GREENHOUSE GAS REDUCTION PLAN

Sustainable Electric & Water Initiatives

MAY 2020

ANAHEIM PUBLIC UTILITIES

ACKNOWLEDGEMENTS

Anaheim Public Utilities (APU) appreciates the input and collaboration from students of the following schools in the development of this plan:

Anaheim High School

Canyon High School

Cornelia Connelly School

Esperanza High School

Katella High School

Loara High School

Savanna High School

Western High School

VISION STATEMENT

The vision for Anaheim's future is a clean and green community that is powered by renewable resources, that reduce greenhouse gases through energy efficiency, water conservation, healthy urban forests, and electric transportation. Together with the support of policy makers, key stakeholders, and customers, APU met its intended targets for 2020, and is looking forward to a bright future that is affordable, reliable, and sustainable.

"Sustainability ensures that our planet isn't being harmed and is saved for the future ."

ANDREW S.
Katella H.S.

INTRODUCTION

What will the City of Anaheim look like in the future? In 2015, developing the answers to this important question led to the creation of the Greenhouse Gas (GHG) Reduction Plan – a vision for the future of Anaheim's electric and water resources to be sustainable and environmentally-friendly, while continuing to be affordable and reliable for the benefit of APU's residential and business customers.

The 2015 GHG Plan established important baseline metrics and goals for 2020 and 2030. Now that five years have passed, it's important to see what has been accomplished, and set new targets for 2030 and 2045. The timelines established are consistent with state policies and the recently enacted Senate Bill 100 that envisions a carbon-free energy future in the state of California.

While APU endeavors to meet or exceed important state goals, the primary reason for APU to exist is to serve its customers. As such, programs are designed at the local level to meet the needs of the Anaheim community. The 2020 GHG Plan pushes forward with utility programs and customer initiatives that capture important planning goals that complement the utility's Integrated Resource Plan that was approved by City Council in May 2018 and the California Energy Commission in October 2018.

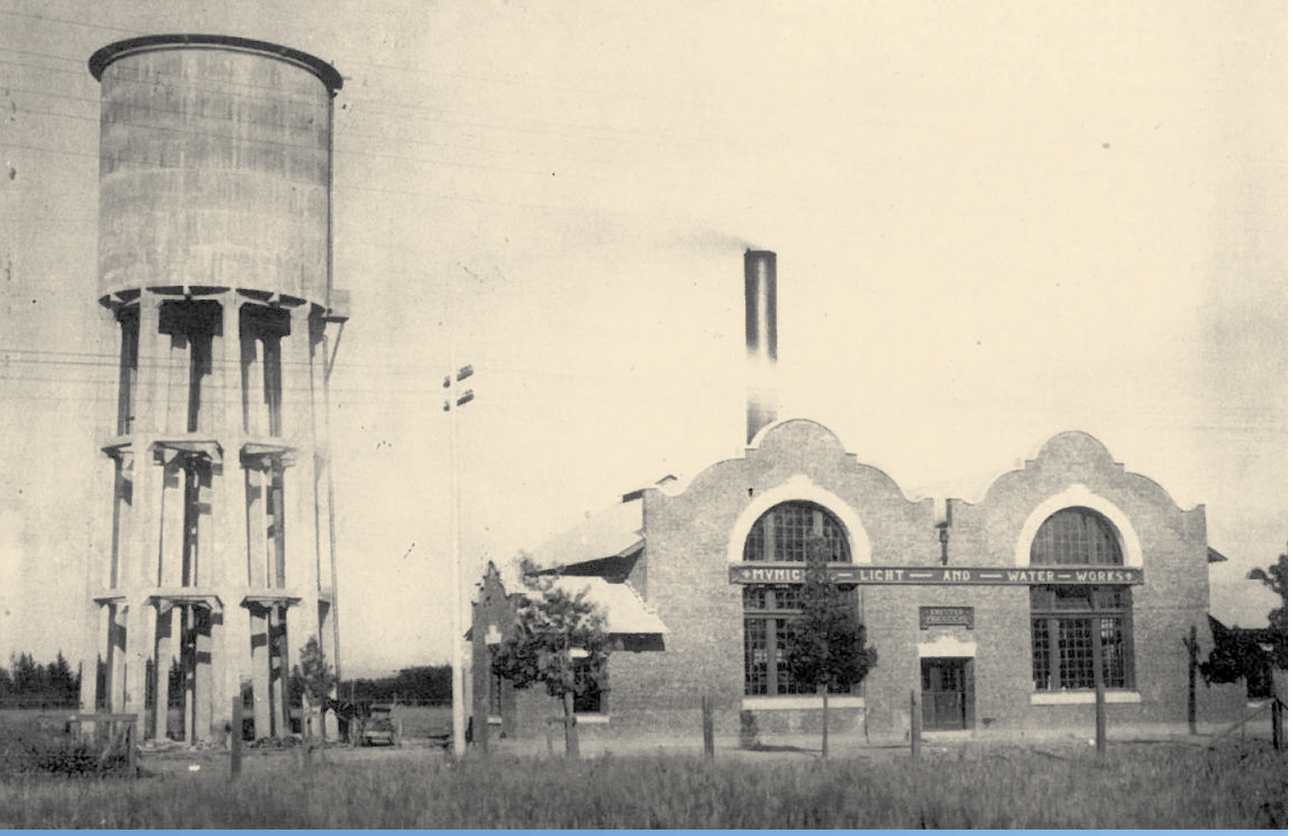
In 2015, APU also captured important feedback from local high school students and their dreams for a cleaner and greener Anaheim. In the 2020 GHG Plan, APU again tapped into the bright minds of local high school students to share their insights and help chart a course for a sustainable future.

HISTORY

The Industrial Revolution started in 1776 with the invention of the steam engine. The advances in technology and production created the Industrial Revolution that was greatly dependent on fossil fuels to sustain and advance society. Without it, the advances seen in technology and today's standard of living would not be possible.

This major turn in history is as important to society today as the advent in agriculture. Because of advances in technology, medicine, and mass food production, people are living longer lives, which in turn places more demand on the environment and its finite natural resources. The standard of living in the United States has greatly increased and everyday lives have been impacted in nearly every way by the technology brought on by the Industrial Revolution and the fossil fuels that made that revolution possible in the first place.

Today, industrialized and technological societies understand that the cost of releasing GHG needs to be mitigated in order to preserve the community's way of life and all the benefits that the Industrial Revolution brought to the United States' economy and prosperity. APU recognizes that a sustainable future does not have to be an "either or" proposition; it can be realized by producing reliable, clean, and cost effective electricity and water supplies to bolster Anaheim's economy, environment, and community by transitioning from fossil fuels to sustainable and renewable resources, in a responsible manner that mitigates rate shock to customers. This requires having a balanced energy portfolio in the near term to help integrate renewables on the pathway towards meeting state legislation of 100% clean energy portfolios by 2045.



125TH ANNIVERSARY

As APU approaches its 125th anniversary this year, it is important to reflect on its founding leaders' ability to innovate and think deeply about the future of Anaheim well over a hundred years into the future. In the late 1800s, the City of Anaheim took responsibility for operating the water system for their growing city. In a little over a decade later, Anaheim seized the opportunity to build the first municipal electric utility in Southern California, changing the face of the region for years to come.

The Anaheim of today looks much different from the Anaheim of the past – and its demands for water and electricity are far higher than our ancestors could ever have imagined. But the dedication of the city to serving its community and meeting challenges head-on has remained unchanged over the past century. APU is dedicated to building upon this legacy by anticipating what a bright and sustainable future should look like for the benefit of future generations.

The focus has always been and will continue to be that of serving the community. As the only municipally-owned electric and water utility in Orange County, APU is committed to listening to community members and developing programs for their benefit. Home energy surveys, efficiency rebates, LED lighting, shade trees, and supporting electric transportation are some of the ways APU has been helping customers towards their sustainable future by placing the power in their hands.

Anaheim Substation (pictured left-below) is an indicator of how APU honors its roots, as it was designed to reflect the original power house (pictured left-above), but with all the modern advances in technology needed to serve customers today.

POWERING ANAHEIM FOR 125 YEARS

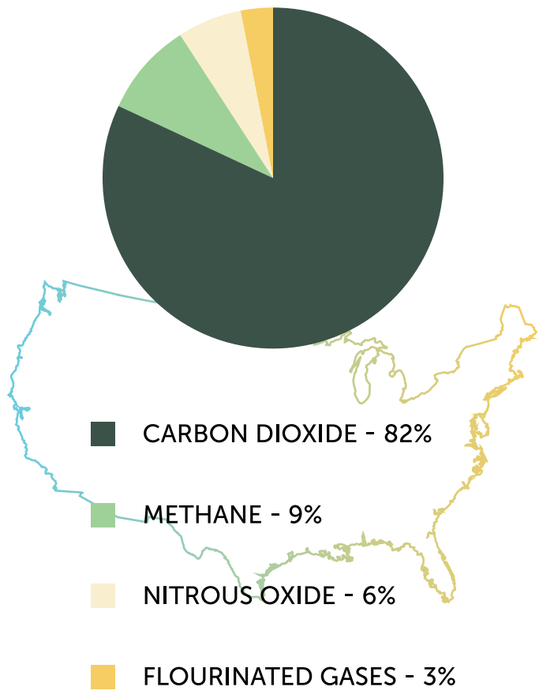
WHAT IS A GREENHOUSE GAS?

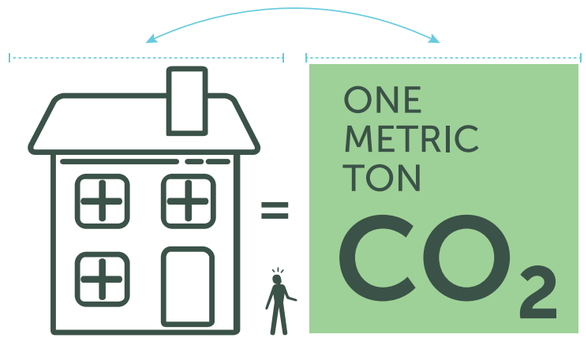
Gas that traps heat in the atmosphere is called greenhouse gas (GHG). The types of GHGs include: carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), and fluorinated gases.

- Carbon dioxide (CO_2) enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., manufacture of cement).
- Methane (CH_4) is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.
- Nitrous oxide (N_2O) is emitted during agricultural and industrial activities, combustion of fossil fuels and solid waste, as well as during treatment of wastewater.
- Fluorinated gases including hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic GHGs that are emitted from a variety of industrial processes.

Each GHG's impact on the environment is dependent on quantity, duration in the atmosphere, and strength of its impact.[1]

U.S. GREENHOUSE GAS EMISSIONS IN 2017

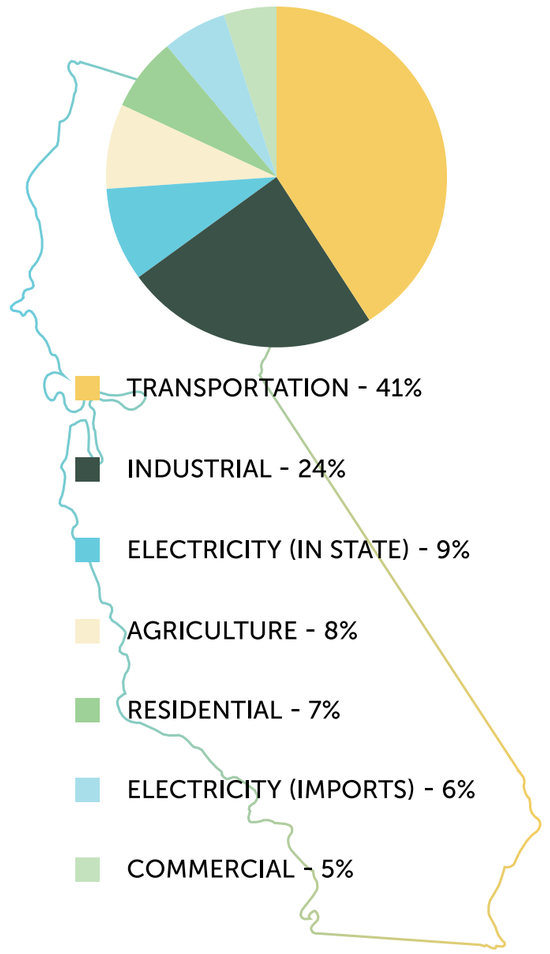


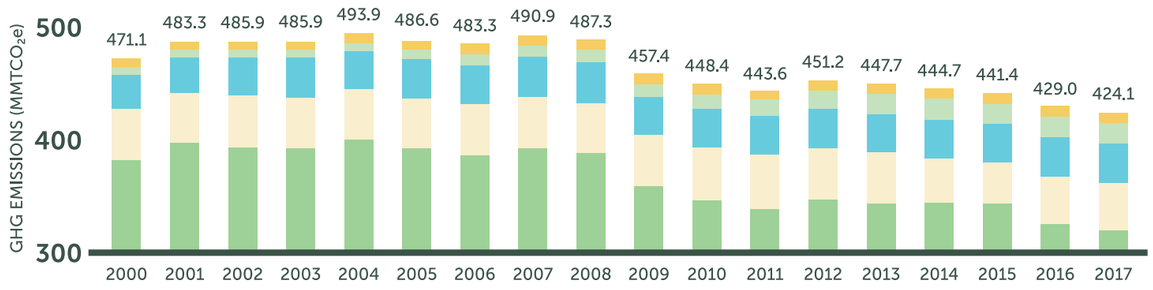


[1] *www.epa.gov/ghgemissions/overview-greenhouse-gases*

TOTAL CALIFORNIA EMISSIONS IN 2017

424.1 $MMTCO_2e$





WHERE DO GREENHOUSE GASES COME FROM?

The California Air Resources Board (CARB) tracks the state's GHGs by industrial sector. Since 2000, efforts to reduce GHGs have resulted in a declining trend of nearly 10%, with significant reductions in the generation of electricity. As utility power supplies continue to migrate towards renewable resources on their way to 100% clean energy portfolios by 2045, the declining trend will continue.

The most significant source of GHGs comes from the transportation sector, accounting for 41% of the state's GHG emissions.[2] California has developed policies to promote the adoption of electric vehicles (EVs) with a goal of 5 million zero-emission vehicles on the road by 2030.

Thoughtful planning and a holistic approach to reducing GHGs are necessary to achieve broader targets in California and throughout the United States.

[2] *ww2.arb.ca.gov/ghg-inventory-data*

"I would like to see more renewable energy, and clean air and water worldwide."

ARIELLE H.
Connelly H.S.

NOTABLE ACCOMPLISHMENTS *(2015—2020)*

Over the past five years, APU has partnered with customers on a variety of sustainability programs such as the 2019 OC Green Expo and Ride & Drive event, attended by 600 residents and offering 170 test drives of different models of EVs. Vendor booths featuring sustainability items and an educational solar car competition were also part of the festivities.

Nine schools participated in the first phase of APU's Solar for Schools Program that provided no-cost solar shade structures, with energy allocated towards a Green Power Discount Program that has helped over 600 income qualified residents benefit from renewable power.

APU's EV charger rebate helped to install chargers at a local affordable housing complex. Future plans are to develop an income qualified car-sharing program at affordable housing developments or community centers.

"Our world is a beautiful and precious place, and it is our job to keep it as healthy as possible for our generation and future generations to live in."

HANNAH T.
Loara H.S.

NOTABLE ACCOMPLISHMENTS *(2015—2020)*

APU developed the Sustainable Schools Award Program in 2019, in which schools are able to apply for recognition as a sustainable campus, and receive 30 laptops for student education. Schools highlighted water bottle filling stations that reduce bottled water use, upgrades to LED lighting, solar energy structures, and related STEM curriculum. The first two schools, Katella High School and Baden Powell Elementary School, were awarded in 2020.

Each Earth Day, APU partners with a local school to plant a shade tree and educate students on the importance of how trees absorb carbon dioxide and reduce air conditioning use. Students prepare speeches or songs to reinforce their classroom lessons and participate in a tree planting ceremony.

NOTABLE ACCOMPLISHMENTS *(2015—2020)*

During the midst of a multi-year drought, APU partnered with customers to meet a state mandate to reduce water usage by 3.3 billion gallons. Residents and businesses all pitched in and the goal was accomplished through watering restrictions, education, and reducing water waste at city facilities and local businesses.

Each year, APU recognizes residents and businesses who transform their gardens with drought-tolerant landscapes that feature California-native plants and drip irrigation. The Turf Replacement Rebate Program helps customers achieve their landscape transformations.

APU extended the reach of its Water Recycling Demonstration Facility by running purple pipe to a nearby park for irrigation in 2018. The recycling facility is in the heart of Downtown Anaheim and is used for median, park, and other outdoor irrigation with associated signage to educate customers.

"We must take care of what we are doing with our environment."

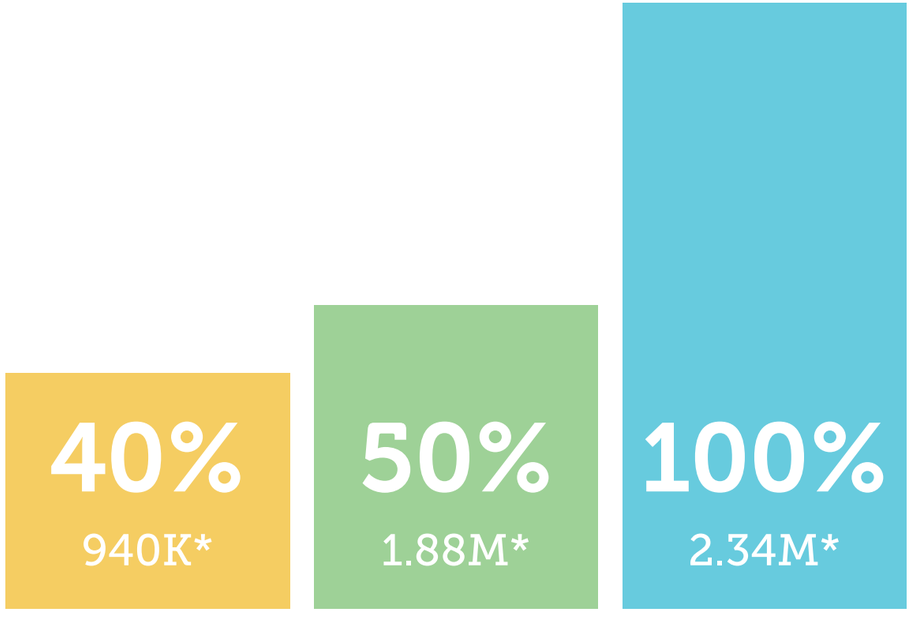
Leslie M.
Anaheim H.S.

GHG REDUCTIONS FROM POWER SUPPLIES

Passed in 2006, Assembly Bill 32 (AB 32) established comprehensive GHG reduction goals, and in 2018, Governor Brown signed Senate Bill 100 (SB 100) into law. SB 100 requires that retail electricity be carbon-free by 2045. Consistent with state legislation, APU's goals in achieving GHG reductions includes increasing renewable power supplies and reducing reliance on fossil fuel resources. APU utilizes fossil fuel power plants to integrate renewables in the near term, but over time will transition towards carbon-free resources.

In 2018, APU divested ownership of the San Juan Generating Station, a coal-fired power plant located in New Mexico. APU had a 50 Megawatt (MW) ownership stake in the plant. Further, in 2019, APU retired the Kraemer Power Plant. The Kraemer Power Plant (pictured below) was a 48 MW natural-gas resource used as a peaking plant to help integrate renewables during evening hours when solar production falls. With continued difficulty maintaining the unit due to limited availability of parts, APU ceased operations and is now in the process of decommissioning the plant.

GHG REDUCTIONS FROM POWER SUPPLIES



In 2015, the 2020 target of GHG emissions reduction from APU's power supply was 20% or 480,000 $MTCO_2e$. Since that time, APU has reduced its emissions by 40% or 940,000 $MTCO_2e$, doubling APU's target.

Future reductions will result from completing divestiture of coal in 2027, greater reliance on renewables and energy storage investments to help integrate growing intermittent renewables, while still relying on existing cleaner natural gas (natural gas emits about half the GHGs as coal) to provide a smooth transition.

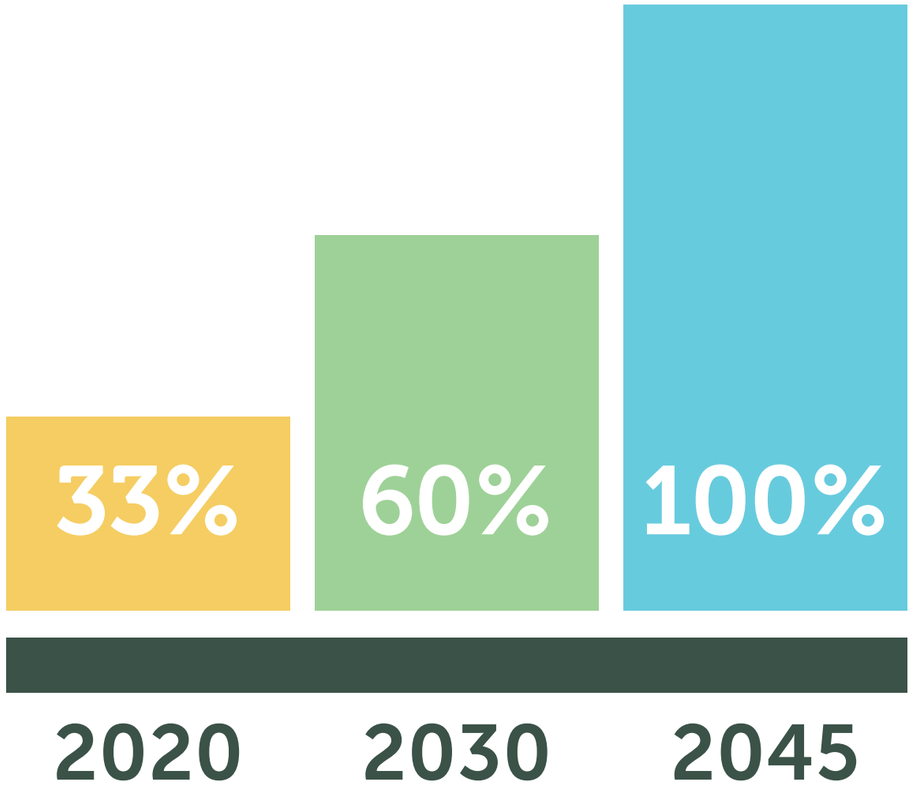
INVESTMENTS IN RENEWABLE POWER SUPPLIES

Before any state mandates were issued, APU began investing in renewable power supplies in 2006. While contractually obligated to remain in existing fossil fuel projects, the transition towards renewable power supplies continues through thoughtful procurement.

In 2014, APU invested in a methane capture power generation system at the Frank R. Bowerman Landfill in Orange County. This local resource provides 20 MW of power throughout the day, and is not subject to the intermittency of solar or wind.

In 2018, APU invested in a large-scale solar project in Riverside County; once online, 36 MW of clean energy will be produced. The power purchase agreement was structured to minimize cost exposure to wholesale market prices.

RENEWABLE & CARBON FREE RESOURCES

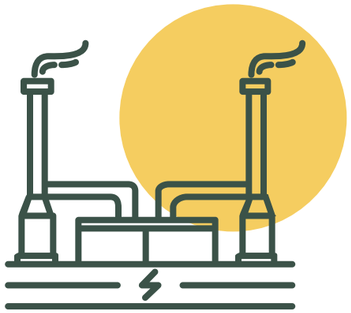


APU met its 2020 renewable energy procurement goal of 33%. Future investments will include a mix of renewables, along with other carbon-free resources such as large hydro from Hoover Dam in Nevada that does not have emissions, but is not considered a renewable resource by the state.

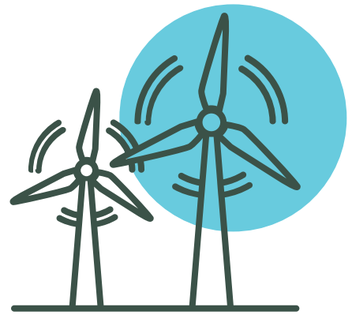
QUALIFYING RENEWABLE RESOURCES

Solar energy is derived from the sun's radiation. Photovoltaic panels generate electricity from sunlight.

Landfill gas energy captures methane from human waste and instead of flaring it into the environment, it drives a generator with emissions controls.



Geothermal energy is thermal energy generated from heat from underground water or rock that drives steam generators.



Wind energy is derived from the blades of a wind turbine. The wind turns the blades, which spin a shaft that is connected to a generator.

Biomass is from natural waste, such as woodchips from dead trees. The woodchips help to reduce wildfire risks and are used as fuel for a generator.

Small-scale hydro power qualifies as a renewable resource. Hydro power captures the flow of water to power a generator.

WATER CONSERVATION AND DROUGHT RESILIENCY

As the 2015 GHG plan was being written, California was experiencing a historic drought. The multi-year drought's immediate short-term conservation target set by the State of California was 20% by 2016 based on 2014's consumption.

Although the drought target was meant to be a short-term solution, Anaheim anticipated an increase in water consumption as the drought came to an end however, Anaheim continued to promote water conservation as a way of life in this new normalized environment.

Reducing the amount of water consumption per person corresponds to a reduction in energy to distribute water, and therefore contributes to the reduction of GHG emissions.

PER CAPITA WATER USE REDUCTION

APU exceeded its 2020 goal of 20% per capita water use reduction by achieving 30% which equates to 481,000 $MTCO_2e$ since 2015.

Future savings will come from continued conservation education, more stringent building standards, replacement of inefficient lawns and appliances, and seeking cost-effective methods to increase recycled water for non-potable uses.

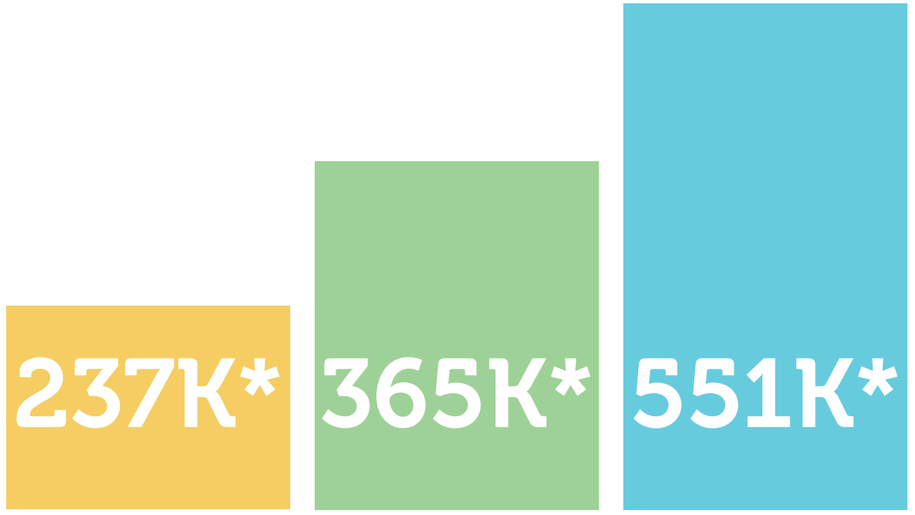
ENERGY EFFICIENCY

Energy efficiency results from a variety of sources in homes and businesses. Lighting upgrades to efficient LEDs were responsible for significant gains in energy reduction. And programs such as weatherization helped income qualified residents lower electric, water and natural gas usage through a partnership with SoCalGas.

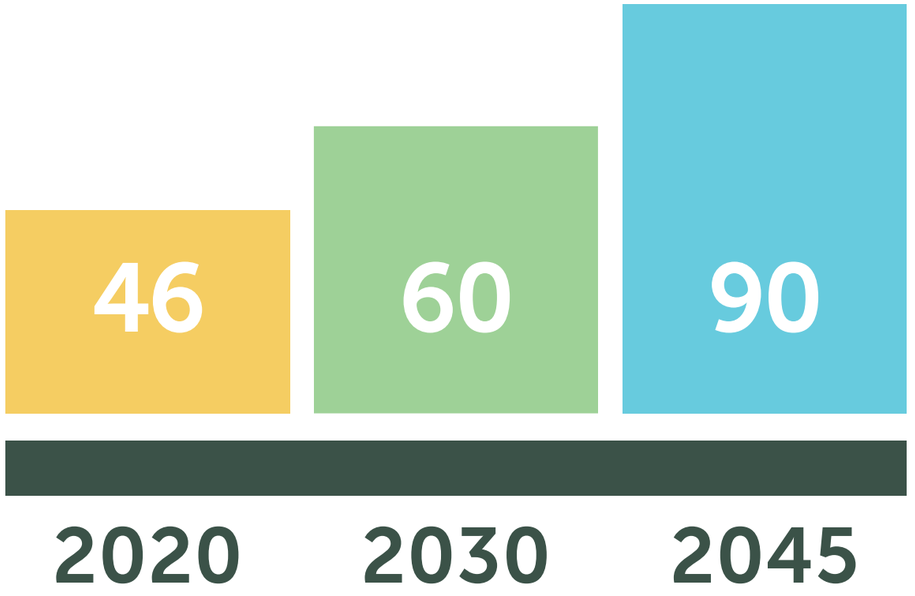
Through 2020, APU's cumulative energy savings from its conservation programs totaled 411,000,000 kilowatt-hours (kWh), which is equivalent to 237,000 $MTCO_2e$ reductions or the same amount of energy used by 61,500 homes.

As a part of those energy savings, APU has partnered with 46 private and public schools to conduct efficiency assessments at local campuses. The measures implemented by schools have resulted in 9,800 $MTCO_2e$ in GHG reduction. Each schools is eligible to receive a new assessment of their campus every 5 years to identify new efficiency measures.

ENERGY EFFICIENCY REDUCTION



NUMBER OF SCHOOL ENERGY ASSESSMENTS



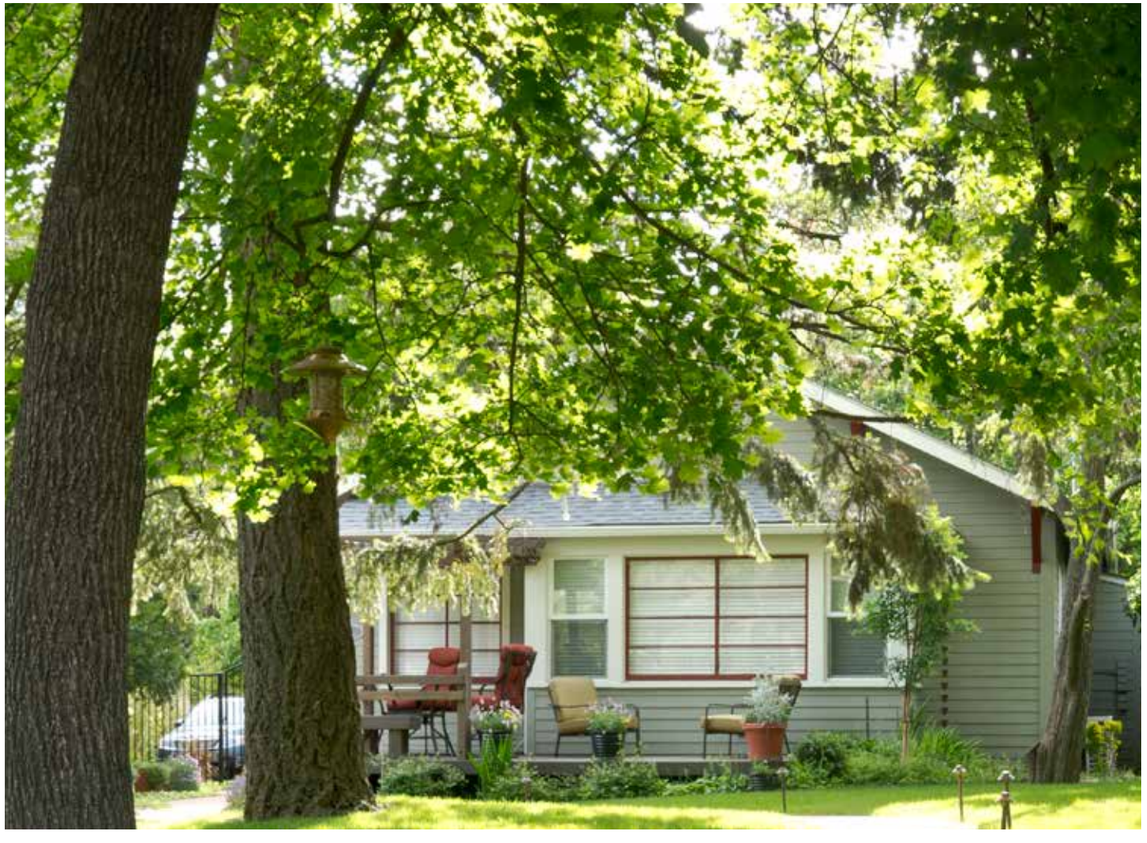
SHADE TREES

Shade trees provide valuable benefits to the environment. Not only do they absorb CO_2, they reduce the heat island effect and lower a building's need for air conditioning.

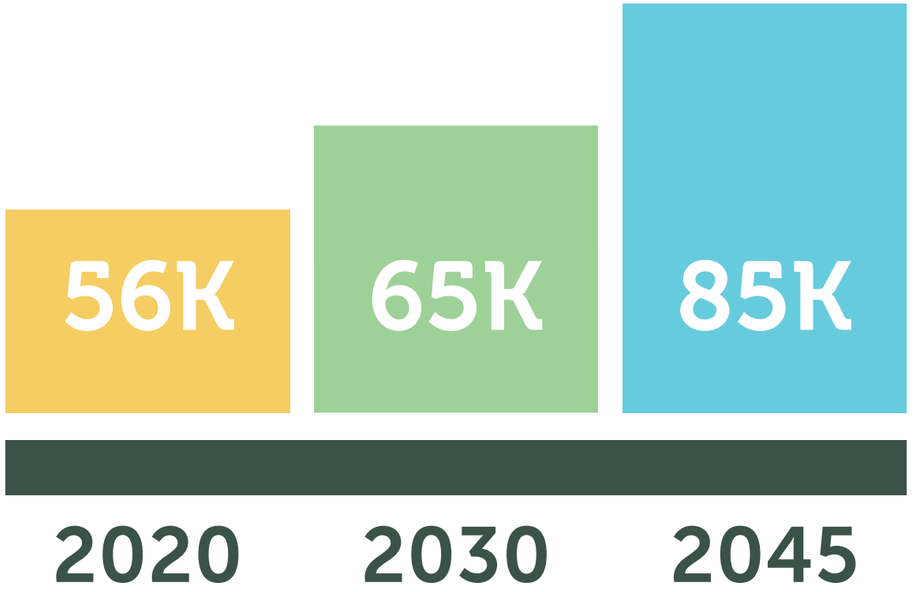
APU's TreePower program provides up to six shade trees per customers to help cool their properties, especially during hot Southern California summers.

Mature trees absorb between 43 to 88 pounds of CO_2 according to the U.S Department of Agriculture's Forest Service.

Schools, businesses, non-profits, and residents have participated in APU's TreePower program, enabling Anaheim to be recognized for its practices that protect and enhance America's urban forests.



CUMULATIVE NUMBER OF TREES PLANTED



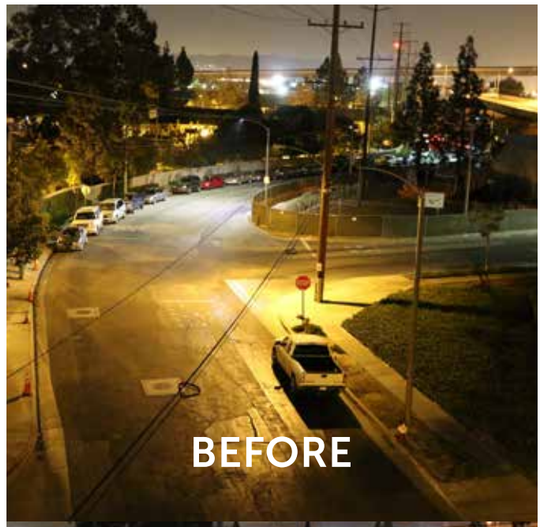
APU has planted about 56,000 since the inception of its TreePower program. The cumulative result is the sequestration of 35,000 $MTCO_2e$ to date.

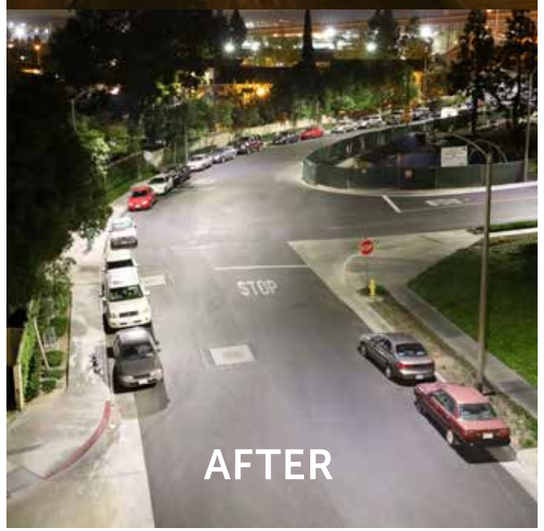
The TreePower program will continue to be promoted through educational programs, publications, and customer outreach at community events.

STREET LIGHTING

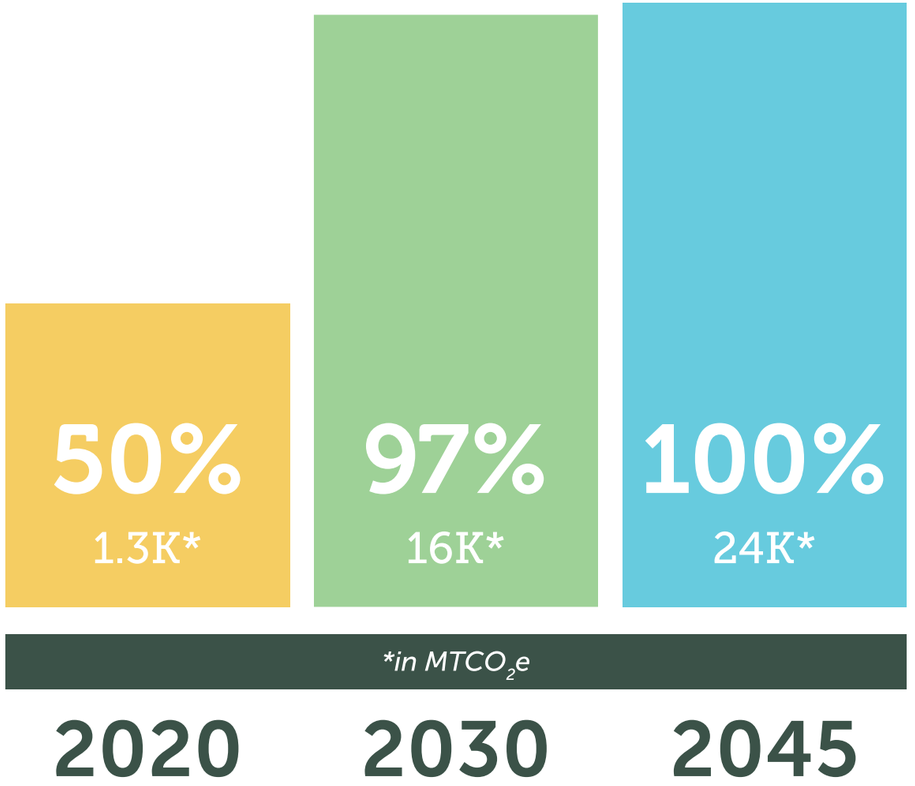
In 2020, APU is celebrating its 125th anniversary as an electric utility, and roadway lighting has been an important part of its service to the community. With the introduction of LED street lights, APU has been on a multi-year program to replace lighting that saves ~30% in energy use on average.

The majority of APU's 20,000+ lights are expected to be converted to LED over the next 3-4 years through its Capital Improvement Program.





% OF STREET LIGHTS CONVERTED TO LED



APU has replaced 50% of its roadway lights to LED. Replacements are prioritized through community input. Approximately 2.5 million kWh per year in energy savings are achieved, which is equivalent to 1300 $MTCO_2e$ reduction.

Resident requests for LEDs have been primarily to address improved visibility and safety concerns. APU staff has therefore accelerated LED implementation in areas of greatest need as confirmed by Anaheim Police Department and Code Enforcement.

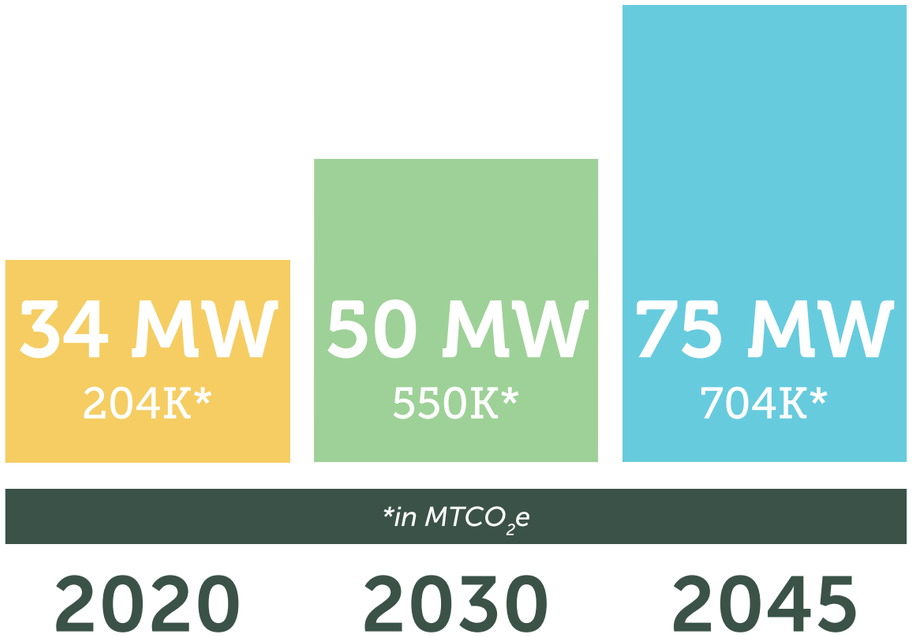
DISTRIBUTED SOLAR ENERGY SYSTEMS

In 2015, APU's goal was to support 27 MW of distributed solar installed in Anaheim. By 2020, about 34 MW has been installed, which is the equivalent of 204,000 $MTCO_2e$ in GHG reductions. The original 2030 goal of 37 MW has therefore been increased to 50 MW with a 75 MW goal in 2045.

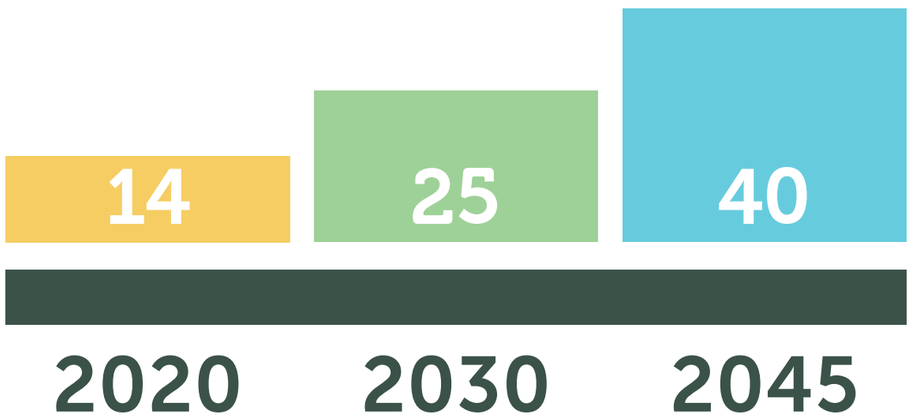
In 2017, APU established the Solar for Schools Program. The program was developed to facilitate implementation of solar energy shade structures at public school locations throughout Anaheim. Solar energy shade structures have multiple benefits, including generating clean, renewable energy to meet state mandates, providing shade structures for parking areas or lunch shelters for students, and educating students in Science, Technology, Engineering, and Mathematics (STEM) as it relates to solar power.

The 2020 target of 14 schools was met, and additional schools are being evaluated for the second phase of the Solar for Schools Program. Schools receive a license payment for the use of their properties, and the energy is used to support APU's Green Power Program for income qualified customers.

DISTRIBUTED SOLAR INSTALLED



NUMBER OF SOLAR STRUCTURES AT SCHOOLS



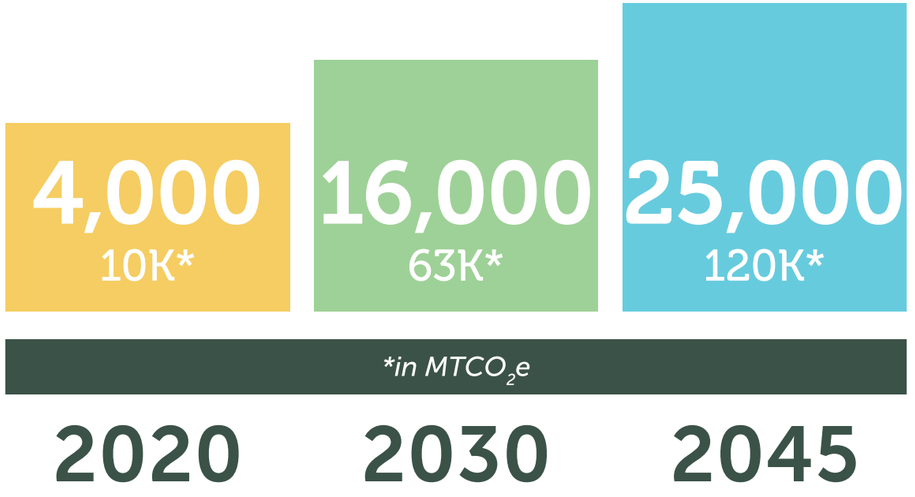
TRANSPORTATION ELECTRIFICATION TO IMPROVE AIR QUALITY

APU supports the transition from fossil fuels to electricity for transportation, as the renewable energy mix increases in California. In 2015, APU had a target of supporting 2,000 EVs registered in Anaheim by 2020 with many receiving rebates for home chargers. In 2020, there are already approximately 4,000 EVs, which equates to over 10,000 $MTCO_2e$ in GHG reductions.

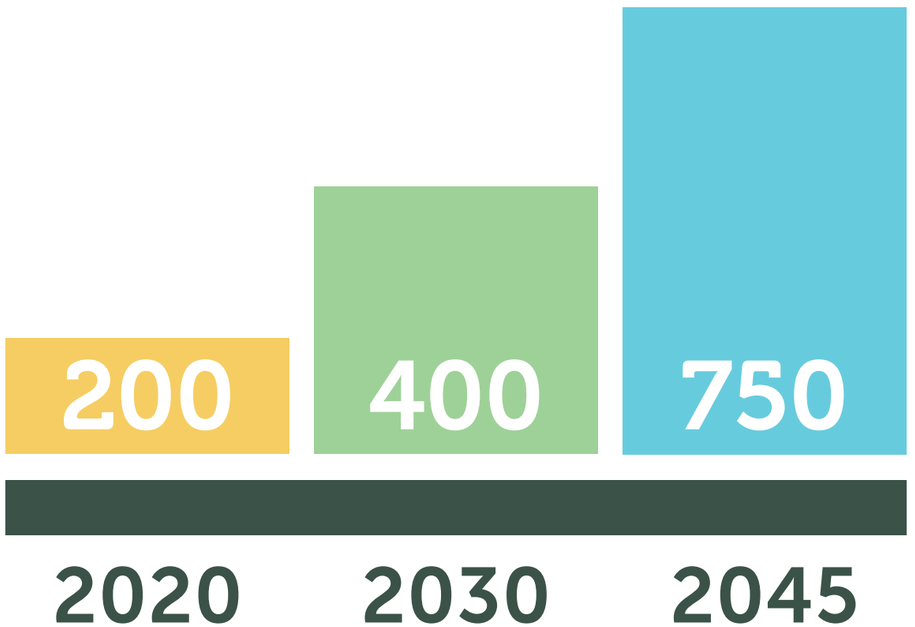
The 2030 goal has therefore been increased from 5,000 to 16,000 vehicles, with a 25,000 goal by 2045.

Additionally, a new metric has been added to support the installation of public access EV chargers. In 2020, there are approximately 200 public chargers, and APU has a rebate program that spurs investment in accelerating charging stations in the city, including at city facilities, commercial centers, hotels, and entertainment venues.

NUMBER OF EVs REGISTERED IN ANAHEIM



NUMBER OF PUBLIC ACCESS CHARGERS

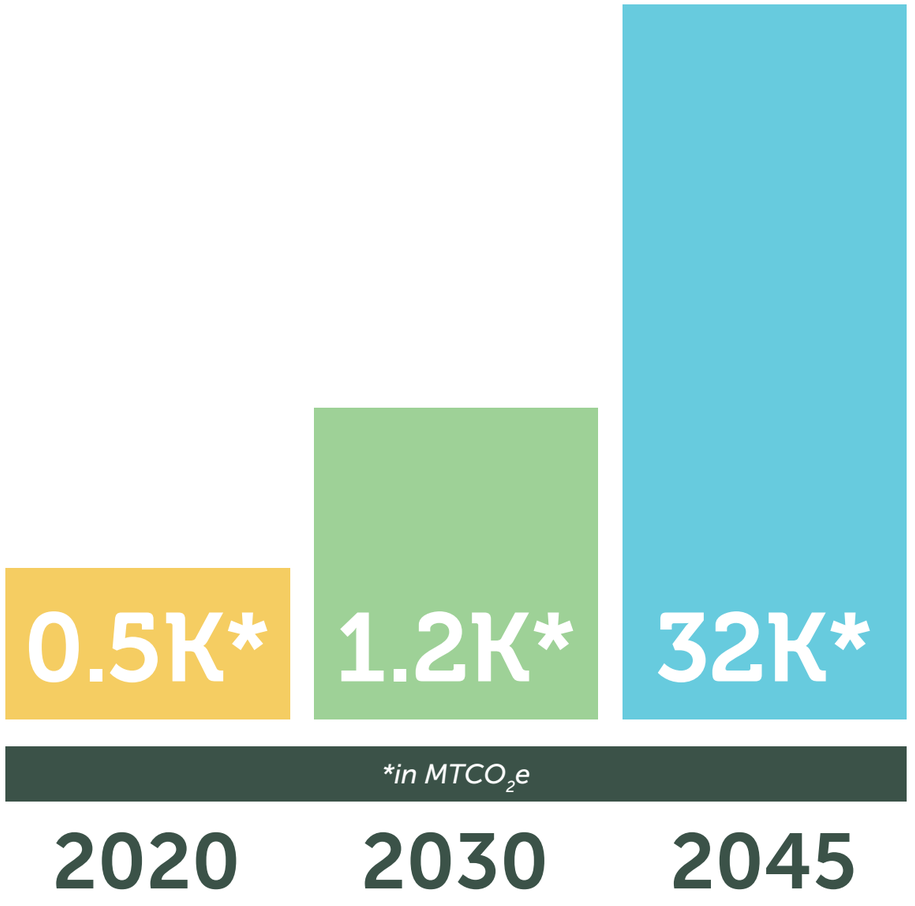


FLEET ELECTRIC VEHICLES

APU is transitioning its fleet to EVs for functions such as meter reading, pool vehicles, and safety inspections. EVs such as Chevrolet Bolts and Nissan Leafs have been utilized to date; however, EV options for larger vehicles such as bucket trucks, backhoes, and dump trucks are currently not as commercially viable as passenger vehicles.

APU is providing rebate assistance to help other city departments transition their passenger vehicles to EVs until the market for heavy duty vehicles materializes. Understanding that heavy duty vehicles are used for mutual aid and other purposes requiring refueling certainty, APU is collaborating with other utilities to push for all-electric or hybrid heavy duty operating equipment.

CITY FLEET GHG EMISSION REDUCTION



As of 2020, there are 30 EVs and hybrid vehicles in APU's fleet. This equates to 0.5 $MTCO_2e$ in GHG reduction.

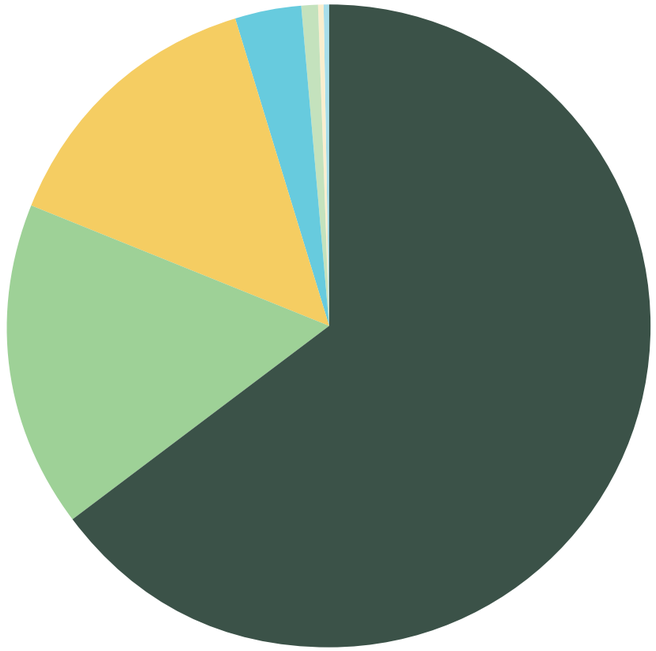
A city fleet rebate program was established in 2020 to encourage other departments to transition away from fossil fuel vehicles, where feasible. The program helps to make up the difference in cost for an equivalent EV.

SUMMARIZING APU'S ACCOMPLISHMENTS

"I want to see more people talking about how to help the environment and supporting ways in which to do so. Some examples would be to buy cars that use electricity instead of fossil fuels and solar panels in schools and households."

JENNA F.
Canyon H.S.

ANAHEIM PUBLIC UTILITIES CUMULATIVE MTCO$_2$e REDUCTIONS THROUGH 2020



Power Supply	940,000 MTCO$_2$e
Energy Efficiency	237,000 MTCO$_2$e
Solar Energy	204,000 MTCO$_2$e
Water Conservation	481,000 MTCO$_2$e
Electric Transportation	10,000 MTCO$_2$e
Shade Trees	35,000 MTCO$_2$e
Street Lights	1,300 MTCO$_2$e

APU cumulatively reduced GHG emissions by **1,908,300 MTCO$_2$e** through 2020 as detailed in this GHG Reduction Plan. The plan has guided the development of programs and initiatives to help the Anaheim community improve the local environment and contribute to statewide goals. It also complements citywide initiatives for additional sustainability initatives.

"Sustainability to me means we take care of our earth today so our future generations can take care of it tomorrow."

Vanessa M.
Loara H.S.


ANAHEIM
PUBLIC UTILITIES