

City of Carlsbad Climate Action Plan Annual Report

Reporting Period 4: July 1, 2019 – Dec. 31, 2020

April 2021

City of Carlsbad
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I. Introduction

The purpose of this document is to provide an update on the status of the Climate Action Plan (CAP) implementation that occurred during the current reporting period. The CAP requires that the city annually monitor and report on CAP implementation activities, and present this report to the City Council in a public meeting. Staff previously reported on CAP implementation on a fiscal year basis. As discussed in Section IV below, staff changed to a calendar year reporting period. This Year 4 annual report covers the period from July 1, 2019 to Dec. 31, 2020.

II. Background on Climate Action Plan

The City of Carlsbad's Climate Action Plan (CAP) was adopted on Sept. 22, 2015, along with the General Plan Update and associated Environmental Impact Report. The purpose of the CAP is to describe how greenhouse gas (GHG) emissions within Carlsbad will be reduced in accordance with statewide targets. The CAP was updated and amended on July 14, 2020. More information on the CAP amendment is contained in Section VI.

Chapter 2 of the CAP contains information about the 2012 GHG inventory conducted with CAP Amendment No. 1. A GHG inventory identifies the major sources and overall magnitude of GHG emissions in the city using standard modeling methods and protocols. Typical inputs include electricity consumed, natural gas consumed, vehicles miles traveled, solid waste disposed, wastewater treated and potable and recycled water used.

Chapter 3 of the CAP contains a discussion of the forecasting used to determine the city's GHG targets for 2020 and 2035, as well as the GHG reductions anticipated by state and federal policies and certain General Plan policies.

Chapter 4 of the CAP describes the additional measures and actions that the city must pursue to reach its GHG emissions reduction targets.

To implement these additional measures and actions, the city needed to identify and allocate appropriate funding. Therefore, subsequent to CAP adoption, staff contracted with University of San Diego's Energy Policy Initiatives Center (EPIC) to study incremental internal costs to the city for CAP implementation. All the participating city departments and divisions were surveyed to quantify the resources needed to effectively implement the CAP. On Feb. 23, 2016, staff presented the findings of the study to City Council and noted that these costs would be included in subsequent departmental budget requests.

CAP implementation is a team effort involving several city departments and divisions, coordinated by the CAP Administrator. The interdepartmental CAP implementation team consists of Public Works (PW) Branch – Fleet and Facilities, Transportation, Environmental

Management and Utilities; Community Services – Community Development, Parks & Recreation; Administrative Services - Finance, City Attorney and City Manager - Communications. Team members coordinate on an ongoing basis to discuss CAP implementation activities and opportunities for collaboration.

The city recently updated the GHG inventories contained in the original CAP using 2012 data. Figure 1 and Table 1 below show the 2012 GHG emissions graphically and in tabular form for the entire city, including emissions from both municipal operations and the community. Municipal operations constitute approximately 1% of all GHG emissions. Since there are several different types of GHG, GHG emissions are typically expressed in metric tons of carbon dioxide equivalent (MTCO_{2e}) to allow for standardization and comparison.

Figure 1 – 2012 Community GHG Emissions by Sector

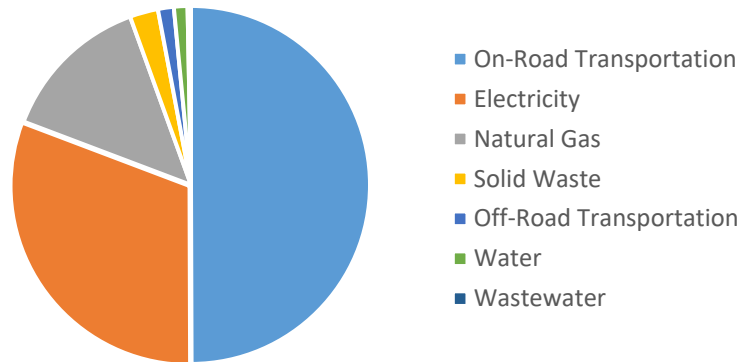


Table 1 – 2012 Community GHG Emissions by Sector

Emissions Category	GHG Emissions (MTCO _{2e})	Percentage of Total Emissions (%)
On-Road Transportation	488,000	49.9
Electricity	301,000	30.8
Natural Gas	134,000	13.7
Solid Waste	25,000	2.5
Off-Road Transportation	14,000	1.4
Water	12,000	1.2
Wastewater	3,000	<1
Total	977,000	100

Of the total emissions in 2012, 97% are attributed to the residential, commercial, industrial and transportation sectors (e.g., buildings and automobiles). This emissions profile by sector is typical of other cities; therefore, similar to most other CAPs, Carlsbad's CAP focuses primarily on GHG emissions reduction strategies on these sectors.

Forecasts for the Carlsbad CAP were conducted for 2020 and 2035 GHG emissions by the University of San Diego's Energy Policy Initiative Center (EPIC). The CAP used the 2012 inventory as the baseline. The first step in forecasting is to determine what is known as the "Business-As-Usual" (BAU) projection. This projection is the amount of GHG emissions increase anticipated over time due to population and job growth and vehicular traffic levels. The forecast then deducts the anticipated emissions reductions derived from state and federal policies, such as low carbon fuel standards, building energy code requirements and the state's requirement for utilities to provide electricity from renewable energy sources (known as the Renewable Portfolio Standard or RPS).

The Carlsbad CAP considered another category of anticipated GHG emissions reduction from the BAU projections: additional General Plan policies and actions. These policies and actions deal with the transportation sector and include bikeway and pedestrian system improvements, traffic calming, parking facilities and policies, and transportation improvements. After deducting these anticipated GHG emissions reductions from the BAU projection, the model then calculates the amount of additional GHG emissions reductions needed to reach the 2020 and 2035 targets.

The statewide targets used for the CAP are taken from Executive Order S-3-05 (EO S-3-05) and the Global Warming Solutions Act of 2006, Assembly Bill (AB) 32. Collectively they call for a reduction to 1990 levels by 2020 and 80% below 1990 levels by 2050. For Carlsbad, the targets are 4% below the 2012 baseline by 2020 and 52% below the 2012 baseline by 2035. Carlsbad has already surpassed the reductions needed to meet the 2020 goal.

The additional GHG emissions reductions necessary to reach the targets are known as the CAP measures; these measures are noted in Table 2. Each measure has actions, which once implemented by the city, should result in the modeled GHG emissions reductions also shown in Table 2. CAP Amendment No. 1 reevaluated the original CAP measures and actions and added an additional Measure for Clean Electricity. The amendment also deleted some existing measures. Section V contains more information about the revisions included in CAP Amendment No. 1.

Table 2 – CAP Measures and GHG Reductions

Measure Letter	GHG Reduction Measures	GHG Reduction in 2035 (MTCO₂e)
A	Install residential PV systems <i>(Deleted in CAP Amendment No. 1)</i>	N/A
B	Install commercial and industrial photovoltaic (PV) systems	4,457
C	Promote building cogeneration for large commercial and industrial facilities <i>(Deleted in CAP Amendment No. 1)</i>	N/A
D	Encourage single-family residential efficiency retrofits	7,986
E	Encourage multi-family residential efficiency retrofits	3,993
F	Encourage commercial and city facility efficiency retrofits	7,579
G	Promote commercial and city facility commissioning, or improving building operations <i>(Deleted in CAP Amendment No. 1)</i>	N/A
H	Implementation of Green Building Code <i>(Deleted in CAP Amendment No. 1)</i>	N/A
I	Replace Incandescent bulbs with light-emitting diodes (LED) bulbs	22
J	New construction residential and commercial solar water heater/heat pump installation & retrofit of existing residential	2,813
K	Promote Transportation Demand Management (TDM)	6,325
L	Increase zero-emissions vehicle travel	49,912
M	Develop more citywide renewable energy projects	2,774
N	Reduce the GHG intensity of water supply conveyance, treatment and delivery	713
O	Encourage the installation of greywater and rainwater systems	137
P	Implement Community Choice Energy <i>(Added in CAP Amendment No. 1)</i>	56,207
Total GHG Reductions		142,918

III. CAP Measures and Actions

The CAP measures listed in Table 2 can be grouped into four strategy areas: Energy Efficiency, Renewable Energy (including Clean Electricity), Transportation and Water. For each of the measures, there are detailed actions that, taken together, should result in the anticipated GHG emissions reductions.

The following section describes the progress made by the city in implementing the CAP measures and actions, organized by the different strategy areas. A more detailed description of activities conducted for each CAP action, along with the 2035 performance goals for each Measure, is contained in Appendix A of this report. The activities involving public outreach and education are described in a separate section, since those efforts cross over all strategy areas.

A. Energy Efficiency

Energy efficiency is an important component to reducing energy consumption and lowering GHG emissions. The California Energy Commission (CEC) has adopted a “loading order,” a prioritized list of actions needed to reduce energy use, and energy efficiency is at the top of the list. For Carlsbad, energy efficiency CAP measures account for 16% of the planned GHG emissions reductions.

Measures D, E, F, and I all deal with energy efficiency, both in the community and municipal operations. These measures call for ordinances mandating energy efficiency improvements in residential and non-residential construction, implementation of energy conservation measures in city facilities, and promotion of energy efficiency rebate and incentive programs.

During the reporting period, staff continued to make progress in implementing the energy efficiency related measures. On Aug. 14, 2019, the CEC authorized implementation of the city’s energy efficiency ordinances for major renovations of existing residential and non-residential buildings. On Dec. 10, 2019, City Council adopted a proclamation supporting the Energy Upgrade California program, encouraging all residents to take energy-saving actions and urging all residents and small businesses to become more conscious energy stewards.

The city also continues to seek energy efficiency in municipal buildings. Heating, ventilation and air conditioning (HVAC) equipment and lighting are replaced with higher efficiency units and bulbs/fixtures. Staff works with the HVAC system consultant to maximize efficiency in operations. During the reporting period, Public Works Facilities Maintenance Division upgraded HVAC units at the Parks Maintenance Yard (near the intersection of Pio Pico and Drive and Carlsbad Village Drive), Fire Station 1, Oak Public Works Yard (on Oak Avenue near the railroad tracks) and the Carlsbad Municipal Water District (CMWD) Building (near the intersection of El Camino Real and Orion Road). Several large LED upgrade projects were completed at the Police and Fire Headquarters (formerly called the Safety Center) and the Carlsbad City Library (near Dove Lane).

The first off-the-grid solar parking lot lighting fixtures were installed at the Carlsbad Water Recycling Facility. New window tinting was completed at the Alga Norte Community Park. Also, staff used Energy Star Portfolio Manager to benchmark energy consumption at the Faraday Center and Police and Fire Headquarters. Due to the impacts of COVID-19 on city facilities, much of the reporting period was focused on addressing those impacts.

B. Renewable Energy

The provision of energy through distributed renewable sources can significantly reduce the need for electricity from the grid and, therefore, lower GHG emissions. The CEC's loading order prioritization of energy efficiency is to lessen the amount of energy used, thereby minimizing the size and cost of the renewable energy system needed to power the building. According to the CAP, renewable energy measures will account for about 46% of the planned GHG emissions reductions.

Measures B, J, M and P relate to community and city renewable energy improvements and increasing the renewable energy on the electrical grid. These measures include ordinances requiring PV systems in new non-residential construction and existing commercial buildings, alternative energy water heating systems, citywide renewable energy projects, promotion of renewable energy rebate and incentive programs, and participation in a community choice energy program.

On Aug. 14, 2019, the CEC authorized implementation of the city's energy efficiency ordinances, requiring installation of solar photovoltaic (PV) panels for all new non-residential development and major renovations of existing non-residential buildings, as well as alternative energy water heating for all new residential and non-residential development.

In November 2019, the Cities of Carlsbad, Del Mar and Solana Beach partnered to form the Clean Energy Alliance (CEA). CEA will operate a community choice energy program that allows for local control of electricity procurement and an increase in the proportion of renewable energy serving Carlsbad's electricity consumers. It will launch in May 2021 and anticipates reaching 100% clean electricity by 2030.

C. Transportation

There are two primary facets of GHG emissions reductions related to transportation. The first is to reduce the number of miles a vehicle is driven. Each mile driven represents an emission of GHG. Reducing the length of trips, or the need to use a motorized vehicle, can significantly reduce GHG emissions. The second facet of transportation-related GHG emissions is to reduce or eliminate the GHG emissions coming from vehicles. Known as low- or zero-emissions vehicles, these automobiles include alternative-fueled vehicles, hybrids and electric vehicles. Taken together, reduction of vehicle miles traveled and tailpipe emissions represents the largest single GHG emissions reduction strategy area. In the Carlsbad CAP, transportation-related measures total over 40% of the planned GHG emissions reductions.

Measures K and L address the transportation related GHG emissions reductions. Measure K relates to reducing vehicle miles traveled and is closely tied to the policies contained in the General Plan Mobility Element. On Aug. 20, 2019, City Council approved a consultant contract for transportation demand management (TDM) program implementation to develop a program

workplan, identity and marketing materials; conduct business member recruitment and retention; and implement commuter outreach and campaigns.

Measure L involves reducing tailpipe emissions through an increase in the proportion of low- and zero-emission vehicles on the road. Staff continued implementation of the City Council adopted ordinance requiring installation of electric vehicle (EV) charging infrastructure for all new residential and non-residential development and major renovations of existing residential buildings. Staff also installed a dual port EV charging station at Aviara Community Park. Other activities during the reporting period included: purchase of an all-electric fleet vehicle and 22 hybrid police pursuit vehicles (of which 12 vehicles were put into service during this reporting period and more vehicles are in the process of being outfitted for use); hiring an EV consultant to analyze EV charging infrastructure installations at 12 city facilities; and, exploration of participation in the CALeVIP EV charging infrastructure rebate program.

D. Water

Water conservation can lower GHG emissions because movement of water and wastewater requires energy. Measures N and O promote increasing energy efficiency in the potable water, recycled water and wastewater conveyance systems and using greywater and rainwater collection systems.

The Carlsbad Municipal Water District (CMWD) analyzes energy usage of their pumps and endeavors to increase energy efficiency of equipment whenever it is replaced. Implementation of the actions associated with measures N and O will continue in the mid- to long-term timeframe.

E. Public Outreach and Education

In addition to the provision of energy-efficient buildings or the availability of PV systems and EVs, a critical component to reducing GHG emissions is encouraging members of the public to engage in behaviors that reduce GHG emissions. Bike lanes, pedestrian improvements and transit expansion only reduce GHG emissions if people use them.

Measures D, E, F and I all contain actions related to public outreach and education. During the reporting period, staff implemented several public outreach and education efforts, including maintaining the city's website with information on rebates and incentives for energy efficiency, renewable energy and EVs for both residential and commercial consumers.

Environmental Management staff made presentations about the CAP at the following local, regional and statewide meetings:

- Carlsbad energy efficiency ordinances – Bay Area Regional Energy Network Forum, September 2019

- CAP and sustainability policy and implementation – San Diego Green Building Council’s Climate LEEDers in Action, October 2019
- CAP ordinance development – Zero Energy Building Task Force Implementation Webinar, August 2020
- Carlsbad’s energy resiliency initiatives – Local Government Sustainable Energy Coalition Forum, January 2020
- Local governments and resilient microgrids - Statewide Energy Efficiency Collaboration, September 2020
- CAP and the California Environmental Quality Act (CEQA) - Association of Environmental Professionals Statewide Conference, November 2020
- Energy efficiency mapping, climate planning and regional partnerships – Statewide Energy Efficiency Collaboration, November 2020

In addition to staff generated outreach, the Statewide Reach Codes program featured an article about Carlsbad’s ordinances <https://localenergycodes.com/content/reach-codes-frontrunner-city-of-carlsbad/>.

IV. Monitoring

Monitoring of CAP implementation can be divided into three general areas: 1) progress on implementing the CAP actions; 2) progress on reaching the CAP measures’ performance goals; and, 3) progress in reaching the CAP GHG emissions reductions targets for 2020 and 2035.

A detailed description of the activities undertaken to implement the CAP actions is contained in Appendix A. Regarding the CAP measures and their corresponding performance goals, there is variability in the monitoring data sources. For example, monitoring for measures D, E and F require San Diego Gas and Electric (SDG&E) electric and natural gas energy usage. Monitoring for Measure L requires vehicle miles traveled (VMT) model output data. The energy usage and VMT data will be collected during the biennial GHG inventory process, conducted by SANDAG, and reported in the corresponding CAP Annual Report. To better coordinate Carlsbad’s CAP reporting with data sources and SANDAG’s GHG inventories which are reported on a calendar year cycle, the CAP reporting period was changed from a fiscal year to calendar year cycle.

A. Renewable Energy

Measures A and B involve increasing the amount of residential and non-residential solar PV systems in Carlsbad. Even though Measure A was deleted in CAP Amendment No. 1, the city still tracks residential PV installations. Data for the reporting period were obtained from the permit activity in the city’s EnerGov permit tracking system. Table 3 shows the number and capacity in kilowatts (kW) of PV system installations in the residential and non-residential sectors during the reporting period.

Table 3 – PV System Installations in Reporting Period 4 (July 1, 2019 – Dec. 31, 2020)

Sector	Total Finaled Permits	Total Capacity (kW)	Highest Capacity Project (kW)	Lowest Capacity Project (kW)	Median Project Capacity (kW)
Residential	1,697	10,055.8	30.0	1.0	5.6
Non-residential	21	3,711.1	550.2	12.3	111.8

Figures 2 and 3 show the residential and non-residential PV installations as they relate to the CAP projections and target. The data were obtained from SDG&E grid interconnections and the city’s EnerGov permitting tracking software system. The residential PV installations far exceed the CAP projections and are greater than the 2035 target of 25 megawatts (MW) of capacity. As of January 2020, California building code requires PV in new residential construction, which will contribute to the continuing increase in residential PV. The non-residential installations currently exceed the trend line amount for reaching the CAP target.

Figure 2 - Residential PV Installations and CAP Projections and Target

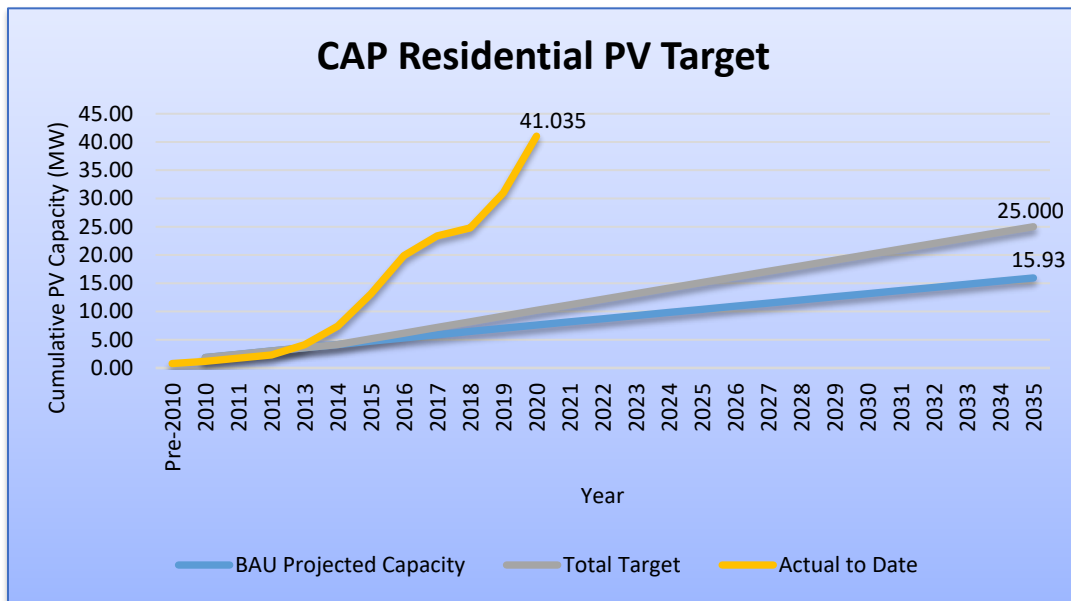
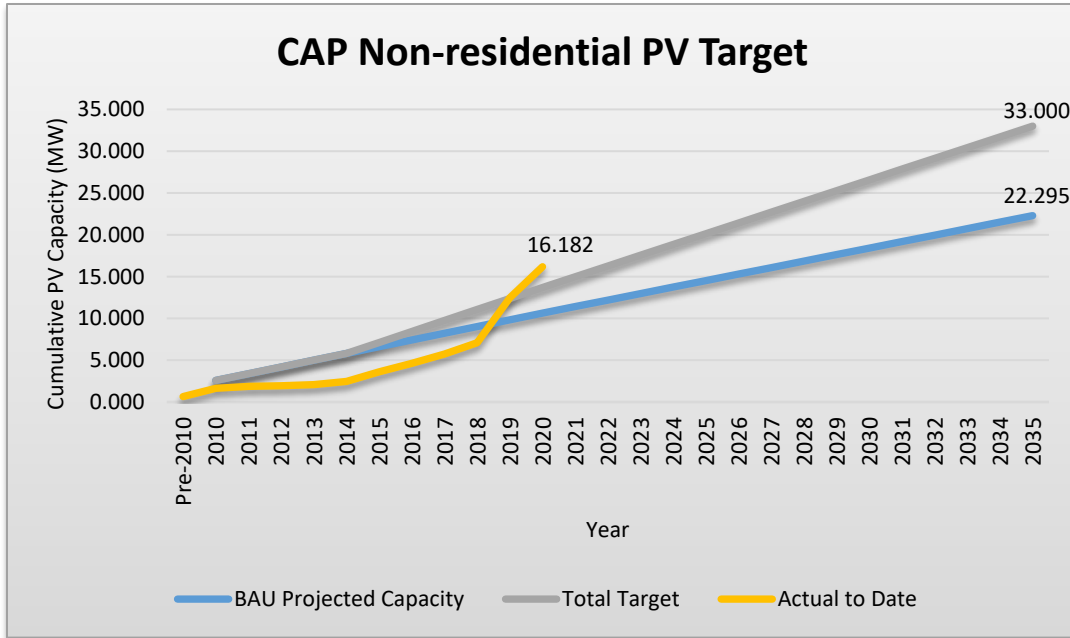


Figure 3 – Non-residential PV Installations and CAP Projections and Target

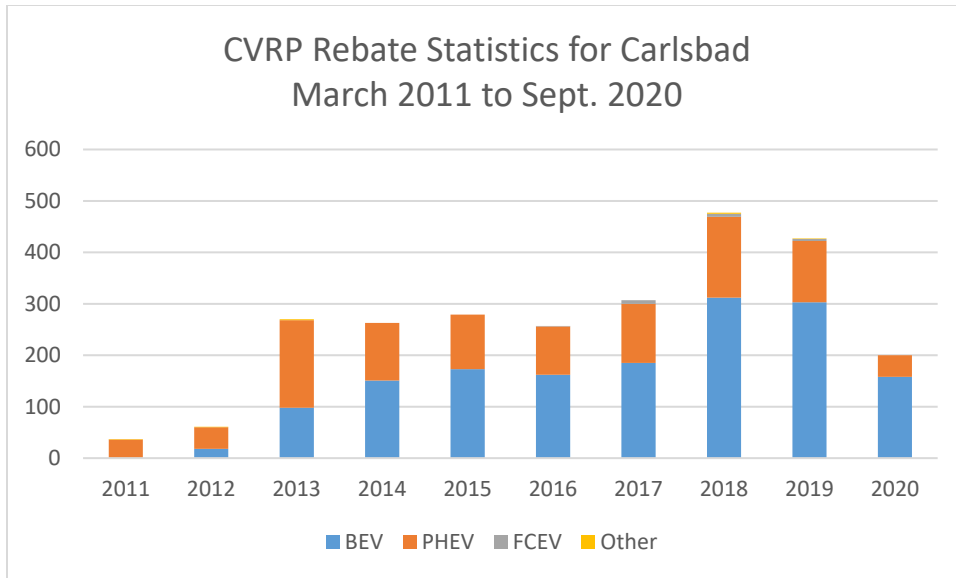


B. Electric Vehicles

CAP Measure L involves promoting an increase in the proportion of zero-emission vehicle (ZEV) miles traveled, specifically EV, of the total VMT. One way to promote an increase in EV ownership and use is to increase the number and locations of publicly available EV charging stations.

The California Air Resources Board (CARB) administers the Air Quality Improvement Program (AQIP), intended to fund clean vehicle and equipment projects, air quality research, and workforce training. One of the AQIP programs is the Clean Vehicle Rebate Program (CVRP). Administered by the Center for Sustainable Energy (CSE), CVRP provides rebates for the purchase or lease of clean vehicles. CVRP participation statistics can be used to gauge EV ownership. Figure shows the annual CVRP participation, expressed through number of applications, within Carlsbad from March 2011 to Sept. 2020.

Figure 4 – CVRP Participation in Carlsbad – March 2011 to Sept. 2020



BEV = battery-electric vehicle; PHEV = plug-in hybrid electric vehicle; FCEV = fuel-cell electric vehicle; other = non-highway, motorcycle & commercial BEV.

Data for the reporting period is available from July 1, 2019 to Sept. 30, 2020. CVRP participation was as follows: BEV = 302; PHEV = 161; FCEV = 4; Other = 1. The city is also acquiring clean vehicles as part of its fleet conversion strategy. During the reporting period, the city purchased 1 battery electric vehicle, which added to the 19 existing plug-in hybrid vehicles in the city’s fleet of vehicles. Additionally, on Oct. 22, 2019, City Council authorized purchase of 22 hybrid police pursuit vehicles. Of the 22 vehicles, nine will be additions to the fleet and 13 will be replacements of existing vehicles. These vehicles with a hybrid powertrain are expected to result in a reduction of 22,560 pounds of GHG emissions per 20,000 miles traveled. Twelve of the 22 hybrid vehicles were put into operation during this reporting period and more vehicles are expected to be ready for use soon.

C. Transportation General Plan Policies

In addition to the CAP measures and actions described in Section III, the CAP also relies upon implementation of some transportation related General Plan policies for GHG reductions. These policies involve bikeway system improvements, pedestrian improvements and increased connectivity, traffic calming, parking facilities and policies, and transportation improvements. While the overall GHG reduction of these General Plan policies is relatively small (less than 4.5% of 2035 reductions) it is important to track progress in completing these improvements because they contribute increased and multimodal mobility within the city.

Bikeway and Pedestrian System Improvements

There were several improvements to the pedestrian system during the reporting period:

Concrete Replacement:

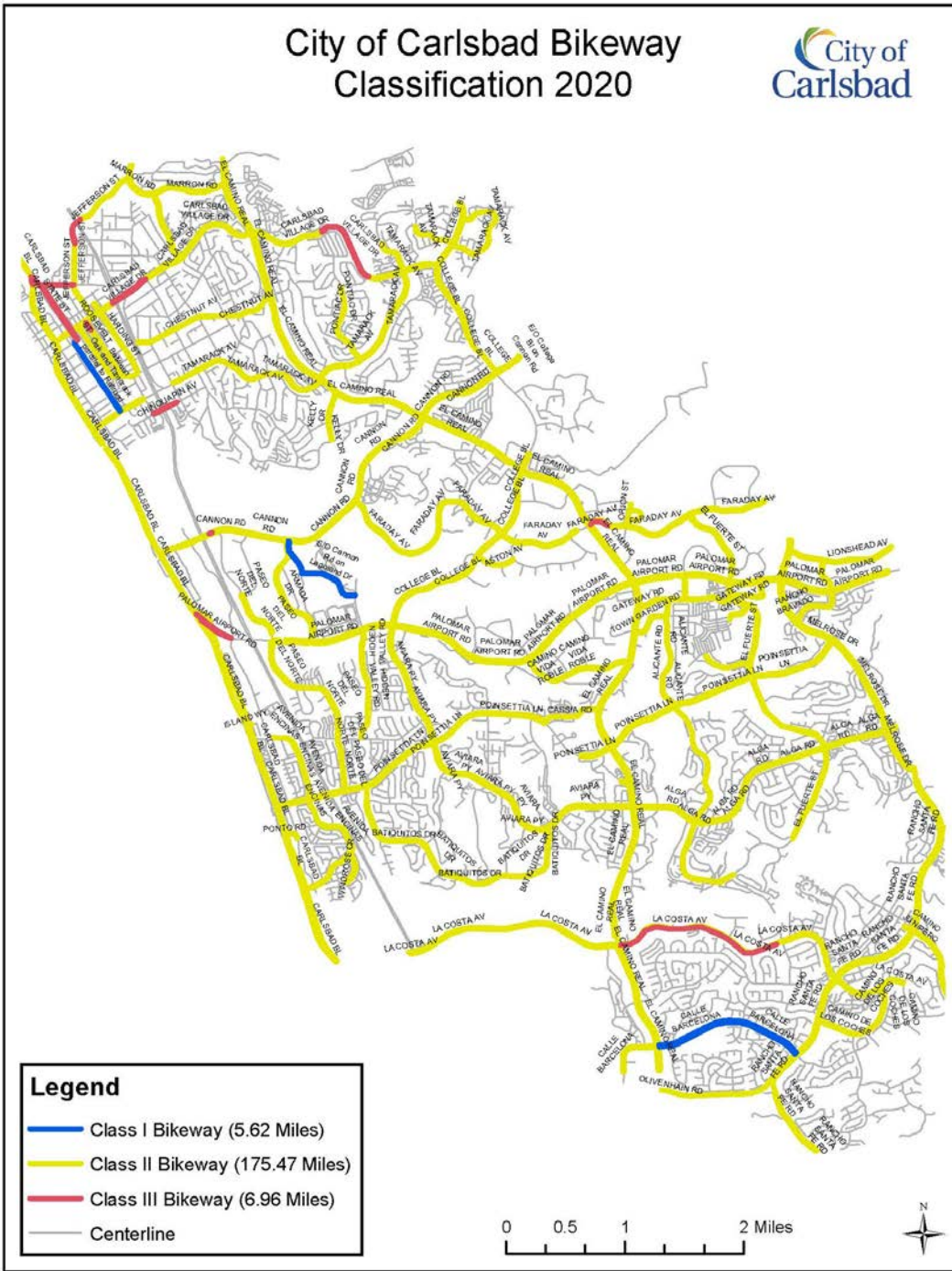
- Replaced 3 non-compliant and damaged curb ramps
- Replaced over 6,000 linear feet of broken or uplifted sidewalk (approximately 30,000 square feet)

The city currently has 188.05 miles of bikeways, as shown in Figure 5. No additional bikeway miles were added to the system during the reporting period.

Additionally, during the reporting period, 12,700 linear feet of La Costa Avenue were resurfaced and restriped, and buffered bike lanes were added where possible as part of the city's efforts to encourage more bicyclists to use the bike lanes.

Figure 5 – Bikeways by Classification

City of Carlsbad Bikeway Classification 2020



Parking Facilities and Policies

On Sept. 26, 2017, the City Council accepted a Parking Management Plan (PMP) for the Carlsbad Village, Barrio and Beach Area, which contains many of the parking policies described in the CAP. Implementation of the plan will occur through the Carlsbad Village and Barrio Master Plan (Ordinance CS-357 adopted by City Council on Aug. 27, 2019). The recommendations in the PMP include hiring a parking program management program manager, incentivizing shared and leased parking, reducing parking requirements, allowing bicycle parking as a replacement for required parking, and installing digital parking locator infrastructure and wayfinding signs. During the reporting period, the city continued the parking data collection program, issuing a report in August 2019.

Transportation Improvements

During the reporting period, staff continued coordination with North County Transit District (NCTD) in the finalization of the city's Trolley Feasibility Study. On Aug. 19, 2019, the Carlsbad Connector program launched. The program is a collaboration between the city, NCTD and SANDAG. It provides first mile/last mile service connecting the Poinsettia Commuter Rail Station to the employment centers in the city's industrial parks. Service was suspended as of July 31, 2020 due to COVID-19 restrictions. It is anticipated that NCTD will resume operations and funding for a new and expanded pilot micro-transit program from Poinsettia Station when normal COASTER service resumes.

The Carlsbad Connector resulted in over 10,000 rides with more than 400 riders per week at its peak in February 2020. The service achieved a maximum daily ridership of 98 trips, just shy of the pilot program's initial goal of 100 daily trip. The Carlsbad Connector demonstrated a 96% on-time performance and achieved 4.9 out of 5 stars average customer ratings. Its success was demonstrated prior to COVID-19 and is expected to resume once the pandemic is over.

V. New Development Projects

The CAP serves as an environmental review tiering document, or Qualified CAP, pursuant to Section 15183.5 of the California Environmental Quality Act (CEQA) Guidelines. MTCO_{2e} must either demonstrate consistency with the CAP or submit a project specific GHG analysis for review and approval.

To evaluate project CAP consistency, the Planning Division uses the Climate Action Plan Consistency Checklist and accompanying Guidance for Demonstrating Consistency with the Climate Action Plan – For Discretionary Projects Subject to CEQA. The Checklist and Guidelines are available at: <http://www.carlsbadca.gov/services/building/forms/default.asp>.

On Jan. 21, 2020, City Council received a CAP update regarding the CAP's Qualified status. During ongoing CAP monitoring, staff determined that the CAP contained a calculation error in the VMT calculations in the original CAP GHG inventory that resulted in a lower GHG

inventory, forecasted emissions and reduction targets. Due to the VMT error, and the resulting inaccurate GHG inventory, the CAP likely failed to constitute as a Qualified Plan. As such, staff paused assessing discretionary projects' GHG impacts using the CAP as a Qualified Plan until the VMT error was addressed through CAP Amendment No. 1 on July 14, 2020, as described in Section VI.

There were three development projects that exceeded the 900 MTCO₂e threshold and were therefore subject to CEQA CAP compliance review. Below are the project names, descriptions and GHG reduction measures:

Marja Acres (294 residential units and 10,000 square feet commercial)

- Installation of a 555 kW residential solar photovoltaic (PV) system and 15 kW commercial PV system
- EV charging infrastructure for all residential units and four commercial parking spaces
- Low-flow or high-efficiency water fixtures
- 75% of project luminaires are LED or equivalent energy efficiency
- All-electric water heating
- TDM plan

Aviara Apartments (329 residential units)

- Installation of a 386 kW PV system
- EV charging infrastructure
- 20% reduction in water consumption
- 75% of project luminaires are LED or equivalent energy efficiency
- TDM plan

West Oaks (192 residential units)

- Installation of PV system consistent with 2019 Building Code
- EV charging infrastructure
- Low-flow or high-efficiency water fixtures
- 75% of project luminaires are LED or equivalent energy efficiency
- All-electric water heating and HVAC
- TDM plan

The city adopted several CAP related energy ordinances that became effective during the reporting period, namely: energy efficiency, renewable energy, and alternative water heating. The electric vehicle infrastructure ordinance was not subject to CEC review, so it became effective on April 11, 2019, during the prior reporting period. The energy efficiency, renewable energy and commercial alternative water heating ordinances became effective on Aug. 16, 2019. Because the residential alternative water heating relied upon the 2019 state code

requirement for PV installation, it became effective on Jan. 1, 2020. However, the ordinance effectiveness was not communicated to the city's consultant building permit planchecker at that time. During regular CAP monitoring, staff discovered the error and developed materials to assist the plancheckers and establish quality assurance. Enforcement of the ordinances began in late October 2020.

The GHG reduction impacts of this temporary lapse in ordinance enforcement was not significant. For example, there were only three commercial projects subject to the renewable energy ordinance during that period. The three projects would have included approximately 65 kW of PV, which represents less than 2% of the total non-residential PV installations during the reporting period.

VI. CAP Amendment No. 1

On July 14, 2020, City Council approved CAP Amendment No. 1 to revise the greenhouse gas inventory and reduction targets and forecast, update reductions from existing measures and incorporate community choice energy as a new reduction measure. The amendment was necessary due to correct the VMT calculation error discussed in Section V.

The amendment also incorporated new regional and statewide guidance and protocols adopted since the original CAP approval. The California Air Resources Board (CARB) issued the 2017 Climate Change Scoping Plan that contains new guidance on calculating greenhouse gas reduction targets. Some state and federal policies affecting greenhouse gas reduction efforts also changed. In 2018, the San Diego Association of Governments (SANDAG) released the Regional Climate Action Planning (ReCAP) Framework, which contains guidance on the preparation of GHG inventories, forecasts and calculation of GHG reduction measures. CAP Amendment No. 1 incorporated this new guidance, as well as the recalculation of expected emissions reductions for all existing measures.

Also, due to the increase in forecasted emissions, an additional CAP reduction measure was needed. Given Carlsbad's participation in the Clean Energy Alliance, a community choice energy program designed to include more renewable energy in the local procurement of electricity, adding a Clean Electricity was a logical option.

CAP Amendment No. 1 included the following:

- Replacement of the 2005 and 2011 greenhouse gas inventories with a 2012 inventory
- Recalculation of the 2020 and 2035 emissions reduction targets based upon the 2012 inventory and using 2017 CARB Scoping Plan guidance
- Recalculation of the BAU forecast, state and federal emissions reductions, and necessary local reductions needed to reach Scoping Plan derived targets

- Addition of Clean Electricity reduction measure (Measure P), with 100% clean electricity goal by 2030
- Recalculation and evaluation of forecasted emissions reductions of existing CAP measures based upon updated state and federal policies and new Clean Electricity measure.

VII. GHG Emissions Inventories

As part of the ReCAP program, SANDAG coordinates with local jurisdictions to prepare biennial GHG inventories. These inventories are based upon energy consumption data from SDG&E, VMT data from SANDAG modeling, and other information such as waste disposal and water consumption. These inventories, along with other local GHG reduction activity, are released as a jurisdiction-specific CAP Snapshot. To date, SANDAG has released 2016 and 2018 Snapshots, available at SANDAG’s Climate Data Portal (<https://climatedata.sandag.org/>). Below are the City of Carlsbad’s CAP Snapshot GHG inventories for 2016 and 2018.

Figure 6 – 2016 Community GHG Emissions by Sector

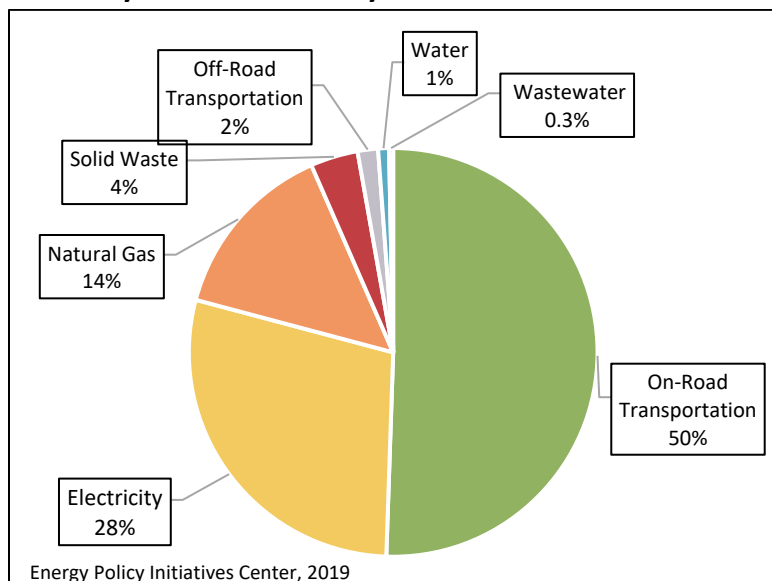


Table 4 – 2016 Community GHG Emissions by Sector

Emissions Category	GHG Emissions (MTCO _{2e})	Percentage of Total Emissions (%)
On-Road Transportation	470,000	50
Electricity	266,000	28
Natural Gas	133,000	14
Solid Waste	35,000	4

Off-Road Transportation	15,000	2
Water	8,000	1
Wastewater	3,000	<1
Total	930,000	100
Emissions in each category are rounded. Sum may not add up to totals due to rounding.		

Energy Policy Initiatives Center, 2019

Figure 7 – 2018 Community GHG Emissions by Sector

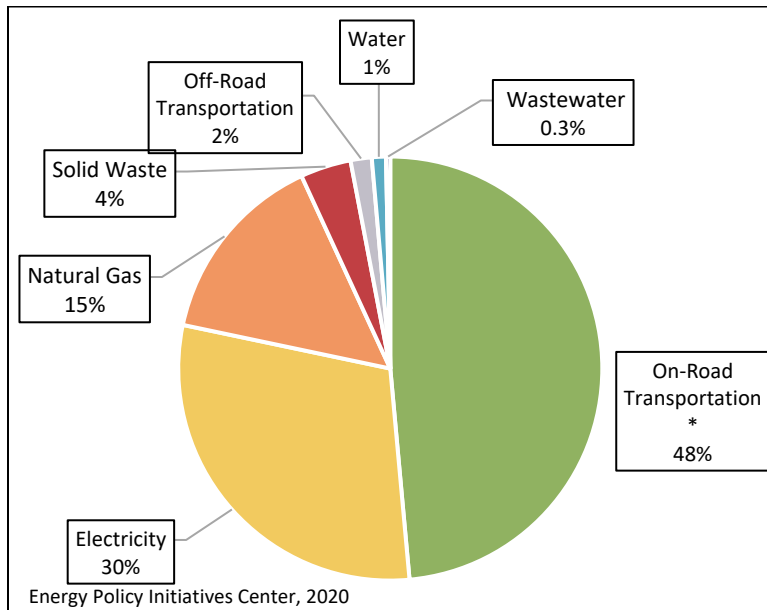


Table 5 – 2018 Community GHG Emissions by Sector

Emissions Category	GHG Emissions (MTCO _{2e})	Percentage of Total Emissions (%)
On-Road Transportation*	452,000	48
Electricity	277,000	30
Natural Gas	138,000	15
Solid Waste	36,000	4
Off-Road Transportation	15,000	2
Water	10,000	1
Wastewater	3,000	<1
Total	930,000	100
*Emissions from on-road transportation were calculated based on 2016 VMT data. Emissions in each category are rounded. Sum may not add up to totals due to rounding.		

Energy Policy Initiatives Center, 2020

Appendix A

CAP Implementation Activities by Measures and Actions July 2019-December 2020

CAP Measures and Actions 2035 Performance Goals for Measures		July 2019-December 2020 CAP Implementation Activities by Measures and Actions
<p><i>Timeframes in CAP:</i> Short-term = 1 - 2 years Mid-term = 2 - 5 years Short to Long-term & Mid-Long-term = begun but not completed in 5 years</p>		
<p>A - Promote installation of residential photovoltaic systems Promote installation of residential PV systems to produce an additional 9.1 MW above already projected amounts, or the equivalent of 2,682 more homes with PV systems, by 2035.</p>		
<p><i>Deleted in CAP Amendment No. 1. See Section IV for residential photovoltaic system monitoring data. CAP measure goal for 2035 has been met.</i></p>		
<p>B - Promote installation of commercial and industrial photovoltaic systems Promote installation of commercial and industrial PV systems to produce an additional 10.7 MW above projected amounts, or roughly 15% of projected commercial and industrial electricity use.</p>		
B-1	<p>Adopt a commercial energy conservation ordinance requiring all new nonresidential developments with more than 50 cars surface parked or on roofs of parking structures to use PV panels over at least half of the surface/roof-parked cars or provide equivalent energy conservation/generation by other means (over and above other requirements). <i>(Short-term)</i></p>	<p>On Aug. 14, 2019, the California Energy Commission authorized implementation of the local revisions to the Energy Code adopted by City Council through Ordinance No. CS-347. This ordinance requires all new nonresidential buildings to install solar PV systems to offset a portion of their electricity requirements.</p>
B-2	<p>Adopt an ordinance requiring existing nonresidential developments to install PV panels to offset a portion of their energy use. <i>(Mid-term)</i></p>	<p>On Aug. 14, 2019, the California Energy Commission authorized implementation of the local revisions to the Energy Code adopted by City Council through Ordinance No. CS-347. This ordinance requires existing nonresidential buildings that undergo major renovations or additions to install solar PV systems to offset a portion of their electricity requirements.</p>
<p>C - Promote building cogeneration for large commercial and industrial facilities Promote building cogeneration for large commercial and industrial facilities, with the goal of producing 6.9 MW by 2035.</p>		
<p><i>Deleted in CAP Amendment No. 1. Staff evaluated the effectiveness of cogeneration systems on city facilities and no facilities met the minimum criteria needed for useful cogeneration. Given the addition of Measure P – Clean Energy, building cogeneration no longer produces significant GHG emission reductions.</i></p>		

D - Encourage single-family residential efficiency retrofits Encourage single-family retrofits with the goal of 50% energy reduction compared to baseline in 30% of the total single-family homes citywide (approximately 10,000 single-family homes out of total of 35,000.)		
D-1	Publicize available incentive and rebate programs, such as SDG&E's Residential Energy Efficiency Program, on the city's website and by other means. <i>(Short-term)</i>	On Dec. 10, 2019, City Council adopted a proclamation supporting the Energy Upgrade California program, encouraging all residents to take energy-saving actions and urging all residents and small businesses to become more conscious energy stewards. Staff maintained a website and made presentations.
D-2	Create a citywide "Energy Challenge," similar to the Department of Energy's Better Buildings Challenge, to promote cost-effective energy improvements, while having residents and building owners commit to reducing energy consumption. <i>(Short-term)</i>	Staff continued work on a multi-year, research-based strategy to achieve measurable changes in public behavior, resulting in reduced GHG emissions. A program such as this could become part of that strategy, based on the findings of research being conducted.
D-3	Adopt a residential energy conservation ordinance, which requires residential property owners to conduct and disclose an energy audit at the time of major renovations (as defined by the ordinance,) to ensure that homes and residential developments meet specified low-cost energy efficiency measures - such as requisite ceiling insulation, insulated pipes, water heater blankets and exterior door stripping. <i>(Short-term)</i>	On Aug. 14, 2019, the California Energy Commission authorized implementation of the local revisions to the Energy Code adopted by City Council through Ordinance No. CS-347. This ordinance requires specified energy efficiency measures in all major residential renovations.
E - Encourage multi-family residential efficiency retrofits Encourage multi-family retrofits with the goal of 50% energy reduction compared to baseline in 30% of the total multi-family homes citywide (approximately 5,000 single-family homes out of total of 17,000.)		
E-1	See D-1 above	See D-1 above
E-2	See D-2 above	See D-2 above
E-3	See D-3 above	See D-3 above
F - Encourage commercial and city facility efficiency retrofits Encourage commercial and city facility efficiency retrofits with the goal equivalent to a 40% energy reduction in 30% of commercial square footage citywide and in city-owned buildings by 2035.		
F-1	Undertake a program of energy efficiency retrofits for city-owned buildings, with the goal of 40% reduction in energy use, beginning with retrofits that would result in most substantial energy savings. <i>(Short-term)</i>	Public Works Facilities Maintenance Division upgraded heating, ventilation and air conditioning (HVAC) units at the Parks Maintenance Yard, Fire Station 1, Oak Public Works Yard and CMWD Building. Several large LED upgrade projects were completed at the Police and Fire Headquarters and the Carlsbad City Library. The first off-the-grid solar parking lot lighting fixtures were installed at the Carlsbad Water Recycling Facility. New window tinting was completed at Alga Norte Park.

F-2	Promote available incentive and rebate programs, such as SDG&E's Energy Efficiency Business Rebates and Incentives Program, on the city's website and by other means. <i>(Short-term)</i>	Staff maintained a website with information on rebates and incentives.
F-3	Adopt a commercial energy conservation ordinance, which requires property owners to ensure that commercial buildings meet specified energy efficiency measures - such as requisite heating, ventilation, and air conditioning improvements, service water system requirements, and improved refrigeration equipment, at time of conducting major renovations (as defined by the ordinance). <i>(Short-term)</i>	On Aug. 14, 2019, the California Energy Commission authorized implementation of the local revisions to the Energy Code adopted by City Council through Ordinance No. CS-347. This ordinance requires specified energy efficiency measures in all new and certain existing nonresidential buildings undergoing major renovations.
G - Promote commercial and city facility commissioning Encourage commercial and city facility commissioning, or improving existing and new building operations, with the goal equivalent to a 40% energy reduction in 30% of commercial square footage citywide and in city-owned buildings by 2035.		
<i>Deleted in CAP Amendment No. 1. Given the addition of Measure P – Clean Energy, building commissioning no longer produces significant GHG emission reductions.</i>		
H - Implement green building measures Implementation of a 5% improvement in energy efficiency above the City of Carlsbad residential green building code (based on CALGreen, the statewide green building code), for new construction.		
<i>Deleted in CAP Amendment No. 1. On Nov. 12, 2019 the City Council adopted the 2019 California Green Building Standards Code (CALGreen), which significantly increases energy efficiency of newly constructed buildings, far beyond the 5% called for in Action H-1.</i>		
I - Promote replacement of incandescent and halogen bulbs with LED or other energy efficient lamps Replace 50% of incandescent and halogen light bulbs citywide with LED or similarly efficient lighting by 2035.		
I-1	Replace 50% of incandescent or halogen light bulbs in city facilities with LED or similarly efficient lighting, or follow SANDAG Energy Roadmap recommendations for lighting in city facilities, whichever results in greater energy savings. <i>(Short-term)</i>	Staff installed replacement LED lighting at the Police and Fire Headquarters, Carlsbad City Library, Maerkle Reservoir and Carlsbad Water Recycling Facility.
I-2	Promote the use of LED or other energy efficient lamps by publicizing rebate programs and information from SDG&E on the benefits of the use of LED or other energy efficient lighting on the city's webpage. <i>(Short-term)</i>	Staff maintained a website with information about rebates and incentives.

I-3.i	Evaluate the feasibility of adopting a minimum natural lighting and ventilation standard, developed based on local conditions. <i>(Mid-term)</i>	<p>In 2018, the CSE performed a qualitative feasibility evaluation for natural lighting and ventilation. CSE determined that it would be difficult to provide a cost-effective natural ventilation requirement that goes beyond the 2019 Building Energy Efficiency Standards. The primary reason is that, while natural ventilation could meet some of a nonresidential building's cooling load due to Carlsbad's moderate climate, the 2019 California state building code nevertheless requires that a building's mechanical ventilation system be sized to meet the full cooling load to ensure that safe indoor air quality is maintained. As such, the cost of providing natural ventilation would not be offset by a reduced mechanical ventilation system.</p> <p>With regards to natural lighting, CSE noted that nonresidential natural lighting is well-governed in state codes, reducing the need for additional local standards. Cost-effectiveness analysis typically includes recommendations to alter building geometry to allow more daylight into the space. Daylighting requirements that may impact the architectural design and layout are challenging to enforce and are susceptible to heightened industry resistance. Daylight dimming plus off lighting control is a simple, cost-effective measure provided in the 2019 Building Energy Efficiency Standards, as it does not require architectural geometry or design changes.</p> <p>Daylighting in residential spaces is less likely to be cost-effective than in nonresidential spaces because the code assumes occupants are not typically present in residential spaces during the day to take advantage of daylighting; therefore, the cost of these controls may not be offset by the savings.</p> <p>The feasibility assessment also concluded that there are no known reach codes that include natural lighting and/or natural ventilation requirements that go beyond current code requirements.</p>
I-3.ii	Demonstrate natural lighting and ventilation features in future facility upgrade or new construction. <i>(Mid-term)</i>	Staff is incorporating natural lighting and ventilation in the future Orion Center, which is a city facility that will consolidate and house Public Works, CMWD and Parks & Recreation maintenance and operations staff.
<p>J - New construction residential and commercial solar water heater/heat pump installation & retrofit of existing residential Install solar water heaters or heat pumps on all new residential and commercial construction. Retrofit up to 30% of existing homes and commercial buildings to include solar water heaters or heat pumps.</p>		
J-1	Promote the installation of residential solar water heaters and heat pumps by publicizing incentive, rebate and financing programs, such as Property Assessed Clean Energy (PACE) programs and the California Solar Initiative for renovations of existing buildings by posting this information on the city's website and by other means. <i>(Short-term)</i>	Staff maintained a website and made presentations.

J-2	Adopt residential and commercial energy conservation ordinances requiring new residential and commercial buildings to install solar water heaters or heat pumps, or use alternative energy (such as PV-generated electricity) for water heating needs. <i>(Short-term)</i>	On Aug. 14, 2019, the California Energy Commission authorized implementation of the local revisions to the Energy Code adopted by City Council through Ordinance No. CS-347. This ordinance requires new residential and nonresidential buildings to install solar thermal water heating or electric heat pump water heaters for water heating needs.
K - Promote transportation demand management strategies Promote Transportation Demand Management Strategies with a goal of achieving a 10% increase in alternative mode use by workers in Carlsbad, for a total of 32% alternative mode use.		
K-1	Adopt a citywide TDM plan, as described in the General Plan Mobility Element, detailing a mix of strategies to reduce travel demand, specifically of single occupancy vehicles. SANDAG’s 2012 “Integrating Transportation Demand Management Into the Planning and Development Process” provides a guide to designing and implementing a TDM plan and will be used as a reference document to develop the city’s TDM plan. TDM strategies evaluated in the plan include parking ordinances, subsidized or discounted transit programs, transit marketing and promotion, carsharing, parking pricing, and bike parking. <i>(Short-term)</i>	<p>On Aug. 20, 2019, City Council approved a consultant contract for TDM program implementation. Known as “Carlsbad Commuter,” this program including a digital ecosystem focused on Carlsbad businesses and employees. This includes a website, a TDM trip planning/tracking tool for desktops and smart-phones, gamification and an automated communication system.</p> <p>In 2019 and 2020, outreach to the existing business community was conducted to a targeted list of employers based on size, existing TDM program needs and proximity to TDM-supportive services. Recruited businesses will receive a custom service that analyzes their commuters by ability to change behavior, which incorporates origin/destination, transportation network, time of day, topography, industry and other key details needed for sustainable behaviors.</p> <p>Prior to the COVID-19 pandemic, the program engaged with over two dozen existing businesses and had begun implementing outreach events specifically geared towards carpooling, public transit and the Carlsbad Connector (a pilot shuttle service to businesses from the Poinsettia Coaster Station which launched in August 2019 and continued until a temporary pause in July 2020 due to the COVID-19 pandemic).</p>

K-2	<p>Adopt a TDM ordinance, defining a minimum trip generation threshold for nonresidential development projects. The city will set performance requirements for minimum alternative mode use based on project type. All projects above the threshold shall submit a TDM plan, which includes a description of how the minimum alternative mode use will be achieved and maintained over the life of the project. Potential TDM trip reduction measures can include carpool and vanpool ridesharing services; designated employees as contacts for trip reduction programs; providing a direct route to transit in coordination with NCTD; developing public-private transit partnerships; passenger loading zones; pedestrian connections; showers and clothes lockers; long-term bicycle parking and shuttle programs. (Mid-term)</p>	<p>The TDM Ordinance efforts are currently evaluating baseline data from the first six TDM Ordinance plans. These businesses will be transitioned to recruitment as an existing business partner for additional behavior change programming and data collection.</p>
<p>L - Promote an increase in the amount of zero-emissions vehicle travel Promote an increase in the amount of ZEV miles traveled from a projected 15% to 25% of total VMT by 2035.</p>		
L-1	<p>Working with industry partners, construct a “PV to EV” pilot project to install a PV charging station at a city facility (such as Faraday Center) to charge city ZEVs. The purpose of the pilot project would be to evaluate the feasibility of incorporating more ZEV into the city's fleet. <i>(Short-term)</i></p>	<p>Staff continues to assess the feasibility of a direct "PV to EV" pilot project(s). During the reporting period, staff issued a Request for Information (RFI) for an off-grid PV powered EV charging station. Staff desired to explore innovative solutions that exceeded current market products, for example with a variety of battery systems and opportunities for direct current charging (DC to DC). Three responses were received; however, all proposals were “off-the-shelf” products.</p>
L-2	<p>Prepare a community-wide charging station siting plan, which evaluates site visibility and exposure, EV driving ranges, high volume destinations, locations with high ownership or interest in EVs, and cost of construction. <i>(Short-term)</i></p>	<p>During the previous reporting period, staff prepared a mapping and travel distance analysis of existing and future EV charging sites and identified gaps in service areas. During the current reporting period, staff contracted with an EV charging station consultant to analyze physical and financial feasibility of 12 city-owned sites.</p>
L-3	<p>Construct ZEV charging stations based on the community-wide charging station siting plan described in L-2 above. The ZEV charging stations will be funded by grant funds when available, and the city will post signage directing ZEVs to charging stations. <i>(Mid-term)</i></p>	<p>During the reporting period, staff installed a dual port EV charging station at Aviara Community Park. Also, the city engaged with the CALeVIP EV charging station rebate program. 12 candidate sites were identified, including three for DC fast-charging stations. Staff continues to seek potential participation eligibility in the program.</p>

L-4	Offer dedicated ZEV parking, and provide charging stations adjacent to ZEV parking as identified in the community-wide charging station siting plan. <i>(Mid-term)</i>	Staff continued to implement the EV charging infrastructure ordinance adopted by City Council as Ordinance No. CS-349, which requires new residential and nonresidential buildings, and major renovations to existing residential buildings, to install EV charging infrastructure.
L-5	Adopt requirements for ZEV parking for new developments. <i>(Short-term)</i>	Staff continued to implement the EV charging infrastructure ordinance adopted by City Council as Ordinance No. CS-349, which requires new residential and nonresidential buildings to install EV charging infrastructure.
L-6	Adopt a residential energy conservation ordinance, similar to Palo Alto, requiring the installation of EV chargers or pre-wiring in new residential construction and major renovations. <i>(Short-term)</i>	Staff continued to implement the EV charging infrastructure ordinance adopted by City Council as Ordinance No. CS-349, which requires new residential and nonresidential buildings, and major renovations to existing residential buildings, to install EV charging infrastructure.
L-7	Update the city's Fleet Management Program to include a low and zero-emissions vehicle replacement/purchasing policy. Increase the proportion of city fleet low and zero-emissions VMT to 25% of all city-related VMT by 2035. <i>(Short-term)</i>	The city acquired its first all-electric fleet vehicle, adding to the 19 existing plug-in hybrid electric fleet vehicles. On Oct. 22, 2019, City Council authorized purchase of 22 hybrid police patrol vehicles. Of the 22 vehicles, nine will be additions to the fleet and 13 will be replacements of existing vehicles. Of the 22 vehicles, 12 were put into operational use during this reporting period and more vehicles are being outfitted for use in the near future. According to manufacturer estimates, the hybrid powertrain is expected to result in a reduction of 22,560 pounds of GHG emissions per 20,000 miles traveled.
M - Develop more citywide renewable energy projects Produce an equivalent amount of energy to power 2,000 homes (roughly equivalent to a 5% reduction) by 2035 from renewable energy projects.		
M-1	Conduct a feasibility study to evaluate citywide renewable energy projects and prioritize accordingly. <i>(Short-term)</i>	Staff continued to explore funding alternatives to implement the Microgrid Feasibility Study for the Carlsbad Police and Fire Headquarters on Orion Way. If implemented, the microgrid would include enough renewable energy generation and energy storage to power the entire complex in case of a blackout.
M-2	Incorporate renewable energy measures such as PV system installation on city buildings and parking lots, or microturbine installation on city facilities, with the goal of producing approximately 12,000 megawatt-hours per year. <i>(Mid to Long-term)</i>	In accordance with the city's solar PV ordinance, future city facilities will be required to incorporate renewable energy. The potential for retrofitting PV on existing buildings is evaluated when other improvements and/or renovations are planned.
M-3	Pursue available funding sources for the construction of renewable energy projects by the city, such as Energy Efficiency Financing for Public Sector Projects and SGIP. <i>(Mid to Long-term)</i>	City staff continually monitors potential funding sources to support CAP implementation, including renewable energy projects. .

N - Reduce the GHG intensity of water supply conveyance, treatment and distribution

Reduce the intensity of GHG emissions from water utilities (including water supply, wastewater, and recycled water) conveyance, treatment and distribution by 8% by 2035.

N-1	Improve water utilities (including water supply, wastewater, and recycled water) conveyance, treatment and distribution, and other system improvements. <i>(Mid to Long-term)</i>	Incorporating energy efficiency into system improvements is standard practice for Carlsbad Utilities. The Carlsbad Municipal Water District (CMWD) analyzes energy usage of their pumps and endeavors to increase energy efficiency of equipment whenever it is replaced. In addition, Public Works – Utilities engages in numerous water conservation programs such as: leak monitoring, high efficiency device rebates, water efficient landscape training.
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O - Encourage the installation of greywater and rainwater systems

Encourage the installation of greywater and rainwater collections systems with a goal of 15% of homes by 2035.

O-1	Host workshops on greywater and rainwater collection systems through the Carlsbad Municipal Water District, or partner with existing workshop providers, for homeowners interested in installing systems suitable for their property. <i>(Mid-term)</i>	CMWD participated in a rain barrel rebate program with other north San Diego County water districts to encourage and provide financial incentive for rainwater collections systems. Details on the program can be found at: https://www.rainwatersolutions.com/products/northcounty
O-2	Create a greywater design reference manual, or provide links to an existing one, for the design of greywater and rainwater collection systems. <i>(Mid-term)</i>	City staff evaluated the feasibility of a greywater system design manual and rebate program. The County of San Diego Department of Health regulates greywater use and generally restricts systems to outdoor irrigation. Given these restrictions, the design manual and rebate program would be limited. Staff is considering other potential water conservation measures not involving greywater that could reduce GHG emissions.
O-3	Evaluate the feasibility of offering a rebate for residential greywater systems that require a permit to cover the cost of obtaining a permit. <i>(Mid-term)</i>	City staff evaluated the feasibility of a greywater system design manual and rebate program. The County of San Diego Department of Health regulates greywater use and generally restricts systems to outdoor irrigation. Given these restrictions, the design manual and rebate program would be limited. Staff is considering other potential water conservation measures not involving greywater that could reduce GHG emissions.

P – Increase the proportion of clean electricity in community energy consumption

Achieve 100% renewable electricity by 2030 for 95% of the residential bundled load and 85% commercial + industrial bundled load.

P-1	Continue participation in the Clean Energy Alliance (CEA) Community Choice Energy program. <i>(Ongoing)</i>	The city continued participation in CEA, with an anticipated May 2021 program launch.
P-2	Explore the purchase of renewable energy credits if Community Choice Energy program is not reaching 2035 goal.	Staff will monitor program participation and implement this action is necessary.