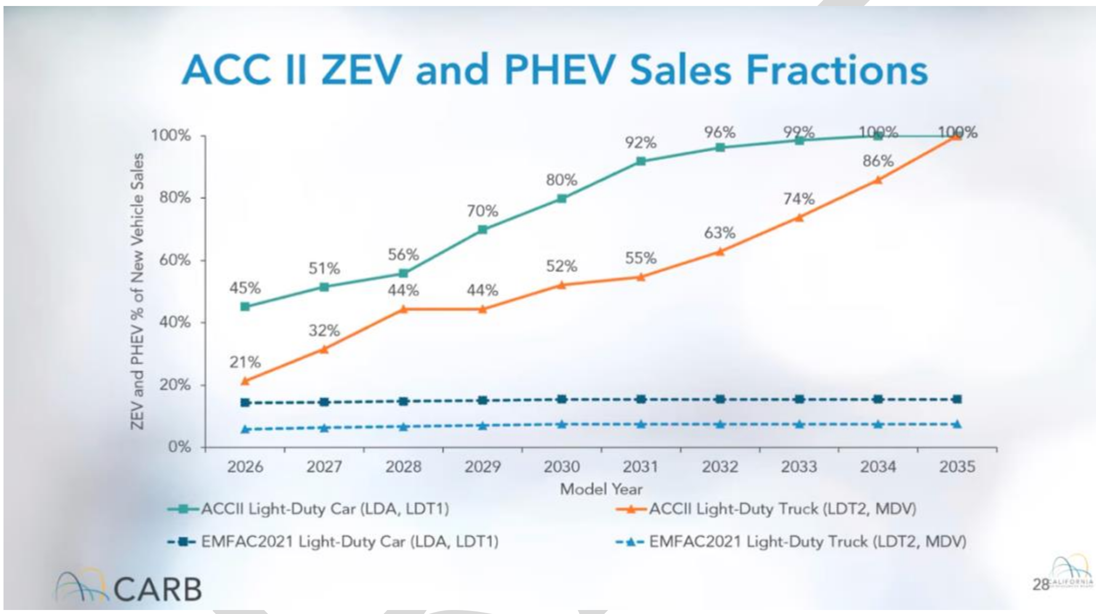

Figure 5 ACCII ZEV and PHEV Sales (Adapted from CARB October 2022 Public Workshop for the EMFAC202Y Model, Presentation Slide 28)

To estimate the impact of ACC off-model, the ACCII ZEV and PHEV sales in Figure 5 are applied to new light-duty cars trucks starting in model year 2026. For example, 45% of new light-duty cars in model and calendar year 2026 will be ZEVs and PHEVs, with the remaining light-duty cars split between gasoline and diesel.[18] Starting with model year 2035, new light-duty vehicles (both cars and trucks) will be 100% ZEVs or PHEVs.

Taking into account EMFAC2021 and ACCII regulations, the average vehicle emission rates (g CO_2e/mile) are calculated based on the distribution of VMT in each vehicle class with ACCII adjustment for light-duty vehicles, as well as the emission rate of each vehicle class. The average vehicle emission rates (Table 13) are used to estimate the GHG emissions reduction impact of federal and State policies that increase vehicle efficiency and ZEVs.

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[17] CARB Presentation EMFAC202Y: An Update to California on-road Mobile Source Emissions Inventory (October 12, 2022). EMFAC2025, released on May 13, 2025.
[18] Based on the EMFAC2021 default gasoline-diesel cars fraction.

Table 13 Average Vehicle Emission Rate in the San Diego Region

Year	EMFAC2021 Default Results (with the Impact of all Adopted State and Federal Policies through 2020) - Ratio of e-VMT to Total VMT (%)	EMFAC2021 Default Results (with the Impact of all Adopted State and Federal Policies through 2020) - Ratio of e-VMT to Total VMT (%) - Average Vehicle Emission Rate (g CO_2e/mile)	Adjusted EMFAC2021 Default Results with ACCII ZEV Regulations - Ratio of e-VMT to Total VMT (%)	Adjusted EMFAC2021 Default Results with ACCII ZEV Regulations - Average Vehicle Emission Rate (g CO_2e/mile)
2019	1.4%	428	1.4%	428
2030	7.7%	343	20%	303
2045	13%	296	74%	122

ACCII: Advanced Clean Cars II Regulations
e-VMT: electric vehicle miles traveled
EMFAC2021 includes all key federal and State regulations related to tailpipe GHG emissions reductions that were adopted by the end of 2020. EMFAC2021 results are adjusted to include the ACCII ZEV regulations.

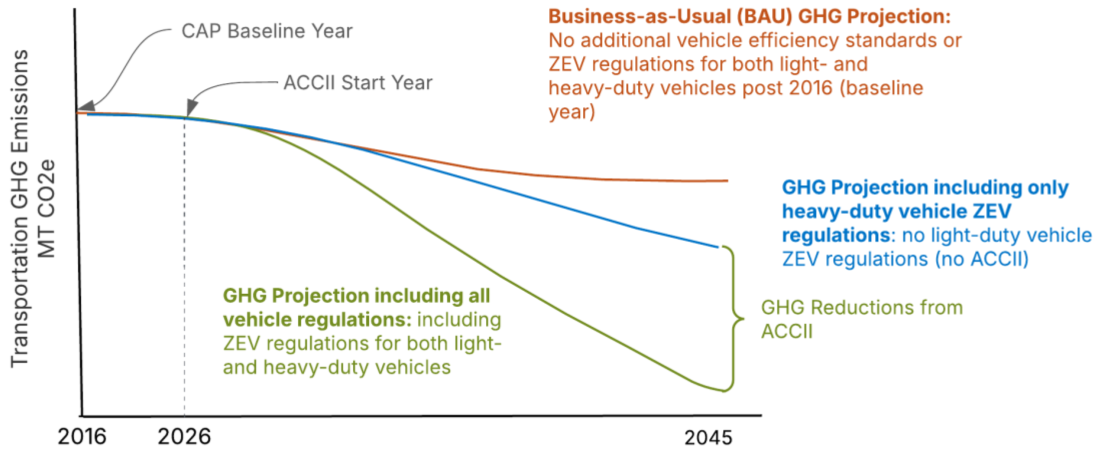
CARB 2021, Energy Policy Initiatives Center, University of San Diego 2024

This Appendix assumes that the impact of ACCII in the San Diego region will be the same as its impact statewide due to the lack of regional specific data available. The additional electric load from the ZEVs and PHEVs is included in the projected gross generation in the electricity category.

7.3.1.2 Impact of State and Local Actions on Increasing Zero Emission Vehicles

CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations* all assist in the implementation of State's ZEV mandates and ACCII that require manufacturers to produce increasing numbers of ZEVs and PHEVs, by providing local EV charging infrastructures.

The total effect of increasing ZEVs in future years is estimated by comparing EMFAC2021 default emissions rates (without the impacts of ACCII) and the adjusted EMFAC2021 emission rates with the impacts of ACCII, as shown in Table 14. An illustration of BAU emission rates used in BAU emissions projections, default EMFAC2021 emission rates, and adjusted EMFAC2021 emission rate is show in Figure 6.



ACCII: Advanced Clean Cars II, vehicle emission standards for model year 2026-2035
ZEV: zero-emissions vehicles

Figure 6 Illustration of Different Transportation Emissions Projections

Table 14 Emissions Reduction from Increasing Zero Emission Vehicles

Year	Projected VMT (annual million miles)	Emissions Projection with Only Heavy-Duty ZEV Regulations (EMFAC2021 Default Results) - Average Vehicle Emission Rate (g CO_2e/mile)	Emissions Projection with Only Heavy-Duty ZEV Regulations (EMFAC2021 Default Results) - On-Road Transportation (MT CO_2e)	Emissions Projection with Both Heavy- and Light-Duty ZEV Regulations (Adjusted EMFAC2021 Results) - Average Vehicle Emission Rate (g CO_2e/mile)	Emissions Projection with Both Heavy- and Light-Duty ZEV Regulations (Adjusted EMFAC2021 Results) – On-Road Transportation (MT CO_2e)	Emissions Reduction from Light-duty ZEV Regulations (MT CO_2e)
2030	542	343	185,753	303	164,443	21,310
2045	587	296	173,709	122	71,339	102,370

ZEV: zero-emission vehicles
EMFAC2021 includes all key federal and State regulations related to tailpipe GHG emissions reductions that were adopted by the end of 2020. EMFAC2021 results are adjusted to include the ACCII ZEV regulations.

CARB 2021, Energy Policy Initiatives Center, University of San Diego 2026

Portions of the total emissions reduction from increasing ZEVs (21,310 MT CO_2e in 2030 and 102,370 MT CO_2e in 2035) are attributed to Measures CET-6, CET-7, and MCET-3 in proportion to each measure's contribution of electric vehicle miles (e-VMT). Table 15 provides the key assumptions and results of the attribution.

Table 15 Allocation of GHG Emissions Reduction from Increasing Zero Emission Vehicle Miles

Year	Projected Miles Driven by EVs of Total VMT	Projected e-VMT from Light-Duty ZEV Regulations	Projected e-VMT from CET-6	Projected e-VMT from CET-7	Projected e-VMT from MCET-3	Emissions Reduction from Light-Duty ZEV Regulations	Emissions Reduction from CET-6	Emissions Reduction from CET-7	Emissions Reduction from MCET-3
2030	20%	108	3.3	2.7	10.3	21,310	650	529	2,035
2045	74%	434	7.6	8.4	10.3	102,370	1,798	1,983	2,427

e-VMT: electric vehicle miles
CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations*

Projected e-VMT percent of total VMT data are from Table 13.
The emissions reduction from each is the projection under the CAP assumptions, including future impact of State policies and programs used in the EMFAC2021 with additional light-duty ZEV regulations (Advanced Clean Cars II).
Energy Policy Initiatives Center, University of San Diego 2026

Based on the adjusted EMFAC2021 results including ACCII, in 2030, 20 percent of all VMT in the San Diego region will be driven by EVs, corresponding to 108 million e-VMT in Encinitas. The requirement through Measure CET-6 would result in about 3.3 million e-VMT in 2030. Therefore, 3 percent (the ratio of 2.7 million miles to 108 million miles) of emissions reductions from the light-duty ZEV program in 2030 (20,103 MT CO_2e from Table 14) are attributed to Measure CET-6. The emissions reductions from Measures CET-7 and MCET-3 and in target year 2045 are attributed using the same method.

7.4 Federal and State Actions that Reduce GHG Emissions in Encinitas

In addition to how federal and State regulations affect the emissions factors of electricity and on-road transportation, these same policies lead to significant emissions reductions in Encinitas through 2045. This section provides a summary of the methods used to estimate and attribute the emissions reductions associated with the following federal and State actions that increase renewable electricity, building energy efficiency, and clean and efficient transportation:

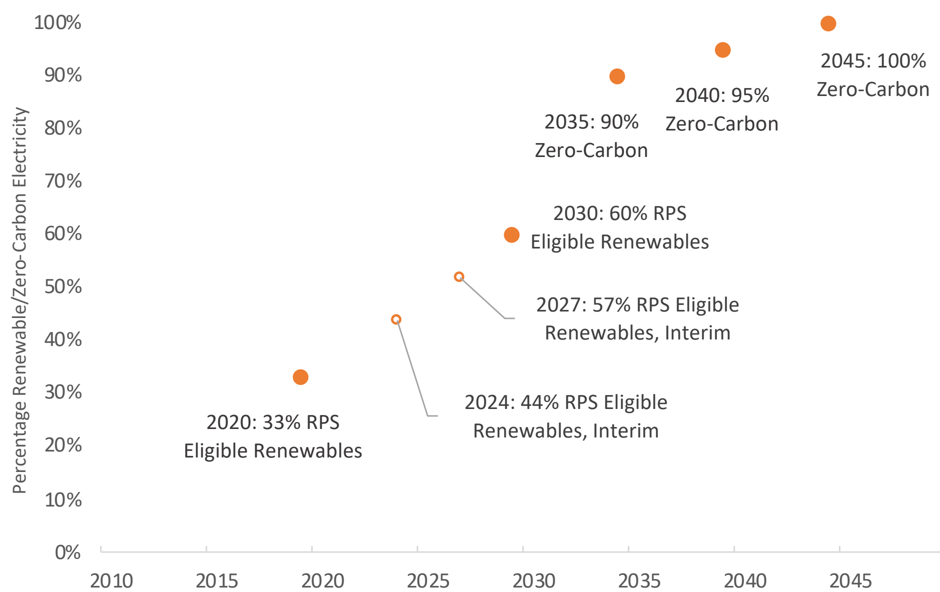
- California RPS – SB 100 and SB 1020
- California Solar Programs, Policies and Mandates
- California Energy Efficiency Programs
- Federal and California Vehicle Efficiency Standards

7.4.1 California Renewables Portfolio Standard

SB 100, the 100 Percent Clean Energy Act of 2018, adopts a 60 percent RPS for all of California's electricity retail sellers by 2030. SB 100 also provides goals for the intervening years before 2030 and establishes a State policy requiring that zero-carbon resources supply 100 percent of all retail electricity sales to end-user customers and all State agencies by December 31, 2045.[19] SB 1020, the Clean Energy, Jobs, and Affordability Act of 2022, adopts two interim targets for all retail electricity sales to end-use customers: 90 percent renewable and zero-carbon electricity by 2035 and 95 percent renewable and

[19] SB 100 (de León): California Renewables Portfolio Standard Program: emissions of greenhouse gases (2017–2018). The interim RPS targets are 44 percent by 2024 and 52 percent by 2027 from eligible renewable energy resources.

zero-carbon electricity by 2040.[20] The statewide renewable and zero-carbon targets are shown in Figure 7 below.



SB100 and SB1020 targets apply to all retail electricity providers include Direct Access, Community Choice Aggregators and Investor-Owned Utilities
Energy Policy Initiatives Center, University of San Diego 2023

Figure 7 SB 100 and SB 1020 Targets

All electricity retail sellers are required to meet the State's RPS requirements, including SDG&E, ESPs for SDG&E's DA customers, and SDCP. In this Appendix, a conservative approach is taken that assumes all sellers, including ESPs, will meet, but not surpass, the RPS requirements. Under this assumption, all emissions reductions from SDG&E and ESPs reaching 60 percent renewables in 2030 are credited to the State under the RPS requirements. In 2045, because all electricity retail sellers are required to meet the 100 percent renewable and zero-carbon requirement, all emissions reductions are credited to the State.

For SDCP, a portion of the emissions reductions in 2030 from the program will be credited to the State under RPS compliance, and the remaining reduction will be attributed to Measure RE-1, as described in Section 7.5.2.1, calculated using Equation 4. In addition, the electricity related to bring water down from the State Water Project and the Colorado River also must be renewable or zero-carbon under the mandates. Table 16 shows results from RPS mandates in target years.

Equation 4 Emission Reduction Calculation for Local Renewable Program in Compliance with RPS

$$\Delta E_{electricity,RPS,n} = \Delta E_{electricity,Local\ RE,n} * \left(\frac{RE_{RPS,n}}{RE_{local\ RE,n}}\right)$$

Where

$\Delta E_{electricity,RPS,n}$ = emissions impact of a local renewable program in a given year, in compliance with RPS, in MT CO_2e

$\Delta E_{electricity,Local\ RE,n}$ = emissions impact of local renewable program in a given year, in MT CO_2e

[20] SB 1020 (Laird): the Clean Energy, Jobs, and Affordability Act of 2022 (2021–2022).

$RE_{RPS,n}$	= RPS requirement in a given year, fixed for RPS target years and interpolated for other years
$RE_{Local\ RE,n}$	= targeted renewable content of a local renewable program in a given year (%)

With,

n	= a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 16 Emissions Reductions from California Renewables Portfolio Standard

Year	RPS-Related Emissions Reductions from SDG&E* (MT CO_2e)	RPS-Related Emissions Reductions from SDCP (MT CO_2e)	RPS-Related Emissions Reductions from Upstream Water-Energy Use (MT CO_2e)	Total RPS-Related Emissions Reductions (MT CO_2e)
2030	6,737	27,400	0	34,137
2045	14,053	60,188	2,476	76,716

SDCP: San Diego Community Power
*Includes SDG&E and electric service providers of SDG&E DA customers.
2030 and 2045 data are projections under the CAP based on current status, future impact of State policies and programs, and CAP Update measures assumptions.

Energy Policy Initiatives Center, University of San Diego 2024

7.4.1.1 California Solar Programs, Policies, and Mandates

California has several policies and programs to encourage customer-owned, behind-the-meter PV systems, such as the California Solar Initiative, New Solar Home Partnership, Net Energy Metering, and electricity rate structures for solar customers. The California 2019 Building Energy Efficiency Standards, which went into effect on January 1, 2020, required all newly constructed single-family homes, low-rise multi-family homes, and detached accessory dwelling units (ADUs) to have PV systems installed, unless the building receives an exception.[21] The latest California 2022 Building Energy Efficiency Standards (2022 Code), which went into effect on January 1, 2023, expanded the PV requirement to include non-residential buildings. In addition, the 2022 Code encourages efficient electric heat pumps and establishes electric-ready requirements for new residential construction.[22]

The California Energy Demand 2023–2040 Forecast, developed by the California Energy Commission (CEC), has projections for PV capacity from behind-the-meter PV adoption in the SDG&E planning area through 2040, including the impact of the residential and non-residential PV mandates.[23] The Net Billing Tariff (NEM 3.0) that went into effect in April 2023 and the federal ITC extension announced in August 2022 will have a long term an impact the behind-the-meter PV installation. This 2023–2040 forecast incorporates these policies and incentives, The Energy Demand Forecasts are updated annually, and the

[21] CEC: 2019 Building Energy Efficiency Standards – 2019 Residential Compliance Manual (December 2018). For the requirements on newly constructed single-family and low-rise multi-family homes, see Section 7.2 Prescriptive Requirements for Photovoltaic System. For the requirements on newly constructed and detached ADU, see Section 9.3.5 Accessory Dwelling Units.
[22] CEC: 2022 Building Energy Efficiency Standards.
[23] Sekar, Ashok, Paritosh Das, Ashreeta Prasanna, Michaela Sizemore, and Kevin McCabe. 2024. *Modeling Distributed Generation in California*. California Energy Commission. Publication Number: CEC-200-2024-011.

impacts will continue be assessed in future versions. The baseline PV projection from 2023–2040 in the SDG&E planning area is used to forecast PV generation in this Appendix.[24]

The California Distributed Generation (DG) Statistics database includes capacities of behind-the-meter PV systems interconnected in a jurisdiction in a year for each of the three Investor-Owned Utility (IOU) planning areas, including SDG&E. This provides a historical record used to determine the capacity in GHG inventory years and the trends in PV installation.

A comparison of the estimated capacity and electricity generation from PV systems in Encinitas and in the SDG&E planning area is given in Table 17 and calculated based on Equation 5.[25]

Equation 5 Estimate Electricity Generation from California Solar Policies and Programs

$$Elec_{PV,local,n} = Elec_{PV,regional,n} * \left(\frac{C_{PV,local} * 18\% * 8{,}760}{Elec_{PV,regional}}\right)_{ave}$$

Where

$Elec_{PV,local,,n}$	= annual electricity generation from behind-the-meter PV systems in a city in a given year, in MWh
$Elec_{PV,regional,,n}$	= annual electricity generation from behind-the-meter PV systems in the SDG&E planning area in a given year, in MWh
$C_{PV,local}$	= historical capacity of the behind-the-meter PV systems in a jurisdiction in a given year, in MW (dc)
18%	= average solar system capacity factor, ratio of average energy generated compared with nameplate capacity, in MWh/MW
8,760	= hours per year

With,

n	= a CAP horizon year, from CAP projection starting year to CAP horizon end year

[24] CEC: California Energy Demand 2023-2040, accessed May 22, 2024.
[25] The capacity of all interconnected PV systems in Encinitas was from the California Distributed Generation Statistics NEM Currently Interconnected Data Set (current as of March 30, 2023), download date: June 3, 2023. National Renewable Energy Laboratory: Residential PV Resources Classes, Mean DC Capacity Factor.

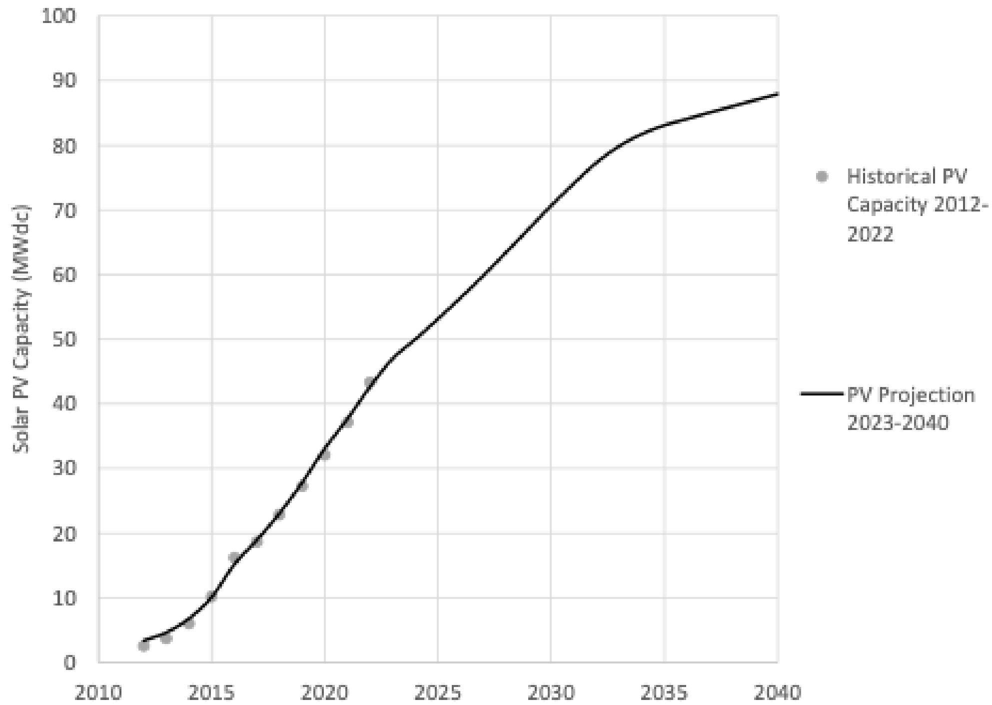
Table 17 Behind-the-meter PV Capacity and Estimated Electricity Generation

Year	Encinitas* PV Capacity (MW)	Encinitas* Estimated Electricity Generation (GWh)	SDG&E Planning Area** Estimated Electricity Generation (GWh)	Historical Encinitas to SDG&E Ratio of Electricity Generation from PV
2019	27	43	2,049	2.1%
2020	32	51	2,438	2.1%
2021	37	59	2,776	2.1%
2022	43	68	3,141	2.2%

MW: megawatt; GWh: gigawatt hour
*Estimated electricity generation based on PV capacity and 18% capacity factor.
**California Energy Demand Baseline 2023–2040 Forecast

California DG Statistics 2023, CEC 2024, Energy Policy Initiatives Center, University of San Diego 2024

For future years, the electricity generation and capacity of behind-the-meter PV systems in Encinitas are estimated based on the PV generation in CEC's baseline forecast for SDG&E's planning area and the average ratio of PV generation in Encinitas to that of SDG&E's planning area from 2016–2022 (2.1%). Because of California's solar programs, policies, and mandates, the estimated 2030 PV capacity in Encinitas is projected to be 71 megawatts (MW). The trend of behind-the-meter PV in Encinitas is shown in Figure 8.



Source of historical capacity: California Distributed Generation Statistics, 2023.
Source of capacity trend: California Energy Demand 2023-2040 Baseline Forecast in San Diego planning area (Jan 2024 version).
Energy Policy Initiatives Center, University of San Diego, 2024

Figure 8 Behind-the-meter Photovoltaic Historical Capacity and Projections

Because there are no statewide PV projections beyond 2040, this Appendix assumes that the PV capacity from State programs beyond 2035 will have an annual growth rate of 1.1 percent (the 2039–2040 growth rate, or the last year with data available) beyond 2040. The projected 2045 PV capacity from State action is approximately 92 MW.

Through CAP Measure RE-2 and Measure MRE-1, the City plans to achieve additional PV capacity citywide beyond the State requirement by 2045. This brings the projected total PV capacity in the City to 95MW in 2045.

The emissions reductions from all State and CAP measures that increase behind-the-meter renewable supply would be 26,345 MT CO_2e in 2035 and 36,751 MT CO_2e in 2045, as shown in Table 12. Total reduction is allocated based on estimated capacity (MW) that would result from each action based on Equation 6

Equation 6 Emissions Impact from Increasing Renewable Supply Through Behind-the-meter PV Systems

$$\Delta E_{electricity,PV,n} = \Delta E_{electricity,RE,n} * \left(\frac{P_{PV,n} * RE_{PV}}{RE_{electricity,n}}\right)$$

Where

$\Delta E_{electricity,PV,n}$ = emissions impact from increasing renewable supply through behind-the-meter PV systems in a given year, in MT CO_2e

$\Delta E_{electricity,RE,n}$	= total emissions impact from increasing renewable electricity supply in a given year, in MT CO_2e; refer to Equation 3
$P_{PV,n}$	= percent of gross generation supplied by behind-the-meter PV systems in a given year (%); refer to Equation 3
RE_{PV}	= 100%, renewable content of PV supply
$RE_{electricity,n}$	= overall renewable content of the electricity supply (gross generation) in a given year; refer to Equation 1

With,

n	= a CAP horizon year, from CAP projection starting year to CAP horizon end year

The emissions reductions from the State action are shown in Table 18 below.

Table 18 Key Assumptions and Results from California Solar Policies, Programs, and Mandates

Year	State or City Action	Total	CAP Measure RE-2	CAP Measure MRE-1	California Solar Policies, Programs, and Mandates*
2030	Projected Behind-the-meter PV Capacity (MW)	71	0.6	Not started	71
2030	Projected Emissions Reduction (MT CO_2e)	26,345	239	0	**26,106**
2045	Projected Behind-the-meter PV Capacity (MW)	95	1.7	0.8	92
2045	Projected Emissions Reduction (MT CO_2e)	36,751	671	330	**35,750**

*Solar policies, programs, and mandates include the impact of the PV mandates from the 2019 and 2022 Building Energy Efficiency Standard.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
CAP Measure RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems
CAP Measure MRE-1: Install Microgrids with On-site Solar and Battery Storage at Existing Municipal Facilities
The projected capacity and emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

7.4.2 California Energy Efficiency Program

In September 2021, the CPUC adopted energy efficiency goals for ratepayer-funded energy efficiency programs (Decision 21-09-037). The adopted energy saving goals for SDG&E's service territory are given in the Decision on an annual basis from 2022 to 2032.[26] The sources of the energy savings include, but are not limited to, rebated technologies, building retrofits, behavior-based initiatives, and codes and standards.[27]

To evaluate the impact of the energy efficiency programs in Encinitas, the total energy savings in

[26] CPUC: Decision 21-09-037, Adopting Energy Efficiency Goals for 2022-2032, accessed September 16, 2022. SDG&E's electricity service territory is larger than San Diego region.
[27] Guidehouse: 2021 Energy Efficiency Potential and Goals Study (April 23, 2021), accessed September 16, 2022. Rebated technologies are the energy efficiency technologies from the utility's historic incentive programs, including equipment and retrofits. Existing and future Codes and Standards included in the Study is discussed in Section 3.9 Codes and Standards.

SDG&E's service territory by 2032 are allocated to Encinitas using a ratio of Encinitas's natural gas and electricity demand to those of SDG&E's entire service territory. The average 2016–2020 ratios are 1.5 percent for electricity and 2.3 percent for natural gas.[28] SDG&E's energy efficiency goal is not estimated by the CPUC beyond 2032; therefore, it is assumed the annual electricity and natural gas savings from energy efficiency programs post-2032 will be the same as in 2032. SDG&E's service territory electricity savings were allocated accordingly to Encinitas, as shown in Table 19.[29]

Table 19 Estimated Energy Savings from California Energy Efficiency Programs

Year	SDG&E Service Territory Electricity Savings* (GWh)	Allocation of Electricity Savings to Encinitas by Demand (GWh)	SDG&E Service Territory Natural Gas Savings (million therms)	Allocation of Natural Gas Savings to Encinitas by Demand (million therms)
2032	1,914	28	18	0.4

*Includes transmission and distribution losses.
SDG&E service territory savings are the cumulative based on the 2022-2032 annual saving goals in CPUC Decision 21-09-037.

Energy Policy Initiatives Center, University of San Diego 2024

Emissions reductions from electricity savings are calculated using Equation 7 by multiplying the electricity savings by the citywide GHG emission factor for electricity, discussed in Section 7.1.1 and shown in Table 10. As the renewable and zero-carbon content in electricity increases, the emissions reductions from the electricity portion of energy efficiency programs decrease. Emissions reductions from natural gas savings were calculated using Equation 8 by the natural gas savings amount and the natural gas emission factor discussed in Section 7.2.

Equation 7 Electricity Emissions Impact from California Energy Efficiency Programs

$$\Delta E_{electricity,BE-State,n} = \Delta Elec_{BE-regional,n} * P_{electricity,Local-regional} * EF_{electricity,n} * 0.000453 - \Delta E_{electricity,BE-local,n}$$

Where

$\Delta E_{electricity,BE-state,n}$ = total emissions impact from California energy efficiency program for a city in a given year, in MT CO_2e

$\Delta Elec_{BE-regional,n}$ = electricity impact from State energy efficiency program in the SDG&E service area in a given year compared with latest historical year in MWh

$P_{electricity,local-regional}$ = ratio of the gross generation (or net energy for load) of a city to that of SDG&E service area, in CAP baseline year or average of most recent years

$EF_{electricity,n}$ = emission factor for the electricity (gross generation) in a city in a given year, in lbs. CO_2e per MWh

$\Delta E_{electricity,BE-local,n}$ = total emissions impact from CAP local building efficiency measures in a given year, if applicable, in MT CO_2e

0.000453 = conversion factor, MT CO_2e in a lb.

[28] SDG&E's service territory demand is from California Energy Demand 2023-2040, accessed May 22, 2024. 2020 is the latest year with historical data available for both Encinitas and SDG&E service territory.
[29] CPUC: Decision 21-09-037, Adopting Energy Efficiency Goals for 2022-2032, accessed September 16, 2022. The 2022 and beyond goals are given on an annual basis for each year from 2022 to 2032.

With,

n = a CAP horizon year, from CAP projection starting year to CAP horizon end year

Equation 8 Natural Gas Emissions Impact from California Energy Efficiency Programs

$$\Delta E_{NG,BE-State,n} = \Delta NG_{BE-regional,n} * P_{NG,Local-regional} * EF_{NG,n} - \Delta E_{NG,BE-local,n}$$

Where

$\Delta E_{NG,BE-state,n}$ = total emissions impact from State energy efficiency programs for a city in a given year, in MT CO_2e

$\Delta NG_{BE-regional,n}$ = natural gas savings from State energy efficiency programs in the SDG&E service area in a given year comparing with latest historical year), in therms

$P_{NG,Local-regional}$ = ratio of the natural gas use of a city to that of SDG&E ervice area, in CAP baseline year or average of most recent years

$EF_{NG,n}$ = emission factor of natural gas in a jurisdiction in a given year, in MT per therm

$\Delta E_{NG,BE-local,n}$ = total emissions impact from CAP local building efficiency measures in a given year, in MT CO_2e

With,

n = a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 20 summarizes the energy savings and GHG emissions reductions in the years 2030 and 2045.

Table 20 Key Assumptions and Results from California Energy Efficiency Programs

Year	Electricity Savings (GWh)	Electricity Emission Factor (lbs CO_2e/MWh)	GHG Emissions Reductions from Electricity Savings (MT CO_2e)	Natural Gas Savings (million therms)	Natural Gas Emission Factor (MT CO_2e/therm)	GHG Emissions Reductions from Natural Gas Savings (MT CO_2e)	Total GHG Emissions Reductions (MT CO_2e)
2030	102	50	630	0.9	0.0054	2,203	2,833
2045	102	0	0	0.9	0.0054	2,203	2,203

Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
The emission rates and emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

7.4.3 Federal and California Vehicle Efficiency Standards

As discussed in Section 7.3, CARB's EMFAC2021 model includes all key federal and State regulations related to tailpipe GHG emissions reductions for both light-duty and heavy-duty vehicles that were in place by the end of 2020. EMFAC2021 results were adjusted to include ACCII ZEV regulations which require an increasing number of ZEVs for post-2026 model year light-duty vehicles. Table 21 summarizes the key assumptions and results in the years 2030 and 2045, calculated based on Equation 9.

Equation 9 Emissions Impact Calculation – Reducing Tailpipe Emissions

$$\Delta\, E_{transp,FE,n} = VMT_n * \Delta\, EF_{transp,n} * 10^{-6}$$

Where,

$\Delta\, E_{transp,FE,n}$	= total emissions impact in transportation category from increasing vehicle fuel efficiency and ZEVs in a given year, in MT CO_2e
VMT_n	= VMT in a given year, miles per year
$\Delta\, EF_{transp,n}$	= difference in average vehicle emission factor in a given year and BAU average GHG emission factor, in grams CO_2e per mile
10^{-6}	= conversion factor, MT per gram CO_2e

With,

n	= a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 21 Federal and California Vehicle Efficiency Standards

Year	Projected Encinitas VMT (million miles per year)	Average Vehicle Emission Rate - BAU Projection with No Regulatory Impacts (g CO_2e/mile)	GHG Emissions from On-Road Transportation - BAU Projection with No Regulatory Impacts (MT CO_2e)	Average Vehicle Emission Rate - With Impact of Heavy-Duty and Light-Duty Regulations (g CO_2e/mile)	GHG Emissions from On-Road Transportation - With Impact of Heavy-Duty and Light-Duty Regulations (MT CO_2e)	GHG Emissions Reductions (MT CO_2e)
2030	542	363	196,692	303	164,443	32,249
2045	587	363	213,207	122	71,339	141,869

Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
ACCII: Advanced Clean Cars II Regulation
ZEV: zero-emission vehicles
The emission rates and emissions reductions are projected based on CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

As discussed in Section 7.3.1.2 (Impact of State and Local Actions on Increasing Zero Emission Vehicles) to avoid double-counting, the maximum emission reductions related to all measures in the CAP facilitating e-VMT are set at the amount from ACCII.

In order to attribute these reductions to the City, the effects of CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations* are subtracted from the maximum emissions reductions from ACCII. Table 22 provides the remaining impacts of federal and state vehicle efficiency standards.

Table 22 Remaining Federal and California Vehicle Efficiency Standards

Year	GHG Emissions Reductions from Federal and State Vehicle Standards ($MT\ CO_2e$)	GHG Emissions Reductions from CAP Measure CET-6, CET-7, and MCET-3* ($MT\ CO_2e$)	Remaining GHG Emissions Reductions from Federal and State Vehicle Standards ($MT\ CO_2e$)
2030	32,249	3,214	29,035
2045	141,869	6,208	135,660

*Calculated in Table 15
CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations*
Federal and state vehicle standards include future impact of State policies and programs used in the EMFAC2021 with additional light-duty ZEV regulations (Advanced Clean Cars II).
Energy Policy Initiatives Center, University of San Diego 2026

7.5 Climate Action Plan Update Measures

The following section describes the methods used to estimate the GHG reductions from the CAP Update measures, which are organized into the following seven strategies:

- Building Decarbonization
- Renewable Energy
- Water Efficiency
- Clean and Efficient Transportation
- Zero Emission Equipment
- Zero Waste
- Carbon Sequestration

7.5.1 Building Decarbonization

7.5.1.1 Measure BD-1: Require Existing Residential Development Energy Efficiency

The City adopted Ordinance No. 2022-13, on October 26, 2022, requiring all additions and alterations for single- and multi-family with a building permit valuation of or higher than $50,000 to include at least one energy efficiency measure, such as attic insulation and air sealing, duct sealing, wall insulation, heat pump water heater, induction cooktop.[30] The requirements apply to the entire residential unit, not just the addition or altered portion. Since Ordinance adoption, the City saw an exponential increase in project completion with 13 final projects in 2023, 57 final projects in 2024, and 104 final projects in 2045.[31] For this Measure, it is assumed the trend, approximately 100 projects each year, will continue once the City readopts the Ordinance for each three-year State Building Code cycle.

The energy (both electricity and natural gas) savings for a typical cost-effective energy retrofit activity vary by project. Based on the Ordinance implementation data, a homeowner/permit applicant typically selects two energy efficiency measures out of all the listed options, but the most common one is the water heater package includes (1) R-6 water heater blanket, (2) R-3 hot water pipe insulation, and (3) low flow fixtures. The estimated energy savings from the water heater package is 16.75 therms per

[30] Encinitas: Single-family Green Building Checklist and Multifamily Green Building Checklist (September, 2024). For the energy efficiency measures, the single-family requirements are listed in Table 150.2-E and the multifamily requirements are listed in Table 180.5-A.
[31] Based on ordinance implementation data from Encinitas Development Service Department (February, 2026).

home.[32] The GHG emissions reductions from the natural gas savings due to the Ordinance are calculated using **Error! Reference source not found.**Equation 10, and summarized in **Error! Reference source not found.**Table 23.

Equation 10 Emissions Impact from Natural Savings – Local Energy Efficiency Program

$$\Delta\, E_{NG,CAP\ measure,n} = \sum_{unit} (N_{unit,n} * P_{audits-retrofits} * \Delta\, NG_{unit,n}) * \ EF_{NG,n}$$

Where

$\Delta\, E_{NG,CAP\ measure,n}$	= total emissions impact in natural gas category from residential energy retrofits natural gas savings, in a given year, in MT CO_2e
$N_{unit,n}$	= number of housing units (projects) over the threshold that are required to implement energy retrofit activities, after ordinance effective year n
$\Delta\, NG_{unit,n}$	= average annual natural gas saving from energy retrofits, therms
$EF_{NG,n}$	= emission factor of the natural gas in a city in a given year, in MT per therm

With,

n	= a CAP horizon year, from ordinance effective year to CAP horizon end year
unit	= including, but not limited to: retrofitted single-family unit, retrofitted multi-family unit

Table 23 Natural Gas Savings from Measure BD-1: Require Existing Residential Development Energy Efficiency

Year	Number of Home Energy Retrofits Due the Ordinance	Natural Gas Savings per Retrofit* (therms/home/year)	Total Natural Gas Savings from All Retrofits (therms/year)	Natural Gas Emission Factor (MT CO_2e/therm)	GHG Emissions Reductions from Natural Gas Savings (MT CO_2e)
2030	500	16.75	8,375	0.0054	46
2045	2,000	16.75	33,500	0.0054	183

*Energy savings are based a water heater package at a single-family home, the most commonly picked energy retrofit activity under the Ordinance
The projected retrofits and emissions reductions are the projections under the CAP Update assumptions, current status, and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2026

7.5.1.2 Measure BD-2: Require New Residential Development Decarbonization

The City adopted Ordinance No. 2024-04, on June 12, 2024, requiring that certain new residential projects meet higher energy performance standards than otherwise allowed under the State Energy Code, and that all residential buildings that are plumbed for natural gas be made ready for future conversion to electric equipment. To prevent climate pollution and reduce costs, it is recommended that project applicants consider an all-electric design for their project.[33] New single-family homes, duplexes, and townhomes and low-rise multifamily projects must meet the higher energy performance standards.

[32] Only single-family data energy savings data are used because no multi-family applications went submitted since the Ordinance adoption. California Energy Codes & Standards. pplication of the 2019 Studies to the 2022 Energy Code: Existing Low-Rise Residential Building Upgrades (September, 14, 2022). Table 11 Water Heating Package. Climate Zone 7.
[33] Encinitas: New Construction Energy Regulations (September 2024).

Based on the 2022 new construction cost-effectiveness studies, the cost-effectiveness of a code-compliant home meeting higher energy performance standards varies by Climate Zone. Table 24 shows the natural gas savings and the additional electricity demand in Climate Zone 7 where Encinitas is located.[34]

Table 24 Assumptions of All-Electric Homes

All Electric Home Type	Single-Family	Mult--Family
Natural Gas Savings Compared with Mixed-Fuel Home (therms per unit)	69	102
Additional Electricity Added Compared with Mixed-Fuel Home (kWh per unit)	1,293	704
Based on prototypes in the cost-effectiveness study. For new single-family homes, the base case is modeled based on electric heat pump water heater with natural gas cooking and clothes drying. For new multi-family homes, the base case is modeled based on a natural gas centralized boiler with solar thermal, and electric cooking and clothes drying. California Statewide Reach Codes Program, 2023 and 2024		

The number of new single-family and multi-family units projected through 2045 are based on the housing projections described in Section 2.2. It is assumed that on average 75% of new homes will opt for all-electric option with the higher energy performance standard requirements. The emissions reduced from natural gas savings and emissions added from electricity use are shown in Table 25 and Table 26, calculated using equations similar to **Error! Reference source not found.** and Equation 10.

[34] California Energy Codes & Standard Reach Codes Program: 2022 Single Family New Construction Cost-Effectiveness Study (April 26, 2024), accessed May 2024; and 2022 Multifamily New Construction Cost-Effectiveness Study (June 20, 2023), accessed September 2023.

Table 25 Electricity Added from Measure BD-2: Require New Residential Development Decarbonization

Year	Number of New All-electric Single-Family Home Due to the Reach Code*	Electricity Added due to All-Electric on Single-Family Homes (kWh/home/year)	Number of New All-electric Multi-Family Homes Due to Reach Code*	Electricity Added due to All-Electric on Multi-Family Homes (kWh/home/year)	Total Electricity Added (MWh/year)	Electricity Emission Factor (lbs CO_2e/MWh)	Emissions Added from Additional Electricity Use (MT CO_2e)
2030	133	1,293	426	704	172	50	11
2045	340	1,293	1,087	704	439	0	0

*It is assumed that on average 75% of new residential construction will opt for all-electric option with the reach code
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
The projected emissions are the projections under the CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

Table 26 Natural Gas Savings from Measure BD-2: Require New Residential Development Decarbonization

Year	Number of New All-electric Single-Family Home Due to the Reach Code*	Natural Gas Savings due to All-Electric on Single-Family Homes (therms/home/year)	Number of New All-electric Multi-Family Homes Due to Reach Code*	Natural Gas Savings due to All-Electric on Multi-Family Homes (therms/home /year)	Total Natural Gas Savings (million therms/year)	Natural Gas Emission Factor (MT CO_2e/therm)	Emissions Reductions from Natural Gas Savings (MT CO_2e)
2030	133	69	426	102	0.1	0.00545	287
2045	340	69	1,087	102	0.1	0.00545	733

*It is assumed that on average 75% of new residential construction will opt for all-electric option with the reach code
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
The projected emissions reductions are the projections under the CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

Combining the totals from Table 25 and Table 26, the net GHG emissions reductions from Measure BD-2 are 276 MT CO_2e in 2030 and 733 MT CO_2e in 2045.

7.5.1.3 Measure BD-3: Require Existing Nonresidential Development Energy Efficiency

The City adopted Ordinance No. 2022-14, on October 26, 2022, requiring certain existing nonresidential buildings with steel framing to maximize energy efficiency to avoid thermal bridging, based on the 2019 California Green Building Standards Code (CalGreen).[35] Because this requirement is not feasible under the most recent (2022) building code, the City will consider and readopt new nonresidential development energy efficiency requirements for the next building code cycle. This measure is currently not quantified for GHG reduction because, given the timing of the final 2025 CalGreen code being available for analysis, it is too soon to determine if there is a cost-effective alternative reach code option.

[35] Encinitas: Nonresidential Building Energy Efficiency Regulations (September 2024).

7.5.1.4 Measure BD-4: Require New Nonresidential Development Decarbonization

The City will consider and adopt new nonresidential building code requirements to meet a higher energy performance standard as approved by the State after the next 2025 Energy Code is enforced. Similar to Measure BD-2, it would be recommended that project applicants consider an all-electric design for their project.

The cost-effectiveness of the next rounds of reach codes (2025 reach codes) are not available. Based on the latest 2022 new construction nonresidential cost-effectiveness studies, the cost-effectiveness of a code-compliant non-residential development meeting higher energy performance standards varies by Climate Zone. Natural gas savings and additional electricity use are calculated on a per-gross floor area basis. Table 27 shows the results for different nonresidential building types and the average.[36]

Table 27 Assumptions of All-Electric Nonresidential Development

Nonresidential Building Type	Building Size (sq. ft.)	Electricity Added Compared with Mixed-Fuel Development (kWh/year)	Natural Gas Savings Compared with Mixed-Fuel Development (therms/year)	Electricity Added Compared with Mixed-Fuel Development (kWh/year/sq. ft.)	Natural Gas Savings Compared with Mixed-Fuel Development (therms/year/sq. ft.)
New Construction Medium Office	53,628	15,005	747	0.28	0.01
New Construction Small Hotel	42,554	166,238	9,977	3.91	0.23
Average of New Nonresidential Construction				2.09	0.12

The 2022 nonresidential new construction cost effectiveness study includes medium retail as a building type; however, the base case already assumes heat pumps for heating and cooling and an electric resistance water heater, so it is not included.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

The average of nonresidential building types is used here, though other types of buildings (e.g., restaurants) have a different energy use on a per-sq. ft. basis and are not captured here. Based on building permit data in the recent years, an annual average of approximately 250,000 sq. ft. of new nonresidential developments would be subject to this reach code.[37] The emissions reductions from natural gas savings and from additional electricity use due to Measure BD-4 are summarized in Table 28 and Table 29, calculated using equations similar to **Error! Reference source not found.** and Equation 10.

[36] California Energy Codes & Standard Reach Codes Program: 2022 Non-Residential New Construction Cost-Effectiveness Study (March 24, 2023), accessed September 2023.
[37] 2017-2022 building permit data were provided by the city to EPIC (May 2024).

Table 28 Natural Gas Savings from Measure BD-4: Require New Nonresidential Development Decarbonization

Year	Annual Nonresidential Developments Subject to Reach Code (sq. ft./year)	Total All-Electric Nonresidential Developments Due to the Reach Code* (sq. ft.)	Natural Gas Savings (therms/sq. ft./year)	Total Natural Gas Savings (therms/year)	Natural Gas Emission Factor (MT CO_2e/therm)	GHG Emissions Reductions from Natural Gas Savings (MT CO_2e)
2030	250,000	937,500	0.12	116,430	0.0054	635
2045	250,000	3,750,000	0.12	465,721	0.0054	2,540

*It is assumed that on average 75% of new non-residential construction will opt for all-electric option with the reach code
The projected emissions reductions are the projections under the CAP Update assumptions, current status, and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

Table 29 Electricity Added from Measure BD-4: Require New Nonresidential Development Decarbonization

Year	Annual Nonresidential Developments Subject to Reach Code (sq. ft./year)	Total All-Electric Nonresidential Developments Due to the Reach Code* (sq. ft.)	Electricity Added (kWh/sq. ft./year)	Total Electricity Use (kWh/year)	Electricity Emission Factor (lbs CO_2e/MWh)	GHG Emissions Increase from Additional Electricity Use (MT CO_2e)
2030	250,000	937,500	2.09	1,962,336	50	44
2045	250,000	3,750,000	2.09	7,849,344	0	0

*It is assumed that on average 75% of new non-residential construction will opt for all-electric option with the reach code
The projected emissions reductions are the projections under the CAP Update assumptions, current status, and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

The net GHG emissions reductions from Measure BD-4 are 591 MT CO_2e in 2030 and 2,540 MT CO_2e in 2045.

7.5.1.5 Measure BD-5: Decarbonize Existing Buildings

The goal of Measure BD-5 is to decarbonize existing buildings that are not subject to the reach code requirements described under the measures above. The goal is to reduce 68 percent of the 2016 baseline natural gas use by 2045 through retrofitting existing buildings. Emissions reductions were calculated using the natural gas savings and the natural gas emission factor discussed in Section 7.2. Table 30 summarizes the key assumptions and results.

Table 30 Key Assumptions and Results from Measure BD-5: Decarbonize Existing Buildings

Year	Baseline 2016 Natural Gas Use (million therms/year)	Natural Gas Savings (%)	Natural Gas Savings (million therms/year)	Natural Gas Emission Factor (MT CO_2e/therm)	GHG Emissions Reductions (MT CO_2e)
2030	10.3	13%	1.3	0.00545	7,001
2045	10.3	68%	7.0	0.00545	38,085

The projected energy and emissions reductions are the projections under the CAP Update, based on current status, future impact of State policies and programs, and CAP Update assumptions.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2026

The decarbonization potential of each existing home and existing non-residential development varies depending on building size, age, type of appliances used. To meet the goal, existing homes and non-residential development would need to be retrofitted and decarbonized with 100 percent renewable electricity by 2045 (no additional GHG emissions added due to the additional electricity use).

Currently, a preliminary building stock analysis for the entire SDCP territory, which includes Encinitas, is available. The analysis looks at parcel-level building inventory in the City, including 15 building types grouped based on common use types and sizes (e.g., residential: single-family homes, commercial: offices), number of buildings, and square footages. However, a more in-depth analysis that matches building energy use, types, and square footages is needed in order to estimate the GHG emissions reduction potential of a building decarbonization policy.

7.5.1.6 Measure MBD-1: Implement Energy Efficiency and Decarbonization Projects at Existing Municipal Facilities

The City will work to reduce energy consumption (electricity and natural gas) from municipal facilities and double the goals set in the 2020 CAP to achieve 30 percent energy reduction below 2012 baseline by 2030 (or equivalent to 579,000 kWh electricity savings and 12,000 therms natural gas savings).[38] This goal will be achieved through the implementation of energy efficiency and conservation measures. For 2030 and onward, the City will identify opportunities to reduce or substitute all natural gas use municipal facilities through energy efficiency and conservation, and all-electric appliance installation by 2045. The additional electricity use will be provided by SDCP's 100 percent renewable, Power 100, product or from on-site renewable electricity generation.

Table 31 summarizes the key assumptions and results, calculated using equations similar to **Error! Reference source not found.** and Equation 10.

[38] The current CAP's goals are to reduce municipal energy consumption below 2012 baseline energy use by 7.5% by 2020 and 15% by 2030. Encinitas: Climate Dashboard.

Table 31 Key Assumptions and Results from Measure MBD-1: Implement Energy Efficiency and Decarbonization Projects at Existing Municipal Facilities

Year	Projected Electricity Savings with Energy Retrofit* (kWh/year)	Projected Additional Electricity Use with Fuel Substitution (kWh/year)	Electricity Emission Factor (lbs CO_2e/MWh)	Projected Natural Gas Savings with Energy Retrofits and Fuel Substitution* (therms/year)	Natural Gas Emission Factor (MT CO_2e/therm)	Total Emissions Reductions (MT CO2e)
2030	579,363	not started	50	12,471	0.00545	81
2045	579,363	59,468	0	24,695	0.00045	135

*Fuel substitution would start after 2030
The projected energy and emissions reductions are the projections under the CAP Update, based on current status, future impact of State policies and programs, and CAP Update assumptions.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.1.7 Measure MBD-2: Require New Municipal Facilities Be All-Electric

The City will adopt an administrative policy requiring the development of new municipal facilities to be all-electric. The GHG reduction of this measure will be quantified once there are new municipal facilities planned and designed. Future new City facilities currently anticipated include Fire Station No. 1 and Fire Station No. 6.

7.5.2 Renewable Energy

7.5.2.1 Measure RE-1: Maintain Membership in San Diego Community Power

As discussed in Section 7.4.1, SB 100 and SB 1020 adopted the 60 percent RPS by 2030 for California's retail electricity suppliers, 90 percent renewable and zero-carbon electricity by 2035, and 100 percent renewable and zero-carbon electricity by 2045. Measure RE-1 assumes SDCP will continue to offer Power100, the 100 percent renewable and carbon-zero electricity product, as the primary electricity rate for Encinitas customers and maintain current 93 percent participation rate through outreach and education.

Because SDCP is required to comply with the State's RPS mandates, a portion of the total emissions reductions from SDCP's renewable and zero-carbon electricity is credited to the State's RPS compliance. The remaining emissions reductions beyond RPS compliance are allocated to Measure RE-1. Table 32 summarizes the key assumptions and results, calculated based on Equation 11.[39]

Equation 11 Emissions Impact Calculation for Local Renewable Program

$$\Delta E_{electricity,CAP\ measure,n} = \Delta E_{electricity,Local\ RE,n} - \Delta E_{electricity,RPS\ ,n}$$

Where

$\Delta E_{electricity,CAP\ measure,n}$ = emissions impact in electricity category through local renewable program in a given year, attributed to a local CAP measure, in MT CO_2e

$\Delta E_{electricity,Local\ RE,n}$ = emissions impact of local renewable program in a given year, in MT CO_2e

[39] All eligible customers in Encinitas currently have SDCP Power100 product as the default option with a 93% participation rate. SDCP: December 12, 2024 Board of Directors Meeting Agenda Packet.

$\Delta E_{electricity,RPS,n}$ = emissions impact of local renewable program in a given year, in compliance with RPS, in MT CO_2e

With,
n = a CAP horizon year, from CAP projection starting year to CAP horizon end year

Table 32 Key Assumptions and Results from Measure RE-1: Maintain Membership in San Diego Community Power

Year	State or CAP Measure	Total for SDCP*	SDCP - Complying with RPS	SDCP - Above RPS
2030	Projected Renewables and Zero Carbon (%)	100%	60%	40%
2030	GHG Emissions Reductions (MT CO_2e)	45,667	27,400	18,267
2045**	Projected Renewables and Zero Carbon (%)	100%	100%	0%
2045**	GHG Emissions Reductions (MT CO_2e)	60,188	60,188	0

SDCP: San Diego Community Power
*Calculated in Table 12.
**All electric service providers must supply 100 percent renewable or carbon-free electricity on and after 2045.
The projected emissions reductions are the projections under the CAP Update, based on current status, future impact of State policies and programs, and CAP Update assumptions.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.2.2 Measure RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems

The City adopted Ordinance No. 2022-13, on October 26, 2022, requiring solar PV equipment on all existing nonresidential, high-rise multifamily residential, and hotel/motel buildings additions that increase total roof area by at least 1,000 sq. ft. or alterations with a permit value of at least $1,000,000 that affect at least 75 percent of gross floor area. Buildings with greater than or equal to 10,000 sq. ft. of gross floor area are required install a minimum PV system sized at 15 kW per 10,000 sq. ft. of gross floor area. Buildings under 10,000 sq. ft. of gross floor area must install a minimum 5 kW PV system.[40]

Based ordinance implementation data in the recent years, an annual average of approximately 48,000 sq. ft. of new nonresidential developments would be subject to this reach code.[41] The additional PV capacity added due to this ordinance is provided in Table 33, calculated using Equation 5 and Equation 6.

[40] Encinitas: Nonresidential/High-Reise Residential Solar Photovoltaic Regulations and Nonresidential, Hotel & Motel Green Building Checklist (September 2024).
[41] 2017-2022 building permit data were provided by the city to EPIC (May 2024).

Table 33 Additional PV Capacity from Measure RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems

Year	Annual Developments Subject to the Ordinance (sq. ft.)*	Total Developments Due to the Ordinance (sq. ft.)	PV Size Requirement (W per sq. ft.)	Total PV Capacity Due to the Ordinance (MW)
2030	48,000	432,000	1.5	0.6
2045	48,000	1,152,000	1.5	1.7

The projected emissions reductions are the projections under the CAP Update, based on current status, future impact of State policies and programs, and CAP Update assumptions.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

The emissions reductions from all State and CAP measures that increase behind-the-meter renewable supply are allocated based on estimated capacity (MW) as shown in Table 17. The emissions reductions from Measure RE-2 are shown in Table 34.

Table 34 Key Assumptions and Results from Measure RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems

Year	State or City Action	Total	CAP Measure RE-2	CAP Measure MRE-1	California Solar Polices, Programs, and Mandates*
2030	Projected Behind-the-meter PV Capacity (MW)	71	0.6	Not started	71
2030	Projected Emissions Reduction (MT CO_2e)	26,345	**239**	0	26,106
2045	Projected Behind-the-meter PV Capacity (MW)	95	1.7	0.8	92
2045	Projected Emissions Reduction (MT CO_2e)	36,751	**671**	330	35,750

*Solar policies, programs, and mandates include the impact of the PV mandates from the 2019 and 2022 Building Energy Efficiency Standard.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
CAP Measure RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems
CAP Measure MRE-1: Install Microgrids with On-site Solar and Battery Storage at Existing Municipal Facilities
The projected capacity and emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.2.3 Measure MRE-1: Install Microgrids with On-site Renewable and Battery Storage at Existing Municipal Facilities

The City will complete a feasibility study and install on-site renewable microgrids at suitable municipal facilities to cover municipal energy use. Under Measure MBD-1, the City will identify opportunities to reduce or substitute all natural gas use municipal facilities through energy efficiency, conservation, and all-electric appliance installation by 2045. The projected electricity use in 2045, including additional all-electric appliance installation, is 1,400,000 kWh, equivalent to 848 kW on-site PV capacity needed.[42]

The emissions reductions from all State and CAP measures that increase behind-the-meter renewable supply are allocated based on estimated capacity (MW) as shown in Table 17. The emissions reductions from Measure MRE-1 are shown in Table 35.

Table 35 Key Assumptions and Results from Measure MRE-1: Install Microgrids with On-site Renewable and Battery Storage at Existing Municipal Facilities

Year	State or City Action	Total	CAP Measure RE-2	CAP Measure MRE-1	California Solar Polices, Programs, and Mandates*
2030	Projected Behind-the-meter PV Capacity (MW)	71	0.6	not started	71
2030	Projected Emissions Reduction (MT CO_2e)	26,345	239	**0**	26,106
2045	Projected Behind-the-meter PV Capacity (MW)	95	1.7	0.8	92
2045	Projected Emissions Reduction (MT CO_2e)	36,751	671	**330**	35,750

*Solar policies, programs, and mandates include the impact of the PV mandates from the 2019 and 2022 Building Energy Efficiency Standard.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.
CAP Measure RE-2: Require Existing Nonresidential Buildings to Install Solar Photovoltaic Systems
CAP Measure MRE-1: Install Microgrids with On-site Solar and Battery Storage at Existing Municipal Facilities
The projected capacity and emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.2.4 Measure MRE-2: Require New Municipal Facilities to Install Microgrids with On-site Solar and Battery Storage

The City will adopt an administrative policy requiring the development of new municipal facilities to install microgrids. The GHG reduction of this measure will be quantified once there are new municipal facilities planned and designed. Future new City facilities currently anticipated include Fire Station No. 1 and Fire Station No. 6.

7.5.3 Water Efficiency

7.5.3.1 Measure WE-1: Support Local Water Districts' Water Conservation Efforts

The City will support San Dieguito Water District (SDWD) and Olivenhain Municipal Water District (OMWD)'s water conservation effort.[43] The emissions reductions are calculated based on the water savings, the difference between the BAU water system electricity use, and the renewable content of

[42] The capacity factor, 19%, is based on a 2020 City of Encinitas PV and Battery Storage PPA study.
[43] San Dieguito Water District: 2022 Water System Master Plan (October 2021). Table 3-6. For Olivenhain Municipal Water District (OMWD), only of a portion of OMWD's service territory is in Encinitas, projected water conservation in Encinitas is based on the current Encinitas to OMWD entire service territory demand, and OMWD entire service territory conservation. 2020 Urban Water Management Plan (June 2021) Table 4-3.

electricity under RPS compliance and under SDCP's renewable content. Table 36 summarizes the key assumptions and results.[44]

Table 36 Key Assumptions and Results from Measure WE-1: Support Local Water Districts' Water Conservation Efforts

Year	BAU Water Demand (acre-feet)	Reduction in Water Use from Water Districts' Conservation Efforts* (acre-feet)	Water Supply after Reduction (acre-feet)	Upstream GHG Emissions Reduction from Water Savings** (MT CO_2e)	Local GHG Emissions Reduction from Water Savings and Additional Renewable Supply*** (MT CO_2e)	Emissions Reductions (MT CO_2e)
2030	10,773	2,022	8,751	790	165	955
2045	11,150	2,250	8,900	879	0	879

*Both San Dieguito Water District (SDWD) and Olivenhain Municipal Water District (OMWD)
**Upstream emissions reductions from water savings are calculated based on the BAU GHG intensity of SDCWA untreated water supply (0.39 MT CO2e/acre-foot) and the reduction in water use. The impact of increased renewable or zero-carbon electricity in the upstream supply due to RPS is captured under Section 7.4.1
*** Local emissions reductions include (1) the reduction in water distribution electricity use associated with water savings and (2) the reduction in both potable and recycled water distribution emissions due to higher renewable and zero-carbon electricity content
The emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs. Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.3.2 Measure WE-2: Require New Single-Family Homes to be Pre-Plumbed for Greywater Systems

The City requires all new constructed single-family homes to be pre-plumbed for a graywater system.[45] A graywater system reduces potable irrigation water use by using water from showers, bathtubs, lavatory sinks, and laundry for outdoor water use. For a typical household, the water savings per year with a greywater system is approximately 36,500 gallons.[46]

The water savings are converted to GHG reductions based on the imported water GHG intensities in 2030 and 2045. Table 37 summarizes the key assumptions and results.

Table 37 Key Assumptions and Results from Measure WE-2: Require New Single-Family Homes to be Pre-Plumbed for Greywater Systems

Year	Number of Greywater Systems	Water Saving per Home with Greywater System (Gallon per year)	Total Water Use Reduction (Gallons)	Total Water Use Reduction (Acre-feet)	Water-GHG Intensity (MT CO_2e /Acre-foot)*	Emissions Reductions (MT CO_2e)
2030	184	36,465	6,692,439	21	0.4	8
2045	459	36,409	16,705,202	51	0.4	20

[44] Wastewater system energy intensity 156 kWh/acre-foot (478 kWh/million gallon) is based on CMWD: 2020 Urban Water Management Plan (June 2021). Appendix H.
[45] Encinitas: Single-family Green Building Checklist (September, 2024).
[46] The calculation method and factors are based on CAPCOA GHG Handbook W-2 Use Grey Water. For a typical home, on average 25 gallons per occupant from showers, bathtubs, and lavatories; and 15 gallons per day per occupant for laundry. The persons per household in Encinitas is 2.5 persons per household.

* Water-GHG intensity of imported water.
The water and emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.3.3 Measure MWE-1: Convert City-Owned Landscape to Drought Tolerant or Native Species

The City plans to identify locations within parks and the public right-of-way to convert landscaping to drought tolerant or native species. City's total landscape area is 3,851,855 sq. ft.[47] Switching to low water use plants identified in the City's existing Water Efficient Landscape Ordinance will reduce landscape irrigation water use.[48] The goal is to convert 5% of the public landscaping to drought tolerant or native species by 2030 and 15% by 2045.

Similar to Measure WE-2, the water savings are converted to GHG reductions based on the imported water GHG intensities in 2030 and 2045. Key assumptions and results are in Table 38.

Table 38 Key Assumptions and Results from Measure MWE-1: Convert City-Owned Landscape to Drought Tolerant or Native Species

Year	Landscape Area Converted to Low Water Use Plants (%)	Outdoor Water Use Reduction due to WELO (Acre-feet)	Water-GHG Intensity (MT CO_2e/Acre-foot)*	Emissions Reductions (MT CO_2e)
2030	5%	6	0.4	2
2045	15%	17	0.4	7

WELO: Water Efficient Landscape Ordinance
*Water-GHG intensity of imported water.
The water and emissions reductions are based on CAP Update assumptions, current status, and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2026

7.5.4 Clean and Efficient Transportation

7.5.4.1 Measure CET-1: Implement the Active Transportation Plan

The City adopted its Active Transportation Plan (ATP) in 2018 and Model Alternatives Project (MAP Encinitas), an implementation plan for the ATP, in 2023. MAP Encinitas identifies a list of prioritized bicycle and pedestrian projects that supports the strategic implementation of mobility projects based on availability of City funds or grant funding opportunities. The City will continue to implement the ATP based on the prioritization in the MAP. Based on the funding level analysis included in the benefit cost analysis, the goal is to implement 13% of the projects in the ATP (55% of the projects in the MAP) by 2030, and 45% of the projects in the ATP (100% of the projects in the MAP plus additional projects).

[47] Data provided by city to EPIC during benefit cost analysis in 2026.
[48] The calculation method and factors are based on CAPCOA GHG Handbook W-5 Design Water-Efficient Landscape. The evapotranspiration adjustment factor (0.45 for non-residential area), plant factor (0.1 for very low water use plants), irrigation efficiency (0.81 for drip system) are based on the city's Water Efficient Landscape Ordinance.

The method to estimate avoided miles if the full ATP is implemented is discussed in *Attachment 1: Avoided Vehicle Miles Traveled from Active Transportation Plan (ATP) Projects*. VMT avoided per year was converted to GHG emissions reductions using the average vehicle emission rates. Table 39 summarizes the key assumptions and results.

Table 39 Key Assumptions and Results from Measure CET-1: Implement the Active Transportation Plan

Year	Miles Avoided due to ATP (Miles per year)	Average Vehicle Emission Rate (g CO_2e/mile)	Emissions Reductions (MT CO_2e)
2030	1,259,255	303	382
2045	4,407,393	122	536

The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2026

7.5.4.2 Measure CET-2: Implement a Microtransit Program

The City will conduct a study to determine the ideal microtransit options that work for the City. The potential microtransit options include, rideshare, neighborhood electric vehicle (NEV) shuttles, circulator routes, and ride-hailing.[49]

The City has an existing Encinitas Transit Feasibility Study, completed in 2014, which identifies potential intra-city routes: express services to Mira Costa College (MCC) and to La Costa Canyon High School (LCC HS), one Encinitas Circulator, and one with COASTER connection.[50] Only the Encinitas Circulator and the COASTER connection routes are included here as potential flexible fleet routes because the other two routes require full-size buses, not flexible fleets.

The Encinitas Circulator would serve key destinations in the City, including Encinitas Library, apartments, shopping centers, and office complexes, with 12 loop trips during the day. The miles avoided is based on the estimated passenger ridership of the Encinitas Circulator (27,630 passengers a year) and the average round trip distance per passenger if they were to drive to the destinations (4 miles/round trip). The Transit Feasibility Study recommends a small bus for the service. Based on the proposed operation schedule, the estimated miles driven by the bus is 31,682 miles per year.

The COASTER connection would provide transit commuters traveling to and from San Diego via southbound COASTER service, with three morning trips and three afternoon trips on weekdays. The miles avoided is estimated based on passenger ridership of the COASTER Connection (9,292 passengers a year) and the average round trip distance per passenger if they were to drive to their jobs in San Diego or Sorrento Valley (40 miles/round trip). The Transit Feasibility Study recommends a small bus for the service. Based on the proposed operation schedule, the estimated miles driven by the bus is 12,240 miles per year.

[49] SANDAG: Flexible Fleets.
[50] The Transit Feasibility Study (June 2014) was provided by the City planning and building department to EPIC in the previous CAP development.

Compressed Natural Gas (CNG) buses are recommended in the Transit Feasibility Study, however, it is assumed the small buses/circulators would be electric, based on current market trends and available technology.[51]

VMT avoided per year from avoided passenger vehicle trips was converted to GHG emissions reductions using the average vehicle emission rates. Running the electric circulators also adds GHG emissions to the City, only the net emissions reductions are accounted under Measure CET-2. Table 40 summarizes the key assumptions and results.[52]

Table 40 Key Assumptions and Results from Measure CET-2: Implement a Microtransit Program

Year	VMT Avoided due to Microtransit (Miles per year)	Average Vehicle Emission Rate (g CO_2e/mile)	Emissions Reductions due to VMT Avoided (MT CO_2e)	GHG Emissions Added due to New Local Electric Circulators (MT CO_2e)	Net GHG Emissions Reductions (MT CO_2e)
2030	510,489	303	155	5	150
2045	510,489	122	62	0	62

The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.4.3 Measure CET-3: Require Transportation Demand Management Programs for New Residential, Nonresidential, and Major Redevelopment Projects

The City will require new developments to create and implement transportation demand management strategies to mitigate traffic impacts of the projects in accordance with the City's Mobility Element and VMT guidelines. The goal of this measure is to have an additional 7,000 commuters traveling in or out of the City using an alternative mode for their commutes by 2045. This would be equivalent to approximately 30 percent of the employees in Encinitas commuting alternatively.

The GHG emissions reductions are based on the number of commuters using alternative modes, estimated average driving distance avoided, and the average vehicle emission rate. Table 41 summarizes the key assumptions and results.[53]

[51] All NEV shuttles and circulators currently operating in the San Diego region are electric. SANDAG: Flexible Fleets.
[52] The vehicle efficiency for an electric circulator is 2.84 kWh per mile. National Renewable Energy Lab: Zero-Emission Bus Evaluation Results: County Connection Battery Electric Buses (2018). Table ES-1.
[53] The round-trip employee commute (driving) distance for Encinitas employees is 31.1 miles based on the SANDAG Mode Choice Report.

Table 41 Key Assumptions and Results from Measure CET-3: Require Transportation Demand Management Programs for New Residential, Nonresidential, and Major Redevelopment Projects

Year	Encinitas Commuter Miles Avoided* (miles/person/year)	New Encinitas Commuters Using Alternative Modes to Work	Total VMT Avoided (miles/year)	Average Vehicle Emission Rate (g CO_2e/mile)	GHG Emissions Reductions (MT CO_2e)
2030	3,777	1,358	5,127,735	303	1,556
2045	3,777	7,469	28,209,570	122	3,430

*31.1 miles round-trip per workday and 255 workdays per year.
The emissions reductions are the projection under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.4.4 Measure CET-4: Reduce Vehicle Miles Traveled

The City will develop and implement a comprehensive set of studies, programs, and regulations to work towards a citywide VMT reduction. For example, a policy requiring projects with a significant and unavoidable VMT impact to mitigate VMT by constructing a priority mobility project or implementing a VMT Exchange Program for all applicable development projects. The goal of this measure is to reduce citywide VMT per capita to 5 percent below 2016 level by 2045, or 1 miles per capita per day.

The GHG emissions reductions are based on the number of commuters using alternative modes, estimated average driving distance avoided, and the average vehicle emission rate. Table 42 summarizes the key assumptions and results.[54]

Table 42 Key Assumptions and Results from Measure CET-4: Reduce Vehicle Miles Traveled

Year	Per Capita VMT Reduction Below 2016 Level (%)	Per Capita VMT Reduction Below 2016 Level** (miles per Capita per Day)	Total VMT Avoided (Million miles/year)	Average Vehicle Emission Rate (g CO_2e/mile)	GHG Emissions Reductions (MT CO_2e)
2030	Not started	Not started	Not started	303	0*
2045	5%	1	28	122	3,451

*Measure to start after 2030
**VMT per capita in 2016 was estimated at 18.9 mile per capita per weekday (including all population and all trips, not just workforce and workday trips)
The emissions reductions are the projection under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2026

[54] 2016 VMT per capita was estimated based on 2016 total citywide VMT (1,441,692 miles per weekday) and 2016 population (76,408).

7.5.4.5 Measure CET-5: Improve Traffic Flow

The City will improve traffic flow by (1) synchronizing traffic signals at 60 intersections by 2030 to obtain more efficient fuel use through smoother traffic flow; and (2) installing nine new roundabouts or traffic circles by 2030 and additional eight (17 total) by 2045.[55]

The effect of traffic signal synchronization and roundabouts on fuel reduction depends on the traffic volume and size of the intersections on the arterials. Based on the study of a traffic signal synchronization project of a similar size, the annual fuel savings per intersection is around 2,400 gallons.[56] The City's Intersection Control Evaluation engineering standards requires intersections to be analyzed for roundabouts or traffic signals and installed wherever feasible. Based on a study of roundabouts with similar sizes, the annual fuel savings per roundabout is around 19,000 gallons.[57]

As vehicles get more efficient and the number of ZEVs increases, the fuel savings per roundabout and per intersection will decrease. Table 43 and Table 44 summarize the key assumptions and results, calculated based on Equation 12.

Equation 12 Emissions Impact from Retiming Traffic Signals or Installing Roundabouts

$$\Delta E_{transp,CAP\ measure,n} = N_n * \Delta V_{fuel} * EF_{transp,n} * MPG_n * 10^{-6}$$

Where

$\Delta E_{transp,CAP\ measure,n}$	= emissions impact in the transportation category from a CAP measure that improves traffic flow (e.g., retime traffic signals or install roundabouts) in a given year, in MT CO_2e
N_n	= additional traffic signals retimed or roundabouts installed since baseline year up to year n
$\Delta V_{fuel,n}$	= equivalent fuel reduction per intersection with signals retimed or roundabouts installed in a given year, gallons per intersection per year
$EF_{transp,n}$	= average vehicle emission factor in the San Diego region in a given year, grams CO_2e per mile
MPG_n	= fuel economy of an average vehicle in the San Diego region, in a given year, miles per gallon
10^{-6}	= conversion factor, MT CO_2e in a gram

With,

n	= a CAP horizon year, from CAP projection starting year to CAP horizon end year

[55] The list of planned, designed, or funded roundabouts, either standard alone or as part of the Leucadia Streetscape project, were provided by city to EPIC (October 2024). Encinitas: Streetscape Segment C West Side.

[56] Sunkari: The Benefits of Retiming Traffic Signals (2004). The Jacksonville traffic signal retiming project at a 25-intersection section resulted in estimated annual fuel savings of 65,000 gallons.

[57] Varhelyi: The Effects of Small Roundabouts on Emission and Fuel Consumption: A Case Study (2002). The study estimated the traffic volume of the intersection and the fuel consumption before and after the roundabout. The traffic volume is 23,500 vehicles per day and the fuel savings are approximately 144 kg per day after the roundabout installation.

Table 43 Key Assumptions and Results from Measure CET-5: Improve Traffic Flow (Signal Synchronization)

Year	Number of Intersections with Traffic Signal Synchronization	Increase in Vehicle Fuel Efficiency Compared to Baseline Year*	Equivalent Fuel Saving per Intersection* (Gallons/ year)	Fuel Saving from All Intersections (gallons/year)	GHG Emissions for Fuel** (lbs CO_2e/gallon)	GHG Emissions Reductions (MT CO_2e)
2030	60	32%	1,642	98,498	19.1	853
2045	60	73%	658	39,471	19.1	342

*Increase in vehicle fuel efficiency is based on the decrease of the average vehicle emission rate.
**Emissions per gallon of fuel use for an average vehicle in the San Diego region, regardless of fuel type, vehicle type, or fuel economy.
The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

Table 44 Key Assumptions and Results from Measure CET-5: Improve Traffic Flow

Year	Number of New Roundabouts	Increase in Vehicle Fuel Efficiency Compared to Baseline Year*	Equivalent Fuel Savings per Intersection* (gallons/year)	Fuel Savings for All Intersections (gallons/year)	GHG Emissions for Fuel** (lbs CO_2e/gallon)	GHG Emissions Reductions (MT CO_2e)
2030	9	32%	13,452	121,065	19.1	1,049
2045	17	73%	5,390	91,638	19.1	794

*Increase in vehicle fuel efficiency is based on the decrease of the average vehicle emission rate.
**Emissions per gallon of fuel use for an average vehicle in the San Diego region, regardless of fuel type, vehicle type, or fuel economy.
The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

By adding the totals from Table 43 and Table 44,the total GHG emissions reductions from Measure CET-5 are 1,902 MT CO_2e in 2030 and 1,136 MT CO_2e in 2045.

7.5.4.6 Measure CET-6: Require Residential Electric Vehicle Charging Stations

The City adopted Ordinance No. 2022-14, on October 26, 2022, and Ordinance No. 2024-04, on June 12, 2024, requiring electric vehicle equipment at all new residential, hotel or motel, and nonresidential projects as well as hotel or motel and nonresidential additions and alterations greater than 10,000 sq. ft.[58] The City will continue to implement these ordinances and readopt the similar local building codes ("reach codes") via ordinance for each three-year State Building Code.

The City anticipates 375 residential permits approved with electric vehicle charging station (EVCS) equipment required by 2030, and 40 permits with EVCS equipment per year post 2030 through 2045 (total of 975 permits with EVCS equipment). These do not include the equipment installed by residents voluntarily. The EVCS equipment at homes will be used to charge residents' personal EVs. The GHG

[58] Encinitas: Electric Vehicle Charging Regulations (September, 2024).

reduction from CET-6 is calculated in Section 7.3.1.2 *(Impact of State and Local Actions on Increasing Zero Emission Vehicles)* and Table 15. Table 48 summarize the key assumptions and results.

Table 45 Key Assumptions and Results from Measure CET-6: Require Residential Electric Vehicle Charging Stations

Year	Projected Miles Driven by EVs of Total VMT	Projected e-VMT from Light-Duty ZEV Regulations	Projected e-VMT from CET-6	Projected e-VMT from CET-7	Projected e-VMT from MCET-3	Emissions Reduction from Light-Duty ZEV Regulations	Emissions Reduction from CET-6	Emissions Reduction from CET-7	Emissions Reduction from MCET-3
2030	20%	108	**3.3**	2.7	10.3	21,310	**650**	529	2,035
2045	74%	434	**7.6**	8.4	10.3	102,370	**1,798**	1,983	2,427

e-VMT: electric vehicle miles
CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations*

Projected e-VMT percent of total VMT data are from Table 13.
The emissions reduction from each is the projection under the CAP assumptions, including future impact of State policies and programs used in the EMFAC2021 with additional light-duty ZEV regulations (Advanced Clean Cars II).
Energy Policy Initiatives Center, University of San Diego 2026

7.5.4.7 Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations

As stated in section 7.5.4.4 above, Ordinance Nos. 2022-14 and 2024-04 were adopted by the City in 2022 and 2024, respectively, and require electrical vehicle equipment to be installed on all new residential, hotel or motel, and nonresidential projects as well as hotel or motel and nonresidential additions and alterations greater than 10,000 sq. ft.

The City anticipates 70 nonresidential permits approved with electric vehicle charging station (EVCS) equipment required by 2030, and 10 permits with EVCS equipment per year post 2030 through 2045 (total of 220 permits with EVCS equipment). A public available Level 2 charger has a capacity approximately 9.6 to 19.2 kW and utilized on average 5.2 hours per day, therefore, the average e-VMT per year per charger is 70,791 miles. Assuming the EVs using these chargers may drive in and out of Encinitas (either Encinitas internal-internal trips, or internal-external/external-internal trips, driving from Encinitas to other jurisdictions or vice versa), the projected e-VMT from all chargers are given in Table 46.

The GHG reduction from CET-7 is calculated in Section 7.3.1.2 *(Impact of State and Local Actions on Increasing Zero Emission Vehicles)* and Table 15. Table 46 summarize the key assumptions and results.

Table 46 Key Assumptions and Results from Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations

Year	Projected Miles Driven by EVs of Total VMT	Projected e-VMT from Light-Duty ZEV Regulations	Projected e-VMT from CET-6	Projected e-VMT from CET-7	Projected e-VMT from MCET-3	Emissions Reduction from Light-Duty ZEV Regulations	Emissions Reduction from CET-6	Emissions Reduction from CET-7	Emissions Reduction from MCET-3

2030	20%	108	3.3	**2.7**	10.3	21,310	650	**529**	2,035
2045	74%	434	7.6	**8.4**	10.3	102,370	1,798	**1,983**	2,427

e-VMT: electric vehicle miles
CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations*

Projected e-VMT percent of total VMT data are from Table 13.
The emissions reduction from each is the projection under the CAP assumptions, including future impact of State policies and programs used in the EMFAC2021 with additional light-duty ZEV regulations (Advanced Clean Cars II).
Energy Policy Initiatives Center, University of San Diego 2026

7.5.4.8 Measure MCET-1: Transition to Zero-Emission Vehicle Municipal Fleet

The City plans to convert gasoline vehicles (light-duty cars and trucks) within its fleet to ZEVs and purchase renewable diesel for all diesel-fueled heavy-duty trucks. Assuming the municipal fleet size does not increase from the most recent years (2021-2023), Table 47 and Table 48 show the key assumptions and results.[59]

Table 47 Key Assumptions and Results from Measure MCET-1: Transition to Zero-Emission Vehicle Municipal Fleet

Year	% Reduction in Gasoline	Gasoline Fuel Use* (Gallons)	Gasoline Reduction (Gallons)	Emissions Reduction from Gasoline Reduction** (MT CO_2e)	Gasoline Fleet Miles (miles/year)	Additional Electric Load (kWh)	Emissions Added due to Electric Load*** (MT CO_2e)	Net GHG Emissions Reductions (MT CO_2e)
2030	50%	17,041	8,521	68	242,889	36,433	0	68
2045	100%	14,721	14,721	117	262,946	78,884	0	117

*Assuming the fleet size is the same, as vehicles get more efficient and more ZEVs are on the market due to California's ZEV mandates, the gasoline demand decreases
**Calculated based the gasoline reduction and the gasoline carbon intensity of 7,978 CO_2e/gallon
***Emissions added due to additional electric load were zero because the electricity will be 100 percent renewable or zero-carbon from San Diego Community Power or on-site renewable
The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

Table 48 Key Assumptions and Results from Measure MCET-1: Transition to Zero-Emission Vehicle Municipal Fleet

Year	% Reduction in Diesel	Diesel Fuel Use* (gallons)	Diesel Reduction (gallons)	GHG Emissions Reductions** (MT CO_2e)
2030	100%	24,081	24,081	197
2045	100%	20,802	20,802	170

*Assuming the fleet size is the same, as vehicles get more efficient and more zero emission vehicles are on the market due to California's mandates, the diesel demand decreases

[59] Fuel carbon contents are based on CARB statewide GHG inventor 2022 Edition, last updated on October 26, 2022. 2021–2023 fleet fuel use and vehicle mileage are provided by city to EPIC (May 2024).

**Calculated based on diesel reduction and the difference between diesel blend carbon intensity (8,661 CO_2e/gallon) and renewable diesel carbon intensity (478 CO_2e/gallon) The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs. Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation. Energy Policy Initiatives Center, University of San Diego 2023

The total GHG emissions reductions from Measure MCET-1 are 265 MT CO_2e in 2030 and 288 MT CO_2e in 2045.

7.5.4.9 Measure MCET-2: Implement a Municipal Employee Transportation Demand Management (TDM) Program

Eligible City employees have the option to telework a maximum of two days a week to avoid commuting to and from the office, with manager approval. In addition, currently 22 City employees commute to work alternatively at 50% of the time. The goal is to increase the number of employees who commute alternatively by 20% to 26 employees by 2045. The City will continue implementing these programs and consider other TDM options for City employees.

The avoided VMT is estimated based on the driving distance avoided per workday of all eligible City staff and the average telecommute/alternative commute days per week. Miles avoided were converted to GHG emissions reductions using the average vehicle emission rates. Table 49 shows the key assumptions and results.[60]

Table 49 Key Assumptions and Results from Measure MCET-2: Implement a Municipal Employee Transportation Demand Management (TDM) Program

Year	Miles Avoided from City Staff Telecommute or Commute Alternatively* (miles/year)	Average Vehicle Emission Rate (g CO_2e/mile)	GHG Emissions Reductions (MT CO_2e)
2030	204,867	303	62
2045	210,893	122	26

*Assumes 1,684 miles commute distance avoided per workday from all 114 telecommute eligible employees, 2 telecommute days a week, and 51 work weeks per year
The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.4.10 Measure MCET-3: Install Public Electric Vehicle Charging Stations

The City will implement the adopted Electric Vehicle Charging Station Master Plan (March 2023) and install publicly available electric vehicle charging stations in municipally owned parking lots and

[60] One-way commute distance avoided per workday, 5,000 miles, was provided by city staff to EPIC based on city internal data analysis, August 17, 2023.

encourage nonresidential property owners to install EV charging stations.[61] Based on the Master Plan, the goal is to install 113 publicly available Level 2 EVCS and 15 DC fast chargers by 2030.

The assumption for a public available Level 2 charger is the same as the assumption under CET-7 *Require Nonresidential Electric Vehicle Charging Stations.* For DC fast chargers, it is assumed the capacity is at to 150 kW and utilized on average 5.2 hours per day, therefore, the average e-VMT per year per DC fast charger is 737,407 miles. Assuming the EVs using these chargers may drive in and out of Encinitas (either Encinitas internal-internal trips, or internal-external/external-internal trips, driving from Encinitas to other jurisdictions or vice versa), the projected e-VMT from all chargers are given in Table 50.

The GHG reduction from CET-7 is calculated in Section 7.3.1.2 *(Impact of State and Local Actions on Increasing Zero Emission Vehicles)* and Table 15. Table 50 summarize the key assumptions and results.

Table 50 Key Assumptions and Results from Measure MCET-3: Install Public Electric Vehicle Charging Stations

Year	Projected Miles Driven by EVs of Total VMT	Projected e-VMT from Light-Duty ZEV Regulations	Projected e-VMT from CET-6	Projected e-VMT from CET-7	Projected e-VMT from MCET-3	Emissions Reduction from Light-Duty ZEV Regulations	Emissions Reduction from CET-6	Emissions Reduction from CET-7	Emissions Reduction from MCET-3
2030	20%	108	3.3	2.7	**10.3**	21,310	650	529	**2,035**
2045	74%	434	7.6	8.4	**10.3**	102,370	1,798	1,983	**2,427**

e-VMT: electric vehicle miles
CAP *Measure CET-6: Require Residential Electric Vehicle Charging Stations*, *Measure CET-7: Require Nonresidential Electric Vehicle Charging Stations,* and *Measure MCET-3: Install Public Electric Vehicle Charging Stations*

Projected e-VMT percent of total VMT data are from Table 13.
The emissions reduction from each is the projection under the CAP assumptions, including future impact of State policies and programs used in the EMFAC2021 with additional light-duty ZEV regulations (Advanced Clean Cars II).
Energy Policy Initiatives Center, University of San Diego 2026

7.5.5 Zero Emission Equipment

7.5.5.1 Measure ZE-1: Limit Use of Gas-Powered Leaf Blowers

In 2019, the City adopted Ordinance No. 2019-06 prohibiting the use of gas-powered leaf blowers within the City, as of January 2020.[62] While the ordinance has been effective for five years, some residents and landscape companies remain non-compliant. The City will continue to provide education and enforce the ordinance and aim to eliminate all emissions from gas-powered leaf blowers by 2030. The method to project emissions from gas-powered leaf blowers is discussed in Section 3 and is based on CARB's OFFROAD2021 model. Table 51 summarizes the key assumptions and results.

[61] Encinitas: Electric Vehicle Charging Master Plan (March 2023).
[62] Encinitas: Leaf Blowers.

Table 51 Key Assumptions and Results from Measure ZE-1: Limit Use of Gas-Powered Leaf Blowers

Year	Projected GHG Emissions from Gas-Powered Leaf Blowers (MT CO_2e)	Percent Reduction in GHG Emissions	GHG Emissions Reductions (MT CO_2e)
2030	250	100%	250
2045	247	100%	247

The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

CARB 2021, Energy Policy Initiatives Center, University of San Diego 2024

7.5.5.2 Measure ZE-2: Limit Use of Gas-Powered Landscape Equipment

In addition to the leaf blower ordinance discussed above, the City will adopt an ordinance restricting the use of gas-powered landscape equipment by 2030 and aim to eliminate all emissions from landscape equipment by 2045. The method to project emissions from landscape equipment is discussed in Section 3 and is based on CARB's OFFROAD2021 model. Table 52 summarizes the key assumptions and results.

Table 52 Key Assumptions and Results from Measure ZE-2: Limit Use of Gas-Powered Landscape Equipment

Year	Projected GHG Emissions from All Gas-Powered Landscape Equipment* (MT CO_2e)	Percent Reduction in GHG Emissions	GHG Emissions Reductions (MT CO_2e)
2030	1,234	Not started	Not started
2045	1,290	100%	1,043*

*Landscape equipment other than leaf blowers, the impact of eliminating emissions from gas-powered leaf blowers is estimated under Measure OR-1: Limit Use of Gas-Powered Leaf Blowers
**Measure to start after 2030
The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

CARB 2021, Energy Policy Initiatives Center, University of San Diego 2024

7.5.6 Zero Waste

7.5.6.1 Measure ZW-1: Implement a Zero Waste Program

The goal of Measure ZW-1 is to implement the Zero Waste Program and reduce the pounds per person per day (PPD) of waste disposed in landfills to 3 PPD by 2030 and 1.5 PPD by 2045. The 2035 and 2045 PPDs are equivalent to an 80 percent waste diversion rate by 2030 and a 90 percent waste diversion rate by 2045.

The City has not conducted a waste characterization study, therefore, the 2016 waste composition data (used in the 2016 GHG inventory) are used and held constant through 2045.[63] The emissions avoided

[63] Recent State actions include organic waste recycling, which may reduce the mixed waste emission factor in future years.

from increasing the waste diversion rate is the difference between the waste category BAU emissions and the solid waste emissions using the target diversion rates and corresponding PPDs. Table 53 summarizes the key assumptions and results, calculated based on Equation 13 and Equation 14.

Equation 13 Solid Waste Reduction Calculation

$$\Delta\, SW_n = SW_{BAU,n} - (2 * PPD_{50\%}) * \left(1 - DR_{target,n}\right) * P_n * 2{,}000 * 365$$

Where,

$\Delta\, SW_n$	= mixed solid waste diverted (avoided) from landfill in a given year, in short tons
$SW_{BAU,n}$	= BAU mixed solid waste disposal by a city projected for a given year, in short tons
$PPD_{50\%}$	= PPD equivalent to 50% diversion rate
$DR_{target,n}$	= waste diversion rate targeted for a given year in the CAP measure, in %
P_n	= projected population in a given year
2	= conversion factor, converting waste disposal (with 50% diversion rate) to waste generation
2,000	= conversion factor, lbs in a ton
365	= conversion factor, days in a year

With,

n	= a CAP horizon year, from baseline year to CAP horizon end year

Equation 14 Emissions Impact from Increased Solid Waste Diversion

$$\Delta\, E_{waste,CAP\ measure,n} = \Delta\, SW_n * EF_{msw} * (1 - C_n) * (1 - 0.1)$$

Where

$\Delta\, E_{waste,CAP\ mesure,n}$	= emissions impact in the waste category from a CAP measure in a given year, in MT CO_2e
$\Delta\, SW_n$	= mixed solid waste diverted (avoided) from landfill in a given year, in short ton
EF_{msw}	= mixed waste emission factor, in MT CO_2e/short ton
$\Delta\, C_n$	= landfill gas capture rate in a given year, in percent
0.1	= default oxidation rate, U.S. Community Protocol

With,

n	= a CAP horizon year, from baseline year to CAP horizon end year

Table 53 Key Assumptions and Results from Measure ZW-1: Implement a Zero Waste Program

Year	Waste Disposed (lbs/person/day)	Waste Disposed (short tons/year)	Waste Disposed (MT/year)	Landfill Gas Capture Rate	GHG Emissions with Targeted Diversion Rate (MT CO_2e)	BAU GHG Emissions (MT CO_2e)	GHG Emissions Reductions (MT CO_2e)
2030	3.0	43,246	39,232	90%	3,815	14,173	10,357
2045	1.5	22,379	20,302	90%	1,974	14,669	12,694

Emissions from waste are calculated based on the mixed waste emission factor of 0.98 MT CO_2e/short ton, an oxidation rate (10%), and the waste capture rates. The emissions reductions are the projections under the CAP Update, based on CAP Update assumptions and future impact of State policies and programs.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.7 Carbon Sequestration

7.5.7.1 Measure CS-1: Establish a Tree Canopy Goal for the City

The City will evaluate its current urban tree canopy and establish a goal for increasing the canopy cover. The most recent urban tree canopy assessment in the San Diego region, based on high-resolution Light Detection and Ranging (LiDAR), shows the City has approximately 22 percent existing urban tree canopy.[64] While awaiting the completion of a tree canopy assessment the City will maintain the current 22 percent canopy cover through 2030. Once the assessment is complete, a tree canopy goal will be established for the City. As a proxy goal, the CAP Update assumes an increase in tree canopy cover of 5 percent, or a total canopy cover of 27 percent by 2045, or another percentage as determined by the study.

The carbon sequestration potential is calculated based on the projected canopy cover and the CO_2 absorption rate per acre.[65] Measure CS-2 through Measure CS-5 also aim to increase the number of trees planted in the City, the carbon sequestration impacts of these measures are removed from Measure CS-1 to avoid double counting. Table 54 summarizes the key assumptions and results.

Table 54 Key Assumptions and Results from Measure CS-1: Establish a Tree Canopy Goal for the City

Year	Canopy Cover Target (%)	Targeted Canopy Cover (Acres)	CO2 Sequestered Rate (MT CO_2/acre/year)*	Carbon Sequestration (MT CO_2)
2030	22%	2,756	1.56	4,096
2045	27%	3,383	1.56	4,841

*Average of trees per year. An improved estimate of the carbon sequestration rate can be evaluated once the implementation parameters are decided.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Brown et al 2004, Energy Policy Initiatives Center, University of San Diego 2024

[64] The assessment was done in 2014 for all urban areas in the San Diego County using method developed by University of Vermont and USDA Forest Service.
[65] Brown, et al.: Baseline Greenhouse Gas Emissions and Removals for Forest, Range, and Agricultural Lands in California (2004).

7.5.7.2 Measure CS-2: Enforce Landscape Tree Requirements at New Developments

The City's current water efficient landscape regulation includes the following requirements for tree planting: (1) a minimum of one tree for every five parking spaces at new residential and non-residential developments; and (2) a minimum of one tree per unit at new residential developments, including single-family and multi-family developments. A minimum of 15 gallons in size and proper irrigation and maintenance are required.[66]

As discussed under Measure BD-4, based on building permit data in recent years, an annual average of approximately 250,000 sq. ft. of new nonresidential developments and 6,000 sq. ft. of additions to nonresidential developments were added that would be subject to the landscape regulation.[67] The Encinitas Municipal Code off-street parking regulations require on average of one parking space per 250 sq. ft. gross floor area; therefore, approximately 1,024 new parking spaces will be added every year at these new nonresidential developments.[68] The new parking spaces will yield 205 new trees planted annually.

For new residential developments, the number of trees added will be the same as the number of new housing units described in Section 3. The proposed strategy is to encourage thoughtful site design practices to optimize tree planting and open space. The carbon sequestration potential from the new trees is based on the projected total number of trees planted and the average CO_2 absorption rate per mature tree per year.[69] Table 55 summarizes the key assumptions and results, calculated based on Equation 15.

Equation 15 CO_2 Sequestered Calculation from Increased Urban Tree Planting

$$\Delta E_{CAP\ measure,n} = \sum_{tree\ species} (P_{tree\ species,n} * CS_{tree\ species})$$

Where,

$\Delta E_{CAP\ measure,n}$	= CO_2 sequestered from a CAP measure in a given year, in MT CO_2
$P_{tree\ species,n}$	= number of new trees planted from baseline year to a given year for each of tree species
$CS_{tree\ species}$	= carbon sequestration rate of each of tree species, MT CO_2 per year

With,

tree species	= type of new trees planted
n	= a CAP horizon year, from baseline year to CAP horizon end year

[66] Encinitas Municipal Code: Sec. 30.54.060 Parking Area Landscaping, accessed May 21, 2024.
[67] 2017-2022 building permit data were provided by the city to EPIC (May 2024).
[68] Encinitas Municipal Code: Sec. 30.54.030 Schedule of Required Off-Street Parking, accessed May 21, 2024. The minimum parking requirements for commercial, office, restaurant/food, retail, etc., are different. The average is used here.
[69] On average, the CO_2 sequestration rate is 0.035 MT CO_2 per tree per year. The carbon sequestration rate depends on the tree species, climate zone, planting location, and tree age. A more accurate carbon sequestration rate will be evaluated once the parameters are decided in implementation of the measure. California Emissions Estimator Model (CALEEMOD). Appendix D Default Data Tables (October 2017).

Table 55 Key Assumptions and Results from Measure CS-2: Enforce Landscape Tree Requirements at New Developments

Year	Total Landscape Trees Added at Non-Residential Developments (New and Additions)	Total Landscape Trees Added at New Residential Developments	Total Landscape Trees Added	CO2 Sequestered* (MT CO_2/tree/year)	Carbon Sequestration (MT CO_2)
2030	2,867	432	3,299	0.0354	117
2045	5,939	895	6,834	0.0354	242

*Average of trees per year. An improved estimate of the carbon sequestration rate can be evaluated once the implementation parameters are decided.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.7.3 Measure CS-3: Incentivize Tree Planting on Private Property

The City will incentivize residents and businesses to plant 500 trees per year on private property through free tree giveaway program. Similar to Measure CS-2, the carbon sequestration potential from the new trees is based on the projected total number of trees planted and the average CO_2 absorption rate per mature tree per year.[70] Table 56 summarizes the key assumptions and results, calculated based on Equation 15.

Table 56 Key Assumptions and Results from Measure CS-3: Incentivize Tree Planting on Private Property

Year	Cumulative Number of Trees from the Free Tree Program*	CO_2 Sequestered Rate (MT CO_2/tree/year)**	Carbon Sequestration (MT CO_2)
2030	500	1.56	18
2045	2,000	1.56	17

*Program starts in 2026
**Average of trees per year. An improved estimate of the carbon sequestration rate can be evaluated once the implementation parameters are decided.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

7.5.7.4 Measure CS-4: Adopt and Implement a Mature Tree Ordinance

The City is in the process of adopting a Mature Tree Ordinance with new replacement ratio based on replacement tree locations and species for new developments and redevelopments, including new multi-family developments, new commercial or mixed-use developments, and redevelopment of existing commercial and multi-family properties. Currently, the ratio is 1:1 for all developments.

The new ratios are: (1) 3:1 replacement ratio if replacing on the same property, (2) 4:1 replacement ratio if replacing on a different property, (3) and 2:1 replacement ratio if replacing with native trees on

[70] On average, the CO_2 sequestration rate is 0.035 MT CO_2 per tree per year. The carbon sequestration rate depends on the tree species, climate zone, planting location, and tree age. A more accurate carbon sequestration rate will be evaluated once the parameters are decided in implementation of the measure. California Emissions Estimator Model (CALEEMOD). Appendix D Default Data Tables (October 2017).

the same property as defined by the ordinance. Because the ordinance is still at the drafting stage with no implementation data available, this measure is not quantified for GHG reductions currently.

7.5.7.5 Measure MCS-1: Plant and Maintain City Trees

The City has been planting and maintaining City trees in accordance with the City's Urban Forest Management Plan and will continue to plant new trees in the City by identifying right of way and park land that have space for additional trees. The goal is to plant and maintain an average of 100 net new trees per year to the City's urban forest.

Similar to Measure CS-2 and CS-3, the carbon sequestration potential from the new trees is based on the projected total number of trees planted and the average CO_2 absorption rate per mature tree pear year.[71] Table 57 summarizes the key assumptions and results, calculated based on Equation 15.[72]

Table 57 Key Assumptions and Results from Measure MCS-1: Plant and Maintain City Trees

Year	Cumulative Number of New City Trees	CO_2 Sequestered Rate ($MT\ CO_2$ /tree/year)**	Carbon Sequestration ($MT\ CO_2$)
2030	1,875	1.56	66
2045	3,375	1.56	119

**Average of trees per tree. An improved estimate of the carbon sequestration rate can be evaluated once the implementation parameters are decided.
Sums may not add up to totals due to rounding. Values are not rounded in the intermediary steps in the calculation.

Energy Policy Initiatives Center, University of San Diego 2024

[71] On average, the CO_2 sequestration rate is 0.035 MT CO_2 per tree per year. The carbon sequestration rate depends on the tree species, climate zone, planting location, and tree age. A more accurate carbon sequestration rate will be evaluated once the parameters are decided in implementation of the measure. California Emissions Estimator Model (CALEEMOD). Appendix D Default Data Tables (October 2017).

[72] 2016 through 2023 historical city tree planting data are from Encinitas CAP Dashboard.

ATTACHMENT 1: AVOIDED VEHICLE MILES TRAVELED FROM ACTIVE TRANSPORTATION PLAN (ATP) PROJECTS

The Active Transportation Plan (ATP) was drafted in November 2018. The plan documents Encinitas' existing bikeway and walkway systems and recommends new projects to improve the systems. The ATP indicates that most future bicycle and walking activities are likely to originate from within residential areas, with the most common trip destinations being schools and parks, followed by commercial, retail and employment centers.

The ATP provides a list of proposed bicycle and pedestrian projects, which together would provide a much-improved network of multimodal connectivity and encourage more residents to use active modes of transportation (walk and bicycle) in lieu of a vehicle. This document details the methods used to update the estimate of the potential vehicle miles traveled (VMT) associated with projects in the ATP and summarizes results of the analysis. These results inform greenhouse gas (GHG) reduction calculations for the City's 2025 climate action plan (CAP) update.[73]

A.1 Comparison with Previous Analysis

The method used to estimate potential VMT avoided for projects in the ATP is consistent with the approach used in the 2020 CAP interim update. Since the unit capacity of the potential sites in the 2021-2029 Housing Element remains unchanged from the 2018 Housing Element Update (HEU), the unit capacity from the HEU also remains the same here. Trip distance and frequency estimates have been updated using data from Google's Environmental Insights Explorer (EIE).[74]

A.2 Methods and Inputs

Estimates for avoided VMT were found using the following equation:

Equation 16 Annual VMT Avoided Calculation

$$\boxed{Annual\ VMT\ Avoided = X_{walk} * 2\beta_{walk} * \omega_{walk} + X_{bike} * 2\beta_{bike} * \omega_{bike}}$$

Where,

X= housing units within the pedestrian/bicycle zones
β= median one-way trip distance in miles to activity center
ω= number of trips per household per year to activity center.

[73] GHG reduction estimates associated with implementation of the ATP are provided under CAP Measure CET-1and are not included here.
[74] Google: Environmental Insights Explorer.

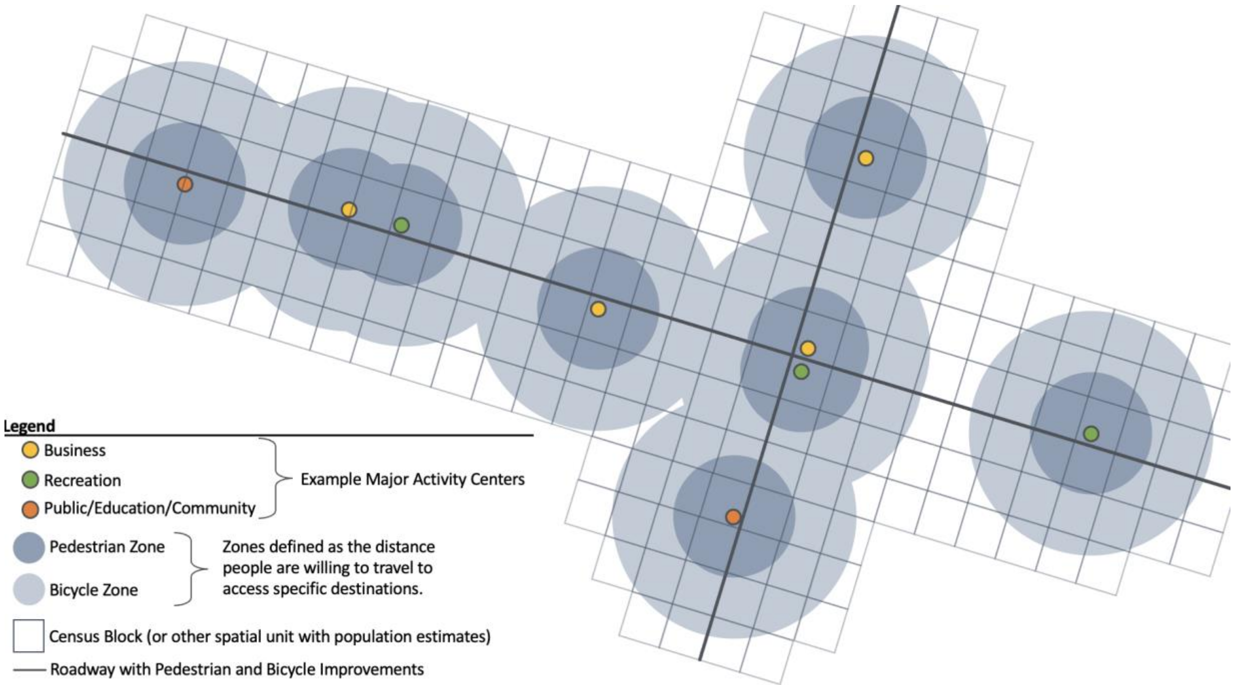


Figure 9 Concept Map Illustrating Pedestrian and Bicycle Zones and Affected Areas

A2.1 Trip Distance and Frequency

Trip distance is measured as the one-way distance in miles individuals are willing to travel using a given mode of transportation to each activity center identified.[75] Trip frequency is measured as the number of trips made by households, using a given mode of transportation, to each activity center annually. Google's EIE were used to estimate the travel distance and frequency by pedestrian and bicycle modes of travel (Table 58). [76] EIE is a tool that provides city-level multi-modal transportation data based on continuous observation, making it more relevant for assessing active transportation in Encinitas.[77] Previously, county-level data from the National Household Travel Survey (NHTS)[78] was used for calculations. For example, in Table 1, pedestrians are willing to walk an average one-way distance of 0.55 miles to *Food & Dining* activity centers, and would do this, on average, 71.51 times per year. Bicycle riders are willing to ride an average distance of 1.53 miles to *Food &* Dining activity centers areas, and 7.77 times per year.

[75] The Encinitas ATP groups 'points of interest' near ATP project areas into one of three major activity centers: (1) business, (2) recreation, and (3) public/education/community. To align with NHTS data, these activity centers were reclassified into six categories: food & dining, other general errands, recreation, religious & community activities, retail goods & services, and school. A seventh category was added—transit—using data available through SanGIS for transit access locations (e.g., bus stops, train stations).
[76] Google Environmental Insights Explorer (Accessed: December 2024).
[77] ICLEI: Technical Review of Google Environmental Insights Explorer Data for Local Greenhouse Gas Inventories (August 2019).
[78] Federal Highway Administration (2019). 2017 National Household Transportation Survey – California Add-on. National Renewable Energy Laboratory. Accessed 14. Feb 2020.

Table 58 Trip Distance and Frequency per Household Estimates

Activity Center	Pedestrian		Bicycle	
	Trip Distance (mi)	Trip Frequency (trips/unit/yr)	Trip Distance (mi)	Trip Frequency (trips/unit/yr)
Food & Dining	0.55	71.51	1.53	7.77
Other General Errands	0.48	20.74	1.99	1.55
Recreation	0.68	39.31	2.56	5.57
Religious & Community Activities	0.62	4.02	1.95	0.31
Retail Goods & Services	0.92	74.91	3.13	3.41
School	0.92	20.12	1.86	1.86
Transit	0.58	17.34	2.12	2.79

A2.2 Housing Units

ArcGIS was used to determine travel distance 'zones' for each activity center category using the median pedestrian and bicycle travel distances provided in Table 1 (see **Error! Reference source not found.** for a v isualization of the 'zones').[79] The number of housing units within each zone were then estimated using parcel level data obtained through SanGIS for the City of Encinitas only. Housing units were estimated using two scenarios: (2) under full buildout of the HEU (Table 59). Appendix C of the HEU was used to modify existing parcel data to determine the number of units per parcel under full buildout of the HEU.[80]

Table 59 HEU Buildout Housing Units within Pedestrian and Bicycle Zones

Activity Center	Pedestrian	Bicycle
Food & Dining	13,960	28,213
Other General Errands	5,173	26,321
Recreation	22,312	29,889
Religious & Community Activities	14,770	29,539
Retail Goods & Services	24,016	29,889
School	22,209	29,412
Transit	19,835	29,889

A.3 Avoided Vehicle Miles Traveled (VMT)

Inputs provided in Table 58 and Table 59 were applied using Equation 16 to calculate avoided VMT associated with ATP projects. Results are provided in Table 60 under the full buildout of the HEU. Increased housing density as a result of the HEU in areas with increased access to active transportation options will lead to an increase in VMT avoided.

[79] Zones were defined using travel distances along defined routes (roads, pathways, pedestrian bridges, etc.) and not "as the crow flies."
[80] Encinitas: 2021-2029 Housing Element.

Table 60 Avoided VMT for ATP Projects – Full Buildout of HEU

Activity Center Category	Pedestrian Avoided VMT (mi/yr)	Bicycle Avoided VMT (mi/yr)	Total Avoided VMT (mi/yr)
Food & Dining	1,089,179	670,969	1,760,148
Other General Errands	103,243	161,856	265,099
Recreation	1,186,369	852,881	2,039,251
Religious & Community Activities	73,184	35,744	108,928
Retail Goods & Services	3,312,545	638,057	3,950,602
School	826,174	202,690	1,028,865
Transit	396,007	352,984	748,992
All Categories	6,986,703	2,915,182	9,901,885

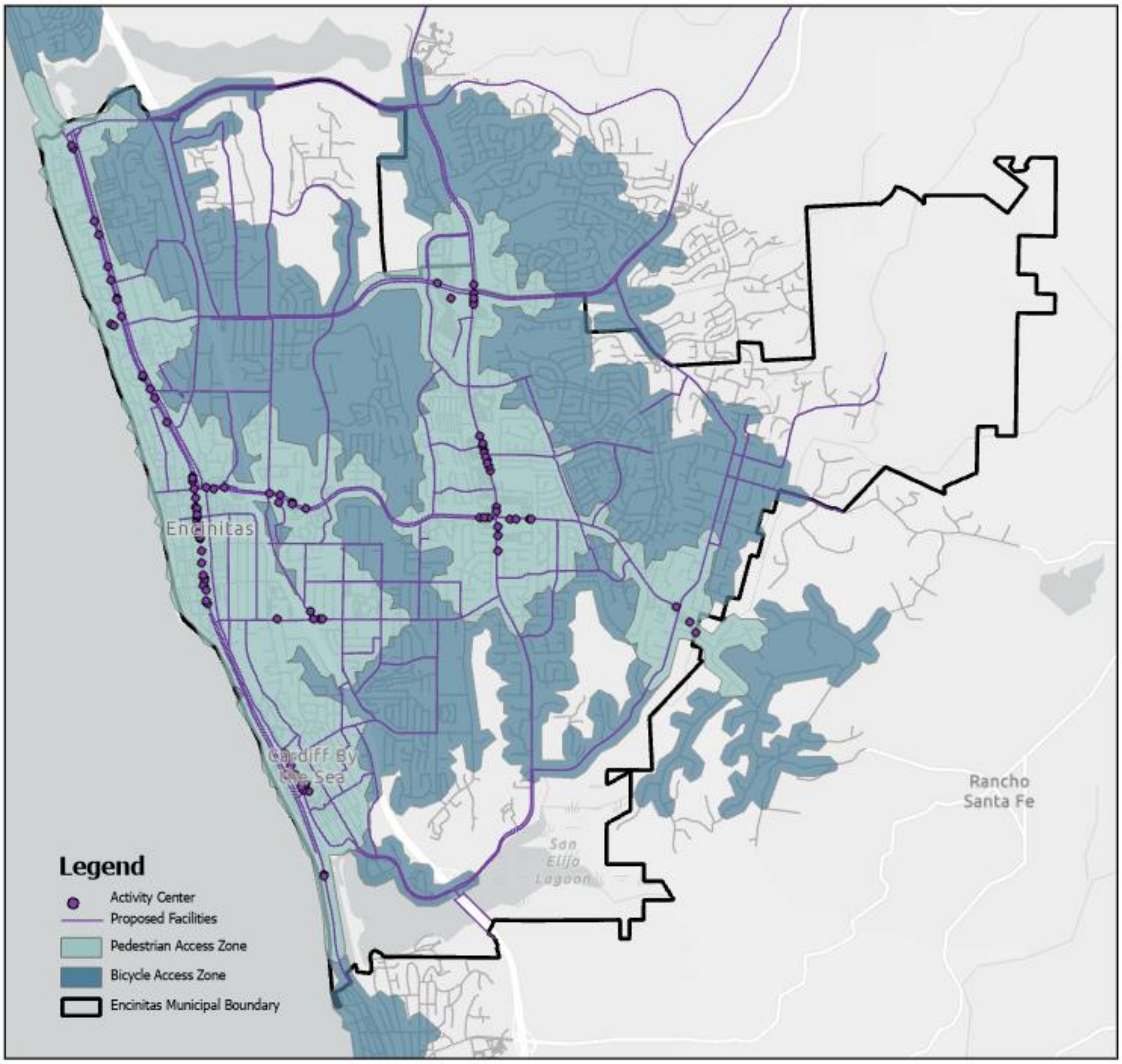


Figure 10 City of Encinitas ATP- Pedestrian and Bicycle Zones for the Food & Dining Activity Center Category (Map for Illustrative Purposes)